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Master's Thesis

Analysis and Evaluation of an Agroterrorism Threat to the Czech Republic

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Objectives of thesis

The objective of this thesis is two-fold, first, to identify and assess the risk and threat of an agroterrorism attack in the Czech Republic, and second, to look into existing plans in place to mitigate and face agroterrorism threats and provide a list of recommendations for improvement if identified.

Methodology

This thesis first identifies the top targets that are most at risk for an agroterrorism attack based on series of factors such as ease of attack, wide-spread impact and potential disruption.

In order to provide a holistic assessment, separate attacks on each identified sector of livestock, crops, and water supply will be presented. First, an attack on the target will be outlined – this will include agents used, the first response, and immediate hazards; second, short to moderate-term potential consequences and response will be discussed, and finally, an evaluation of the current apparatus will be put forward, with recommendations if needed. A major part of the assessment will be comprised of interviews with experts in the field of Czech state security, agriculture, diplomacy and crisis planning.

The proposed extent of the thesis

70 – 90 pages

Keywords

agroterrorism, bioterrorism, terrorism, agriculture, crisis planning, threat assessment, security

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Recommended information sources

Adam G. (2006) SIGNIFICANT WAYS TO SPREAD PLANT VIRUS DISEASES IN AGRICULTURAL ECOSYSTEMS: IS AGROTERRORISM POSSIBLE?. In: Cooper I., Kühne T., Polishchuk V.P. (eds) Virus Diseases and Crop Biosecurity. NATO Security through Science Series. Springer, Dordrecht. https://doi.org/10.1007/978-1-4020-5298-9_4

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Declaration

I declare that I have worked on my master's thesis titled "Analysis and Evaluation of an Agroterrorism Threat to the Czech Republic" by myself and I have used only the sources mentioned at the end of the thesis. As the author of the master's thesis, I declare that the thesis does not break any copyrights.

In Prague on March 31, 2022 _____

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Analysis and Evaluation of an Agroterrorism Threat to the Czech Republic

Abstract

This master thesis focuses on the topic of agroterrorism, with the aim to provide a preliminary assessment of the agroterrorism threat to the Czech Republic. The theoretical portion first looks at the topic of terrorism, with focus on types, methods, history, and actors. The term agroterrorism is then defined and conceptualized with examples of historical incidents. Types of agroterrorism threats are outlined, followed by the response apparatus in place, with potential consequences and widespread impacts. Biological agents and diseases are classified and ranked by most probable threat.

The practical part of the master thesis then uses a risk assessment formula, as well as a probability-impact risk matrix, with inputs from experts in the field of agriculture and security to quantify the agroterrorism threat to the Czech Republic in relation to three sectors - an attack on the water supply, an attack on livestock and an attack on crops. The threat assessment also considers agriculture statistics such as production, consumption as well as self-sufficiency of the Czech Republic.

The discussion part leans heavily on the conducted interviews and applies the outputs into an evaluation of the impact of an agroterrorist attack on the Czech Republic from three angles – attack inside the country and impact abroad, attack inside the country and impact domestically, and third, an attack abroad and impact on the Czech Republic. Finally, recommendations on how to improve preparedness and combat an agroterrorism threat from the interviews and literature research are presented.

Keywords: agroterrorism, bioterrorism, terrorism, agriculture, food safety, crisis planning, threat assessment, risk assessment, security

Analýza a Vyhodnoceni Hrozby Agroterorsmu v České Republice

Abstrakt

Tato diplomová práce se zaměřuje na téma agroterorismu s cílem poskytnout předběžné zhodnocení agroteroristické hrozby pro Českou republiku. Teoretická část se nejprve zabývá tématem terorismu se zaměřením na jeho druhy, metody, historii a aktéry. Poté je definován a konceptualizován pojem agroterorismus s příklady historických incidentů. Jsou nastíněny typy agroteroristických hrozeb, následuje existující aparát reakce s možnými důsledky a rozsáhlými dopady. Biologické agens a nemoci jsou klasifikovány a seřazeny podle nejpravděpodobnější hrozby.

V praktické části diplomové práce je pak pomocí vzorce pro hodnocení rizik a také matice rizik s přispěním odborníků z oblasti zemědělství a bezpečnosti kvantifikována agroteroristická hrozba pro Českou republiku ve vztahu ke třem sektorům - útok na vodu, útok na hospodářská zvířata a útok na plodiny. Hodnocení hrozeb zohledňuje také statistické údaje o zemědělství, jako je produkce, spotřeba a také soběstačnost České republiky.

Diskusní část se opírá do značné míry o provedené rozhovory a výstupy aplikuje do hodnocení dopadů agroteroristického útoku na Českou republiku ze tří hledisek - útok uvnitř země a dopad v zahraničí, útok uvnitř země a dopad v tuzemsku, a za třetí, útok v zahraničí a dopad na Českou republiku. Na závěr jsou uvedena doporučení, jak zlepšit připravenost a bojovat proti agroteroristické hrozbě, která vyplynula z rozhovorů a literární rešerše.

Klíčová slova: agroterorismus, bioterorismus, terorismus, zemědělství, bezpečnost potravin, krizové plánování, hodnocení hrozeb, hodnocení rizik, bezpečnost

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List of Abbreviations

ADIS	EU Animal Diseases Information System
APHIS	Animal and Plant Health Inspection Service
EPPO	European and Mediterranean Plant Protection Organization
BIS/SIS	Security Information Service of the Czech Republic
BWC	Biological Weapons Convention, or Biological and Toxin Weapons Convention
CBRN	Chemical, Biological, Radioactive and Nuclear
CDC	Center of Disease Control
CR	Czech Republic
CZSO	Czech Statistical Office
DOD	US Department of Defense
EFSA	European Food Safety Authority
EU	European Union
FBI	Federal Bureau of Investigation
FMD	Foot and Mouth Disease
FRS CR and IRS	Fire Rescue Service of the Czech Republic and the Integrated Rescue System
HOPKS	Economic Measures for Crisis Situations
IPPC	International Plant Protection Convention

MF	Ministry of Finance of the Czech Republic
MFA	Ministry of Foreign Affairs of the Czech Republic
MH	Ministry of Health of the Czech Republic
MInt	Military Intelligence of the Czech Republic
MJ	Ministry of Justice of the Czech Republic
MoI	Ministry of Interior of the Czech Republic
NATO	North Atlantic Treaty Organization
NCBI	National Center for Biotechnology Information
NCOC	National Centre Against Organized Crime
NPPO	National Plant Protection Organization
NSA	National Security Authority of the Czech Republic
NSC	National Security Council of the Czech Republic
OIE	World Organisation for Animal Health, formerly the Office International des Epizooties
RASFF	Rapid Alert System for Food and Feed
STC IZS	Integrated rescue system type activity plan
UZSI/ OFRI	Office for Foreign Relations and Information of the Czech Republic

Introduction

Following the attacks of September 11, 2001, terrorism has gained the potential to exploit vulnerabilities and focus on targets with massive effect. The world is evolving, and threats are evolving as well. Hybrid warfare is the new norm with the sophistication of cyber threats, disinformation campaigns, in addition to unconventional targets and methods. Agroterrorism, which is not very well known, and is a fairly recent addition into agricultural vocabulary, is a subset of bioterrorism. It is the deliberate introduction of an animal or plant disease for the purpose of generating fear, causing economic losses, or undermining social stability.

Although there has officially not been an act of agroterrorism in the Czech Republic, nor in the EU, not counting criminal cases of food and production poisoning or manipulation, the threat does exist and is very real. The simple mathematics of the importance of agriculture cannot be understated. Within the EU, agriculture and food sectors combine for 15 million jobs, or about 8.3% of total employment, as well as 4.4% of the GDP.[1] The EU is the world's largest producer of food and beverages. Any attack on this sector would carry massive consequences.

Almost by definition, agriculture and food supply are vulnerable to any disruption or disturbance; and represent appealing targets. An attack on the food supply of a state is as old as civilizations and conflict itself. In early history, attacks on water supplies, as well as siege tactics to wait out an enemy were common tactics. As this thesis will lay out, perhaps it is why agroterrorism as a tactic targets and attacks not only the very economic stability of a country, but also can cause social unrest, and loss of confidence in the government.

Although the consequences of a successful agroterrorism attack could be devastating, rather little attention is given to the threat. There is credible evidence of a list of pathogens and agricultural objectives targeting livestock, crops and the water supply found in an Al Qaeda hideout in 2002.[2] A major agroterrorist attack would have wide-spread repercussions. Just in the economic sector alone, any attack would have an impact on suppliers, distributors,

[1] An assessment of the causes and consequences of agricultural land abandonment in Europe | University of Stirling, n.d. https://www.stir.ac.uk/research/hub/publication/547344

[2] Agroterrorism: Threats to America's Economy and Food Supply [WWW Document], n.d. . FBI: Law Enforcement Bulletin. URL https://leb.fbi.gov/articles/featured-articles/agroterrorism-threats-to-americas-economy-and-food-supply (accessed 3.4.22).

transporters, stores, and restaurants. If an agent used would be harmful to humans, the health sector would also become impacted as seen with the ongoing COVID-19 pandemic.

This thesis looks to assess the risk level of a threat of an agroterrorist attack on the Czech Republic. Risk is estimated and assessed through a risk equation as well as risk matrix, using inputs from interviews with experts. Three sectors will be analyzed – water, livestock, and crops. The potential impact on the Czech Republic will then be outlined, followed by a list of recommendations identified.

1. Objectives and Methodology

1 Objectives

The objective of this thesis is two-fold, first, to identify and assess the risk and threat of an agroterrorism attack in the Czech Republic, and second, to assess the impact on the Czech Republic if an attack were to take place, with potential impacts outlined, and a list of recommendations provided for improvement if identified. Several specific questions that this thesis will attempt to answer are the following:

- Is there an acute and real agroterrorism threat facing the Czech Republic?
- What is the threat level of such a threat?
- What are the top targets within different sectors, or which targeted sectors would cause the most impact?
- Is the Czech Republic ready to face an agroterrorism threat, and are there plans in place?

2 Methodology

The theoretical part of the thesis first introduces the topic of terrorism as a whole, with focus on the different types, methods, actors; as well as the history and statistics of terrorism. Next, the term bioterrorism is defined, as well as it's subset – agroterrorism. The subject is conceptualized with examples of historical incidents, types of agroterrorism threats, as well as potential actors, agents used, and potential targets. The response apparatus in place is looked at, with potential consequences and widespread impacts drawn out.

In the practical part, the thesis first identifies potential targets that are most at risk for an agroterrorism attack by presenting an overview of likely targets through agriculture statistics (shares, production, consumption, trade, self-sufficiency, geographic location). The above information and statistics are used from the Czech Statistical Office (CZSO), and span from 1989-2020 to show a more long-term view. Second, a risk assessment is conducted based on a series of factors such as ease of attack, wide-spread impact, vulnerability, and potential disruption. This is used to estimate threat level, criticality, and vulnerability of a target. Calculating risk using this methodology will help to determine and summarize risk in an equation, and by extension in numerical form, where it can be used to prioritize certain threats, highlight serious risk and pinpoint what to best focus on in prevention and planning,

allowing for more efficient decision-making. Overall, the risk assessment process allows for a complete overview of risk of a particular threat to a particular sector. The result of the assessment allows risk to be diluted down into a single numerical rating.

Methodologically, in order to properly identify the top targets that are most at risk for an agroterrorism attack as well as what targets would cause the most disruption, the risk assessment will be presented in a holistic way, with separate attacks on each identified sector of livestock, crops, and water supply. An attack on the target will be outlined - this will include potential agents used, followed by the risk assessment with determinations of short to moderate-term potential consequences, vulnerability, and likelihood of attack.

The risk assessment will be calculated using the below equation from the United States Department of Justice: [3]

$$Risk = Threat \times Vulnerability \times Criticality$$

In the equation, risk is defined as the extent to which a target is exposed to a hazard or danger; threat is the probability or likelihood of attack, vulnerability is how vulnerable the target is to attack, and criticality is the potential impact of an incident. Using this methodology to determine and summarize risk in an equation, as well as in numerical form, it can be used to prioritize certain threats, highlight serious risk, and pinpoint what to best focus on in prevention and planning, allowing for more efficient decision-making. Overall, the risk assessment process allows for a complete overview of risk of a particular threat to a particular sector. As mentioned, the result of the assessment allows risk to be diluted down into a single numerical rating.

In addition to the risk equation, a probability-impact risk matrix will also be presented based using the formula: [4]

$$Risk = Probability \times Impact$$

The intersection of the probability and impact values determine the risk level. The matrix is shown in color form, allowing for quick recognition of when a risk rating level

[3] Assessing and Managing the Terrorism Threat | Office of Justice Programs [WWW Document], n.d. URL https://www.ojp.gov/ncjrs/virtual-library/abstracts/assessing-and-managing-terrorism-threat (accessed 3.18.22).

[4] Kassem, M., Khoiry, M.A., Hamzah, N., 2019. Using probability impact matrix (PIM) in analyzing risk factors affecting the success of oil and gas construction projects in Yemen. International Journal of Energy Sector Management 14, 527–546. https://doi.org/10.1108/IJESM-03-2019-0011

urges more action, or more preparedness, and when the threat does not need additional resource allocation. This is used to essentially prioritize risk and focus on the highest threat.

Following these assessments, an evaluation and discussion of the results will be presented, heavily leaning on interviews from experts in the security and agricultural field, with input from diplomats, intelligence officers and crisis management experts.

The interviews were conducted with:

Ing. Petr Ježek

- Works for the Ministry of Foreign Affairs. Currently the Agriculture Attaché to the Embassy of the Czech Republic in Washington DC.

Luděk Moravec, MSc.

- Works for the Ministry of Foreign Affairs. Currently the Science and Technology Attaché to the Embassy of the Czech Republic in Washington DC. Previous work experience in the security field, as well as the Czech Ministry of Agriculture.

PhDr. Jan Paďourek

- Security expert specializing in intelligence services and security threats, former Deputy Director for Analytics and Foreign Relations of the Office for Foreign Relations and Information (ÚZSI), also works at the Police Academy of the Czech Republic in Prague.

The interviews were managed in open-ended question, and discussion form, allowing the topics discussed to naturally flow. Much of the output was then used in the discussion portion of this thesis with the main focus being the assessment of the agroterrorism threat to the Czech Republic, as well as the impact on the Czech Republic if an attack were to take place, with potential impacts outlined from three main angles – attack inside the Czech Republic and impact abroad, attack inside the Czech Republic and impact domestically, and third, an attack abroad and impact on the Czech Republic. Lastly, the current apparatus is looked at, and a list of recommendations provided for improvement if identified.

2. Literature Review

2.1 Definition of Terrorism

2.1.1 Origin and History

The literal term “terrorism” is derived from the French word “terrorisme”, from the Latin word “terror” implying fear or dread, which itself is from the Latin verb “terrere” meaning to threaten or frighten.[5] The first mention of the term in an academic setting appeared in a French dictionary in 1694, defining the word terreur as "a great fear, a violent outrage of the human soul caused by the performance of images of pain." [6]

2.1.2 Lack of Consensus

Currently, there are over 100 different definitions of terrorism across countries, organizations, agencies, and scholars.[7] There is no consensus definition mainly because terrorism is so emotionally and politically intertwined.[8] Even within the United States government, the State Department, Department of Defense (DoD), and the FBI each have different definitions of terrorism, each tailored to their views and scope of work.[9]

The State Department defines terrorism as ‘Premeditated, politically motivated violence perpetuated against noncombatant targets by sub national groups or clandestine agents, usually intended to influence an audience’[10]; the U.S. Department of Defense defines terrorism as ‘the unlawful use of, or threatened use of, force or violence against individuals

[5] *The History of the Word “Terrorism.”* https://www.merriam-webster.com/words-at-play/history-of-the-word-terrorism.
[6] “Origins Of the Term Terrorism.” Crime Museum, https://www.crimemuseum.org/crime-library/terrorism/origins-of-the-term-terrorism/.
[7] Bruns, V., Walter, C., 2004. Defining Terrorism in National and International Law, in: Walter, C., Vöneky, S., Röben, V., Schorkopf, F. (Eds.), Terrorism as a Challenge for National and International Law: Security versus Liberty?, Beiträge Zum Ausländischen Öffentlichen Recht Und Völkerrecht. Springer Berlin Heidelberg, Berlin, Heidelberg, pp. 23–43. https://doi.org/10.1007/978-3-642-18896-1_2
[8] Record, J., 2003. BOUNDING THE GLOBAL WAR ON TERRORISM. Strategic Studies Institute, US Army War College.
[9] Terrorism Definitions | Department of Emergency and Military Affairs [WWW Document], n.d. URL https://dema.az.gov/army-national-guard/military-museum/publications/terrorism-definitions (accessed 3.1.22).
[10] ibid

or property to coerce and intimidate governments or societies, often to achieve political, religious or ideological objectives[11]; and the FBI defines terrorism as 'the use of serious violence against persons or property, or the threat to use such violence, to intimidate or coerce a government, the public, or any section of the public in order to promote political, social or ideological objectives.'[12]

As seen and mentioned, even the fact that there are differences in three major US counter terrorism agencies shows the complexity of defining terrorism. The main alterations stem from the various angles each agency focuses on and views– does there have to be actual violence, or can just threat of violence constitute terrorism?[13] Is terrorism used to archive an objective, or to promote it? To further help understand the intricacy, it is useful to think about terrorism as three different things: a tactic, a legal term, and a political label.[14]

When viewed as a tactic, terrorism is not unique to a single group or ideology – any group is free to use it. Thus, the actual threat of violence cannot be stopped, the actual act of violence can though, through prevention. Terrorism as a tactic does not look to directly impact the whole of the enemy, but rather attack something that has meaning or an influence over the audience, creating psychological fear and uncertainty.[15] This is the perfect example of terrorism in the recent past. The groups are not able to fight with their adversaries on the conventional battlefield, so they take the fight to a soft target creating fear among the civilian audience. Due to this, terrorism is practically unstoppable – they need to get it right once, while counterterrorism needs to get it right all the time.

Viewing terrorism as a legal term brings up the curious case that terrorism carries a specific threshold for it to be classified as such. There are specific circumstances and criteria that must be met to allow individuals to be prosecuted under terrorism law.[16] This is one of

[11] ibid
[12] ibid
[13] Terrorism as Controversy: The Shifting Definition of Terrorism in State Politics, 2019. . E-International Relations. URL https://www.e-ir.info/2019/09/24/terrorism-as-controversy-the-shifting-definition-of-terrorism-in-state-politics/ (accessed 3.1.22).
[14] ibid
[15] Schmid, A.P., 2012. The Revised Academic Consensus Definition of Terrorism 6, 2.

[16] Refugees, U.N.H.C. for, n.d. Refworld | Addressing Damage, Urging Action. Report of the Eminent Jurists Panel on Terrorism, Counter-Terrorism and Human Rights [WWW Document]. Refworld. URL https://www.refworld.org/docid/499e76822.html (accessed 3.1.22).

the main reasons why authorities are always careful not to label an incident as terrorism right away.

Lastly, when terrorism is viewed as a political label, it immediately brings on negative connotations and makes the landscape very subjective. Politicians use the term for personal gain to convince an audience that certain actions are necessary and need support.[17]

Overall, it can be argued that the term terrorism is mainly a buzz word – one that has little value in describing events or perpetrators. Among the vast net that encompasses the term "terrorists", they all have different personalities, motives, MOs, and agendas. Terrorist or terrorism neither defines the person nor the act, and is insufficient when trying to understand the phenomena. The Mujahedeen in the 1980's was lauded in the west as "freedom fighters" when they fought against the Soviets. Their motivations and personalities have not changed since that time, yet they have been rebranded as pure evil. In a vacuum, they are acting rationally towards a specific goal, they simply have a different rationale than used in conventional warfare.

2.1.3 Definition of Terrorism

Nevertheless, one of the most common definitions of terrorism is "planned, deliberate, and politically motivated violence against non-participants in order to achieve its objectives. Unlike organized crime, its direct goal is not financial gain."[18]

Likewise, in 1980, a popular definition of terrorism in the US Code of Federal Regulations defined terrorism as "the unlawful use of force and violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political or social objectives."[19]

In addition to this, there are several more popular characteristics that help with the definitions debated on by scholars as according to Bruce Hoffman.[20] He suggests

[17] ibid
[18] Organized Crime Module 1 Key Issues: Similarities & Differences [WWW Document]. URL //www.unodc.org (accessed 3.2.22).
[19] Terrorism 2002/2005 [WWW Document], n.d. . Federal Bureau of Investigation. URL https://www.fbi.gov/stats-services/publications/terrorism-2002-2005 (accessed 3.1.22).
[20] Hoffman, B., 2006. Inside Terrorism, Columbia Studies in Terrorism and Irregular Warfare Series. Columbia University Press.

differentiating terrorists and terrorism from other criminals and crimes, ultimately settling on terrorism as something:

- Ineluctably political in aims and motives;
- Violent – or, equally important, threatens violence;
- Designed to have far-reaching psychological repercussions beyond the immediate victim or target;
- Conducted either by an organization with an identifiable chain of command or conspiratorial cell structure (whose members wear no uniform or identifying insignia) or by individuals or a small collection of individuals directly influenced, motivated, or inspired by the ideological aims or example of some existent terrorist movement and/or its leaders; and
- Perpetrated by a subnational group or nonstate entity.[21]

Other scholars, like Rhyl Vallis, agreed with this, and further concluded that most of the formal definitions of terrorism, albeit different, do have some common characteristics: a fundamental motive to make political/societal changes; the use of violence or illegal force; attacks on civilian targets by 'nonstate'/'subnational actors'; and the goal of affecting society.[22]

This conclusion can also be seen in the listing of Kathleen Blee's three components of terrorism:

1. Acts or threats of violence;
2. The communication of fear to an audience beyond the immediate victim, and;
3. Political, economic, or religious aims by the perpetrator(s).[23] [24]

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[21] Ibid

[22] Rhyll Vallis, Yubin Yang, Hussein A. Abbass, Disciplinary Approaches to Terrorism: A Survey, University of South Wales, p. 7. For similar surveys see also: Hoffman, Bruce Inside terrorism, 2 ed. Columbia University Press, 2006, p. 34; and Alex Schmid, Statistics on Terrorism: The Challenge of Measuring Trends in Global Terrorism" in Forum on Crime and Society, v. 4, N. 1-2 (2004) pp. 52-53

[23] Ibid

[24] BLEE, K.M., 2007. Women and organized racial terrorism in the United States, in: Female Terrorism and Militancy. Routledge.

Lastly, Boaz Ganor, the director of the International Policy Institute for Counterterrorism in Herzliya, Israel, came up with perhaps arguably the best list of why it is important to have a common international understanding as to what constitutes "terrorism": [25]

1. “Developing an effective international strategy requires agreement on what it is we are dealing with, in other words, we need a definition of terrorism.
2. International mobilization against terrorism... cannot lead to operational results as long as the participants cannot agree on a definition.
3. Without a definition, it is impossible to formulate or enforce international agreements against terrorism.
4. Although many countries have signed bilateral and multilateral agreements concerning a variety of crimes, extradition for political offences is often explicitly excluded, and the background of terrorism is always political.
5. The definition of terrorism will be the basis and the operational tool for expanding the international community's ability to combat terrorism.
6. It will enable legislation and specific punishments against those perpetrating, involved in, or supporting terrorism, and will allow the formulation of a codex of laws and international conventions against terrorism, terrorist organizations, states sponsoring terrorism, and economic firms trading with them.
7. At the same time, the definition of terrorism will hamper the attempts of terrorist organizations to obtain public legitimacy and will erode support among those segments of the population willing to assist them (as opposed to guerrilla activities).
8. Finally, the operational use of the definition of terrorism could motivate terrorist organizations, due to moral and utilitarian considerations, to shift from terrorist activities to alternate courses (such as guerrilla warfare) in order to attain their aims, thus reducing the scope of international terrorism.”[26]

[25] Boaz Ganor, Defining Terrorism: Is One Man's Terrorist Another Man's Freedom Fighter?(Aug. 1998), at http://www.ict.org.il/articles/define.htm.

[26] ibid

2.1.4 European Union Definition

Moving onto the definitions set by organizations and countries, the European Union originally defined terrorism for legal and official purposes in Art. 1 of the Framework Decision on Combating Terrorism (2002)[27]; it currently defines terrorism in Article 3 of the Directive on Combating Terrorism (2017)[28]. "The directive provides an exhaustive list of serious offences that EU countries must classify as terrorist offences in their national law when they are committed or there is a threat to commit them for a particular terrorist aim.

Terrorist aims are described as any of the following:

- seriously intimidating a population;
- unduly compelling a government or an international organization to perform or abstain from performing any act;
- seriously destabilizing or destroying the fundamental political, constitutional, economic, or social structures of a country or an international organization." [29]

Similarly, especially following the 9/11 attacks, as well as complying with the European Union, the Czech Republic also had to respond to the definition of terrorist.[30] In the Czech Republic, a "terrorist act" is a set of listed acts that can, by their nature seriously jeopardize the operation of a particular state.[31] Under Czech national law, these are acts committed with the intention to:

- Seriously intimidate the population
- Improperly induce a government or international organization to act or not in concrete steps; seriously destabilize or destroy basic political, constitutional, or economic the social structure of the country or international organization, namely:
- an attack on human lives that can cause death;
- attacks on the psychological integrity of persons;

Directive (EU) 2017/541 of the European Parliament and of the Council of 15 March 2017 on combating terrorism and replacing Council Framework Decision 2002/475/JHA and amending Council Decision 2005/671/JHA, 2017. , OJ L.

[28] ibid

[29] ibid

[30] Definice pojmu terorismus - Ministerstvo vnitra České republiky [WWW Document], n.d. URL https://www.mvcr.cz/clanek/definice-pojmu-terorismus.aspx (accessed 3.1.22).

[31] ibid

- kidnapping or hostage-taking;
- causing extensive government or public destruction equipment, transport systems, infrastructure equipment, fixed platforms on the continental shelf, public places or endangering human lives or endangering consequence of a serious economic loss;
- occupation of aircraft, ships or other means of public transport or transport of goods;
- Production, holding, procurement, transport, delivery, or use of nuclear or chemical weapons or explosives biological in nature, as well as research or development work on these weapons;
- release of these dangerous substances into free circulation, by starting fires, explosions, or floods which the course threatens human lives;
- interruption or interruption of water, electricity, or other basic resources, which can also endanger human lives. [32]

2.1.5 Definition for this Thesis

With all these definitions and findings put together, the final definition of terrorism for this thesis must include some sort of political violence in the greater context of an asymmetrical conflict, in addition to the action being designed to induce terror and fear through destruction of noncombatant targets. The acts are meant to send a message with the purpose to achieve the maximum publicity to influence the targeted audience in order to reach political goals and/or desired long-term end states.

Due to the aforementioned realities, and desire to look at the agroterrorism threat in the Czech Republic, it is very important to provide a definition for terrorism that this thesis will adhere to. This is also particularly important due to the fact that in order for a state apparatus to properly function and fight terrorism, it must first define and identify the threat, even if working with several definitions at once. For this thesis, the definition of terrorism will be in line with the definition provided by the Ministry of the Interior of the Czech Republic that reads that terrorism is "planned, deliberate, and politically motivated violence against non-participants, serving to achieves the set goals." [33]

[32] ibid
[33] Definice pojmu terorismus - Ministerstvo vnitra České republiky [WWW Document], n.d. URL https://www.mvcr.cz/clanek/definice-pojmu-terorismus.aspx (accessed 3.1.22).

2.2 History of Terrorism: Waves

When studying a phenomenon like terrorism through history, for some scholars, it is preferable to divide terrorism into waves. In their work, Foltin and Rehak do just this, dividing into five waves[34] - The first wave is the historical wave up until the 17th century; second, the nationalist wave from the 18th century to 1913; third, the war wave encompassing both world wars until 1945; fourth, the Cold War wave spanning until 1989; and lastly the Cold Peace wave from 1990 until present day.[35]

Other scholars such as David Rapoport also convey the history of terrorism through waves but divide the history a little bit differently. Rapoport's work is one of the most influential looks in terrorism studies; he introduces four consecutive waves with individual energy drives– each with a major event, signature tactics and weapons before cumulating and shifting to another wave starting with modern terrorism. [36] The four waves are: the Anarchist wave (1878–1919), the Anti-Colonial wave (1920s–early 1960s), the New Left wave (mid-1960s–1990s), and the Religious wave (1979–present day).[37]

2.2.1 Pre-historic/Ancient Terrorism

Wherever there is a political power struggle taking place, there is also terrorism present - especially in the ancient world as evidenced by political assassinations, decimation of the enemy, genocides, and massacres. Among these are the murder of the people of Jericho, the genocide of Carthage, the crucifixion of participants in the Spartacist uprising, the massacre of the Jewish population following an uprising, and the assassinations of King Philip of Macedonia, Cesar, and Nero.[38]

One of the very first instances of "actual" terrorism appear in the 1st century BC in Jerusalem, when a group of zealots used daggers to commit public attacks in broad daylight-executing random non-combatants in crowds heading into the Holy Land using brutal tactics

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[34] Foltin, P., Rehak, D., 2006. Historický vývoj terorismu. Obrana a strategie (Defence & Strategy) 45–60.
[35] ibid
[36] Rapoport, D., 2001. The Fourth Wave: September 11 in the History of Terrorism. Current history (New York, N.Y.: 1941) 100, 419–424. https://doi.org/10.1525/curh.2001.100.650.419
[37] ibid
[38] Miller, M.A., 2013. The Foundations of Modern Terrorism: State, Society and the Dynamics of Political Violence. Cambridge University Press.

like cutting throats, stabbing, and gauging out eyes. All this to send a message to the Roman Empire that unless Jewish independence from Rome is granted, the cruel terror will not stop.[39]

Another popular use of seemingly terrorist tactics can be seen in the Middle East in the 11th century, where we can witness the first group – the Hashishim (Assassins), to exclusively use terrorist attacks in achieving their goals. [40] The group, an offshoot of a medieval Shiite Muslim sect known as the Ismailis, used tactics similar to the zealots, by stabbing victims, usually politicians or clerics, who refused to adopt their version of Islam, in broad daylight. The name Assassin stems from the Islamic word Hashashim, meaning "hashish-eater". This is a reference to the ceremonial drug consumption of hashish that the assassins partook in prior to their acts. Many attacks were carried out in public, at religious sites, on holy days to maximize the publicity of their cause as well as the terror.[41] As seen in religiously inspired terrorists today, they too viewed their death as a sacrifice to enter paradise. The fear and pressure of these tactics led their political opponents to back down and succumb, rather than be killed.[42]

As David Rapoport puts it: "Before the 19th century, religion provided the only acceptable justifications for terror." [43] More secularized motivations for such actions did not emerge until the French Revolution in the late 18th century.

[39] Miller, M.A., 2013. The Foundations of Modern Terrorism: State, Society and the Dynamics of Political Violence. Cambridge University Press
[40] A Brief History of Terrorism [WWW Document], n.d. . Project On Government Oversight. URL https://www.pogo.org/investigation/2015/02/brief-history-of-terrorism/ (accessed 3.1.22).
[41] Romaniuk, S.N., 2011. Review of THE HISTORY OF TERRORISM: FROM ANTIQUITY TO AL QAEDA. Perspectives 19, 185–188.
[42] Foltin, P., Rehak, D., 2006. Historický vývoj terorismu. Obrana a strategie (Defence & Strategy) 45–60.
[43] Rapoport, D., 2001. The Fourth Wave: September 11 in the History of Terrorism. Current history (New York, N.Y.: 1941) 100, 419–424. https://doi.org/10.1525/curh.2001.100.650.419

2.2.2 Nationalist Wave/ Anarchist Wave

During the nationalist or anarchist wave, there were significant changes in the motives for committing violence with terrorist elements, moving from religious motives to mainly nationalist sentiments. [44]

Fueled by the environment that people lived in multinational states, where they felt they do not belong, but rather belong to their own community, and with their desire to choose their own leaders, own laws and own future; there was an eagerness to disconnect from the status quo.[45] The formation of new political ideologies in the era such as Marxism, which allowed unrest towards the status quo to spread much easier, with terrorism being seen as a means for change.

This was conceptualized by Italian revolutionary Carlo Pisacane's theory of the 'propaganda of the deed', which recognized the function of terrorism to deliver a message to an audience outside of the direct target, and at the same time draw attention and support to a cause.[46] Pisacane's theory was not new, and can be seen used by the aforementioned ancient terrorist groups; but is most associated with the Russian populist group called the Narodnaya Volya, meaning the People's Will. The Narodnaya Volya was established in 1878 as opposition to the Tsar rule. The group is most famous for the assassination of Alexander II in 1881. The outwardly successful tactics of the group inspired groups all over with nationalist groups in Ireland and the Balkans.[47] This has led to some scholars to view it as the precedent for terrorism as seen today, as many terrorists are perceived as anarchists freely using tactics like assassinations, and bombings to attract attention to their cause.[48] [49]

2.2.3 War Wave /Anti-Colonial Wave

To preface this, it can be argued that terrorism itself brought on WWI with the assassination of the Archduke Franz Ferdinand in Sarajevo in 1914 by the Black Hand, a

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[44] ibid
[45] ibid
[46] A Brief History of Terrorism [WWW Document], n.d. . Project On Government Oversight. URL https://www.pogo.org/investigation/2015/02/brief-history-of-terrorism/ (accessed 3.1.22).
[47] ibid
[48] ibid
[49] Romaniuk, S.N., 2011. Review of THE HISTORY OF TERRORISM: FROM ANTIQUITY TO AL QAEDA. Perspectives 19, 185–188

Serbian secret nationalist group. At the same time, a new phase was ushered in of separatist and anti-colonial terror.[50] Violence was used to fight against colonial empires such as the Ottomans and British.

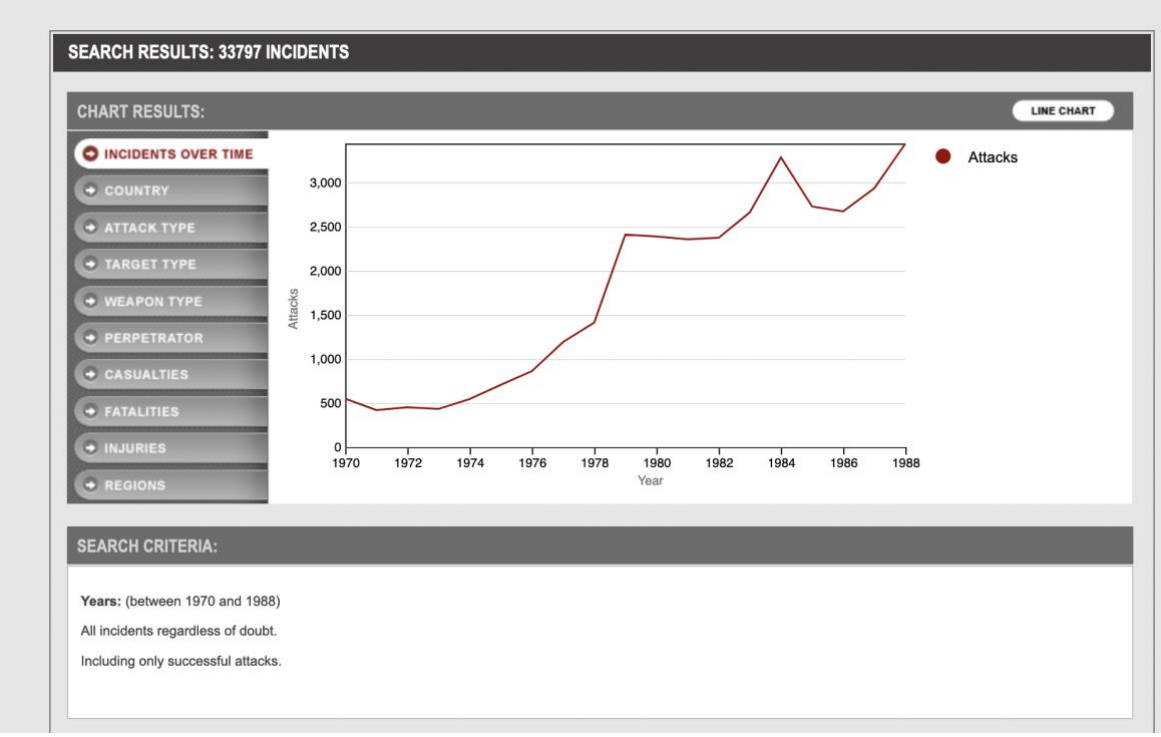
The inter-war period brought on an era of fascist terror, seen in Hitler Germany and Mussolini Italy, with violence and intimidation to grasp power and attack segments of the population.[51] Terrorism in the 1940's was highlighted by resistance groups in Nazi Germany and across Europe. The war wave is perhaps the most complicated, as wartime is inherently different from peace time. During war, certain military missions can be highlighted for their civilian casualty numbers such as the bombing of Dresden, or the atomic bombing of Nagasaki and Hiroshima.[52]

2.2.4 Cold War Wave/ Anti-Colonial Wave

The period of the Cold War led to an unprecedented rise in terrorism. In the period from 1968 to 1988 there was a steep increase in the number of terrorist attacks, as well as the number of casualties. While in 1970, there were just over 500 attacks carried out, in which, in 1988 it rose to around 3,500 attacks, as seen in Figure 1.

[50] Rapoport, D., 2001. The Fourth Wave: September 11 in the History of Terrorism. Current history (New York, N.Y.: 1941) 100, 419–424. https://doi.org/10.1525/curh.2001.100.650.419
[51] Foltin, P., Rehak, D., 2006. Historický vývoj terorismu. Obrana a strategie (Defence & Strategy) 45–60.
[52] ibid

Figure 1 Number of Terrorist Attacks Over Time 1970-1988.



Source: Global Terrorism Database (GTD), START UMD

New tactics popped up like arson attacks or hostage-taking, armed attacks, bombings, and kidnappings, as well as suicide attacks.

Nationalist and anti-colonial groups revolved around guerilla warfare, which differed from terrorism mainly in that it tended to operate along more military lines.[53] Examples include the Palestinian Liberation Organization (PLO), the Basque ETA, the Provisional Irish Republican Army (IRA), and the Italian Red Brigade. [54] Many of the terrorist groups of this period readily appreciated and adopted methods that would allow them to publicize their goals and accomplishments internationally.[55] The Palestinian groups for example favored hijacking of airplanes, as well as the attack on Israeli athletes in the 1972 Munich Olympics, leading to massive publicity.

[53] Basu, R., 2012. International Politics: Concepts, Theories and Issues. SAGE Publications India.
[54] ibid
[55] ibid

After the Cold War, the face of terrorism changed namely in motivation. Religious and nationalist terrorism rose to the forefront which also led to a change in terrorist tactics, methods, and approaches.[56]

2.2.5 Contemporary Terrorism

Today, terrorism influences events on the international stage to a degree that it has not in history mainly due to the attacks of September 11, 2001. Since then, terrorism and the fight against it has consumed the US and much of the western world. The threat of terrorism has repeatedly been portrayed as the acute threat to citizen. The fear that future strikes might be even more deadly and employ weapons of mass destruction is greater than in the past. In recent years there have been outbursts of public alarm about cyber-terrorists, narco-terrorists, and eco-terrorists.[57]

2.3 Typology of Terrorism: Motivation

A complex and seemingly undefinable term like terrorism requires a method to the madness. Typology offers that with categorization and classification of the phenomena as well as characteristics associated with it. Most often, types of terrorism are classified by several topics, including actors, motives, goals, tactics and actions, purpose, and implications.[58]

2.3.1 First Typology: Actors

First, the most fundamental typology of terrorism is based on the actors themselves, and what they essentially are.[59] There are three main types:

- State terrorism: Used by the state to eliminate opponents of the current governing body, as well as maintain obedience and control over the state

[56] Foltin, P., Rehak, D., 2006. Historický vývoj terorismu. Obrana a strategie (Defence & Strategy) 45–60.
[57] Mintz, S., & McNeil, S. (2018). Terrorism in Historical Perspective. Digital History. https://www.digitalhistory.uh.edu/topic_display.cfm?tcid=94)
[58] Chojnowski, L., 2020. On Terrorism and its Typologies. Security Dimensions 33, 22–39. https://doi.org/10.5604/01.3001.0014.2667
[59] ibid

- State sponsored terrorism: Terrorism motivated and supported by the state to fight against internal or external enemies. Support can be financial, diplomatic, material, or intellectual.
- Non-state terrorism: Used by non-state terrorist organizations with brutal violence against "weaker" non-combatants or "stronger" states. [60]

2.3.2 Second Typology: Motives

The second typology to classify terrorism is the motive behind the phenomena. Terrorism motives can be divided into political, criminal, and individual.

- Political: Aimed to achieve political goals of terrorists
- Criminal: Use of violence by criminal organizations to gain material benefits; or by terrorist organizations to gain funds for political goals.
- Individual: Idiosyncratic motivation through psychological incentive.[61]

2.3.3 Third Typology: Goals

The third typology focuses on the goals of the terrorists. Among these are mainly political goals such as liberation, revolution, reaction, and religious.

- Liberation: Directed at gaining the right to self-determination. Examples include national-liberation, anti-colonial, ethnic-national, separatist.
- Revolution: Aim to bring rapid change to the status quo and socio-political system with the participation of a large part of society.
- Reaction: Anti-revolutionary. Desire to preserve the status quo and traditional socio-economic order.
- Religious: Motivated by religious reasons, associated with fanaticism and religious fundamentalism. Main characteristic is religious imperative of acting in the name of God and especially violent acts of violence.
- Millenarian (anarchistic leftist): Associated with armed utopians with lofty, but unrealistic goals of creating a paradise on earth. The world is seen as corrupt and evil and must be destroyed and created anew. [62]

[60] ibid
[61] ibid
[62] ibid

2.3.4 Fourth Typology: Tactic Selection

A fourth typography of terrorism is tactic selection. Among these are direct, indirect causation and terrorism as propaganda through action.

- Direct terrorist attacks: Achieve strategic goals, such as overthrowing the existing status quo.
- Indirection causation attacks: Aimed at forcing a change in policy without desire to overthrow the existing status quo. Harassment of power through violence.
- Propaganda through action: Attacks aimed to awaken the masses. The purpose is to inform a large audience about the group, encourage membership, and to incite social upheaval with the goal to upset the existing status quo. [63]

2.3.5 Fifth Typology: Circumstances of Attacks

The fifth typography deals with the type of terrorist attack and under what circumstances – is it repressive, defense or offensive.

- Repressive: Repression used by the state, revolutionary, or movement in order to enforce obedience.
- Defensive: Defense, in order to preserve the existing status quo. Namely directed at occupying forces (anti-revolutionary).
- Offensive: During struggle with the current regime or social system with the goal to overthrow it or change the status quo (revolutionary, liberation).[64]

2.3.6 Sixth Typology: Intended Targets

The sixth typology is the characteristic of the intended target. This can be classified as personal, objective-based, or symbolic.

- Personal: The target are specific members of selected groups, or specific, important places to the actor.
- Objective (economic): Attacks directed against property to cause economic damage

[63] ibid
[64] ibid

- Symbolic: Targets are symbols of individual or collective identify to groups or societies.[65]

2.3.7 Seventh Typology: Implications and Influence

Lastly, the seventh typology is the implication of terrorism with influence on international relations. These include classifications such as national or domestic terrorism, international and transnational.

- National (domestic): Terrorism caused by local (internal, national) actors, which are responsibility of the given state
- International: Terrorist activity that goes beyond national borders and has international implications
- Transnational: Terrorism affecting the international environment, crosses national borders beyond control of a state. [66]

2.4 Types of Attacks and Methods

There are many terrorist methods or types of attacks, stemming from conventional, to modern, to more futuristic. These attacks are characterized as being ruthless, violent, and meant to have an impact. [67] Attacks are chosen to inhibit the maximum psychological and physical effect, with the goal to evoke fear, helplessness, vulnerability to the biggest audience possible. Due to the asymmetric nature of a conflict the terrorist face, terrorist attacks usually do not specifically target specific people that have anything directly to do with their goals. Rather, the motive to attack a seemingly random person is to create the most fear possible which makes the general audience feel that it can happen to them, which then forces action and pressure on the government to act.[68]

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[65] ibid
[66] ibid
[67] Typologie terorismu - Ministerstvo vnitra České republiky [WWW Document], n.d. URL https://www.mvcr.cz/clanek/typologie-terorismu.aspx?q=Y2hudW09Mg%3d%3d (accessed 3.2.22).
[68] ibid

2.4.1 Conventional methods

Conventional methods of attack are what are most imagined under terrorism, and are the following: [69]

- Beatings, shooting or the use of cutting and stabbing weapons
    - The target is a crowd of random people; or specific people - politicians, leaders, journalists
    - Attacks focused on specific nations or groups of people – nationality, soldiers, police, etc.
    - Busy areas where people gather- malls, movie theaters, schools, transportation hubs [70]
- Bombs and other explosive devices
    - The target is the immediate area - Aimed at places where many people gather: malls, squares, supermarkets, stadiums, amusement parks, hospitals
    - Targeted at specific institutions (embassies, courthouses, government offices)
    - Places frequented by tourists,
    - VBIED - bombs in vehicles, attacks on buildings
    - Explosions aiming to cause confusion during elections and referendums,
    - Explosions damaging communication arteries (bridges, railways, metro, airports, data cables, water mains);
    - Attacks on the means of transport themselves - planes, trains, buses, ships
    - Sabotage aimed at economic operations (factories, power plants)[71]
- Attacks initiating further destructive activity
    - Attack on chemical plants; ice cooling units in ice hockey rinks (ammonia)
    - Attack on nuclear operations (nuclear power plants, reactors, research plants, etc., or even nuclear power weapons)
        - A conventional attack on these targets is much easier and cheaper than production or theft of an atomic bomb
    - Attack on a water reservoir (dam or flood protection)

[69] ibid
[70] ibid
[71] ibid

- Attack on sites with high concentration of highly flammable matter, with the threat of environmental pollution,
- An explosion which initiates an avalanche, rockslides, or landslides
- Attacks on prisons[72]

- Kidnappings, hostage-taking
  - Kidnappings of anonymous or specific prominent persons (associated with others demands - release of other terrorists, reading the demands of terrorists in the media; ransom)
  - Can be carried out on the ground, on a ship, on an airplane, occupying an entire building [73]
- Violence against tourists
  - Attacks aimed at tourists, which aim to harm those countries for which tourism is a great benefit [74]
- Letter bombs
  - Letter bombs used, for example, by the Unabomber who sent home-made bombs that together they killed three people and injured 23 others.[75] [76]
- Specific goals of postmaterialist and environmental (ecological) terrorism
  - Destruction of fast-food restaurants (McDonald's, KFC),
  - Attacks on fur-wearing people
  - Attacks on slaughterhouses,
  - Attacks on laboratories where they carry out experiments on animals, etc.
  - Hammering nails into tree trunks so that they cannot be harvested by loggers[77]

[72] ibid
[73] ibid
[74] ibid
[75] Ibid
[76] Worthen, M., n.d. What Is the Unabomber's Life Like Now? [WWW Document]. Biography. URL https://www.biography.com/news/unabomber-ted-kaczynski-today (accessed 3.2.22).
[77] Typologie terorismu - Ministerstvo vnitra České republiky [WWW Document], n.d. URL https://www.mvcr.cz/clanek/typologie-terorismu.aspx?q=Y2hudW09Mg%3d%3d (accessed 3.2.22).

- Other
    - Attacks on artistic monuments and galleries,
    - Damage to operability vehicles (sugar in gas tanks, sand in the mechanism of locomotive wheels),
    - Spread or disinformation, fake-news, alarming messages leading to chaos, injuries resulting from panic [78]

2.4.2 Modern and Future Methods

Modern and future terrorist methods for use of weapons of mass destruction have become more frightening with the development of new technologies and scientific developments. In comparison to contemporary methods, modern methods can be virtually invisible until too late.[79] The use of chemicals, bacteria, or cyber threats maybe be more dangerous, and have the capability to kill more people, in addition to the resulting contamination leaving long-term uninhabitable areas or economic impact. It also has the advantage that terrorists can carry out an attack without having to expose themselves to imminent danger, but they do not have the immediate "satisfaction" of a clear hit. Thus, due to this, as well as the advanced intellect and expertise needed, the vast number of terrorist groups will stick to the tried-and-true classic methods that are tangible, primitive in nature, and immediate.[80]

These current and future threats of terrorism take advantage of the development of scientific research and experiments to create conditions that are not yet conceivable to the general public. Terrorist threats in the future can stem from misuse of scientific experiments in the fields of genetic engineering, biological and gene manipulation, or cloning.[81] A connected, and large-scale problem area is the control and transport of hazardous substances, including the control of hazardous industrial waste. This can cause some weapons of mass destruction or their effective components to become very effective means of coercion in blackmailing governments, state institutions or even various sections of the population, like industrial and agricultural groups. Terrorists count on the use of a strongly cultivated fear of

[78] ibid
[79] Typologie terorismu - Ministerstvo vnitra České republiky [WWW Document], n.d. URL https://www.mvcr.cz/clanek/typologie-terorismu.aspx?q=Y2hudW09Mw%3d%3d (accessed 3.2.22).
[80] ibid
[81] ibid

using weapons of mass destruction and are convinced that by holding such power they will force the state to accept their demands.[82]

- Nuclear technology
    - Nuclear material can be purchased on the black market, stolen from spent waste repositories, or depleted uranium ammunition
        - Use of this radioactive material namely nuclear isotopes (cesium 137, strontium), mixed into sources of drinking water or in public drinking areas can affect a large number of people.
    - An explosion of a small atomic bomb about 40km above the earth can result in electromagnetic waves capable of destroying entire electric grids, satellites, and ground equipment (radio, television antennas)
        - EMP waves are unpredictable, therefore it is difficult to create protection for the entire infrastructure against them.[83]
- Biological technologies
    - The use of various viruses, microbes, and dangerous diseases with the intention of affecting the civilian population
    - Bioweapons (often called the "nuclear weapon of the poor") are cheaper and "safer" for terrorists
    - All that is needed is to cultivate or obtain bacteria and discreetly disperse it somewhere.
        - Until the moment that it takes effect, or noticed, the terrorist is long gone.
        - Some agents have a long incubation period
    - A syringe filled with blood infected with HIV.
    - Deliberate introduction of diseases affecting animals: Bovine Spongiform Encephalopathy (BSE)/Mad Cow Disease, foot, and mouth disease, etc.[84]
- Chemical technology
    - Chemical substances are available and inexpensive, compounds are easy to manufacture and portable, difficult to detect
    - Can cause death within minutes, and immediate medical care is necessary

[82] ibid
[83] ibid
[84] ibid

- Binary chemical weapons are very dangerous and attractive for terrorists.
  - It does not contain a dangerous substance, but only the initial components (so-called precursors), which, when mixed, create the dangerous substance (Novichok agent)
- Example of the ease of possible threats, sabotage (not necessarily an explosion) at an ice rink, where ammonia is used as a cooling medium, which, if released into the air, is able to destroy the population of a medium-sized city in a short time.
- There are many such stadiums in the Czech Republic and their security is minimal.
- Poison of food and produce in shops using poisons, industrial chemicals, bacteria
- A considerable amount of biological production can be carried out in a relatively short time through fermentation.
- Only a small amount of biological substance is needed to produce suitable biological weapons material in large quantities.
- The use of crop-dusting aircraft or helicopters can serve as a very efficient transport system for the use of chemical and biological agents. [85]

- Sound weapons
  - A little explored area is the dangers of applying weapons based on the emission of specific sounds (ultrasonic, infrasound) and frequencies (waves)
  - These waves can cause physiological complications in humans (palpitations, resonance of body cavities and body fluids) and can also affect the psyche (put people into apathy or, conversely, cause panic reactions)
  - Their use can result in the death of a large number of people.[86]
- Cyber terrorism
  - Attacks via computer networks and the Internet pose a threat comparable to weapons of mass destruction.
  - Massive reliance on computer networks and automation
    - Possible to block distribution of water, electricity, gas, and oil.

[85] ibid
[86] ibid

- Open dams and flood adjacent areas.
- Fully electronic operations in aviation and financial sectors
- Government and military communication systems – control of drones, UAVs, modern warships.
- Self-driving cars and traffic[87]

It is important to differentiate between focusing on the methods and steps that lead to terrorist attacks, and the focus on the motivations per se. The focus on the steps that lead to an attack allows for any recommendations and analysis to be used on a broad spectrum, regardless of ideology or motivation. Understanding why terrorism is so often turned to in order to achieve goals is important, as the motivation is the reason for any threat in the first place.[88]

2.5 Agroterrorism

The potential for a terrorist attack against agricultural targets has become increasingly recognized as a major security threat, especially after the events of September 11, 2001. The ensuing pursuit and capture of Al Qaeda's plots and planned operations found in a hideout in a cave in Afghanistan in 2002, showed detailed agricultural documents and manuals describing ways to make animal and plant agents and poisons.[89]

The deliberate misuse of biological agents poses a threat not only to public health, but also to the agricultural sector, the food chain, and by extension to society. Most of the world's population caloric requirements come from crops and plant-based foods like wheat, rice, and maize.[90] Some countries do not have the capability to produce enough for their populations and must rely on international trade and imports. This interconnectedness and

[87] ibid

[88] Chojnowski, L., 2020. On Terrorism and its Typologies. Security Dimensions 33, 22–39. https://doi.org/10.5604/01.3001.0014.2667

[89] - AGROTERRORISM: THE THREAT TO AMERICA'S BREADBASKET [WWW Document], n.d. URL https://www.govinfo.gov/content/pkg/CHRG-108shrg91045/html/CHRG-108shrg91045.htm (accessed 3.2.22).

[90] Once neglected, these traditional crops are our new rising stars [WWW Document], n.d. . Food and Agriculture Organization of the United Nations. URL http://www.fao.org/fao-stories/article/en/c/1154584/ (accessed 3.2.22).

the amount of food, crop, livestock and produce transport does carry with it some vulnerabilities and potentially detrimental implications. Two quick examples of outbreaks of foot-and-mouth disease in the United Kingdom and Taiwan in 2001 and 1997 respectably, show the consequences that just a natural outbreak can have on not only the country, but world.[91]

2.5.1 Definitions of Concepts

To provide a holistic and full view of the entire threat, three concepts related to agroterrorism must be introduced and defined: agroterrorism itself, bioterrorism, and food terrorism.

2.5.2 Definition of Agroterrorism

Agroterrorism can be defined as the deliberate introduction of an animal or crop disease with the goal of generating fear over the safety of food and/or water, causing economic losses, and/or undermining social stability.[92] A more detailed definition is provided by Schaub, he defines agroterrorism, "as the intentional or threatened use of viruses, bacteria, fungi, or toxins from living organisms to produce death or disease in humans, animals, or plants; or intentional or threatened use of chemicals against food or animals; or the intentional or threatened use of explosives to disrupt agriculture production or supplies of food; the purpose of the act or threat is to intimidate or coerce a government or civilian population." [93]

2.5.3 Definition of Bioterrorism

A term that the general populace would be more familiar with is bioterrorism. One of the definitions of bioterrorism is "the threat or use of biological agents by individuals or

[91] Keremidis, H., Appel, B., Menrath, A., Tomuzia, K., Normark, M., Roffey, R., Knutsson, R., 2013. Historical Perspective on Agroterrorism: Lessons Learned from 1945 to 2012. Biosecurity and Bioterrorism: Biodefense Strategy, Practice, and Science 11, S17–S24. https://doi.org/10.1089/bsp.2012.0080

[92] Ashlock, M.A., Leising, J.G., Cartmell, D.D., 2009. Agroterrorism and the Implications of Uncertainty Reduction Theory for Agricultural Communicators. Journal of Applied Communications 93. https://doi.org/10.4148/1051-0834.1200

[93] ibid

groups motivated by political, religious, ecological, or other ideological objectives."[94] The Center for Disease Control has further defined it in more detail as "the deliberate release of viruses, bacteria, or other germs (agents) used to cause illness or death in people, animals, or plants."[95] It must be noted that agroterrorism is a subset of bioterrorism.

2.5.4 Definition of Food Terrorism

The final aspect of the threat is food terrorism, which can be defined as an act or threat to deliberately contaminate food for human consumption with biological, chemical, or physical agents or radio-nuclear materials for the purpose of causing injury or death to civilian populations and/or disrupting social, economic, or political stability.[96]

2.5.5 Conceptualization

Leaning on the aforementioned definitions, any agroterrorism incident would have to involve bioterrorism, and include some agents like viruses, bacteria, or fungi. Bioterrorism is usually associated with the colloquial "dirty bomb", and characterized with attacks directly targeting human health, with recently examples like anthrax or the novichok agent.

With agroterrorism, usually, the primary goal is not to directly kill or physically harm the population per se, nor is it to kill crops or animal; these are just byproducts of the means to an end and achieving the goal of attacking the foundations of society. Of course, food terrorism does deal with attacks that do have the goal of food contamination and attack on human health. Attacks on the food supply and supply chain can quickly lead to economic crisis, and social unrest. These types of attacks are not the sexy, loud, and shocking events that get quick attention that more traditional methods garner. But agroterrorism has the lure of being low-cost, and highly effective.

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[94] Parker, H.S., 2002. Agricultural Bioterrorism: A Federal Strategy to Meet the Threat. Institute for National Strategic Studies, National Defense University.
[95] CDC | Bioterrorism [WWW Document], 2021. URL https://emergency.cdc.gov/bioterrorism/ (accessed 3.2.22).

[96] User, A., Health, J.B.S. of P., n.d. Topic Center - Bioterrorism and Food Security [WWW Document]. Johns Hopkins Bloomberg School of Public Health. URL https://www.jhsph.edu/research/centers-and-institutes/johns-hopkins-center-for-public-health-preparedness/tips/topics/food_security.html (accessed 3.2.22).

2.5.6 Appeal of Agroterrorism as a Terrorist Method

One of the main draws for agroterrorism as a method of terrorist attack is its ease in obtaining biological agents. Some are natural and appear naturally in the environment, saving actors resources and risks of obtaining it from a laboratory. As some of the agents are naturally occurring, it also provides an initial cover, as it will not always be immediately obvious to distinguish a naturally occurring threat, or something from an attack. [97]

Low Cost and Low Risk

The costs of the preparation of bioweapons are often much less than what it would cost, for example, to use nuclear bombs of various types. “Experts have estimated that for a terrorist group to develop a nuclear weapon could cost them a billion dollars.…But to develop a very good biological arsenal you would need about ten million dollars and a very small lab and a master's degree in chemical engineering.”[98] Due to this low cost, effort and risk, there is increased fear that terrorist actors may focus their attacks on agriculture using biological agents.

Wide-spread Impact

As mentioned, the agriculture economy in the context of globalization allows for the attack to spread around the world. This would be a great coup for a terrorist actor, as an agroterrorism attack goal is to spread disease or poison leading to panic, fear, disruption, and in some societies unrest or even collapse.[99] As seen in recent years with the COVID-19 pandemic, outbreaks that are natural in origin still have vast impacts on society and the worldwide populous. If a successful agroterrorism attack was to be carried out, the impact will not be limited to the agricultural sector. Effects would cascade and cause disruption of

[97] Peterson, M.E., n.d. AGROTERRORISM AND FOOT-AND-MOUTH DISEASE: Is the United States Prepared? 40.

[98] Keremidis, H., Appel, B., Menrath, A., Tomuzia, K., Normark, M., Roffey, R., Knutsson, R., 2013. Historical Perspective on Agroterrorism: Lessons Learned from 1945 to 2012. Biosecurity and Bioterrorism: Biodefense Strategy, Practice, and Science 11, S17–S24. https://doi.org/10.1089/bsp.2012.0080

[99] Biological Terrorism Targeted at Agriculture: The Threat to U.S. National Security | Office of Justice Programs [WWW Document], n.d. URL https://www.ojp.gov/ncjrs/virtual-library/abstracts/biological-terrorism-targeted-agriculture-threat-us-national (accessed 3.2.22).

trade, economic losses, and restrictions which in some cases can have more severe economic consequences than the outbreak itself.[100]

Economic Consequences of an Agroterrorism Attack

One of the main worries of a successful agroterrorism attack is the impact on the economy. The losses would be felt all over like the value of lost production, cost of destroying the diseases products, and the cost of containment with vaccines, pesticides, or other services.[101]

In addition, the situation would not be contained locally, exports would be affecting as countries would place restrictions on the import of the product.[102] Also, with agriculture being a major part of any economy and society, the event would ripple through other sectors like farm suppliers, food manufacturing, transportation, retail grocery, food service, and tourism.[103]

2.5.7 Potential Agroterrorism Actors

Agroterrorism could be attractive to a certain faction of terrorists. Today, state run biological weapon programs have been on the decline; and the appeal of the use of biological weapons by terrorist groups has been on the rise. There are four main types of groups or actors that could turn to agroterrorism and not be afraid to use a biological weapon – political groups, religious extremists, apocalyptic sects, and lone wolves.[104] Although the motives might be different for each group, a common denominator is the willingness to use biological weapon to effectively change society, as the ensuing violence will be death, fear, and disruption.

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[100] ibid
[101] Monke, J., n.d. Agroterrorism: Threats and Preparedness 49.
[102] ibid
[103] ibid
[104] Keremidis, H., Appel, B., Menrath, A., Tomuzia, K., Normark, M., Roffey, R., Knutsson, R., 2013. Historical Perspective on Agroterrorism: Lessons Learned from 1945 to 2012. Biosecurity and Bioterrorism: Biodefense Strategy, Practice, and Science 11, S17–S24. https://doi.org/10.1089/bsp.2012.0080

Political Terrorist Groups

For some political groups, the end goal can be a revolution, or focus on a single issue, meaning they give little attention to public opinion. As mentioned, political groups are very often single-issue groups, where radical action is taken by a group to reach their goal whether it be opposing abortion, championing ecoterrorism (anti-GMO), or fight for animal rights and the environment through nefarious means. Ecoterrorists and animal rights activists especially have aimed their attacks against agriculture infrastructure, but has usually involved more traditional violence, cyber-attacks, and vandalism rather than biological agents.[105]

Religious Terrorist Groups

Religious extremist terrorism is perhaps the most well-known type of terrorism. Religious extremists have aimed to cause mass casualties and hurt western values. Several groups have plotted and attempted to obtain biological weapons, as well as drew up plans to attack the agriculture sector of a country.[106]

Apocalyptic Sects

Apocalyptic sects believe that the end of the world is near, and doomsday will come in the near future. These beliefs are usually intertwined in the belief that they are on a path from God – whether the religious being, or often a charismatic leader that isolates members from the outside world.[107]

Lone Wolves

Lone wolves are the most unpredictable type of potential agroterrorist. Even though lone wolves do not belong to a specific terrorist group per se, they still in many cases share similar ideologies and views. There are so many types and such a range of motives including political, economic, religious, personal (work or relationship dispute) or individuals that are mentally unwell. [108]

[105] ibid
[106] ibid
[107] ibid
[108] ibid

2.6 History of Agroterrorism

Biological warfare and agroterrorism has been well documented in historical literature throughout the ages. Due to the fundamental connection between survival and agriculture, "attacks against agriculture are as old as war itself."[109]

Although in comparison to more traditional methods of terrorism, there have been relatively few cases of agroterrorism. However, due to the catastrophic nature of the potential consequences, it is vital to study the few incidents that have occurred in effort to understand motivations or tactics used by actors to better face them. Using history as a help, it is possible to improve preparedness for future threats and incidents.

2.6.1 First Attacks

Agroterrorism has indeed been a tactic use throughout history for millennia. Over two thousand years ago, the Romans contaminated their enemies' water by dumping rotting corpses into their wells and nearby water reservoirs.[110] More attacks on water supply can be seen in 600 BC in Greece where the Athenians contaminated the Amphitryonic League's drinking water supply in the city of Kirrha.[111] [112] One of the first actors employing food terrorism, was a Carthaginian general that contaminated wine he left behind for the enemy allowing his army to catch them ill and defenseless. [113] Attacks on the land and environment, with scorched earth tactics in 149 BC in the Battle of Carthage, can be seen when Romans

[109] - EVALUATING THE THREAT OF AGRO-TERRORISM [WWW Document], n.d. URL https://www.govinfo.gov/content/pkg/CHRG-109hhrg23605/html/CHRG-109hhrg23605.htm (accessed 3.2.22).

[110] Del Giacco, L.J., Drusiani, R., Lucentini, L., Murtas, S., 2017. Water as a weapon in ancient times: considerations of technical and ethical aspects. Water Supply 17, 1490–1498. https://doi.org/10.2166/ws.2017.043

[111] ibid

[112] Ing. Hana Vlachová, Ph.D. Potravinový terorismus a agroterorismus - PDF Free Download [WWW Document], n.d. URL https://docplayer.cz/46583120-Ing-hana-vlachova-ph-d-potravinovy-terorismus-a-agroterorismus.html (accessed 3.2.22).

[113] Hoffman, J., Kennedy, S., 2007. International Cooperation to Defend the Food Supply Chain: Nations Are Talking; Next Step—Action. Vanderbilt Jornal of Transnational Law 40, 1169–1178.

poured salt on Carthaginian crop lands.[114] And late in the 6th century a violent Jewish sect poisoned several granaries. [115] The first documented attack of bioterrorism against livestock occurred more than 1,200 years ago in Bavaria when a poisonous powder was used to kill cattle. [116]

2.6.2 Identified Attacks from 1912 to 1990

Dr. Seth Carus of the National Defense University Center for Counterproliferation Research published his work Bioterrorism and Biocrimes in 1998 which chronicles in detail, the history of illicit use of biological agents around the world since 1900.[117] In his work, Carus researched 270 alleged cases of the use of biological agents and recognized 180 confirmed cases of nefarious biological agent use.[118] Of the 180 cases, 23 were identified as instances where biological agents were acquired and used for criminal purpose; while 8 cases were flagged as biological agents acquired and used by terrorists.[119] The remaining 149 cases involved threats, or hoaxes. Carus remarked that there is a concerning uptick in attacks after 1990, possibly indicating an increasing interest in agroterrorism. Of the confirmed cases, 14 were agriculture related attacks of which 11 involved food poisoning, and 3 involved attacks on plants or animals.[120]

Other research that is frequently looked to, is the James Martin Center for Nonproliferation Studies at the Monterey Institute of International Studies (MIIS), which actually greatly collaborated with Carus in his research.[121] The MIIS has classified 23 occurrences of chemical or biological weapon incidents targeting agriculture between 1915 and 2008 of which 19 are defined as acts of agroterrorism.[122] 12 cases of pathogens used to

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[114] Roth, J.P., 1999. The logistics of the Roman army at war (264 B.C.-A.D. 235), Columbia studies in the classical tradition. Brill, Leiden ; Boston.
[115] Mcclaskey, J.M., n.d. A MULTIDISCIPLINARY POLICY APPROACH TO FOOD AND AGRICULTURAL BIOSECURITY AND DEFENSE 567.
[116] ibid
[117] Carus, W.S., 2001. Bioterrorism and Biocrimes: The Illicit Use of Biological Agents Since 1900: Defense Technical Information Center, Fort Belvoir, VA. https://doi.org/10.21236/ADA402108
[118] ibid
[119] ibid
[120] ibid
[121] Florida Law Enforcement's Role in Agroterrorism, 2014. . HOMELAND SECURITY AFFAIRS. URL https://www.hsaj.org/articles/3341 (accessed 3.2.22).
[122] ibid

attack livestock or crops were recognized since 1912. In addition to this, 12 large-scale cases of food supply attack were documented. In this case, large-scale was defined as more than thirty casualties and/or greater than $100 million in lost revenue.[123] Figure 2 below lists further examples of biological and chemical warfare during the past 2000 years.

Figure 2 Biological Warfare and Bioterrorism: A Historical Review

Examples of biological and chemical warfare use during the past 2000 years

Time	Event
600 BC	Solon uses the purgative herb hellebore during the siege of Krissa
1155	Emperor Barbarossa poisons water wells with human bodies in Tortona, Italy
1346	Tartar forces catapult bodies of plague victims over the city walls of Caffa, Crimean Peninsula (now Feodosia, Ukraine)
1495	Spanish mix wine with blood of leprosy patients to sell to their French foes in Naples, Italy
1675	German and French forces agree to not use "poisones bullets"
1710	Russian troops catapult human bodies of plague victims into Swedish cities
1763	British distribute blankets from smallpox patients to Native Americans
1797	Napoleon floods the plains around Mantua, Italy, to enhance the spread of malaria
1863	Confederates sell clothing from yellow fever and smallpox patients to Union troops during the US Civil War
World War I	German and French agents use glanders and anthrax
World War II	Japan uses plague, anthrax, and other diseases; several other countries experiment with and develop biological weapons programs
1980–1988	Iraq uses mustard gas, sarin, and tabun against Iran and ethnic groups inside Iraq during the Persian Gulf War
1995	Aum Shinrikyo uses sarin gas in the Tokyo subway system

Source: Baylor University. Medical Center

2.6.3 List of Historical Examples of Agroterrorism Attacks on Crops [124] [125]

- "During the French and Indian Wars, the English gave smallpox infested blankets to Indians allied to the French, resulting in a devastating smallpox epidemic among the native population.

[123] ibid

[124] Mcclaskey, J.M., N.D. A Multidisciplinary Policy Approach to Food and Agricultural Biosecurity and Defense 567

[125] Keremidis, H., Appel, B., Menrath, A., Tomuzia, K., Normark, M., Roffey, R., Knutsson, R., 2013. Historical Perspective on Agroterrorism: Lessons Learned from 1945 to 2012. Biosecurity and Bioterrorism: Biodefense Strategy, Practice, and Science 11, S17–S24. https://doi.org/10.1089/bsp.2012.0080

- Germany engaged in a large-scale bioweapons program during World War I involving the infection of military horses and livestock, including swabbing horses and mules with anthrax and glanders as they were shipped to the Allies.
    - More than 3,500 horses were infected and rendered useless to the Allied troops. The German goal was to infect draft horses, military cavalry, and food animals to disrupt transportation and supply lines.
- The US and Britain both had extensive anti-plant programs during World War II. The US even considered using a rice fungus in Japanese rice fields (Ban, 2000).
- In World War II, despite Hitler's ban on offensive bioweapons, Germany continued efforts to weaponize FMD. They conducted open-air trials on reindeer and domestic cattle on an island in a lake in northwest Russia.
- Japan weaponized anthrax and Rinderpest against Russia and Mongolia in World War II.
- In 1944, the UK initiated Operation Vegetarian, a plan to drop 5 million anthrax cattle-cakes in enemy territory to wipe out dairy and beef cattle.
- Bioweapons research continued well into the Cold War with nine countries having agricultural bioweapons programs including Canada, France, Germany, Iraq, Japan, South Africa, UK, U.S., and USSR.
- The Soviets experimented with ticks as a vector for transmitting foot-and-mouth disease.
- In 1950, East Germany accused the US of scattering potato beetles over their potato crops (Ryan & Glarum, 2008).
- In 2000, Israeli settlers allegedly contaminated Palestinian agricultural fields with sewer water with the intent to get them to abandon their land."

2.6.4 Historical Examples of Agroterrorism Attacks on Animals[126]

- "In 1952, the Mau Mau (an insurgent organization in Kenya) killed 33 head of cattle at a mission station using African milk bush (a local plant toxin).
- In the late 1970's the Rhodesian government used anthrax to destroy African cattle.
- Mexican contract workers were accused by the USDA of deliberately spreading screwworm in livestock (Keremidis et al., 2013).

[126] ibid

- From 1985 to 1991, Iraq weaponized anthrax and botulinum toxin, and the United Nations (UN) found proof of Iraq's program to develop camel pox (which may have been a surrogate for smallpox) as a weapon in 1995.
- In 1997, the Russian army used glanders against the Afghan mujahidin and their horses.
- In 2011, a South African man was arrested and prosecuted for threatening to spread FMD in the US and Great Britain even though it was never proven he actually obtained the virus."

2.7 Types of Threats of Agroterrorism

2.7.1 Pests and Agroterrorism: Attack on the Environment

Although pests usually pose less risk to human or animal health directly, the indirect broad impact, as well as the targeting of the economy, can be very detrimental. Pests and other alien plants can be used in many ways including using pests to look to change the environment or affect the existing ecosystem by introducing something new.[127] This can not only affect the yield and quality of crops, but also ripple through the national economy affecting imports and exports, as well as harming the natural environment of the region, which is something that can be felt in agriculture sectors as well as impact tourism or recreation.

In the context of pests, the earlier they are identified, the quicker countermeasures can be put in place to combat the spread, the better.[128] This first course of action is the same regardless of if the outbreak is agroterrorism or if it is an unintentional introduction. The follow-up action does depend on the nature of the outbreak. Some measures that are taken after a pest introduction is identified are legal restrictions, cleansing and disinfection, disposal of infected material and the closing down of trade.

Due to the natural occurrence of pests, as well as the real risk of entry; an agroterrorism attack would also certainly not be immediately identified. In addition to what was mentioned that during the initial stages, the response would be the same regardless of

[127] Threats, I. of M. (US) F. on M., 2007. Surveillance Strategies, Global Infectious Disease Surveillance and Detection: Assessing the Challenges—Finding Solutions, Workshop Summary. National Academies Press (US).
[128] ibid

agroterrorism or unintentional introduction; there are several mechanisms in place that deal with pest risk analysis as well as contingency plans to deal with a nefarious outbreak.

Pest Risk Analysis

The main "natural" and non-malicious risk of pest introduction to an environment comes from imported plants, seeds, or plant products. However, if there was a nefarious and targeted effort in place, alien pest introduction and dispersal can take place in a span of days. When analyzing the risk of a pest within an environment, there are minute differences in analyses if the outbreak is involuntary or if it is agroterrorism - like the analysis of trade would be less helpful in case of agroterrorism attack.[129] Conversely, it also forces officials to rework pest risk assessments focusing on solely natural entry points. High impact pests that are classified as "low risk" to an environment due to a lack of natural pathways to enter, maybe revised as a "high risk" in terms of the realities and capabilities of agroterrorism.[130]

Therefore, it is vital for countries to identify high risk pests based on epidemiological, economic, and sociological criteria.[131] Some of these criteria that factors into their assessment are[132]:

- The ease of obtaining the pest (culture collection or naturally from the environment.
- The ease in production of mass quantities, large enough for malicious use.
- The specialist knowledge and facilities needed.
- The infectiousness of the pest, as well as transmission.
- The speed of spread.
- Treatments available.
- The ease of containment or eradication of the pest.
- The damage assessment in both short, medium, and long term.

To monitor trade and the import of plants and potential pest carrying imports, a phytosanitary certificate is issued. This certificate is an official document that verifies a commodity has been inspected and is found to be relatively free of pests or pathogens. The

[129] Plant health aspects of bioterrorism [WWW Document], n.d. URL https://www.eppo.int/RESOURCES/position_papers/https%3A%2F%2Fwww.eppo.int%2FRESOURCES%2Fposition_papers%2Fcouncil_bioterrorism (accessed 3.2.22).
[130] ibid
[131] ibid
[132] ibid

certificate is used to attest that the imports meet phytosanitary requirements, and it is the responsibility of the National Plant Protection Organization (NPPO) of a country.[133]

National Plant Protection Organization (NPPO)

A NPPO in each country is the organ responsible inspecting for pests; reporting of occurrence; surveillance; managing treatments related to plants; and conducting pest risk analyses. NPPOs are representatives of the members to the International Plant Protection Convention (IPPC).[134] The IPPC is a multilateral treaty signed in 1951, overseen by the United Nations Food and Agriculture Organization, with the goal to secure coordinated, effective action to prevent and to control the introduction and spread of pests of plants and plant products.[135] Irrespective of how a pest entered the region, the NPPO exists to keep pests and alien plants out of the country as well as contain the pest is outbreaks occur.[136]

Surveillance of pests and alien plants is perhaps one of the only ways to reasonably prevent the spread. According to the IPPC, the surveillance is the responsibility of the NPPOs in each country.[137] Most commonly, surveillance is gathered through both formal and informal networks including farmers, consultants, diagnostic laboratories, or inspectors. Among the formal networks, inspectors are perhaps more important, as they have undergone significant phytosanitary training, allowing them to detect not only known pests, but also notice new pests or anything out of the ordinary.[138] In addition to this, mass coordination and cooperation between NPPOs in several countries, as well as intelligence services may be necessary to quickly identify is an attack is agroterrorism in nature. Cooperation among countries and regions within the IPPC is placed in the trust of Regional Plant Protection

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[133] ibid
[134] NPPO ESTABLISHMENT AND OPERATION [WWW Document], n.d. . International Plant Protection Convention. URL https://www.ippc.int/en/core-activities/capacity-development/phytosanitary-system/nppo-establishment-and-operation/ (accessed 3.2.22).
[135] About [WWW Document], n.d. . International Plant Protection Convention. URL https://www.ippc.int/en/structure/ (accessed 3.2.22).
[136] NPPO ESTABLISHMENT AND OPERATION [WWW Document], n.d. . International Plant Protection Convention. URL https://www.ippc.int/en/core-activities/capacity-development/phytosanitary-system/nppo-establishment-and-operation/ (accessed 3.2.22).
[137] Surveillance [WWW Document], n.d. . International Plant Protection Convention. URL https://www.ippc.int/en/publications/615/ (accessed 3.2.22).
[138] ibid

Organizations (RPPO), which are intergovernmental organizations divided by region tasked with cooperation and harmonization in relation to plant protection.[139] These organizations have a key role in coordinating national and international approaches as well as developing guidance.

European and Mediterranean Plant Protection Organization (EPPO)

The European and Mediterranean Plant Protection Organization (EPPO) is the RPPO for Europe and the Mediterranean.[140] The main objectives of the organization are to protect plant health in agriculture, forestry and the uncultivated environment while also developing a strategy against the introduction and spread of pests that can damage wild or cultivated plants in the natural ecosystems.[141]

As trade has become more diverse and complex, the risk of pests and alien plants that can harm the region has increased. To combat this, the EPPO has focused on developing common strategies to identify, evaluate and mitigate pest risk by putting together an alert list that lists pests that are of possible risk.[142] This alert list is the basis of the Pest Risk Analysis (PRA), which is the process of evaluating biological or other scientific and economic evidence to determine whether a pest should be regulated and the strength of any phytosanitary measures to be taken against it.[143] The pests are divided into two lists – A1[144] and A2.[145] These lists contain more than 300 key pests that the EPPO has recommended to

[139] ibid
[140] What is EPPO [WWW Document], n.d. URL https://www.eppo.int/ABOUT_EPPO/https%3A%2F%2Fwww.eppo.int%2FABOUT_EPPO%2Fabout_eppo (accessed 3.2.22).
[141] ibid
[142] EPPO activities on plant quarantine [WWW Document], n.d. URL https://www.eppo.int/ACTIVITIES/https%3A%2F%2Fwww.eppo.int%2FACTIVITIES%2Fquarantine_activities (accessed 3.2.22).

[143] EPPO activities on PRA [WWW Document], n.d. URL https://www.eppo.int/ACTIVITIES/plant_quarantine/https%3A%2F%2Fwww.eppo.int%2FACTIVITIES%2Fplant_quarantine%2Fpra_activities (accessed 3.2.22).
[144] EPPO A1 List [WWW Document], n.d. URL https://www.eppo.int/ACTIVITIES/plant_quarantine/https%3A%2F%2Fwww.eppo.int%2FACTIVITIES%2Fplant_quarantine%2FA1_list (accessed 3.2.22).
[145] EPPO A2 List [WWW Document], n.d. URL https://www.eppo.int/ACTIVITIES/plant_quarantine/https%3A%2F%2Fwww.eppo.int%2FACTIVITIES%2Fplant_quarantine%2FA2_list (accessed 3.2.22).

regulate to prevent their introduction into the region.[146] The A1 list contains pests that are not present in the EPPO region[147], while the A2 list contains pests that are present, not widely distributed in the EPPO region.[148] The pests in the lists have been identified due to their real threat of introduction, mainly through trade or import. Overall, the impact of a pest being introduced into an ecosystem is not felt right away, there is no immediate dramatic impact, but rather plays out in the long term.[149]

Security Measures

The advantage of a capable NPPO, working in conjunction with other stakeholders like governments and regional organizations like the EPPO, can safeguard the agriculture sector, as well as the environment and local ecosystems from negative impact of pests.[150]

2.7.2 Water Supply and Agroterrorism

As seen in the historical overview, attacks on water supplies are sensible targets for agroterrorism attacks with various exploitable vulnerabilities.[151] There are three main types of threats or methods to attack a water supply – natural contamination, chemical contamination and a direct attack on a water company's treatment plant or facility.[152]

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[146] EPPO activities on plant quarantine [WWW Document], n.d. URL https://www.eppo.int/ACTIVITIES/https%3A%2F%2Fwww.eppo.int%2FACTIVITIES%2Fquarantine_activities (accessed 3.2.22).
[147] EPPO A1 List [WWW Document], n.d. URL https://www.eppo.int/ACTIVITIES/plant_quarantine/https%3A%2F%2Fwww.eppo.int%2FACTIVITIES%2Fplant_quarantine%2FA1_list (accessed 3.2.22).
[148] EPPO A2 List [WWW Document], n.d. URL https://www.eppo.int/ACTIVITIES/plant_quarantine/https%3A%2F%2Fwww.eppo.int%2FACTIVITIES%2Fplant_quarantine%2FA2_list (accessed 3.2.22).
[149] EPPO activities on plant quarantine [WWW Document], n.d. URL https://www.eppo.int/ACTIVITIES/https%3A%2F%2Fwww.eppo.int%2FACTIVITIES%2Fquarantine_activities (accessed 3.2.22).
[150] Identification of risks and management of invasive alien species using the IPPC framework [WWW Document], n.d. URL https://www.fao.org/3/y5968e/y5968e09.htm (accessed 3.2.22).

[151] Gleick, P.H., 2006. Water and terrorism. Water Policy 8, 481–503. https://doi.org/10.2166/wp.2006.035
[152] Ing. Hana Vlachová, Ph.D. Potravinový terorismus a agroterorismus - PDF Free Download [WWW Document], n.d. URL https://docplayer.cz/46583120-Ing-hana-vlachova-ph-d-potravinovy-terorismus-a-agroterorismus.html (accessed 3.2.22).

Biological Agent Contamination

Contamination with natural biological agents like viruses, bacteria (Escherichia coli or Bacillus anthracis anthrax spores), cysts (intestinal lamblia - Giardia intestinalis, Cryptosporidium hominis or Cryptosporidium parvum).[153] The most important detail is the actual size of the agent, as it must be smaller than the pores of the filters in water treatment plants.[154] Today, most threatening agents are identified and removed by flocculation, filtration, or disinfection.[155]

Chemical Contamination

The second set of threats include the use of chemicals, namely synthesized organic chemicals, or radioactive materials. Although most organic substances are trapped by activated charcoal in the filters, inorganic agents are removed more efficiently by distillation or reverse osmosis.[156]

Physical Attack on Water Supply Infrastructure

The third possibility of attack on the water supply is a direct attack on a water company, water treatment plant or reservoirs in order to disrupt water supply or cause anthropogenic floods.[157]

Security Measures

Security-wise, the North Atlantic Treaty Organization (NATO) pays close attention to the protection of water resources against terrorist attacks and label water as a key security asset. NATO facilitates a variety of projects that are directly related to water issues since they are considered of critical importance in today's security environment. Flooding,

[153] ibid
[154] ibid
[155] ibid
[156] ibid
[157] ibid

droughts, as well as the management or protection of infrastructure for water supplies are examples of the types of projects NATO supports.[158]

Although conventional water treatment methods can dispose some of the substances potentially used by terrorists such as bacteria and viruses which are large enough, protection against the others would often require too high of a cost and would also need to be reinforced by an overhaul of physical security measures of water reservoirs and pipelines, which for economic reasons is not feasible.[159]

Examples of Agroterrorism Attacks on Water Supplies

There are several more recent examples of agroterrorism on water supplies with a wide range of motives from election manipulation, to worker benefit grievances, attacks against a military, profit stealing to pathological motives.

Ranjeeshee

One of the most famous examples is from Oregon in the United States, when in 1984, members of the Rajneeshee religious cult purchased Salmonella bacteria from a medical supply company in Seattle and cultured it in labs; before contaminating salad bars at several local restaurants. The second part of their plot to contaminate the city's water system, did not come to fruition. Regardless, the result was 751 infected people.[160] The motive for the attack was to incapacitate the voting population of the city so that their own candidates would win the 1984 Wasco County elections. The incident was the first and is the single largest bioterrorist attack in United States history.[161]

Cellatex

An example from the summer of 2000, when laid off workers from a chemical factory called Cellatex on the border of France and Belgium, poured 5,000 liters of sulfuric acid into

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[158] NATO On-line library: Water - a key security asset [WWW Document], n.d. URL https://www.nato.int/docu/water/html_en/water01.html (accessed 3.4.22).

[159] ibid

[160] Gleick, P.H., 2006. Water and terrorism. Water Policy 8, 481–503. https://doi.org/10.2166/wp.2006.035

[161] ibid

the tributary of the river Meuse, in protest against the closure of the factory.[162] The acid was quickly contained, and the workers did in fact have their demands met with increased severance payments.[163]

Other Examples

In 1992 The Kurdistan Workers' Party (PKK) put lethal concentrations of potassium cyanide in the water tanks of a Turkish Air Force compound in Istanbul.[164]

The Khumbuwan Liberation Front (KLF) blew up a 250-kW hydroelectric power plant in the Bhojpur District on January 26, 2002. The power supply to Bhojpur and adjoining areas was cut off. Estimated repair time was six months; repair costs were estimated at 10 million rupees ($135,000 USD).[165]

Four incendiary devices were found in the pumping station of a Michigan water-bottling plant in 2003. The Earth Liberation Front (ELF) claimed responsibility, accusing Ice Mountain Water Company , a subsidiary of Nestle, of stealing water for profit.[166]

In 2006, Tamil Tiger rebels cut the water supply to government-held villages in northeastern Sri Lanka. Sri Lankan government forces then launched attacks on the reservoir, declaring the Tamil actions to be terrorism.[167]

In 2000, Queensland police arrested a man for using a computer and a radio transmitter to take control of the Maroochy Shire wastewater system and release sewage into parks, rivers, and property.[168]

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[162] ibid
[163] 2000: Cellatex chemical plant occupation [WWW Document], n.d. . libcom.org. URL http://libcom.org/history/2000-cellatex-chemical-plant-occupation (accessed 3.4.22).
[164] Gleick, P.H., 2006. Water and terrorism. Water Policy 8, 481–503. https://doi.org/10.2166/wp.2006.035
[165] ibid
[166] ibid
[167] ibid
[168] ibid

2.7.3 Animals and Agroterrorism

An attack on livestock is done for the purpose to cause damage to the national economy and not usually to hurt the animals. Attacks on animals represent one of the most feared threats from agroterrorism. Attacks can vary from relatively simple, using regular biological agents; to more complex using toxin and proteins.[169] "A covert biological attack could be easily designed to cripple the poultry or livestock industry by simultaneously introducing three or four highly contagious, highly fatal animal diseases"[170]

Most experts believe that animal agriculture is more vulnerable and at greatest risk for an intentional attack because livestock move frequently, have a higher individual value, and are more difficult to free from disease.[171]

Livestock Industry and Poultry Industry

The livestock, and poultry industry can be devasted with the use of several agents or the prompting of an outbreak of several diseases. Potential risks to livestock may include pathogenic zoonotic diseases such as Foot-and-Mouth disease (FMD), Anthrax (Bacillus anthracis), Glanders (Pseudomonas mallei, African Swine Fever, Rinderpest, or Avian Influenza.[172] An outbreak of any of these diseases can cause massive disruptions to food availability and safety; and drastic measures like eradication of animals are needed.

Fishing Industry

In addition to livestock and poultry, fish and fish farms can also be a target. Many readily available insecticides, herbicides or fungicides used in agriculture in large quantities are highly toxic for fish.[173] A specific and problematic group of insecticides are

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[169] - AGROTERRORISM: THE THREAT TO AMERICA'S BREADBASKET [WWW Document], n.d. URL https://www.govinfo.gov/content/pkg/CHRG-108shrg91045/html/CHRG-108shrg91045.htm (accessed 3.2.22).

[170] Watson, S.A., 1999. The changing biological warfare threat. Anti-crop and anti-animal agents. Ann N Y Acad Sci 894, 159–163. https://doi.org/10.1111/j.1749-6632.1999.tb08059.x

[171] Monke, J., n.d. Agroterrorism: Threats and Preparedness 49.

[172] ibid

[173] Ing. Hana Vlachová, Ph.D. Potravinový terorismus a agroterorismus - PDF Free Download [WWW Document], n.d. URL https://docplayer.cz/46583120-Ing-hana-vlachova-ph-d-potravinovy-terorismus-a-agroterorismus.html (accessed 3.2.22).

organophosphorus insecticides (organophosphates). All organophosphate fertilizers registered in the Czech Republic are toxic to fish. [174]

Foot-and-Mouth Disease (FMD)

One of the major fears from attacks on animals is the spread of foot-and-mouth disease (FMD), a disease that the FBI notes has twenty times the infectiousness of chickenpox.[175] The disease is caused by a virus from the Aphtovirus family, which causes painful blisters on the tongue, hooves and udders.[176] It is possible to be contaminated by inhalation of the virus, consumption of contaminated produce such as milk or penetration of the virus into the skin. The disease can be spread as easily as taking a mucus sample from an infected animal, soaking a handkerchief with the mucus, and then either wiping it on another animal or just tossing it on the ground in a feedlot.[177] The incubation period of the disease is 2-7 days.[178] It can be spread from animal to animal by air from fifty miles away and could spread to twenty-five states in five days; forty states within two weeks.[179] The disease is rare in humans, who can carry the virus in their lungs and can then transmit it to animals they come into contact with for forty-eight hours.[180] Symptoms in humans include fever, blisters in the mouth area as well as between toes and on the palms of hands. Symptoms in humans usually go away with no medical attention needed[181].

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[174] ibid
[175] Agroterrorism: Threats to America's Economy and Food Supply [WWW Document], n.d. . FBI: Law Enforcement Bulletin. URL https://leb.fbi.gov/articles/featured-articles/agroterrorism-threats-to-americas-economy-and-food-supply (accessed 3.4.22).
[176] Domingo, E., Baranowski, E., Escarmís, C., Sobrino, F., 2002. Foot-and-mouth disease virus. Comp Immunol Microbiol Infect Dis 25, 297–308. https://doi.org/10.1016/s0147-9571(02)00027-9
[177] Agroterrorism: Threats to America's Economy and Food Supply [WWW Document], n.d. . FBI: Law Enforcement Bulletin. URL https://leb.fbi.gov/articles/featured-articles/agroterrorism-threats-to-americas-economy-and-food-supply (accessed 3.4.22).
[178] Peterson, M.E., n.d. AGROTERRORISM AND FOOT-AND-MOUTH DISEASE: Is the United States Prepared? 40.
[179] Bioterrorism: A Threat to Agriculture and the Food Supply [WWW Document], n.d. URL https://www.govinfo.gov/content/pkg/GAOREPORTS-GAO-04-259T/html/GAOREPORTS-GAO-04-259T.htm (accessed 3.4.22).
[180] Hand-foot-and-mouth disease - Symptoms and causes [WWW Document], n.d. . Mayo Clinic. URL https://www.mayoclinic.org/diseases-conditions/hand-foot-and-mouth-disease/symptoms-causes/syc-20353035 (accessed 3.4.22).
[181] ibid

The most common measure against foot-and-mouth disease is the 'stamping-out method' of the animals.[182] All infected and animals susceptible to infection due to contact, are slaughtered or eradicated. The carcasses are then burned or buried to prevent further spread.[183] Other ways, such as transport away from the outbreak is risky, if not impossible, with a large number of animals needed to be slaughtered. This brings up new challenges such as mass-carcass disposal, in addition to the ban on production and sale of meat, which would make it hard on the meat industry.[184] The impact of the outbreak would be felt for months and even years after its start.

After an outbreak is identified, a protection zone is enacted of at least 3km from the hot spot. In addition to this, in a zone of at least 10km, a zone of increased surveillance is established and under extraordinary measures such as count of all animals deemed susceptible, veterinarian inspections, increased disinfections, prohibition of animal transport, and in some cases restriction of movement of people.[185] There is a ban and prohibition on the export of live animals, fresh meat, milk and products like leather and skin from the area.[186]

The disease is currently endemic in several parts of the world including Africa, Asian and South America. The FBI views the disease and an 'ominous threat' and according to Bill White, Director of the Plum Island Foreign Animal Disease Diagnostic Laboratory is 'the most important disease to worry about here in the United States'[187] The estimates of a FMD are astronomically high. One economist estimates a loss of $750,000 USD - $1 million USD per operating hour that the US beef industry is halted due to a nationwide FMD outbreak; with total estimated losses of up to $60 billion by the time the

[182] USDA APHIS, Veterinary Services. "Foot and Mouth Disease Response Plan: The Red Book ." USDA APHIS, https://www.aphis.usda.gov/animal_health/emergency_management/downloads/asf-responseplan.pdf.
[183] ibid
[184] ibid
[185] ibid
[186] ibid
[187] Burns, B.E., n.d. FLORIDA LAW ENFORCEMENT'S ROLE IN AGROTERRORISM 139.

outbreak is squashed.[188] [189] The United States Department of Agriculture (USDA) itself notes the total economic impact of an outbreak over the long term is estimated at $12.8 billion per year over the course of ten years with a total price tag of $128 billion USD.[190] More detail about FMD and other diseases will be communicated in a following section.

Security Measures

In connection with prevention measures against an attack on the livestock industry, agrosecurity has become more widespread, and educational campaigns have popped up to inform about animal and plant diseases.[191]

2.7.4 Plants and Agroterrorism

An agroterrorist attack against crops is generally considered less likely than one targeting animals for reasons having to do with characteristics of plant specific biological agents.[192] Plant pathogens are highly sensitive to temperature, humidity, and sunlight, they do not travel far or fast through the air, and they would be more difficult for a potential terrorist to produce and effectively disperse. Plant pathogens have various methods of spread including water, wind, agricultural equipment, seeds, or vectors like insects, animals, or farm workers.[193]

Introducing pathogens to crops would be a less visible attack, and the effects might not be seen for quite some time. However, the attack, which effectively targets a country's food supply, may have serious and wide-spread impacts, both short and long term, including loss of quantity and quality of product, cost of growing crops, increase in product prices; as well as rise in consulting and management strategies to mitigate the spread and development of pathogen resistant varieties.[194]

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[188] ibid
[189] Knight-Jones, T.J.D., Rushton, J., 2013. The economic impacts of foot and mouth disease – What are they, how big are they and where do they occur? Preventive Veterinary Medicine 112, 161. https://doi.org/10.1016/j.prevetmed.2013.07.013
[190] 2019 President's Budget Agriculture Research Service [WWW Document], n.d. URL https://www.usda.gov/our-agency/about-usda/budget (accessed 3.4.22).
[191] Planning and Preparing for Foot-and-Mouth Disease: Quick Briefing, n.d. 14.
[192] Kohnen, A., n.d. Responding to the Threat of Agroterrorism: Specific Recommendations for the United States Department of Agriculture 52.
[193] ibid
[194] ibid

Some plant pathogens have the ability to infect humans, particularly fungi, which can produce mycotoxins and other spores that can pose risks to humans that are allergic, or to the immunocompromised such as the very young or old. The use of microbes, such as the anthrax bacterium, against human targets is a highly visible act with immediate consequences.[195] Indirect impacts on human health can also be experienced through loss of crops which then narrows down nutrition options and increases livestock feed loss.[196]

As in the previous threats, the most prominent impacts would be felt economically. In addition to the aforementioned devastation of crops, the imposition of quarantine and embargo of affected products would affect not only the farmers and growers but be felt further along the supply chain as well with effects on companies that deal with storage, packaging, transport, and marketing of a product. The effect on international trade and the loss of trading partner and markets would shake markets worldwide.[197]

The psychological impact of an attack on the food supply could also lead to a decrease in public trust in the safety of food, as well as the ability of the government to ensure security. Regions that rely on agriculture as a primary livelihood could become quickly destabilized, leading to mass panic and uncertainty.[198]

Impacts of Plant Diseases

The scope of plant pathogen impact can be seen in events such as the Irish potato famine in 1845, which was caused by the pathogen Phytophthora infestans.[199] It led to extensive famine that resulted in the deaths of a million people and forced the emigration of another 1.5 million Irish to escape. During the same time, in another region of the world, a rust fungus affecting coffee plants in Sri Lanka, which was the main supplier of coffee beans to Great Britain, led to a large number of the British society to turn to tea as their primary

[195] Medicine, I. of, Health, B. on G., Threats, F. on M., 2007. Global Infectious Disease Surveillance and Detection: Assessing the Challengesâ¬"Finding Solutions: Workshop Summary. National Academies Press.
[196] ibid
[197] ibid
[198] ibid
[199] Medicine, I. of, Health, B. on G., Threats, F. on M., 2007. Global Infectious Disease Surveillance and Detection: Assessing the Challengesâ¬"Finding Solutions: Workshop Summary. National Academies Press.

hot beverage.[200] During WWI, plant diseases in wheat and potatoes, which were the main crops for suppling the front lines led to food shortage and supply chain issues that some argue, changed the course of the war.[201] There is also evidence that in the 1980s and 1990s, the Iraqi bioweapons program was heavily focused on developing fungi diseases including rusts, blasts, and smuts, with emphasis on cereal crops like wheat.[202]

Risk of the Threat to Plants

Many of the available dangerous pathogens can be obtained with ease by those who want to cause harm. Among them, there are attractive options due to criteria such as ease of handling, growing, transportation; favorable method of dispersion, low expertise needed, low tech equipment; and low risk to the health of the terrorist.

In almost every country, plant resources like crops, rangelands and forests are vulnerable to endemic, introduced, and emerging pathogens. The growing globalization of trade has led to many alien and exotic pathogens to be found in regions where they would not otherwise be found.

In any region on earth, producers are faced with an average of 10-15 plant diseases that put crops at risk.[203] There are more than 50,000 plant diseases that occur in the United States, caused by a variety of pathogens like fungi, virus, viroids, bacteria, nematodes, and parasites.[204] In the United States alone, an estimated of 65% of crop losses, valued at $137 billion USD were due to pathogens in a single year.[205] Of that, all crop pests including pathogens, arthropods and weeds accounted for preharvest losses of 42%, and 10% loss after harvest. Of the damage, 13% was caused by pathogens, 15% due to arthropods, and 13% due to weeds.[206] Worldwide, losses for the eight major crops that comprise half of the global croplands were estimated at $300 billion in 1988–1990.[207]

[200] ibid
[201] ibid
[202] ibid
[203] ibid
[204] ibid
[205] ibid
[206] ibid
[207] Ibid

Vulnerabilities

There are several reasons as to why crops and agriculture production is so vulnerable to emerging diseases and pathogens. First, the sheer vastness of the crop fields lends itself to the impossibility to monitor such extensive areas or disease symptoms, especially since some period of time will go by between pathogen introduction, and detection.[208] Second, is the lack of general agricultural diversity of crops with most production focused on wheat, corn, and soybeans. A pathogen that is detrimental to any of these crops would be able to cause a massive impact.[209] Lastly, due to the fact that eradication of plant pathogens is seldom physically or financially feasible, the most common and effective method is simply to cut the losses and focus on managing an outbreak by making sure it stays under a certain threshold of economic impact.[210]

2.7.5 Food Safety (Food Terrorism) and Agroterrorism

As defined before, food terrorism is an act of intentional contamination of food intended for human consumption using chemical, biological or radioactive substances with the goal to undermine social, economic, or political stability.[211]

Food can be tampered with in any part of the food chain, from production, transport, storage, preparation, and serving. Therefore, albeit difficult, it is necessary to ensure safety in all these phases through food defense.[212] Food defense is the protection of food from deliberate degradation through biological, chemical, radioactive substance or objects such as glass shards, nails or sawdust through training, inspection, and monitoring of food.[213]

[208] ibid
[209] ibid
[210] ibid
[211] Ing. Hana Vlachová, Ph.D. Potravinový terorismus a agroterorismus - PDF Free Download [WWW Document], n.d. URL https://docplayer.cz/46583120-Ing-hana-vlachova-ph-d-potravinovy-terorismus-a-agroterorismus.html (accessed 3.2.22).
[212] ibid
[213] ibid

Usually, the goal is not primarily the death of people affected, but rather to upset the society with economic destabilization as well as propagate panic, fear, and social unrest.[214] When a larger attack is carried out, it also affects food that is part of international trade.

This can be seen in 1978 when a Palestinian organization poisoned Israeli citrus fruits meant for the European market with the clear intent to "sabotage the Israeli economy".[215] Israeli oranges, lemons, grapefruits were contaminated with mercury. The first contaminated oranges showed up in Rotterdam.[216] A letter sent from the group to governments of dozens of European countries stated that thousands of oranges had been poisoned by Palestinian workers in Israel's orchards.[217] The fear and panic spread quickly, and anxiety of importing and consuming Israeli oranges grew. The attack forced Israel to halt the export of its citrus fruits, their biggest export. Supermarkets refused to accept Israeli oranges, and customs would not release oranges into Europe. In the end 12 people became ill.[218] It goes to show that, albeit no deaths in the attack, and only a handful of illness, the propaganda, and fear that was widespread throughout Europe created apprehension to buy Israeli citrus products, leading to disruption in trade and the economy. The toll of the attack was that the Israeli orange industry never fully recovered, citrus exports plummeted by over 75% since the 1980s.[219] This example shows the importance of food safety for national economies especially in countries that rely on agriculture production. The agroterrorist attack was not large in any manner, only a minute number of oranges were poisoned, but can cause millions

[214] Hoffman, J., Kennedy, S., 2007. International Cooperation to Defend the Food Supply Chain: Nations Are Talking; Next Step—Action. Vanderbilt Jornal of Transnational Law 40, 1169–1178.
[215] Ing. Hana Vlachová, Ph.D. Potravinový terorismus a agroterorismus - PDF Free Download [WWW Document], n.d. URL https://docplayer.cz/46583120-Ing-hana-vlachova-ph-d-potravinovy-terorismus-a-agroterorismus.html (accessed 3.2.22).
[216] Why So Little? The Palestinian Terrorist Organizations and Unconventional Terrorism [WWW Document], n.d. URL https://www.ict.org.il/Article.aspx?ID=978#gsc.tab=0 (accessed 3.6.22).
[217] ibid
[218] ibid
[219] Israel exchanges oranges for technology [WWW Document], n.d. URL https://www.freshplaza.com/article/9197402/israel-exchanges-oranges-for-technology/ (accessed 3.6.22).

in damages and changes to trade patterns for years to come. In the US, foodborne illness totals over $15.5 billion USD.[220]

A domestic example can be seen in 2014, Toshiki Abe, a Japanese factory worker was sentenced to 3.5 years in prison for intentionally contaminating frozen foods with malathion, which is a chemical used as a pesticide to control insects. Over 2,500 people in Japan were contaminated and it represents one of the most serious intentional acts of food contamination. Over 6 million packages of frozen foods were ordered to be destroyed due to the incident.[221]

A survey by the US Food and Drug Administration (FDA) of samples from major distributors showed that 1.6% of domestic produce was contaminated with human pathogens.[222] E. coli and salmonella contamination incidents of products like leafy greens and peanut butter, or in food establishments like Chipotle, can show the impact that failure of food safety can have – resulting in consumer buying habit changes, producers suffering mass economic losses and mistrust in specific restaurants due to bad PR.[223]

Security Measures

On the European Union level, the main body dealing with food risk analysis and feed is the European Food Safety Authority (EFSA).[224] In addition to this, there is a rapid alert system for food safety in place called the Rapid Alert System for Food and Feed (RASFF). The RASFF is a notification system operated by the European Commission to exchange information on identified hazards between Member States and covers food, food contact

[220] USDA ERS - Quantifying the Impacts of Foodborne Illnesses [WWW Document], n.d. URL https://www.ers.usda.gov/amber-waves/2015/september/quantifying-the-impacts-of-foodborne-illnesses/ (accessed 3.6.22).
[221] Agro Terrorism: A Global Perspective | Abstract [WWW Document], n.d. URL https://www.longdom.org/abstract/agro-terrorism-a-global-perspective-36433.html (accessed 3.6.22).
[222] Institute of Medicine (US) Forum on Microbial Threats, 2007. Global Infectious Disease Surveillance and Detection: Assessing the Challenges—Finding Solutions, Workshop Summary, The National Academies Collection: Reports funded by National Institutes of Health. National Academies Press (US), Washington (DC).
[223] ibid
[224] Ing. Hana Vlachová, Ph.D. Potravinový terorismus a agroterorismus - PDF Free Download [WWW Document], n.d. URL https://docplayer.cz/46583120-Ing-hana-vlachova-ph-d-potravinovy-terorismus-a-agroterorismus.html (accessed 3.2.22).

materials and animal feed.[225] This effective tool for the exchange of information helps Member States to act more rapidly and in a coordinated manner in response to a safety threat.

Food Terrorism Risk

Due to a high level of food safety control in developed countries, food contamination or food terrorism is relatively difficult. In addition to the strict controls, diet variety in developed countries means that the population is not dependent on one product, but a larger number. In developing countries, where the controls are not as strict, and the population is reliant on a more limited variety of food, food terrorism can be a greater threat.

Food Safety Hazards

Organically, foods contain several naturally occurring chemicals to begin with. During harvest, production and processing, food can come into contact with a range of microorganisms and objects that can be naturally occurring or man-made. Any potentially harmful factors in food are called hazards and can include microorganisms, naturally occurring chemicals, contaminants from the natural environment, chemical substances arising during heat treatment, additives, pesticides, and foreign objects. These hazards are divided into biological, chemical, and psychical.[226]

Biological Hazards

Biological hazards are health hazards caused by living organisms, microorganisms or parasites that can enter the human body and cause disease such as salmonella, dysentery, or trichinosis. Biological hazards tend to be underestimated by consumers, but when they do break out, the consequences and the number of affected is huge.[227]

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[225] ibid
[226] SmartSense, n.d. The 4 Primary Food Safety Hazards and Preventing Foodborne Illness [WWW Document]. URL https://blog.smartsense.co/food-safety-education-month-hazards-prevention (accessed 3.6.22).
[227] ibid

Chemical Hazards

Chemical hazards are hazards caused by chemicals in food that can cause harm to the human body in any acute or chronic intoxication leading to adverse reactions. Chemical hazards include natural toxins in food like solanine in potatoes, allyl isothiocyanate, hydrogen cyanide from cyanogenic glycosides, fungal poisons, toxins in marine animals, and mycotoxins from primary production.[228] Other contaminates can be found in production like oils, lubricants, cleaning and disinfecting residue, and heavy metal use; as well as in packaging materials including monomers, plasticizers, stabilizers, antioxidants, and printing dyes.[229]

Physical Hazards

Physical hazards are foreign objects or mechanical impurities like sharp and firm objects that come from any part of the food supply chain, which can cause harm to the consumer. Examples include endogenous sources which are impurities and object from raw materials such as stones, shells, bones, cartilage, sand, and clay; and exogenous sources including human items like clips, cigarette butts, buttons, coins, hairs, fingernails, as well as pieces of the machines used like glass, screws, equipment parts, plaster, etc.[230]

2.8 Biological Agents

2.8.1 Spread of Diseases

Threatening diseases are predominantly viral and transmitted in various ways. Most viruses are transmitted through direct contact, some are airborne and can spread through the air over great distances in aerosol form; and others need a vector to spread, most commonly insect vectors.[231]

[228] ibid
[229] ibid
[230] ibid
[231] Ryan, J.R., PhD, J.R., Glarum, J., 2008. Biosecurity and Bioterrorism: Containing and Preventing Biological Threats. Butterworth-Heinemann.

Airborne Transmission of Animal Diseases.

Diseases that can spread via airborne aerosols over great distances. Airborne diseases are very difficult to contain and present a colossal challenge. Foot-and-mouth disease, avian influenza, and Newcastle disease all can spread via airborne aerosols over long distances. In 1981, three days after an outbreak of FMD in Brittany, France, single cases appeared across the English Channel on the Isle of Wight. Prevailing wind patterns corroborate the hypothesis that the virus traveled a distance of 175 miles as an airborne aerosol.[232]

Direct Transmission Mode of Animal Diseases.

Spread by direct contact with an infected animal or object. Examples of spread – feeding and water throughs, milking machines; people's clothes, shoes; and equipment. Good sanitation, clean facilities and human interaction restrictions can help curb the risk.[233]

These include diseases such as rinderpest, vesicular stomatitis, hog cholera, and African swine fever.

Vector Transmission Mode of Animal Diseases.

Some diseases are spread via vectors mainly with the use of insect vectors. Ticks or mosquitos can become carriers for a disease and transmit it to another animal through a bite. In case of these outbreak, disease control is depended on insect control. Others, such as bluetongue and African swine fever, are spread by insect vectors.[234]

2.8.2 Classification of Possible Agents Used in an Agroterrorist Attack

There are multiple avenues to classify potential agents and pathogens used to carry out an agroterrorism attack.

This thesis will look at three major classifications of biological agents. The first, the CDC's regulatory classification of agents divided into categories based on risk; second the OIE's classification which includes a comprehensive list of up-to-date diseases and used as

[232] ibid.
[233] ibid
[234] ibid

a guideline in international trade; and lastly, a classification of military application based on types and if the agent has been weaponized. Each classification focuses on a different criterion of an agent and provides detail on different attributes like spread, lethality, or type.

Classification of Bioterrorism Agents: CDC

In order to regulate biological agents, the Center for Disease Control and Prevention (CDC), working with the Department of Homeland Security evaluated and divided the agents into three categories – Category A, Category B, and Category C.[235] Category A comprises of agents that are the highest risk; Category B consist of agents that can threaten food and water safety; and Category C pathogens are considered emerging diseases which can be further engineered.[236]

Determination of Classification

To determine the risk from the agents, the CDC considers several factors. The classification itself is based on:

- the ability of the agents to be spread;
- the morality of the agent;
- the actions required for public health preparedness;
- and the capability of causing public panic.[237]

In more detail, other elements are considered like the method of transmission, the availability of vaccines and therapies. The classification of agents is looked at and reviewed periodically, with new agents being added or agents for which there are vaccines and represent a lower threat, taken off.[238]

[235] CDC | Bioterrorism Agents/Diseases (by category) | Emergency Preparedness & Response [WWW Document], 2019. URL https://emergency.cdc.gov/agent/agentlist-category.asp#catdef (accessed 3.6.22).
[236] ibid
[237] ibid
[238] ibid

Category A

Category A agents pose the greatest threat and include high rates of mortality, high ease of spread, special action required by public health officials, and have the ability to cause mass public panic.[239]

Category A Agents/Diseases[240]

Anthrax (Bacillus anthracis)
Botulism (Clostridium botulinum toxin)
Plague (Yersinia pestis)
Smallpox (variola major)
Tularemia (Francisella tularensis)
Viral hemorrhagic fevers, including
Filoviruses (Ebola, Marburg)
Arenaviruses (Lassa, Machupo)

Category B

Category B agents represent the second highest risk and include agents that have moderate mortality, moderate ease of spread, and require specific enhancements to disease surveillance.[241]

Category B Agents/Diseases[242]

Brucellosis (Brucella species)
Epsilon toxin of Clostridium perfringens
Food safety threats (Salmonella species, Escherichia coli O157:H7, Shigella)
Glanders (Burkholderia mallei)
Melioidosis (Burkholderia pseudomallei)
Psittacosis (Chlamydia psittaci)
Q fever (Coxiella burnetii)

[239] ibid
[240] ibid
[241] ibid
[242] ibid

Ricin toxin from Ricinus communis (castor beans)

Staphylococcal enterotoxin B

Typhus fever (Rickettsia prowazekii)

Viral encephalitis (alphaviruses, such as eastern equine encephalitis, Venezuelan equine encephalitis, and western equine encephalitis])

Water safety threats (Vibrio cholerae, Cryptosporidium parvum)

Category C

The third category is Category C which includes emerging pathogens than can potentially be engineered for mass spread in the future and if in the wrong hands due to mass and ease of availability, ease of production and spread, and the potential of high mortality and major health impacts.[243]

Category C Agents/ Diseases[244]

Emerging infectious diseases such as Nipah virus and hantavirus

World Organization for Animal Health (OIE) Classification

The World Organization for Animal Health (OIE) is an intergovernmental organization with 155 member countries that is considered the primary organization that deals with animal diseases. The OIE maintains and tracks animal diseases and outbreaks from member countries on a list. The World Trade Organization (WTO) recognizes the OIE as the main international agency for setting animal health standards for conducting international trade. The list of transmissible diseases is reviewed on a regular basis and any changes are adapted each year. In 2021, the list included 117 animal diseases, infections, and infestations.

[243] ibid
[244] ibid

Classification of Diseases

In the past, the list of diseases was divided into two lists – List A and List B.[245] [246] As of 2005, all the diseases contained on both lists were combined into a single list known as the "OIE List".[247] Part of the reason a new list was created was that it allowed for the criteria to include a disease to be reviewed, as well as newly require member states to file disease and epidemiological events. Nearly all former List A and List B diseases are included in the new single OIE List.[248] The new list classifies each of the diseases equally, giving all diseases the same importance in international trade. The primary reason why this thesis still leans on and focuses on the older classification is due to the greater justification in classification of an agent.[249]

The OIE's List A diseases were transmissible animal diseases that had the potential for very serious and rapid spread, irrespective of national borders. List A diseases had serious socioeconomic or public health consequences and were of major importance in international trade.[250] List B diseases were transmissible diseases considered to be of socioeconomic or public health importance within countries and significant in international trade.[251]

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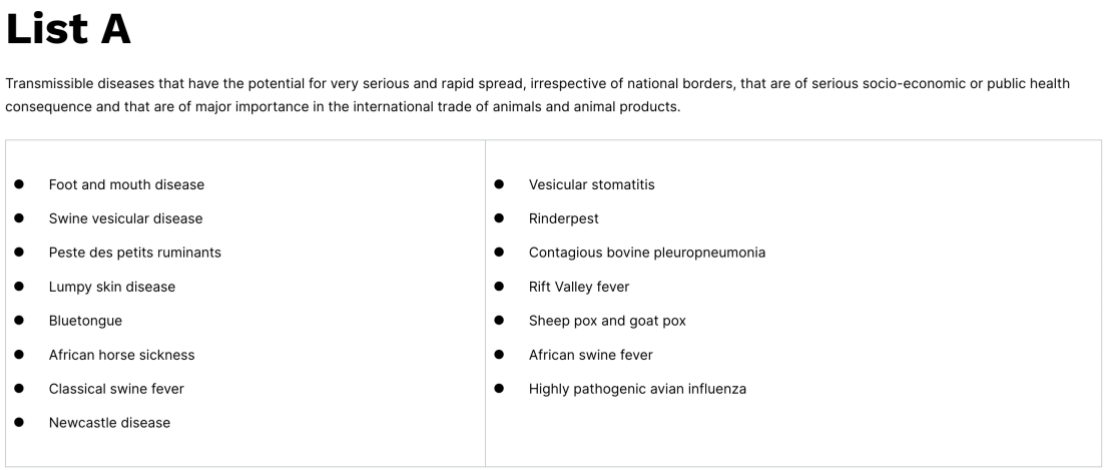
[245] Old Classification of Diseases Notifiable to the OIE – List A, n.d. . OIE - World Organisation for Animal Health. URL https://www.oie.int/en/what-we-do/animal-health-and-welfare/animal-diseases/old-classification-of-diseases-notifiable-to-the-oie-list-a/ (accessed 3.6.22).
[246] Old Classification of Diseases Notifiable to the OIE – List B, n.d. . OIE - World Organisation for Animal Health. URL https://www.oie.int/en/what-we-do/animal-health-and-welfare/animal-diseases/old-classification-of-diseases-notifiable-to-the-oie-list-b/ (accessed 3.6.22).
[247] Surveillance, T.A.H., n.d. Home - The Animal Health Surveillance [WWW Document]. URL http://www.animalhealthsurveillance.agriculture.gov.ie/oielisteddiseases/ (accessed 3.6.22).
[248] ibid
[249] Biological threat reduction, n.d. . OIE - World Organisation for Animal Health. URL https://www.oie.int/en/what-we-do/global-initiatives/biological-threat-reduction/ (accessed 3.6.22).

[250] Old Classification of Diseases Notifiable to the OIE – List A, n.d. . OIE - World Organisation for Animal Health. URL https://www.oie.int/en/what-we-do/animal-health-and-welfare/animal-diseases/old-classification-of-diseases-notifiable-to-the-oie-list-a/ (accessed 3.6.22).
[251] Old Classification of Diseases Notifiable to the OIE – List B, n.d. . OIE - World Organisation for Animal Health. URL https://www.oie.int/en/what-we-do/animal-health-

List A Diseases

Diseases under List A listed in Figure 3, were diseases which were identified to have the potential to be serious outbreaks with rapid spread irrespective of national borders, carry a high socio-economic or public health risk, and are of major importance in the international trade of animals and animal products. The outbreak of any of these diseases is internationally recognized as grounds for trade embargo. Vaccination against most List A disease agents is practiced in endemic areas of the world.[252]

Figure 3 Old Classification of Diseases Notifiable to the OIE - List A.



List A

Transmissible diseases that have the potential for very serious and rapid spread, irrespective of national borders, that are of serious socio-economic or public health consequence and that are of major importance in the international trade of animals and animal products.

- Foot and mouth disease
- Swine vesicular disease
- Peste des petits ruminants
- Lumpy skin disease
- Bluetongue
- African horse sickness
- Classical swine fever
- Newcastle disease
- Vesicular stomatitis
- Rinderpest
- Contagious bovine pleuropneumonia
- Rift Valley fever
- Sheep pox and goat pox
- African swine fever
- Highly pathogenic avian influenza

Source: OIE - World Organization for Animal Health.

List B Diseases

Diseases under List B listed in Figure 4, were considered to be of socio-economic and/or public health importance within countries in addition to being significant in international trade.[253]

and-welfare/animal-diseases/old-classification-of-diseases-notifiable-to-the-oie-list-b/ (accessed 3.6.22).

[252] Old Classification of Diseases Notifiable to the OIE – List A, n.d. . OIE - World Organisation for Animal Health. URL https://www.oie.int/en/what-we-do/animal-health-and-welfare/animal-diseases/old-classification-of-diseases-notifiable-to-the-oie-list-a/ (accessed 3.6.22).

[253] Old Classification of Diseases Notifiable to the OIE – List B, n.d. . OIE - World Organisation for Animal Health. URL https://www.oie.int/en/what-we-do/animal-health-and-welfare/animal-diseases/old-classification-of-diseases-notifiable-to-the-oie-list-b/ (accessed 3.6.22).

Figure 4 Old Classification of Diseases Notifiable to the OIE - List B.

List B

Transmissible diseases that are considered to be of socio-economic and/or public health importance within countries and that are significant in the international trade of animals and animal products.

Multiple species diseases	**Cattle diseases**
• Anthrax • Aujeszky's disease • Echinococcosis/hydatidosis • Heartwater • Leptospirosis • New world screwworm (*Cochliomyia hominivorax*) • Old world screwworm (*Chrysomya bezziana)* • Paratuberculosis • Q fever • Rabies • Trichinellosis	• Bovine anaplasmosis • Bovine babesiosis • Bovine brucellosis • Bovine cysticercosis • Bovine genital campylobacteriosis • Bovine spongiform encephalopathy • Bovine tuberculosis • Dermatophilosis • Enzootic bovine leukosis • Haemorrhagic septicaemia • Infectious bovine rhinotracheitis/infectious pustular vulvovaginitis • Malignant catarrhal fever • Theileriosis
	• Trichomonosis • Trypanosomosis (tsetse-transmitted)
Sheep and goat diseases	**Equine diseases**
• Caprine and ovine brucellosis (excluding *B. ovis*) • Caprine arthritis/encephalitis • Contagious agalactia • Contagious caprine pleuropneumonia • Enzootic abortion of ewes (ovine chlamydiosis) • Maedi-visna • Nairobi sheep disease • Ovine epididymitis (*Brucella ovis*) • Ovine pulmonary adenomatosis • Salmonellosis (*S.* abortusovis) • Scrapie	• Contagious equine metritis • Dourine • Epizootic lymphangitis • Equine encephalomyelitis (Eastern and Western) • Equine infectious anaemia • Equine influenza • Equine piroplasmosis • Equine rhinopneumonitis • Equine viral arteritis • Glanders • Horse mange • Horse pox • Japanese encephalitis • Surra (*Trypanosoma evansi)* • Venezuelan equine encephalomyelitis

Swine diseases • Atrophic rhinitis of swine • Enterovirus encephalomyelitis • Porcine brucellosis • Porcine cysticercosis • Porcine reproductive and respiratory syndrome • Transmissible gastroenteritis	**Avian diseases** • Avian chlamydiosis • Avian infectious bronchitis • Avian infectious laryngotracheitis • Avian mycoplasmosis (*M. gallisepticum)* • Avian tuberculosis • Duck virus enteritis • Duck virus hepatitis • Fowl cholera • Fowl pox • Fowl typhoid • Infectious bursal disease (Gumboro disease) • Marek's disease • Pullorum disease
Lagomorph diseases • Myxomatosis • Rabbit haemorrhagic disease	**Bee diseases** • Acariosis of bees • American foulbrood
• Tularemia	• European foulbrood • Nosemosis of bees • Varroosis
Fish diseases • Epizootic haematopoietic necrosis • Infectious haematopoietic necrosis • *Oncorhynchus masou* virus disease • Spring viraemia of carp • Viral haemorrhagic septicaemia	**Mollusc diseases** • Bonamiosis (*Bonamia exitiosus, B. ostreae, Mikrocytos roughleyi*) • Marteiliosis (*Marteilia refringens, M. sydneyi*) • Mikrocytosis (*Mikrocytos mackini*) • MSX disease (*Haplosporidium nelsoni*) • Perkinsosis (*Perkinsus marinus, P. olseni/atlanticus*)
Crustacean diseases • Taura syndrome • White spot disease • Yellowhead disease	**Other List B diseases** • Leishmaniosis

Source: OIE - World Organization for Animal Health.

Zoonotic Diseases

On the OIE list are also some diseases which are called zoonotic, meaning diseases than are shared between animals and humans. Zoonotic pathogens may be bacterial, viral or parasitic in nature.[254] Many people interact with animals on a daily basis- animals provide food, livelihoods, travel, sport, companionship and education for people all over the world;

[254] Zoonotic Diseases | One Health | CDC [WWW Document], 2021. URL https://www.cdc.gov/onehealth/basics/zoonotic-diseases.html (accessed 3.6.22).

so, these diseases represent a major public health problem around the world due to this close relationship with animals.

Spread of Zoonotic Diseases

The spread of zoonotic diseases is due to obvious reasons almost identical to the spread of any other diseases on the OIE list. The close connection between people and animals can ease the spread.[255]

- Direct contact: Contact with saliva, blood, urine, mucus, feces, or other body fluids from petting, touching, taking care of an animal.
- Indirect contact: Contact with areas, objects, or surfaces where the animal lives, roams or has touched. Examples includes aquariums, chicken coops, barns, soil, food dishes.
- Vector-borne: Bites from ticks or other inspects like mosquitoes or flees.
- Foodborne: Consumption of contaminated food like unpasteurized milk, undercooked meat or eggs, contaminated fruits, and vegetables.
- Waterborne: Drinking or contacting water that has been contaminated.[256]

Risk of Zoonotic Disease

Zoonotic diseases account for a significant portion of newly infectious diseases. It is estimated that 6 out of every 10 known infectious diseases can be spread from animals; and 3 out of every 4 new infectious diseases come from animals. Some diseases like the foot-and-mouth disease, vesicular stomatitis or Newcastle disease are zoonotic, but the disease is mild in humans, so is not considered a major risk. Obviously, some pathogens are capable of serious harm to human health. Some noteworthy diseases in this category are the avian influenza virus (Bird Flu), Nipah virus, HIV, Ebola, salmonella. Others still, such as novel coronaviruses are capable of causing global pandemics as seen with COVID-19.[257]

[255] ibid
[256] ibid
[257] ibid

Military Application Classification

One of the first uses of biological agents was seen in ancient war. Today, the military application of biological agents is concerning the microorganisms that may be deliberately used in weapons to cause disease or death. In a military application, biological agents are classified by type - pathogens (bacterial, viral and rickettsia), toxins, bioregulators and prions.[258]

Pathogens

Bacterial Agents

Bacteria are single-celled microscopic organisms that outnumber all other forms of microorganisms. It is estimated that around 100 bacteria are known to cause disease; and few bacteria are of military significance. Some bacteria are exclusive to humans, but some bacteria are zoonotic and can infect humans from animals including anthrax, tularemia, and brucellosis.[259]

Viral Agents

Viruses are all parasites that live in the cells of a host – they cannot survive out on their own. Viruses cause around 60% of all known infectious diseases. Once a virus enters a living cell, it survives by replicating itself and taking over the metabolic process of the cell. If the infected cells degenerate and eventually dies, so does the virus. Viral diseases do not respond to antibiotics.[260]

Rickettsial Agents

Rickettsia are intracellular microorganisms that are between the size of bacteria and viruses. They resemble bacteria in their shape and resemble viruses in the need for a host to survive. Most rickettsia are parasites and can be transmitted to humans via vectors like ticks,

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[258] Potential Military Chemical/Biological Agents and Compounds, 2005. . ARMY CHEMICAL SCHOOL FORT LEONARD WOOD MO.

[259] ibid
[260] ibid

lice, fleas, mosquitoes, and mites. Rickettsia is easily killed by heat, dehydration, and disinfectants.[261]

Toxins

Toxins are natural poisons formed as a secreting product in a vegetable or animal organism. Toxins are produced in a variety of organism such as microbes, snakes, inspects, spiders and plants.[262]

Bioregulators

Bioregulators are biochemical compounds that regulate cell processes and active compounds such as catalysts and enzymes. They are naturally found in the human body, but in large quantities can cause severe adverse reaction or death.[263]

Prions

Prions are proteins that can cause neurodegenerative disease in humans and animals. When prions enter brain cells, they convert normal proteins into prions. Proteins themselves are unique in the sense that they have a genetically defined amino acid sequence that determines their shape and function. Normal proteins have the same amino acid building block as prions, but fold differently. Once infected, cells die and release more prions, destroying brain cells. Transmission from cows is the main suspected cause of the disease. There is no known cure, nor therapy that is effective against prions.[264]

2.8.3 Most Probable Biological Agents Used in an Agroterrorist Attack

Out of the hundreds of agents analyzed above in the classifications and types of biological agents, only around a couple dozen agents are available to agroterrorists to cause mass economic damage.[265] As mentioned, what determines the threat level are the agent's contagiousness, in addition to classification which dictates availability, as well as potential

[261] ibid
[262] ibid
[263] ibid
[264] ibid
[265] Monke, J., 2007, March. Agroterrorism: Threats and preparedness. LIBRARY OF CONGRESS WASHINGTON DC CONGRESSIONAL RESEARCH SERVICE. https://sgp.fas.org/crs/terror/RL32521.pdf.

consequences and targets and how quickly it can be identified or reported and mitigation costs.

Animal Select Agents List

In the United States, the Animal and Plant Health Inspection Service (APHIS) created an official list of animal pathogens that are of greatest concern for agroterrorism called the Select Agents List.[266] The list, in Figure 5, takes into account classification of agents by the CDC as well as the OEI List. There 23 animal diseases on the list, including 20 OIE listed diseases; the other three considered to be emerging.[267] The Select List looks to identify the main threats as perceived in the context of agroterrorism due to additional risks and opportunities.[268]

[266] ibid.
[267] ibid
[268] ibid

Figure 5 Livestock Diseases in the Select Agent List.

Animal diseases and agents/toxins listed exclusively by APHIS 9 CFR 121.3	**OIE class**	**Overlap diseases and agents/toxins listed by both APHIS and CDC 9 CFR 121.4**	**OIE class**
African horse sickness	E	Anthrax (*Bacillus anthracis*)	M
African swine fever	S	Botulinum neurotoxins	
Akabane		Botulinum neurotoxin-producing species of *Clostridium*	
Avian influenza (highly pathogenic)	A		
Bluetongue (exotic)	M	Brucellosis of cattle (*Brucella abortus*)	B
Bovine spongiform encephalopathy	B	Brucellosis of sheep (*Brucella melitensis*)	C
Camel pox		Brucellosis of swine (*Brucella suis*)	S
Classical swine fever	S	Glanders (*Burkholderia mallei*)	E
Contagious caprine pleuropneumonia	C	Melioidosis (*Burkholderia pseudomallei*)	
Contagious bovine pleuropneumonia	B	*Clostridium perfringens* epsilon toxin	
Foot-and-mouth disease (FMD)	M	(Valley fever) *Coccidioides immitis*	
Goat pox	C	Q fever (*Coxiella burnetii*)	M
Heartwater *(Cowdria ruminantium*)	M	Eastern equine encephalitis	E
Japanese encephalitis	E	Tularemia (*Francisella tularensis*)	L
Lumpy skin disease	M	Hendra virus (of horses)	
Malignant catarrhal fever	B	Nipah virus (of pigs)	
Menangle virus		Rift Valley fever	M
Newcastle disease (exotic)	A	Shigatoxin	
Peste des petits ruminants	C	Staphylococcal enterotoxins	
Rinderpest	B	T-2 toxin	
Sheep pox	C	Venezuelan equine encephalitis	E
Swine vesicular disease	S		
Vesicular stomatitis	M		

Source: CRS Report for Congress

Some of select agent pathogens receive more attention than others. For example, foot and mouth disease (FMD) is probably the most frequently mentioned disease when agroterrorism is discussed, due to its ease of use, ability to spread rapidly, and potential for great economic damage[269]. On the other hand, the causative agent of bovine spongiform encephalopathy (BSE, or "mad cow disease") is considered dangerous enough to be a select agent, even though mad cow disease is less likely to be a terrorist's choice than other diseases. With BSE, infection is not certain, symptoms take years to manifest, and the disease may

[269] Fagel, M.J., 2011. Principles of Emergency Management: Hazard Specific Issues and Mitigation Strategies. CRC Press.

not be detected—all making credit for an attack more doubtful.[270] Widespread animal diseases like brucellosis, influenza, or tuberculosis receive relatively less attention than FMD, hog cholera, or Newcastle disease.[271] However, emerging diseases such as Nipah virus, Hendra virus, and the H5N1 strain of avian influenza (zoonotic diseases that have infected people, mostly in Asia) can be lethal since vaccines are elusive or have not been developed.[272]

Plant Select Agents List

The APHIS also created a Select Agents List of potential plant agents. The agents in Figure 6 that are listed are viruses, bacteria or fungi that can pose a severe threat to a large number of vital crops such as wheat, potatoes, rice, corn, and citrus. Due to the complexity of plants, and the threat, the list was compiled in conjunction with the USDA Agricultural Research Service, Forest Service, and the American Psychopathological Society.

Figure 6: Plant Diseases in the Select Agent List

Plant diseases caused by...	**the select agents listed in 7 CFR 331.3**
Citrus greening	*Liberobacter africanus, L. asiaticus*
Philippine downy mildew (of corn)	*Peronosclerospora philippinensis*
Bacterial wilt, brown rot (of potato)	*Ralstonia solanacearum*, race 3, biovar 2
Brown stripe downy mildew (of corn)	*Sclerophthora rayssiae* var. *zeae*
Potato wart or potato canker	*Synchytrium endobioticum*
Bacterial leaf streak (of rice)	*Xanthomonas oryzae* pv. *oryzicola*
Citrus variegated chlorosis	*Xylella fastidiosa*

Source: CRS Report for Congress

As mentioned before, the Selected Agents List was created to identify the highest risk agents, so some of the plant agents not selected to the list can still be highly dangerous, but the effectiveness or probability of a successful attack is lower due to environmental or

[270] ibid
[271] ibid
[272] ibid

other conditions. Some of these agents can be Karnal bunt, citrus canker, and soybean rust. [273]

2.9 Response to Biological Weapons and Threats

The most prominent response to biological weapons from a coordinated international community view is the Biological Weapons Convention (BWC) which prohibits the development, production, acquisition, transfer, stockpiling, and use of biological and toxin weapons.[274] It was the first multilateral disarmament treaty banning an entire category of weapons of mass destruction (WMD).

The treaty entered into force in 1975 and has an unlimited duration.[275] As of 2022, 183 states are part of the treaty – another four have not yet ratified, and another ten have not signed.[276] The BWC is key in banning and mitigating biological weapon programs that were run by states up until that point.

The BWC dictates that members shall never in any circumstances to develop, produce, stockpile, or otherwise acquire or retain:
1. Microbial or other biological agents, or toxins whatever their origin or method of production, of types and in quantities that have no justification for prophylactic, protective or other peaceful purposes.
2. Weapons, equipment or means of delivery designed to use such agents or toxins for hostile purposes or in armed conflict."[277]

2.9.1 European Union

The primary responsibility to respond to CBRN (chemical, biological, radiological, and nuclear defense) threats lie mainly with the Member States. At the EU level, the first effort to counter CBRN threats were at the Ghent European Council in October of 2001, where a program to improve cooperation between members states in the realm of biological

[273] ibid
[274] Biological Weapons Convention – UNODA, n.d. URL https://www.un.org/disarmament/biological-weapons/ (accessed 3.6.22).
[275] ibid
[276] ibid
[277] ibid

terrorism was brought up.[278] Today, the European Union has several competences, legislations, and key initiatives on biological weapons and CBRN.

EU Legislation

Regarding the detection and response to CBRN threats, there is no encompassing piece of EU legislation per se. Rather, due to the complexity of the threat, the risk is managed with multisectoral, multidisciplinary approach spanning different policies that mention CBRN. An example can be seen in Decision 1082/2013/EU, which addresses the securing of the food chain against CBRN contamination by developing preventive measures.[279]

In 2010, the European Commission created the EU CBRN Centers of Excellence (CBRN CoE). The CBRN CoE are primarily a cooperation apparatus to communicate with third countries on CBRN issues, with the goal to mitigate CBRN threats by promoting best practices[280].

The EU also adopted two Action Plans in 2009 and in 2017. The plan adopted in 2009 was aimed at strengthening Chemical, Biological, Radiological and Nuclear Security, a roadmap against WMDs, containing 124 different actions in an all-hazards approach.[281] The second plan in 2017 was an action plan focused on enhancing preparedness against chemical, biological, radiological, and nuclear security risk.[282] It was part of a wider counterterrorism package set out in Directive (EU) 2017/54133 in the context of various terror attacks in the EU at the time. The 2017 CBRN Action Plan focused on reducing the accessibility of CBRN materials, ensuring a more robust preparedness for and response to

[278] Report on strengthening chemical, biological, radiological and nuclear security in the European Union - an EU CBRN Action Plan [WWW Document], n.d. URL https://www.europarl.europa.eu/doceo/document/A-7-2010-0349_EN.html (accessed 3.6.22).
[279] Decision No 1082/2013/EU of the European Parliament and of the Council of 22 October 2013 on serious cross-border threats to health and repealing Decision No 2119/98/EC Text with EEA relevance, 2013. , OJ L.
[280] European Court of Auditors., 2014. Can the EU's centres of excellence initiative contribute effectively to mitigating chemical, biological, radiological and nuclear risks from outside the EU?Special report No 17/2014 . Publications Office, LU.
[281] EUR-Lex - jl0030 - EN - EUR-Lex [WWW Document], n.d. URL https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=LEGISSUM%3Ajl0030 (accessed 3.6.22).
[282] YogThemes, n.d. EU CBRNe Policy. ENCIRCLE. URL https://encircle-cbrn.eu/resources/eu-cbrn-policy/ (accessed 3.6.22).

CBRN security incidents, building stronger internal-external links in CBRN security with key regional and international partners, and enhancing knowledge of CBRN risks.[283]

By 2021, the risk of CBRN threats have quickly evolved, highlighted by the COVID-19 pandemic which shows the impact of an infectious disease and by extension a biological threat on the EU.

EU Competences

As mentioned, EU Member States have the primary competence regarding internal security and protection including prevention, detection, and response to CBRN threats; however, due to recent terrorist attacks around the EU, and due to the connected nature of the EU, competences require many actors across levels and countries. The EU looked to act was the main forum for cooperation and coordination among member states. The Lisbon Treaty provided the legal groundwork for 'shared legal competences' within the EU in areas of freedom, security, justice, common safety concerns, transport, civil protection, and external actions.[284] In response to a threat, EU Member States can use EU cooperation tools in place such as judicial coordination, cooperation efforts, and monitoring through agencies like Europol.[285]

EU Response

If an agroterrorism attack were to occur, there are information exchange system apparatuses in placed within the EU – namely, The Early Warning and Response System and the Rapid Alert System.[286] These aid public health officials to quickly implement measures to control an outbreak, as well as help with containment, distribution of medicine, and research by linking experts throughout the EU specialized in detection and identification.[287]

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[283] ibid
[284] EUR-Lex - ai0020 - EN - EUR-Lex [WWW Document], n.d. URL https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=LEGISSUM%3Aai0020 (accessed 3.6.22).
[285] COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE EUROPEAN COUNCIL, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS on the EU Security Union Strategy, 2020.
[286] Surveillance and early warning [WWW Document], n.d. URL https://ec.europa.eu/health/health-security-and-infectious-diseases/surveillance-and-early-warning_en (accessed 3.6.22).
[287] ibid

2.9.2 Czech Republic

The main document regulating the strategic framework of the fight against terrorism in the Czech Republic is the Strategy of the Czech Republic for Combating Terrorism from 2013.[288] The strategy deals with five key areas- cooperation of relevant subjects in the fight against terrorism, public protection and other potential targets, security research and communication with the public, prevention of radicalization and recruitment by terrorist groups, and the necessary insight into the legislative anchoring of the fight against terrorism.[289]

Legislation in Response to Terrorism

Legislation ensures the readiness and robustness of protection of the population by security authorities in the form of laws on crisis management, protection of public health and other related legal measures.

Act No. 40/ 2009 Coll.: Criminal Code

Although there is no counterterrorism act in the Czech Republic per se, terrorism in general appears in the Criminal Code of the Czech Republic verbatim under paragraphs 310, 311 and 312, under the principle of protection and principle of universality section.[290] Among the crimes specifically listed are terrorist attack (paragraph 311), terrorism (paragraph 312), general danger (paragraph 272), participation in a terrorist group (paragraph 129), hostage taking (paragraph 174), blackmail (paragraph 175), terrorist financing (paragraph 311), support and promotion of terrorism and threat of a terrorist offence, unauthorized production and possession of radioactive materials and highly dangerous materials (paragraph 281).[291] Other crimes like sabotage (paragraph 314), murder (paragraph 140), violence against public authority, attack against humanity and use of prohibited means of combat (paragraph 280) are also represented.[292]

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[288] Strategie ČR pro boj proti terorismu od roku 2013 | Databáze strategií - portál pro strategické řízení [WWW Document], n.d. URL https://www.databaze-strategie.cz/cz/mv/strategie/strategie-cr-pro-boj-proti-terorismu-od-roku-2013 (accessed 3.6.22).
[289] ibid
[290] 40/2009 Sb. Trestní zákoník [WWW Document]. Zákony pro lidi. URL https://www.zakonyprolidi.cz/cs/2009-40?text=agro+terorismus (accessed 3.5.22).
[291] ibid
[292] ibid

Act No. 281/2002 Coll.: Certain Measures Related to the Prohibition of Bacteriological (Biological) and Toxin Weapons and on the Amendment of the Trade Licensing Act

Regarding the niche of agroterrorism, this law is important as it regulates the rights and obligations of persons in relation to the prohibition of the development, production, stockpiling and use of bacteriological (biological) and toxin weapons.[293] The law specifies exactly what weapons and equipment is banned and defines the conditions for issuing of permits for the management of high-risk biological agents and toxins.[294] It further states that the management and competence of biological and toxin weapons is under the State Office for Nuclear Safety, which also exercises the competence of ensuring proper compliance of the Biological Convention, as well as ensuring proper destruction of any weapons.[295]

Act No. 258/2000 Sb., on the Protection of Public Health

This law acts to define the rights and obligations regarding protection and promotion of public health.[296] At the same time, it also defines jurisdiction and the activity of public health authorities. This law is important for agroterrorism because it determines the primary emergency measures if an attack were to occur, for example – the establishment of a "danger zone" perimeter. In Section 67 of the law, it states that the health authority responsible for the location where the incident has jurisdiction and responsibility to decide on the type and manner of implementation of counter measures (such as epidemiological).[297]

[293] 281/2002 Sb. Zákon o některých opatřeních souvisejících se zákazem bakteriologických (biologických) a toxinových zbraní [WWW Document]. Zákony pro lidi. URL https://www.zakonyprolidi.cz/cs/2002-281 (accessed 3.6.22).
[294] ibid
[295] ibid
[296] 258/2000 Sb. Zákon o ochraně veřejného zdraví [WWW Document]. Zákony pro lidi. URL https://www.zakonyprolidi.cz/cs/2000-258 (accessed 3.6.22).
[297] ibid

Decree No. 474/2002 Coll..: Decree implementing Act No. 281/2002 Coll., On Certain Measures Related to the Prohibition of Bacteriological (Biological) and Toxin Weapons and on Amendments to the Trade Licensing Act

This decree implementing Act. No. 281/2002 Coll. sets out a list of high-risk bio-agents and toxins that have properties to be misused as a weapon.[298]

Legislation Regarding Mass Crop Diseases

Act No. 326/2004 Coll., on phytosanitary care and amendments to certain related acts

The law incorporates the relevant regulation of the EU and regulates the protection of plants and plant products against harmful organisms and disorders, as well as the control of the plant product market,[299]

Decree No. 5/2020 Coll., on measures against the introduction and spread of plant pests and plant-damaging products

This decree incorporates the relevant regulation of the EU and regulates measures against the introduction and spread of harmful organisms of plants and plant products into the Czech Republic from abroad.[300]

Legislation Regarding Animal Diseases

Act No. 166/1999 Coll., on veterinary care and amendments to certain related acts

This act is the Veterinary Act in the Czech Republic. It incorporates the relevant European Union regulations and lays down veterinary requirements for animal husbandry and health of animals for animal products. It regulates the rights and obligations and competence in the field of veterinary care, as well as certain professional veterinary activities and their performance.[301] Among other issues, the act deals with animal health care and

[298] 474/2002 Sb. Vyhláška, kterou se provádí zákon o zákazu biologických a toxinových zbraní [WWW Document]. Zákony pro lidi. URL https://www.zakonyprolidi.cz/cs/2002-474 (accessed 3.6.22).

[299] 326/2004 Sb. Zákon o rostlinolékařské péči [WWW Document]. Zákony pro lidi. URL https://www.zakonyprolidi.cz/cs/2004-326 (accessed 3.6.22).

[300] 5/2020 Sb. Vyhláška o ochranných opatřeních proti škodlivým organismům rostlin [WWW Document]. Zákony pro lidi. URL https://www.zakonyprolidi.cz/cs/2020-5 (accessed 3.6.22).

[301] 166/1999 Sb. Veterinární zákon [WWW Document]. Zákony pro lidi. URL https://www.zakonyprolidi.cz/cs/1999-166 (accessed 3.5.22).

protection, in particular the prevention and control of diseases communicable directly or indirectly between animals of susceptible species and other animal diseases, the protection of human health against animal-to-human diseases; care for the health safety of animal products and feed and protection of human health against damage or threat to animal products; and protection of the territory of the Czech Republic against the introduction of animal diseases and diseases communicable from animals to humans and against the import of unhealthy animal products and feeds from abroad. [302]

Decree No. 159/2021 Coll., on veterinary products and veterinary technical resources

This decree regulates the application for approval of veterinary medical products, the approval of the variation, the extension and suspension of the decision approving the veterinary medicinal product, as well as the particulars of the application for withdrawal of approval of the veterinary medicinal product.[303]

Decree No. 299/2003 Coll., on measures for the prevention and control of infections and Diseases transmittable from animals to humans

This decree regulates general measures to control and prevent the spread of animal diseases with specific methods and deadlines for disease reporting; measures to control and prevent spread; and rules for vaccinating animals.[304]

Decree No. 382/2003 Coll., on veterinary controls during trade in animals

This decree regulates the method of veterinary control of live animals, veterinary control of semen, egg cells and embryos, as well as veterinary control of pathogens intended for trade. The decree also deals with conditions laid down for trade and procedure in case the conditions are not met or there is a dispute between the breeder and veterinary inspection authority.[305]

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[302] ibid
[303] 159/2021 Sb. Vyhláška o veterinárních přípravcích a veterinárních technických prostředcích [WWW Document]. Zákony pro lidi. URL https://www.zakonyprolidi.cz/cs/2021-159 (accessed 3.5.22).
[304] 299/2003 Sb. Vyhláška o opatřeních pro předcházení a zdolávání nákaz a nemocí přenosných ze zvířat na člověka [WWW Document]. Zákony pro lidi. URL https://www.zakonyprolidi.cz/cs/2003-299 (accessed 3.5.22).
[305] 382/2003 Sb. Vyhláška o veterinárních požadavcích na obchodování se zvířaty a o veterinárních podmínkách jejich dovozu ze třetích zemí [WWW Document]. Zákony pro lidi. URL https://www.zakonyprolidi.cz/cs/2003-382 (accessed 3.5.22).

Legislation Regarding Water Threats

Act No. 254/2001 Coll., on water and on amendments to certain other acts (Water Act)

This law is the Water Act in the Czech Republic, with the purpose to protect surface and ground water by setting conditions for efficient use of water resources, to preserve water resources and prevent water scarcity and to maintain and improve surface and groundwater quality.[306] The purpose of this law is also to contribute to the provision of drinking water to the population and to the protection of aquatic ecosystems and terrestrial ecosystems directly dependent on them.[307]

Decree No. 471/2001 Coll., on the technical and safety supervision of waterworks

This decree defines the technical safety supervision of water components and stipulates criteria and procedure for classifying water works into categories.[308] It also lists the scope and frequency of supervision at individual categories of waterworks and at individual stages of their preparation, construction, alteration, or operation of the waterworks.[309]

Decree No. 24/2011 Coll., on river basin management pans and flood risk management plans

This decree regulates the content of river basin management plans and flood risk management plans, and the method of identifying areas with a significant flood risk.[310]

Legislation Regarding a Response to an Attack or Emergency

Act No. 240/2000 Sb.: Crisis Management Act and on Amendments to Certain Acts (Crisis Act)

The Crisis Act was signed into force on January 1, 2001 and has been critical in navigating the legal and public health challenge of the COVID-19 pandemic response of the Czech government. The act was first applied on a larger scale dealing with emergencies in

[306] 254/2001 Sb. Vodní zákon [WWW Document]. Zákony pro lidi. URL https://www.zakonyprolidi.cz/cs/2001-254 (accessed 3.5.22).
[307] ibid
[308] 471/2001 Sb. Vyhláška o technickobezpečnostním dohledu nad vodními díly [WWW Document]. Zákony pro lidi. URL https://www.zakonyprolidi.cz/cs/2001-471 (accessed 3.5.22).
[309] ibid
[310] 24/2011 Sb. Vyhláška o plánech povodí a plánech pro zvládání povodňových rizik [WWW Document]. Zákony pro lidi. URL https://www.zakonyprolidi.cz/cs/2011-24 (accessed 3.5.22).

2002 when mass flooding endangered the country. The act stipulates the competence and authority of the state bodies in preparing for internal (domestic) crisis situations and threats, as the responsibility in facing them. The act incorporates the relevant EU regulations and regulates the identification and protection of European critical infrastructure. This act outlines the basic apparatus and obligations of ministries and other authorities regarding the competence and powers of the state bodies in crisis preparation and resolution.[311] The act allows for the limitation of certain rights and freedoms of citizens guaranteed by the Charter of Fundamental Rights and Freedoms for a necessary amount of time and extent to ensure security of the public.[312]

Act No. 241/2000 Sb.: Act on Economic Measures for Crisis Situations and on Amendments to Certain Related Acts

The law on Economic Measures for Crisis Situations and on Amendments to Certain Related Acts, establishes a system (Czech: Systém hospodářských opatření pro krizové stavy (HOPKS)) allowing for a set of organizational, material, or financial measures adopted by the Ministry of Interior and other public administration bodies in connection with the provision of necessary and mobilized supplies of productions, works and services, without which is it not possible to overcome crisis situations.[313]

The HOPKS system consists of five basic elements[314]:

1. The emergency management system designed to provide the necessary supplies needed to cover the basic living needs of the population, and to support the activities of authorities and support the performance of the state administration.[315]
2. The system of economic mobilization which is designed to provide the necessary material resources for the armed forces, and security forces.[316]
3. The system of state material reserves comprises of material resources necessary for overcoming crisis situations, for when it cannot be provided by businesses and for

[311] 240/2000 Sb. Krizový zákon [WWW Document]. Zákony pro lidi. URL https://www.zakonyprolidi.cz/cs/2000-240 (accessed 3.5.22).
[312] ibid
[313] Systém hospodářských opatření pro krizové stavy (HOPKS) [WWW Document], n.d. . SSHR. URL https://www.sshr.cz/pro-verejnou-spravu/system-hopks/ (accessed 3.5.22).
[314] Metodiky HOPKS [WWW Document], n.d. . SSHR. URL https://www.sshr.cz/pro-verejnou-spravu/system-hopks/metodiky-hopks/ (accessed 3.5.22).
[315] ibid
[316] ibid

which the state is responsible. State material reserves are established on the basis of requirements of crisis plans of administrative authorities and can be divided into material reserves, contingency reserves, humanitarian aid reserves and mobilization reserves.[317]

4. The construction of critical infrastructure covers the requirements for material resources. [318]
5. The system of regulatory measures is prepared as an extreme measure for the period when the effect of a crisis prevents normal means of production and distribution of goods needed to cover basic living needs of the population in the crisis area.[319]

The HOPKS system creates a comprehensive and robust system of providing the necessary material resources for solving all types of crisis situations, from local to large-scale emergencies. The system is closely connected to the crisis management system, the defense system, and the emergency management system in the Czech Republic.[320] In addition to ensuring the legislative process to support the system, the State Material Reserves Administration is also responsible for ensuring the HOPKS system operation and implementation in the Czech Republic. It also ensures the preparation and implementation of the education and information system of all persons who ensure its operation at various levels and ensures the necessary control activities.[321]

State Material Reserves Administration

The administration of state material reserves ensures the financing, restocking, exchanging, loaning, releasing, leasing, selling, storing, protecting, and controlling of state material reserves and, according to the requirements of crisis plans, their acquisition. In the Czech Republic, the state material reserves are established in accordance with Act No. 97/1993 Coll.[322], On the competence of the State Material Reserves Administration and Act

[317] ibid
[318] ibid
[319] ibid
[320] Systém hospodářských opatření pro krizové stavy (HOPKS) [WWW Document], n.d. . SSHR. URL https://www.sshr.cz/pro-verejnou-spravu/system-hopks/ (accessed 3.5.22).
[321] ibid
[322] Státní hmotné rezervy (SHR) [WWW Document], n.d. . SSHR. URL https://www.sshr.cz/pro-verejnou-spravu/system-hopks/statni-hmotne-rezervy-shr/ (accessed 3.5.22).

No. 241/2000 Coll.[323], On economic measures for crisis situations and amendments to some related acts.

Breakdown of Material Reserves

As mentioned, state material reserves are divided into four sections - material reserves, mobilization reserves, contingency or emergency reserves and humanitarian aid reserves.[324]

Material Reserves

Material reserves consist of selected raw materials, basic resources, and products designed to ensure the defense of the state and to mitigate the consequences of crisis situations by protecting vital economic interests of the state. Examples of material reserves are the state's strategic reserves of emergency stocks of crude oil and petroleum products as well as stocks for ensuring raw material and food security.[325]

Mobilization Reserves

Mobilization reserves consist of selected raw materials, products, machinery, and other assets intended for securing mobilization of supplies, mainly to support armed forces and security forces in a state of emergency or state of war.[326]

Emergency Reserves

Emergency reserves consist of selected basic materials and products to provide necessary supply to support the population, emergency services, after the declaration of a state of emergency, which cannot be otherwise tapped into or distributed in time of peace.[327]

Humanitarian Aid Reserves

[323] Systém hospodářských opatření pro krizové stavy (HOPKS) [WWW Document], n.d. . SSHR. URL https://www.sshr.cz/pro-verejnou-spravu/system-hopks/ (accessed 3.5.22).
[324] Státní hmotné rezervy (SHR) [WWW Document], n.d. . SSHR. URL https://www.sshr.cz/pro-verejnou-spravu/system-hopks/statni-hmotne-rezervy-shr/ (accessed 3.5.22).
[325] ibid
[326] ibid
[327] ibid

Humanitarian aid reserves consist of selected basic materials and products intended to be provided after the declaration of a state of emergency free of charge to severely affected persons.[328]

Civil Emergency Planning Committee

The Civil Emergency Planning Committee (Czech: Výbor pro civilní nouzové plánování (VCNP)), is a permanent working body of the State Security Council in the area of civil emergency planning, and coordination to ensure the protection of the internal security of the state. Under its auspice, the VCNP represents broad and inter-ministerial cooperation with an emphasis on preparation and management of emergencies and crises. The activities of the body take place on the basis of an annual work plan, in addition to "simulation scenarios" throughout the year with specific simulated attacks. Out of these simulated attacks, crisis plans are evaluated, and if need be, drawn up with explicit responsibilities, actions, and timelines to be taken if such an event were to occur.

Activities of Integrated Rescue System Units

The main document produced from the simulated attacks, in accordance with Act No. 239/2000 Coll., on IRS is the Activities of IRS Units (Czech: Soubor typové činnosti integrovaného záchranného systému (STČ IZS)). Essentially, it lists the activities and the capabilities of the integrated rescue system (IRS), distributed by unit with the main responsibilities and competencies as well as first response. Several STČ IZS have been released with valuable guidelines usable in response to terrorist attacks as well as averting of mitigating their impact on the population. Currently, there are 17 such documents[329]:

STČ 01/IZS Dirty Bomb Attack

STČ 02/IZS Demonstration of Suicidal Intent

STČ 03/IZS Threat of Using an IED or Finding an IED, Suspicious Object , Ammunition, Explosives or Explosive Objects

STČ 04/IZS Response of IRS Units to an Emergency Air Accident

STČ 05/IZS Finding of an object with suspected presence of B-agents or toxins

[328] ibid

[329] Dokumentace IZS - Hasičský záchranný sbor České republiky [WWW Document], n.d. URL https://www.hzscr.cz/clanek/dokumentace-izs-587832.aspx (accessed 3.5.22).

STČ 06/IZS Measures to Ensure Public Order at Assemblies and Techno-parties

STČ 07/IZS Rescue of Missing Persons – Searching

STČ 08/IZS Traffic Accident

STČ 09/IZS IRS Response to a Mass Casualty Event

STČ 10/IZS Response in the Event of Dangerous Disruption to the Flow of Traffic on the Highway

STČ 11/IZS Bird Flu

STČ 12/IZS Providing Psychological Assistance

STČ 13/IZS Response to a Chemical Attack in the Metro

STČ 14/IZS Active Shooter Attack

STČ 15/IZS Emergencies in Railway Transport

STČ 16A/IZS Extraordinary Event with Suspicion of a Highly Contagious Disease in a Medical Facility or Other Premises

STČ 16B/IZS Extraordinary Event with Suspicion of a Highly Contagious Disease Onboard an Aircraft Landing at Prague Airport.

STČ-05/IZS: Activities of IRS units during joint response to "Finding of an object with suspected presence of B-agents or toxins"

This is one of the key documents that came from a simulated threat of B-agents or toxins. The document contains the procedure of IRS units in protection, identification, and liquidation of a biological threat.[330]

STČ 11/IZS Bird Flu

This document outlines the plan and the involved units and authorities when dealing with an outbreak of the bird flu.[331]

[330] Soubor typové činnosti IZS: STČ 5 – Nález předmětu s podezřením na přítomnost B-agens nebo toxinů | POŽÁRY.cz [WWW Document], n.d. URL https://www.pozary.cz/clanek/201442-soubor-typove-cinnosti-izs-stc-5-nalez-predmetu-s-podezrenim-na-pritomnost-b-agens-nebo-toxinu/ (accessed 3.5.22).

[331] Soubor typové činnosti IZS: STČ 11 – Chřipka ptáků | POŽÁRY.cz [WWW Document], n.d. URL https://www.pozary.cz/clanek/57586-soubor-typove-cinnosti-izs-stc-11-chripka-ptaku/ (accessed 3.5.22).

Institution Competencies of the Czech Republic Against Terrorism Threats

The Government of the CR

The Government, as a supreme executive authority, is responsible for national security and for the management and the functioning of the Czech security system. The Government reports to the Chamber of Deputies of the Parliament of the CR. The Government is authorized to declare a state of emergency.[332]

The National Security Council (NSC)

The NSC is a permanent working body of the Government for coordinating national security and preparing measures to maintain the security. The NSC consists of the Prime Minister (chairman) and other members of the Government. The NSC prepares Government proposals for measures ensuring internal security.[333]

The Ministry of the Interior (MoI)

The MoI is responsible for internal security and public order, and thus is one of the main coordinators of the fight against terrorism. The MoI proposes to the Government the announcement of the terrorist threat level and other related measures.[334]

Police of the Czech Republic

The National Centre against Organized Crime (NCOC) plays a key role within the police structure in the fight against terrorism. The NCOC, specifically the section on terrorism and extremism, is, tasked with detecting, screening, and investigating criminal activity of organized criminal groups or in the area of terrorism, extremism, and terrorism financing.[335]

The Ministry of Foreign Affairs (MFA)

The MFA deals with relations with other states and international organizations. Cooperation and communication between countries is vital in the fight against terrorism.[336]

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[332] Audit národní bezpečnosti - Terorismus a měkké cíle [WWW Document], n.d. URL https://www.mvcr.cz/cthh/clanek/audit-narodni-bezpecnosti.aspx (accessed 3.5.22).
[333] ibid
[334] ibid
[335] ibid
[336] ibid

The Security Information Service (BIS/SIS)

The SIS provides information relating to organized crime and terrorism. It provides information to the President, the Prime Minister, and members of the Government.[337]

The Office for Foreign Relations and Information (UZSI/OFRI)

The OFRI is a Czech intelligence service whose primary mission is to provide state officials with timely, objective, and high-quality intelligence originating abroad and important for the security and protection of Czech foreign political and economic interests. The purpose of the OFRI's work is to protect the CR against threats originating abroad, including the threat of international terrorism.[338]

Military Intelligence (MInt)

MInt participates in carrying out the tasks of the security system relating to terrorism, particularly in the field of detecting threats, by obtaining intelligence that will be helpful in determining whether there is a threat, as well as defining the threat level.[339]

The National Security Authority (NSA)

The scope of competencies of the NSA in the field of cybersecurity. The NSA helps to identify, assess, and tackle threats in cyberspace, reduce cybernetic risks, and eliminate the impact of cyberattacks, including cyberterrorism.[340]

The Ministry of Justice (MJ)

The MJ is responsible for the field of judicial cooperation, questions of extradition and international legal assistance. The Criminal Code falls within its responsibilities. It is the main coordinator of the national criminal policy, including the issue of terrorism prosecution.[341]

The Fire Rescue Service and the Integrated Rescue System (FRS CR and IRS)

The responsibility to deal with the aftermath of terrorist attacks - rescue and liquidation; and to mitigate the impacts on property, lives, health, falls within the

[337] ibid
[338] ibid
[339] ibid
[340] ibid
[341] ibid

competencies of the IRS (mainly its primary units – the FRS CR, the Police CR, and the EMS). The FRS CR is in charge of the IRS.[342]

The Ministry of Finance (MF)

The Financial Analytical Unit that falls within the MF and looks into and flags any suspicious or potential financing of terrorism.[343]

The Ministry of Health (MH)

In terms of responding to a possible terrorist threat, the MH is responsible for health services, the protection of public health, medical research activities, the coordination of health service providers, and handling of addictive substances. The primary task of the MH is to minimize the consequences of a terrorist attack impacting the lives and health of persons which is ensured by providing urgent medical care during incidents that are brought about by situations with a mass effect on the health of persons or a threat to public health - including use of chemical, biological, or nuclear materials.[344]

2.9.3 Jurisdiction and Competencies of Responsible Bodies of the Czech Republic Regarding Agroterrorism

For specific competencies to combat agroterrorism, a more grass-root, bottom-up approach is required. Rather than the overarching and national plan that exists to fight terrorism, agroterrorism is best defended against on more local levels.

2.9.4 Crop Disease Threat Competency

When there is a threat or a suspicion of an attack that can affect crops, the regional emergency and contingency plans are put in place – these include first response, mitigation, and remediation of outbreaks. Usually, these plans are with extensive cooperation with the first responders to the scene – the Fire Rescue Service, as well as the Ministry of Agriculture, and the Central Control and Testing Institute of Agriculture.[345]

[342] ibid
[343] ibid
[344] ibid
[345] ČR, M., 2016. Environmentální bezpečnost [WWW Document]. http://. URL https://www.mzp.cz/cz/environmentalni_bezpecnost (accessed 3.5.22).

2.9.5 Animal Disease Threat Competency

The response to an animal disease threat is similar in the sense that region plans are enacted, and local authorities lead the response as obligated under law. Measures that can be taken include establishing a perimeter, increased sanitation, or dealing with the logistics of mass killing of animals. In addition to the local authorities, the Ministry of Agriculture as well as the State Veterinary Administration and local veterinary administrations are brought in to coordinate.[346]

2.9.6 Water Threat Competency

When facing a water contamination threat or "special flood" threat which can caused by accidents or intentional damage to water plant or water storage, measures must be quickly implemented. Water threats can have massive implications for the population living near the facilities. Responsible institutions for this threat are the Ministry of Agriculture, working with the Ministry of Environment and Ministry of Interior, in addition to first response on the scene – any rescue efforts needed, or securing efforts that would require assistance from the Armed Forces of the Czech Republic.[347] The way to mitigate this threat is through technical and safety supervision as well as regular analysis on the possibilities of the occurrence of special floods, by determining their effects and setting benchmarks for flood activity levels included in the Plan for Protection of Areas near Waterworks against Special Flood.[348]

[346] ibid
[347] Koncepce environmentální bezpečnosti 2021-2030 s výhledem do roku 2050 | Databáze strategií - portál pro strategické řízení [WWW Document], n.d. URL https://www.databaze-strategie.cz/cz/mzp/strategie/koncepce-environmentalni-bezpecnosti-2021-2030-s-vyhledem-do-roku-2050?typ=detail (accessed 3.5.22).
[348] ibid

3. Practical Part

3 Agroterrorism in the Czech Republic

Although the Czech Republic has so far evaded a major agroterrorism attack, it must nevertheless be prepared to face such a threat and have action plans at the ready. Within the international community, the Czech Republic is perceived as a country actively involved in counter-terrorism efforts and can be a legitimate potential target.

3.1.1 Agroterrorism Events in the Czech Republic

As mentioned, no classic agroterrorism attack have been carried out within the Czech Republic. There have however been instances of disruption of goods and services closely related to agroterrorism, most notably the methanol poisonings in 2012. Over the course of several days, 48 people in the Czech Republic, as well as 3 people in Poland died due to methanol poisoning from alcohol consumption; many more had other permanent health damage such as loss of eyesight.[349] In response, the Czech government quickly banned the sale of alcohol with over 20% alcohol by volume as well as the export of the products.[350] To ensure compliance, police checked shops where alcohol was sold, as well as restaurants and other stands. The source of the contaminated alcohol was found in an Opava-based business, from where it traveled to the black market. Three suspects knew they were mixing the cocktail and were detained on charges of general public endangerment.[351] This incident goes to show, how big of an impact a few men can have. The ensuing prohibition of sale of alcohol as well as export rippled through the economy, society, and culture – shops, bars and restaurants lost revenue, alcohol producers lost revenue and trust, the Czech Republic lost trade partners, and overall society was impacted more so than thought.

Further, there are other cases that skirt the line of agroterrorism or eco-terrorism - some examples can be the behavior and actions of some environmental organizations - an eco-anarchist organization, the distribution group from Dvur Kralove nad Laben, called Green Distribution (Czech: Zelena distribuce), led by Rostislav Siksta. The group published

[349] 117 otrávených, 48 mrtvých, 15 000 litrů závadného alkoholu. Připomeňte si kauzu Metanol [WWW Document], n.d. . iROZHLAS. URL https://www.irozhlas.cz/zpravy-domov/metanol-smrt-otraveni-prohibice_1804221130_pj (accessed 3.18.22).

[350] ibid
[351] ibid

a magazine called Zeleny provaznicek in which ecoterrorism and similar topics were highlighted.[352]

Another instance was when an employee of the State Office for Nuclear Safety described a protest in front of the offices as ecoterrorism, during which protestors used sirens and physically chained themselves to the building of the office.[353]

A mass protest led by an organization called Animal SOS against horseracing took place at the biggest horserace in the Czech Republic, Velka Pardubicka, in 1992. 700 protestors made up of ecological and anarchist movements in the Czech Republic ran onto the racetrack during the race, which caused mass complications which could be seen on televisions screens throughout the country.[354] However, there was no violence against people, or deliberate destruction of property. Following this, the Animal SOS foundation continued to be active for about two more years with protests and campaigns against circuses, the fur industry, as well as propagating for a healthier lifestyle, among others.

The Animal Liberation Front has also been active within the Czech Republic, the most significant event being in 1995, with an attack on the control room of a cable car in Moravsky kras near the Macocha chasm. The construction of the cable car cut through a protected area and provoked great push back from environmentalists. Two incendiary devices were placed, but only one of them ignited, leading to damage to the control panel.[355]

The dangers of pests and other bothersome bugs can be seen with the potato beetle, (Leptinotarsa decemlineata) or the Colorado beetle, which originated in North America and was first described in the 1820's and spread over the continent.[356] The transport of potatoes from North America allowed it to spread to Europe. After WWII, due to an increase in potato

[352] Rebelové s eko-příčinou » Sedmá generace Sedmá generace [WWW Document], 2007. . Sedmá generace. URL https://sedmagenerace.cz/rebelove-s-eko-pricinou/ (accessed 3.18.22).

[353] ibid

[354] Skandálem skončila Velká pardubická – ekologičtí aktivisté vtrhli na dráhu - Vyprávěj | Česká televize, n.d.

[355] Šukalová, A., 2006. Animal Liberation Front v České republice. Masarykova univerzita, Fakulta sociálních studií.

[356] Moderní-Dějiny.cz | Kampaň proti „americkému brouku" a její politické souvislosti [WWW Document], n.d. URL https://www.moderni-dejiny.cz/clanek/kampan-proti-americkemu-brouku-a-jeji-politicke-souvislosti/ (accessed 3.18.22).

transport, the beetle spread massively. It was first discovered in Czechoslovakia in 1945 and was such a nuisance and serious threat that by 1948, the Ministry of Agriculture set up a committee to fight it. Communist propaganda at the time used the beetle spread to demonize the West by saying the beetles were maliciously introduced into the region.[357]

Another pest problem is the bark beetle that has been plaguing parts of the country for several years now. Although not the work of an agroterrorist, the bark beetle problem seen throughout the Czech Republic can again show just how much of an impact a single out of control pest can have. It must be stressed that this was the result of long-term forest mismanagement and a change in climate. In 2017, the bark beetle destroyed around 6 million cubic meters of wood to be used for timber and lumber.[358] The total number of wood produced for that year in the Czech Republic was 19 million cubed meters. In 2019, In the Vysocina region alone, 5 million cubic meters of wood had to be cut down prematurely due to a bark beetle infestation. The infected lumber cannot be sold, nor used, and is an economic, environmental, and social loss.[359] In 2019, a total of 25.7 million cubic meters of lumber and timber was produced, of which 13 million cubic meters was infected and unusable, totaling 57% of the total industry. Due to the calamity, the price of a cubic meter of spruce wood decreased to less than 1000 CZK, wood fiber fell to 200 CZK per cubic meter, which is less than production costs, which at the time were around 400-450 CZK per cubic meter.[360]

3.2 Agriculture Target Assessment

To properly assess and identify potential targets of agroterrorism in the Czech Republic, it is necessary to look at the overview of likely targets in a holistic way. First through agriculture statistics (shares, production, consumption, trade, self-sufficiency, geographic location), and second through conducting a risk assessment determining risk by estimating threat level, criticality, and vulnerability of a target.

[357] ibid

[358] Vysočina kvůli kůrovci přišla o pětinu jehličnanů. ‚Jdeme naproti další vlně,' varují odborníci [WWW Document], n.d. . iROZHLAS. URL https://www.irozhlas.cz/zpravy-domov/kurovec-sucho-vysocina-kalamita-lesy_2110270500_jab (accessed 3.18.22).

[359] ibid

[360] ibid

3.2.1

Statistical Overview of Basic Commodities and Agriculture

Distribution of Cultivated Agriculture Land by Type

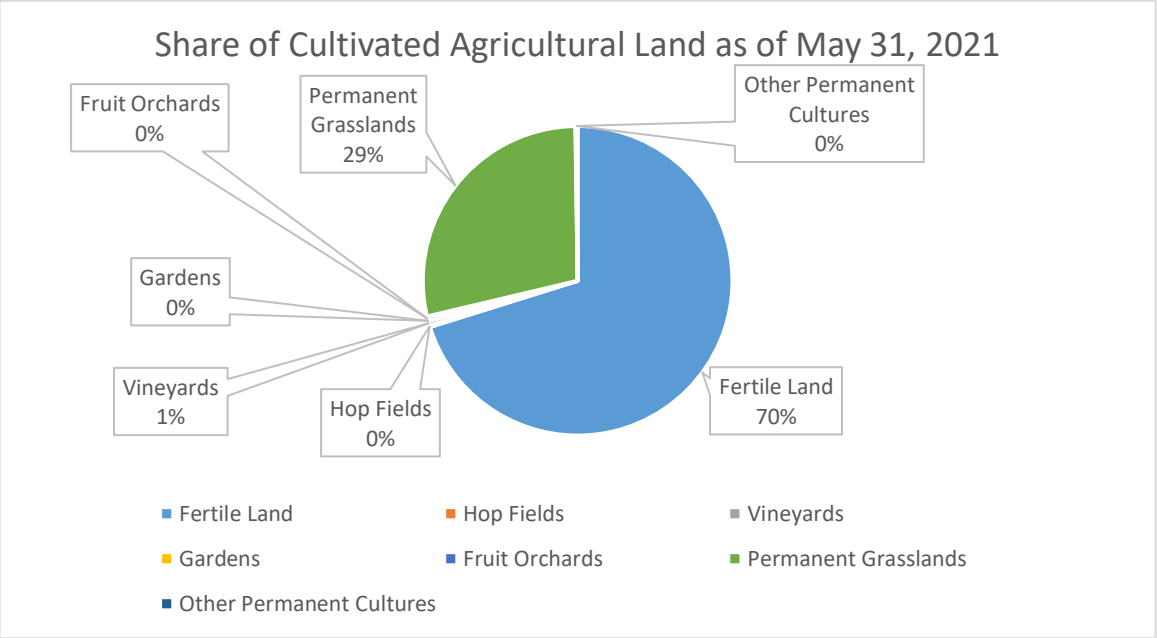
Today, most farms are privately owned; a major shift form the large collective farms during the communist era until 1989. Agriculture land in the Czech Republic is divided into several types: arable land, gardens, fruit orchards, vineyards, hop fields, and grassland. Of these, the main targets of agroterrorism would be arable land, vineyards and hop fields – mainly due to their reach through economic sectors.

Table 1 Share of Cultivated Agricultural Land as of May 31, 2021

Share of Cultivated Agricultural Land as of May 31, 2021	
Total Cultivated Agricultural Land	3 529 797
Of which is:	
Fertile Land	2 476 913
Hop Fields	5 601
Vineyards	17 464
Gardens	595
Fruit Orchards	15 999
Permanent Grasslands	1 005 525
Other Permanent Cultures	7 700

Source: CZSO

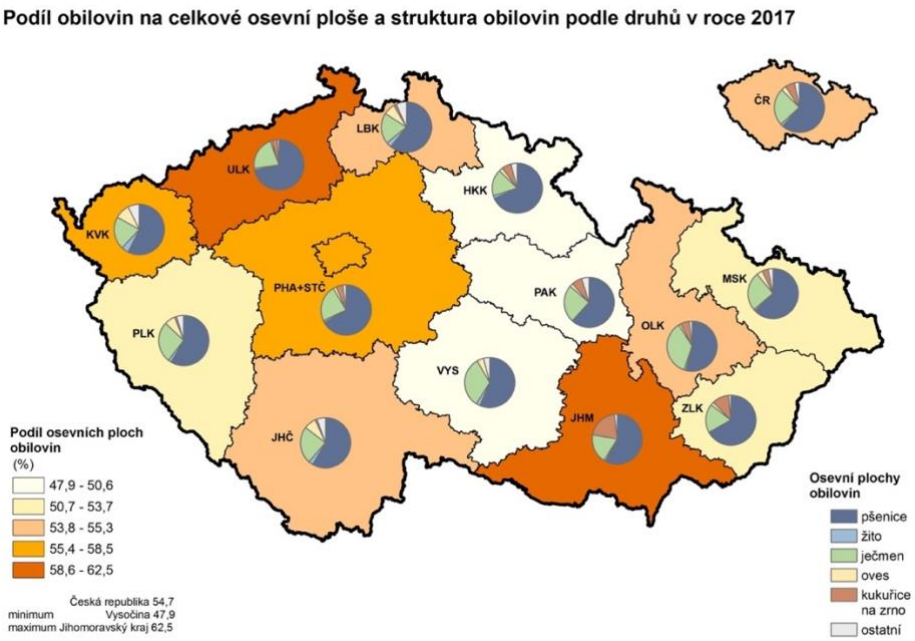
Figure 7 Graph of Share of Cultivated Agricultural Land as of May 31, 2021.



Source: CZSO and Own Work

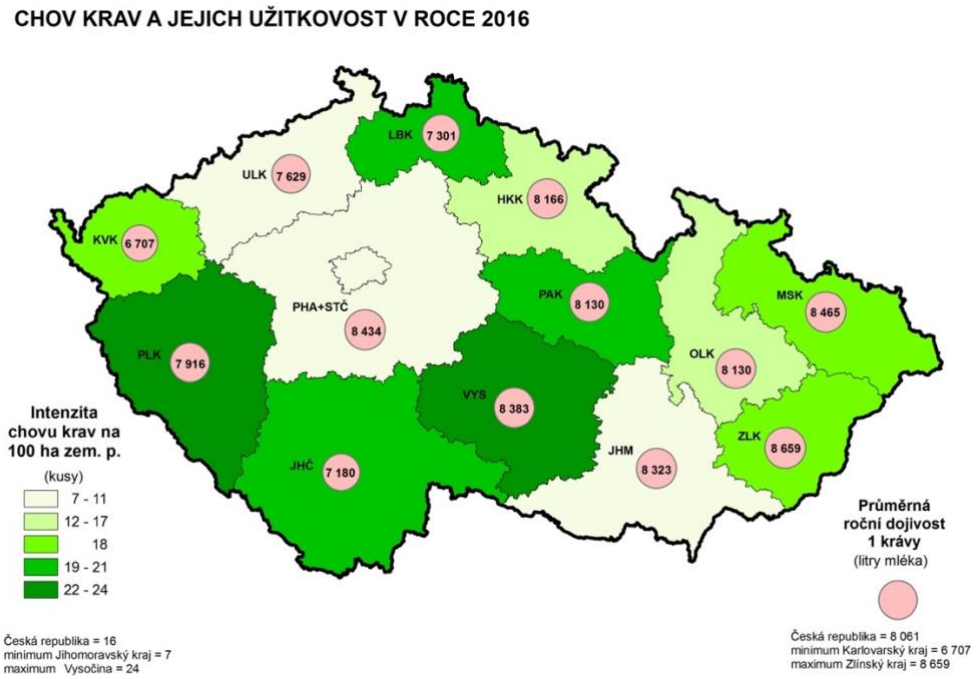
Figures 8, 9, and 10 show the geographic locations of production of cereals, cattle breeding and milk production, and chicken breeding and egg production.

Figure 8 The Share Of Cereals in the Total Sown Area and Structure of Cereals by Type In 2017.



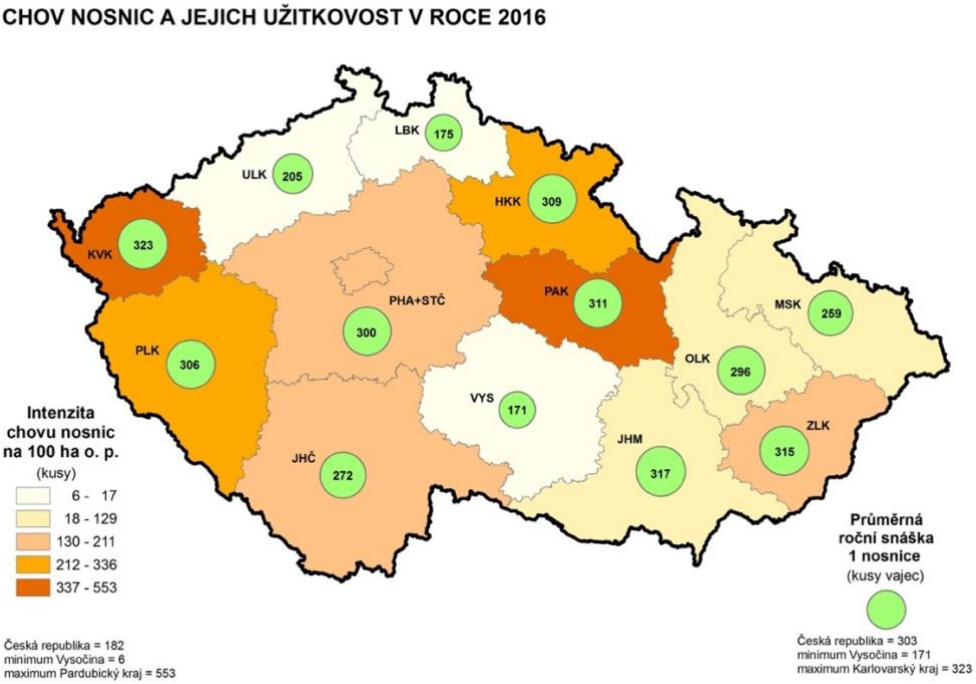
Source: CZSO

Figure 9 Cattle Breeding and Milk Production in 2016.



Source: CZSO

Figure 10 Chicken Breeding and Egg Production in 2016.

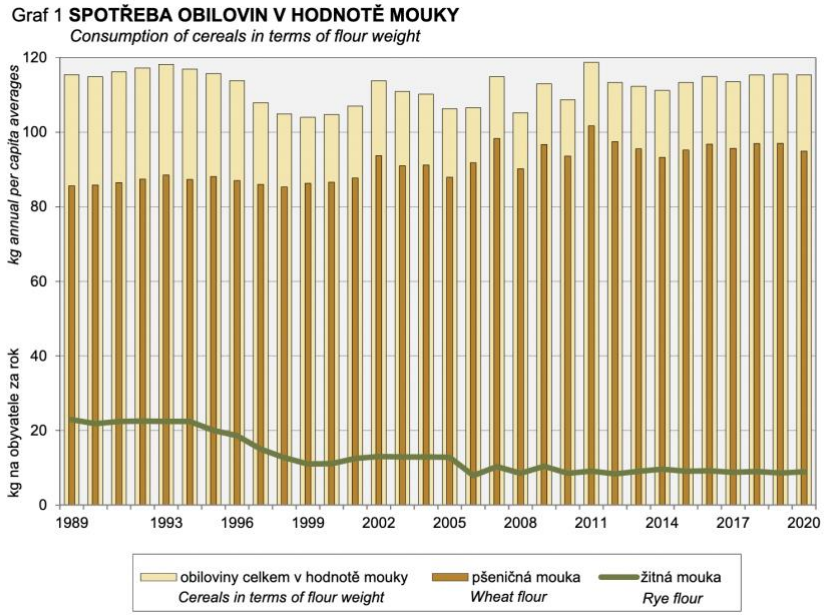


Source: CZSO

3.2.2 Consumption of Goods

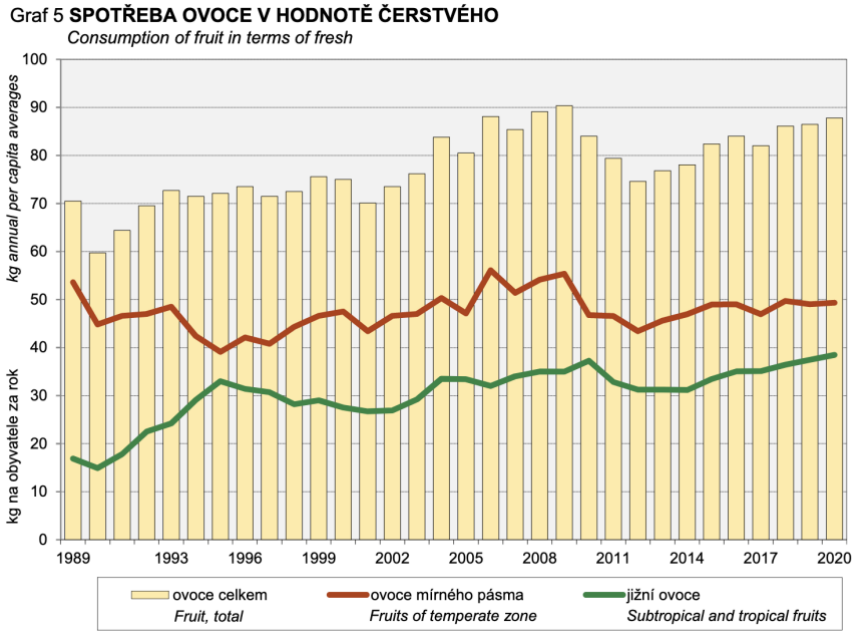
Figures 11-18 show the consumption of cereals, fresh fruit, vegetables, and potatoes, livestock, milk, and fats and oils and alcohol from 1989- 2020.

Figure 11 Consumption of Cereals in Flour Weight 1989- 2020



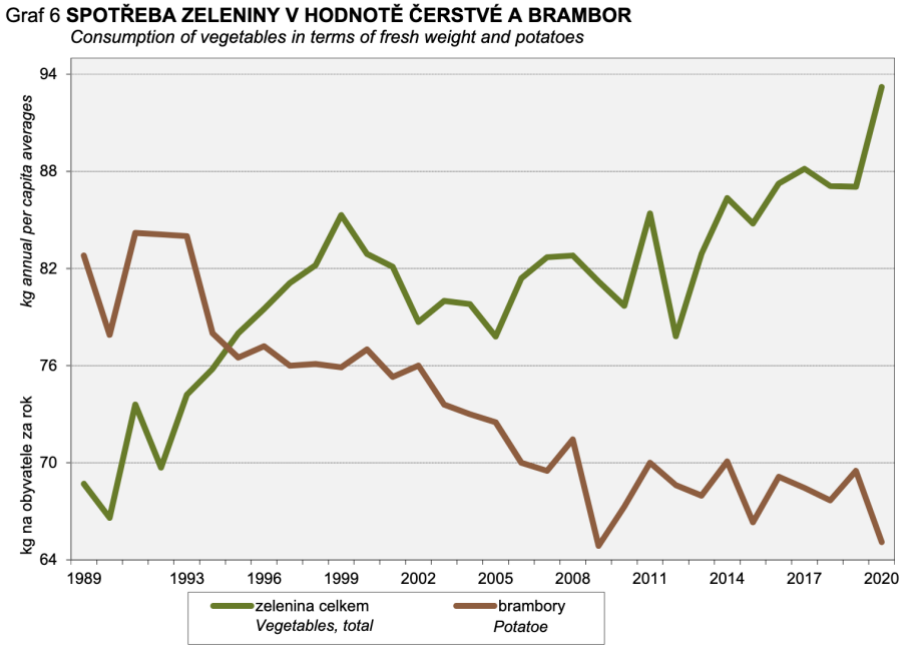
Source: CZSO

Figure 12 Consumption of Fresh Fruit 1989-2020.



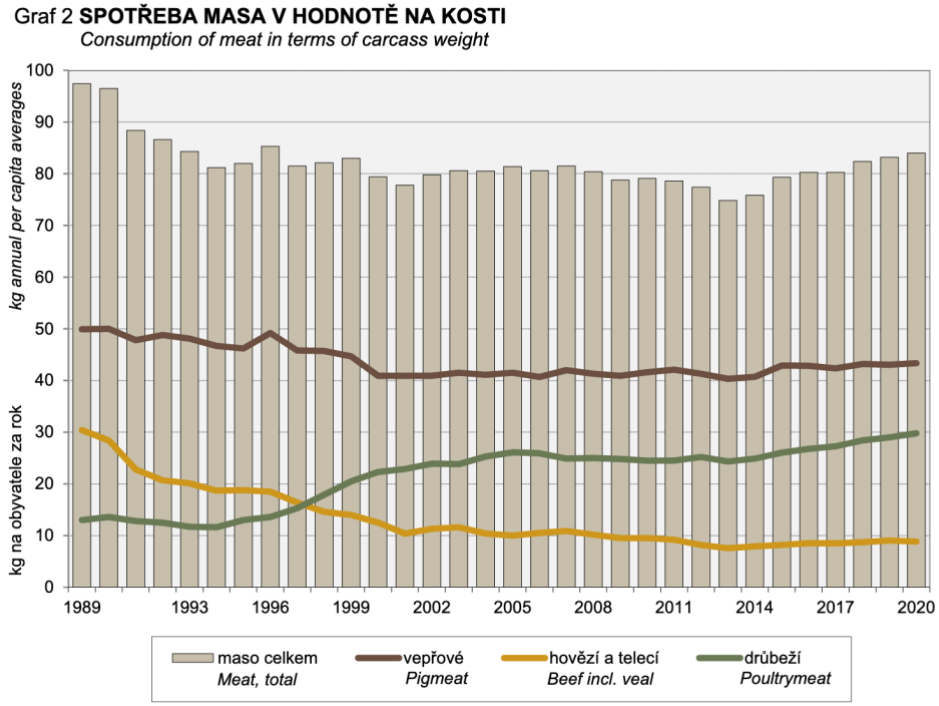
Source: CZSO

Figure 13 Consumption of Vegetables and Potatoes 1989-2020



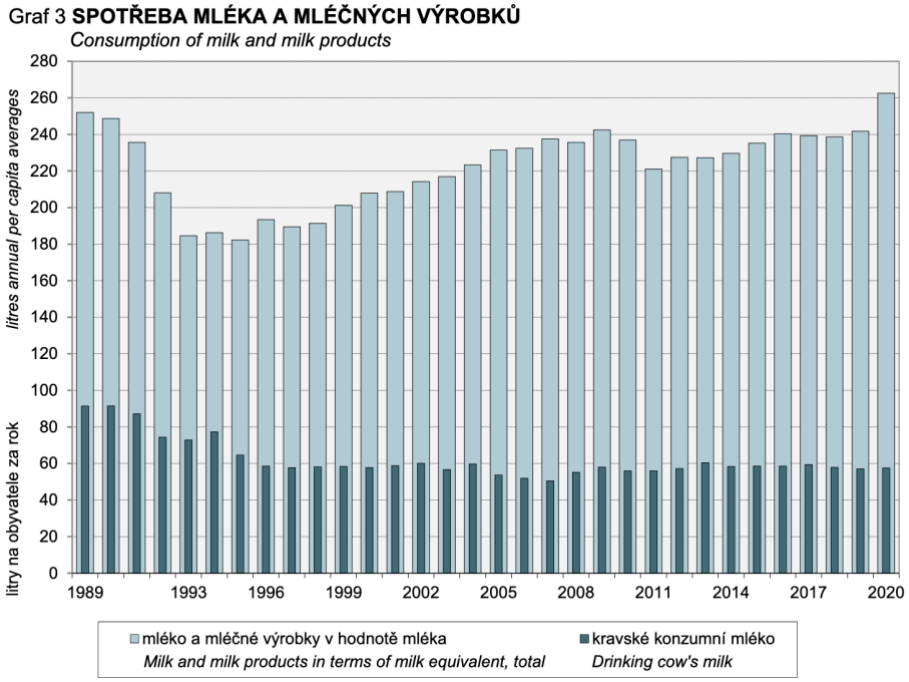
Source: CZSO

Figure 14 Consumption of meat in terms of carcass weight in the Czech Republic 1989-2020



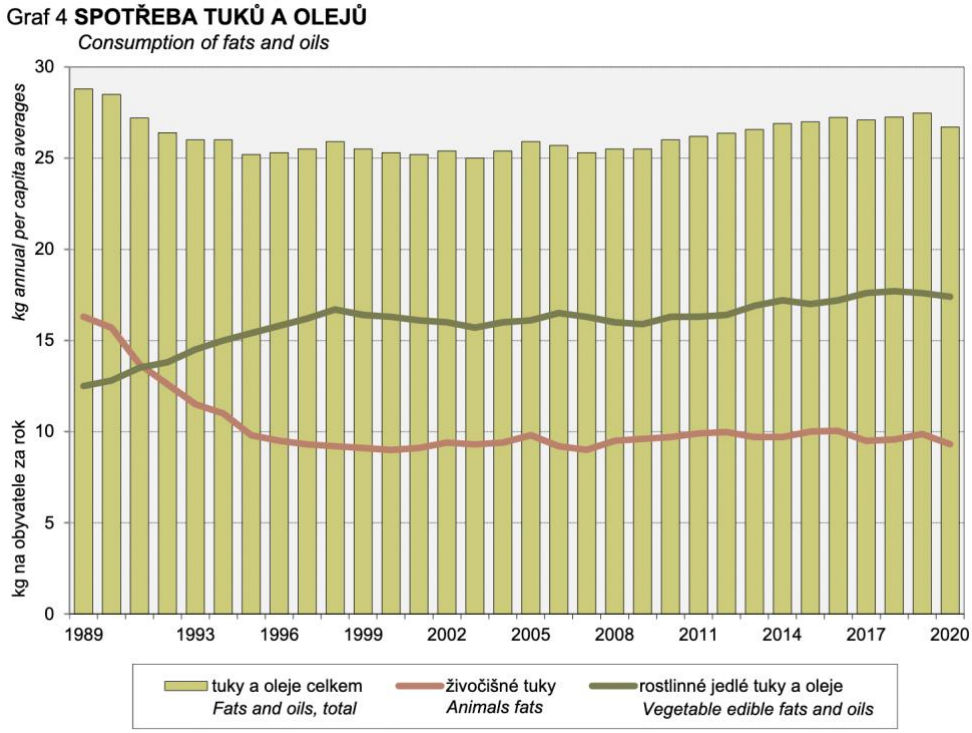
Source: CZSO

Figure 15 Consumption of Milk 1989-2020



Source: CZSO

Figure 16 Consumption of Fats and Oils 1989-2020

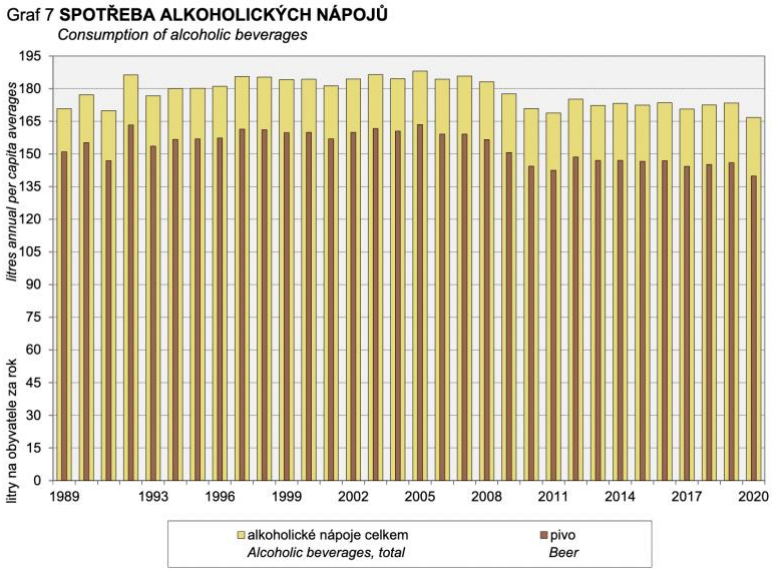


Source: CZSO

Special Items – Alcohol

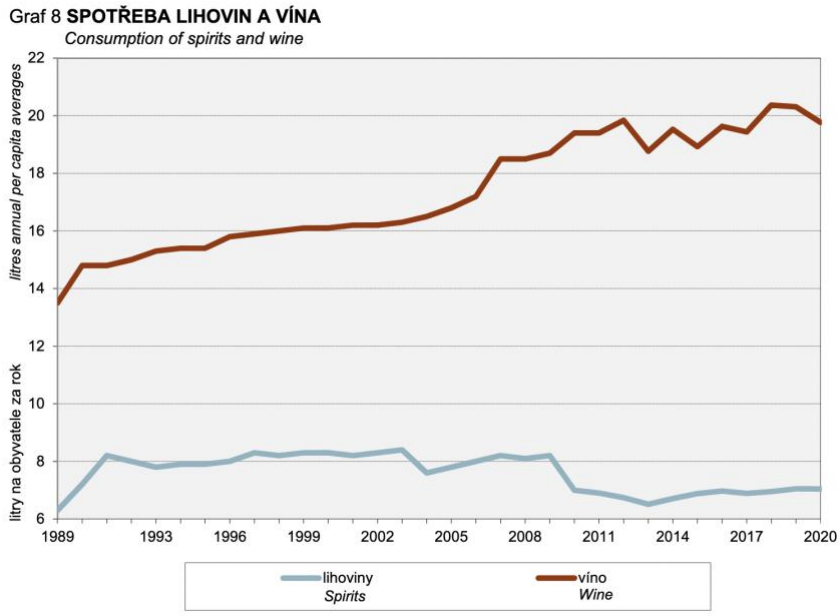
Although alcoholic beverages are not a basic commodity per se, the Czech Republic is a large consumer, thus opening up the potential of a target.

Figure 17 Consumption of Alcoholic Beverages 1989-2020



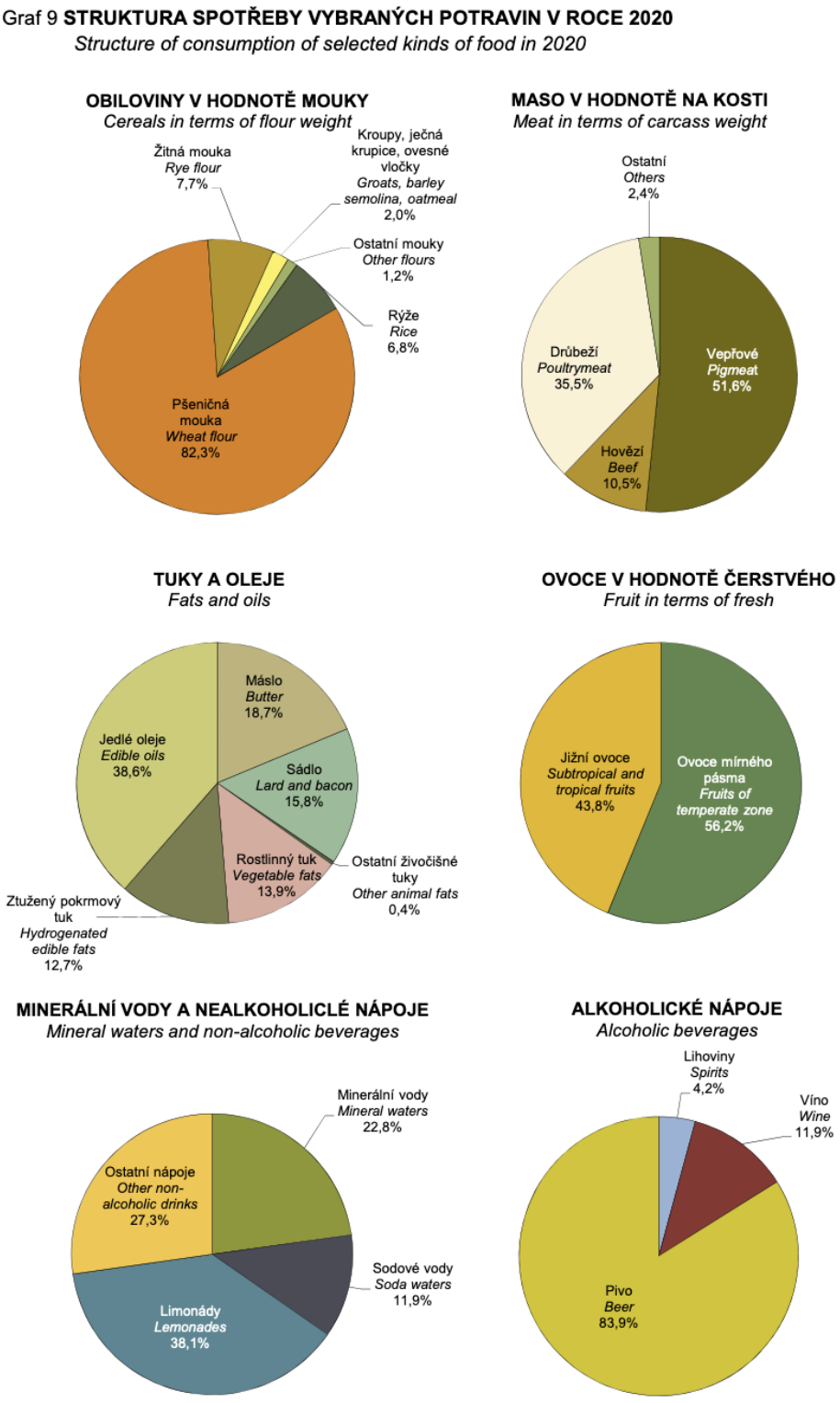
Source: CZSO

Figure 18 Consumption of Spirits and Wine 1989-2020



Source: CZSO

Figure 19 Structure of Consumption of Selected Types of Foodstuffs in 2020.



Source: CZSO

There are several conclusions that can be made from the data. Pork and poultry are the dominant livestock species, and wheat is the dominant crop grown in the Czech Republic. By extension, these are also the top consumed commodities. Therefore, any agroterrorism attack aimed at this sector would most impact these.

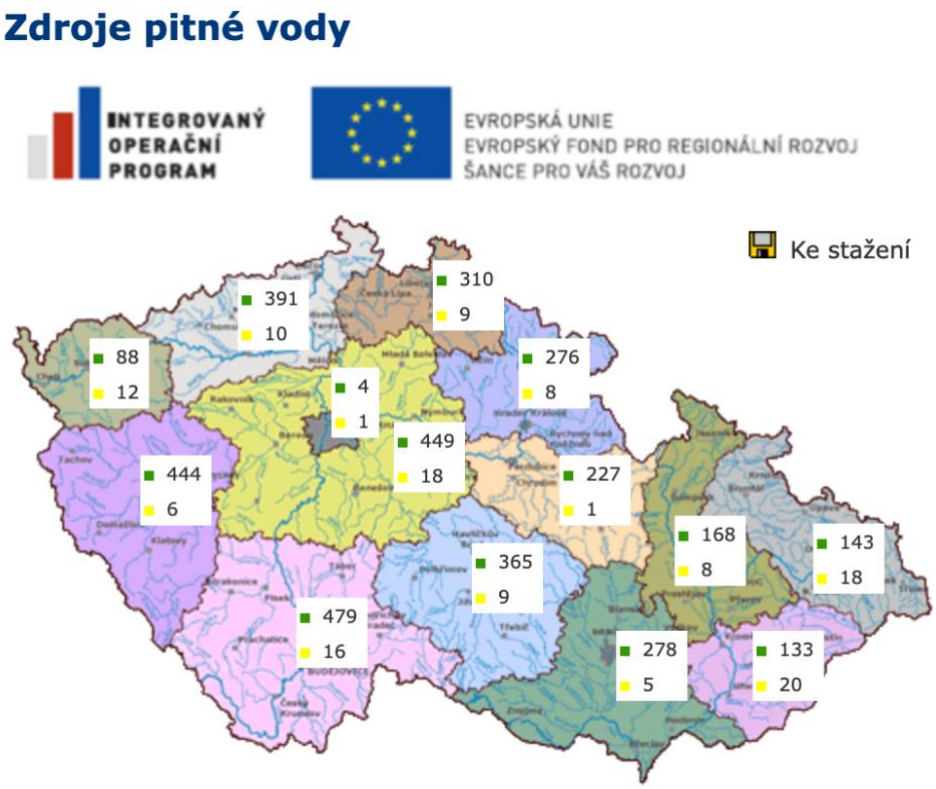
Drinking water

Right after the fall of communism in 1989, 82.4% of the population of the Czech Republic was supplied with drinking water. Today, that number is over 95%.[361] The average daily water consumption per person in 2019 was about 89 liters, which, at the price set for 2020 of 98.91 CZK per hectoliter for water and sewerage costs including VAT, amounts to a total of 8.80 CZK per person, per day.[362] Figure 20 shows the sources of drinking water for the Czech Republic. In green are number of underground sources, and in yellow surface water.

[361] The Czech Republic presented its second voluntary national review [WWW Document], n.d. URL https://www.mzv.cz/un.newyork/en/news_events/the_czech_republic_presented_its_second.html (accessed 3.22.22).

[362] Spotřeba vody v domácnosti - Severočeské vodovody a kanalizace, a.s. [WWW Document], n.d. URL https://www.scvk.cz/vse-o-vode/pitna-voda/spotreba-vody/ (accessed 3.18.22).

Figure 20 Sources of Drinking Water.



Legenda:	
■	zdroje podzemních vod
■	zdroje povrchových vod

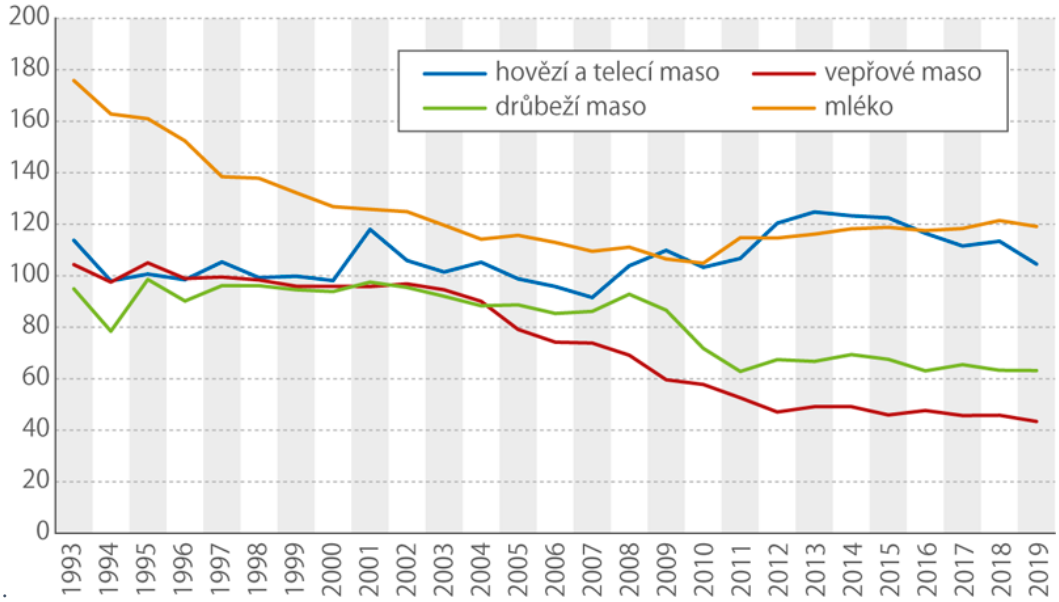
	Hlavní město Praha
	Středočeský kraj
	Jihočeský kraj
	Plzeňský kraj
	Karlovarský kraj
	Ústecký kraj
	Liberecký kraj
	Královéhradecký kraj
	Pardubický kraj
	Kraj Vysočina
	Jihomoravský kraj
	Olomoucký kraj
	Zlínský kraj
	Moravskoslezský kraj

Source: Ministry of Agriculture

3.2.3 Agricultural Self-sufficiency of the Czech Republic

From 1993 to 2019, food self-sufficiency in the Czech Republic decreased for almost all commodities - only self-sufficiency in beer production shows an upward trend.[363] As seen in Figures 21 and 22. Nevertheless, despite the drop, milk production and beef production are still both over 100% self-sufficient. Commodities that the Czech Republic was self-sufficient in 1993 but not in 2019 include apples and pork. Lastly, commodities that were never over 100% include poultry, eggs, carrots, wheat flour, onions, cabbage, and tomatoes.[364]

Figure 21 Self-sufficiency in the production of food of animal origin 1993- 2019 (in %)

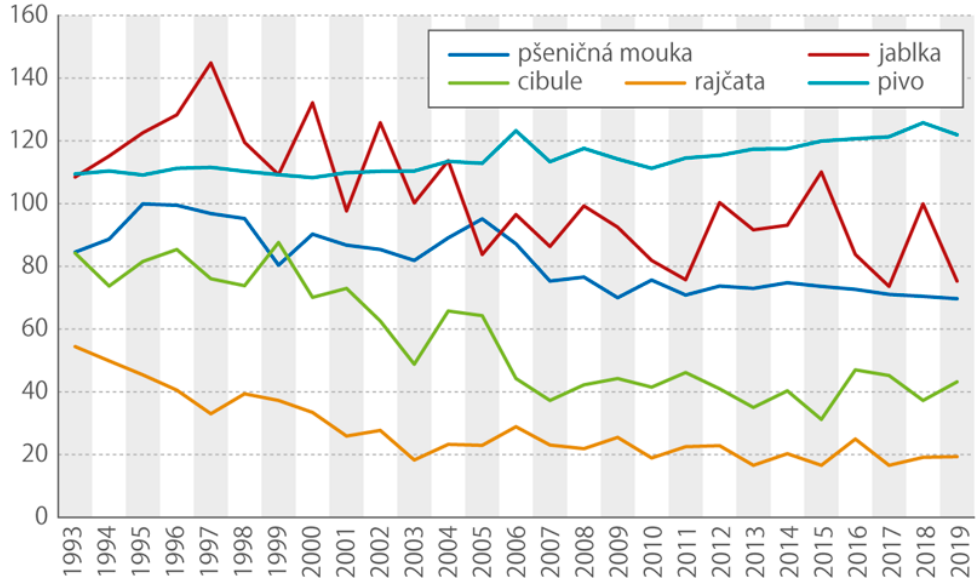


Source: Statistika&My

[363] Kolik potravin si vyrobíme sami? | Statistika&My, n.d. URL https://www.statistikaamy.cz/2021/04/19/kolik-potravin-si-vyrobime-sami (accessed 3.18.22).

[364] ibid

Figure 22 Self-sufficiency in crop food production 1993- 2019 (in %)



Source: Statistika&My

3.3 Threat Risk Assessment

Now that the top agricultural commodities in terms of production, consumption, and self-sufficiency have been determined, it is necessary to next conduct a risk assessment to quantify the target threat. To quantify a threat, a risk equation will be used to assess the threat of attack to each of the analyzed sectors. A risk equation is used to specify the probability of attack, vulnerability, as well as the impact of consequences.[365]

3.3.1 Threat Risk Assessment Methodology

For each type of threat, risk is determined using the formula:

Risk = Threat x Vulnerability x Criticality

Where, threat is the probability or likelihood of attack, vulnerability is how vulnerable the target is to attack, and criticality is the potential impact of an incident. In the above formula, risk is defined as the extent to which a target is exposed to a hazard or danger.

[365] Assessing and Managing the Terrorism Threat | Office of Justice Programs [WWW Document], n.d. URL https://www.ojp.gov/ncjrs/virtual-library/abstracts/assessing-and-managing-terrorism-threat (accessed 3.18.22).

Using this methodology to determine and summarize risk in numerical form, it is used to prioritize certain threats, highlight serious risk, and pinpoint what to best focus on in prevention and planning, allowing for more efficient decision-making. Overall, the risk assessment process allows for a complete overview of risk of a particular threat to a particular sector. The result of the assessment allows risk to be diluted down into a single numerical rating.

3.3.2 Calculating Threat

In order to calculate the threat, or in other words, the probability of an attack, there are several factors that are taken into consideration. These factors can be present alone, or in combinations:[366]

- Existence: A terrorist group is present or is able to gain access to a given locality.
- Capability: The capability of a terrorist group to carry out an attack has been assessed or demonstrated
- Intent: Evidence of terrorist group activity, including stated or assessed intent to conduct terrorist activity.
- History: Demonstrated terrorist activity in the past.
- Targeting: Current credible information or activity exists that indicates preparations for specific terrorist operations.
- Security environment: Indicates the level of capability of terrorist elements to carry out their intentions. Addresses whether the jurisdiction is concerned with terrorism and whether it has taken strong proactive countermeasures to deal with such a threat.

Calculating threat is difficult due to several factors such as difficulty in assessing terrorist capabilities, intentions, and tactics. Threat of an agroterrorism attack can be quantified in the following way.[367]

Table 2 Calculating Threat.

Critical (5)	Existence, capability, and targeting are present. History and intentions may not be.
High (4)	Existence, capability, history, and intentions are present

[366] ibid
[367] ibid

Medium (3)	Existence, capability, and history are present. Intention may not be
Low (2)	Existence and capability are present. History may not be
Negligible (1)	Existence or capability may not be present.

Source: US Department of Justice and Own Work

3.3.3 Calculating Vulnerability

Vulnerability is difficult to measure objectively. According to the US Department of Homeland Security, vulnerability is defined as, "the identification of weaknesses in physical structures, personnel protection systems, processes, or other areas that may be exploited by terrorists."[368]

The vulnerability assessment also may suggest options to eliminate or mitigate those weaknesses. Several factors to consider when determining vulnerability include:[369]

- Location: Geographic location of potential targets or facilities, and routes of ingress and egress; location of facility or target relative to public areas, transportation routes, or easily breached areas.
- Accessibility: How accessible a facility or other target is to the adversary (i.e., disruptive, terrorist, or subversive elements); how easy is it for someone to enter, operate, collect information, and evade response forces
- Adequacy: Adequacy of storage facilities, protection, and denial of access to valuable or sensitive assets such as hazardous materials, weapons, vehicles or heavy equipment, and explosives or other materials that some person or organization could use deliberately or in an opportunistic manner to cause harm.
- Availability: Availability of equipment, adequacy of response forces and of general physical security measures

Table 3 Calculating Vulberability

Highly Vulnerable (5)	A combination of two or more of the following with due consideration of the threat level: - Direct access to asset or facility is possible via one or more major highway systems. Waterside access is open or adjacent land areas are unoccupied, unguarded, or allow free access.

[368] ibid
[369] ibid

	- Asset or facility is open, uncontrolled or unlighted, or security is such that threat elements may have unimpeded access with which to collect intelligence, operate, and evade response forces. Patrols, electronic monitoring, or alarm systems are easily defeated or provide incomplete coverage. - Individual systems within the facility, such as hazardous materials, weapons, explosives, or vehicles, are accessible with minimum force or possibility of detection. - Response units provide minimum effective force to counter the experienced threat level. In place physical security measures do not provide protection commensurate with the anticipated threat level.
Moderately Vulnerable (3)	A combination of two of the following: - Direct access to asset or facility is possible via one or more major highway systems, but road system is restricted or patrolled. Waterside access may be open or adjacent land areas unoccupied but mitigating geographic conditions may be present (e.g., lengthy channel access). - Asset or facility is open, uncontrolled or unlighted, or security is such that threat elements may meet some resistance, be detected, or activate a remotely monitored alarm. Access to collect intelligence, operate, and evade response forces is at least partially hampered. Patrols,

	electronic monitoring, or alarm systems may be easily defeated or provide incomplete coverage. - Individual items within the facility, such as hazardous materials, weapons, explosives, or vehicles, are accessible with moderate force, or tampering may result in detection. - Response units provide effective force to counter the experienced threat level. Physical security measures do not provide protection commensurate with the anticipated threat level.
Low Vulnerability (1)	A combination of two or more of the following, provided continual awareness of the anticipated threat level is maintained: - Asset or facility is difficult to access from major highway or road network, or outside access is limited by geography. - Asset or facility has adequate, positive access control. Patrols, cameras, remote sensors, and other reporting systems are sufficient to preclude unauthorized entry, loitering, photography, or access to restricted areas. - Appropriate and reasonable safeguards are taken to prevent or hinder access to sensitive materials. Protection is commensurate with degree of material sensitivity and level of threat. - Response force is able to answer an infrastructure or facility breach with appropriate personnel, equipment, and timeliness.

Source: US Department of Justice and Own Work

3.3.4 Calculating Criticality

As mentioned, criticality is the likely impact or consequence if a sector is targeted and attacked. Criticality assessments help planners determine the relative importance of targets, helping to prioritize the allocation of resources to the most critical assets. Assessing criticality can at times be subjective. Certain facilities or sectors are inherently vulnerable or more prone to an attack.

To calculate criticality, a five-point scale is used to estimate the impact of loss of life and property. However, to better mold it to an agroterrorism threat, criticality is used to estimate the former loss of property and life, but also the loss of revenue, crops, trading partners, interruption of facility or supply, and overall trust.[370]

Table 4 Calculating Criticality

Extreme (5)	Substantial loss of life or irreparable, permanent, or prohibitive costly repair to a farm or facility. Lack of, or loss of, a system or capability which would provide invaluable advantage to the adversary, such as press coverage.
High (4)	Serious and costly damage to a facility or a positive effect for the adversary. No loss of life.
Medium (3)	Disruptive to facility operations for a moderate period of time; repairs—although costly—would not result in significant loss of facility capability. No loss of life.
Low (2)	Some minor disruption to facility operations or capability; does not materially advantage the enemy. No loss of life
Negligible (1)	Insignificant loss or damage to operations or budget. No loss of life

Source: US Department of Justice and Own Work

[370] ibid

3.3.5 Risk Matrix

To further quantify and assess actions needed to combat a threat, a risk matrix will also be used:[371]

$$Risk = Probability \; x \; Impact$$

Table 5 Estimating Probability or Likelihood

Probability or Likelihood	
High Probability/Frequent (5)	Frequent and high probability exists
Moderate Probability/ Probable (4)	Possible
Low Probability/Occasional (3)	
Remote (2)	Just a theoretical probability exists
Improbable (1)	Very unlikely probability

Source: Xenon Management and Own Work

Table 6 Estimating Impact or Severity Source: Xenon Management and Own Work

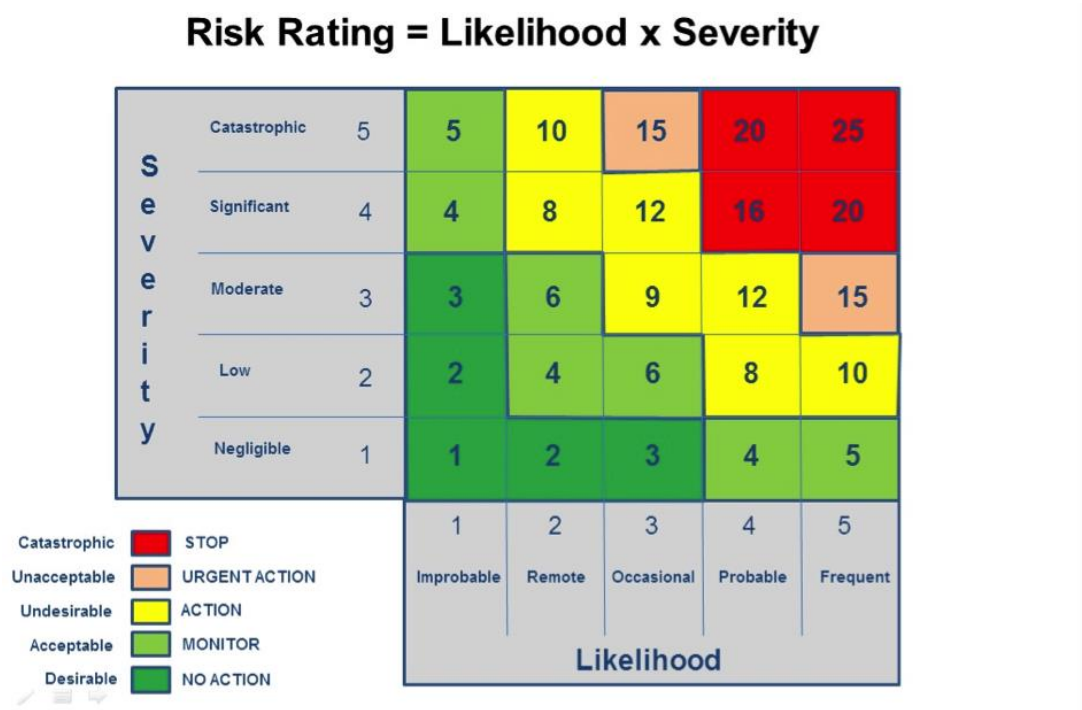
Impact or Severity	
Catastrophic (5)	Extensive impact on life, health, property, and the environment, with impacts on social stability.
Significant (4)	Greater, regional impact on life, health, property, and the environment
Moderate (3)	Localized impact on life, health, property, and the environment
Low (2)	Miniscule impact on life, health, property, and environment
Negligible (1)	No impact on life, health, property, and environment

Source: Xenon Management and Own Work

[371] The risk formula – how to calculate the level of risk to your business, n.d. . Xenon Management, Training and Recruitment Ltd. URL https://www.xenongroup.co.uk/knowledge-centre/risk-management/the-risk-formula-how-to-calculate-the-level-of-risk-to-your-business (accessed 3.18.22).

The intersection of the severity and likelihood values determine the risk level.[372] The matrix below shows in color form when a risk rating level urges more action, or more preparedness, and when the threat does not need additional resource allocation. A value in green encourages no action, or to just monitor the situation, while values in yellow urge action, and in salmon and red need urgent action or immediate change.

Figure 23 Risk Rating Matrix



Source: Xenon Management

3.4 Agroterrorism Threat/Risk Assessment in the Czech Republic

3.4.1 Attack on a Water Source

Potential Agents Used

Some potential agents that can be used to attack a water supply include:[373]

[372] ibid

[373] Water-related Diseases and Contaminants in Public Water Systems | Public Water Systems | Drinking Water | Healthy Water | CDC [WWW Document], 2018. URL https://www.cdc.gov/healthywater/drinking/public/water_diseases.html (accessed 3.18.22).

Table 7 General categories of drinking water contaminants and examples of each

Physical contaminants	Sediment or organic material, particles, like rust suspended in the water
Chemical contaminants:	Nitrogen, bleach, salts, pesticides, metals, toxins, nerve agents, drugs. Other attacks that can cause chemical imbalances in the water.
Biological contaminants	Organisms in water - bacteria, viruses, and parasites
Radiological contaminants	Cesium, plutonium, uranium

Source: United States Environmental Protection Agency

Figure 24 List of potential agents with occurrence, health impacts and limit value in the water source.

Parameter	Occurrence	Health Significance	Limit Value
Non-biological			
Ammonia	Results in microbiological activity	Irritations to eyes, nose and throats, non-deadly threats to human	0.5 mg/L
Arsenic	Dissolution of minerals from industrial	Very toxic to humans, high risk of skin cancers	10 µg/L
Barium	Natural occurring chemicals	Painful swallowing, ulcer	5 µg/L
Boron	Natural occurring chemicals, leach of rocks and soil	Kidney failure, depression	0.5 mg/L
Chlorine	Industrial effluents	Toxicity to humans, hazardous	5 mg/L
Chromium	Industrial processes	Skin irritation, damage kidney, liver	10 µg/L
Cadmium	Sediments of rock and soil	Hazardous to human, effect respiratory system and bone disease	3 µg/L
Lead	Leaching from ores, attack on water pipes	Toxic cumulative poison	10 mg/L
Mercury	Normally from industrial waste	Very toxic, human fatal	1 µg/L
Nickel	Chemical used in water treatments	Cancer of lungs and nose	20 µg/L
Nitrate	Presence from agricultural activities	Risk of lifetime cancer	3 mg/L
Sodium	Natural waters, abundant of rocks and soil	High-blood pressure, heart diseases	200 mg/L
Biological			
Cryptosporidium	Presence in human and animal waste	Infections, fever, stomachache, diarrhoea	630 mL/L
Escherichia coli	Sewages and similar waste	Pathogenic properties, effect human health	10 CFU/mL
Giardia	Presence in human and animal waste	Effect human health, rarely fatal	10 cysts/L
Legionella	Sediments of water	Risk of Legionnaire's disease and Pontiac fever	100 CFU/mL
Pesticide	Agricultural discharges, spillages	Eyes and ears infection	0.1 µg/L
Pseudomonas	Abundant in sewage	Hypertension if taken excess	500 CFU/mL

Source: Water Quality Products

Risk Equation Inputs

3.4.1.1.1 Threat

The threat assessment for an attack on water source is estimated on the following factors:

- Existence: No known terrorist group is present but would be able to gain access.
- Capability: Capability to carry out an attack has been demonstrated
- Intent: No real evidence of terrorist group activity, including stated or assessed intent to conduct terrorist activity.
- History: No demonstrated terrorist activity in the past.
- Targeting: No current credible information or activity exists that indicates preparations for specific terrorist operations that is known.
- Security environment: Indicates the level of capability of terrorist elements to carry out their intentions. Addresses whether the jurisdiction is concerned with terrorism and whether it has taken strong proactive countermeasures to deal with such a threat.

Based on the assessed factors. The threat assessment is estimated to be:

Medium (3)	**Existence, capability, and history are present. Intention may not be.**

3.4.1.1.2 Criticality

The criticality assessment estimate for an attack due to the following factors:

High (4)	**Serious and costly damage to a facility or a positive effect for the adversary. No loss of life.**

3.4.1.1.3 Vulnerability

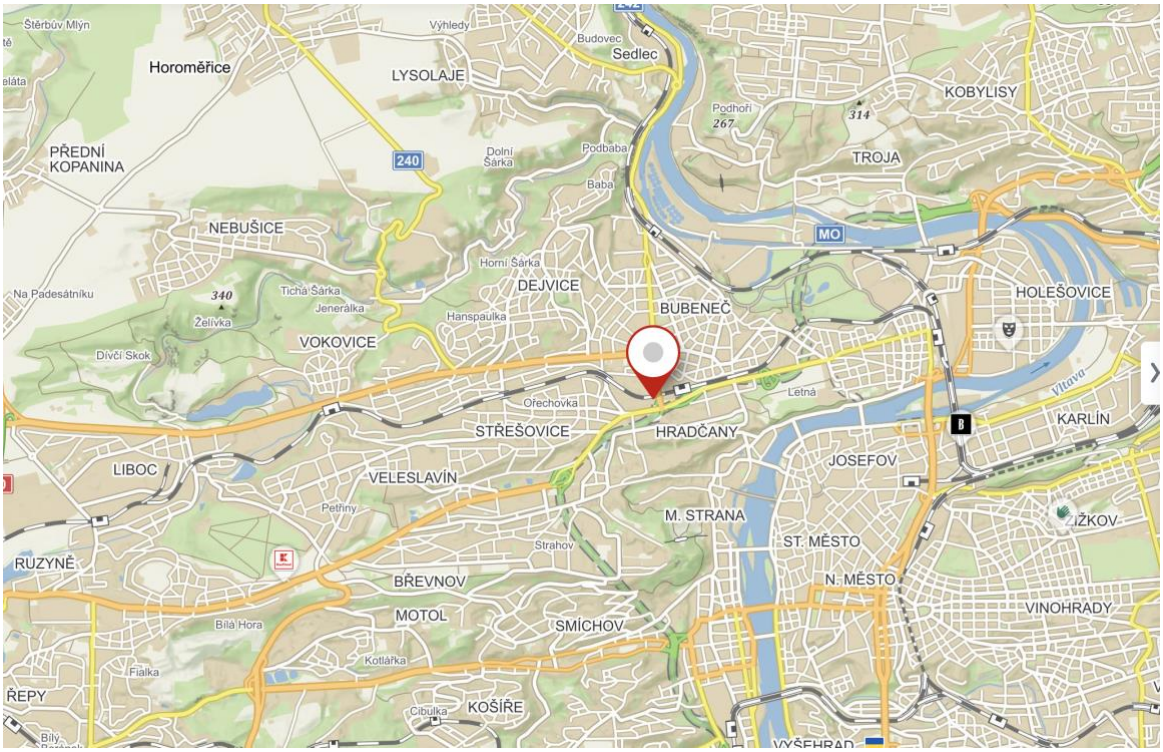
The vulnerability assessment for an attack is based on the following factors:

- Location: Geographic location of potential targets or facilities, and routes of ingress and egress; location of facility or target relative to public areas, transportation routes, or easily breached areas.

There are several „angles of attack “. The most obvious are at the sources of drinking water. However, more realistic, and feasible would be to target pumping stations already

within the city. One such pumping station is in Prague 6 - Bruska on Svatovítská street seen on Figure 25.[374] The station pumps water from the two major water sources for Prague - Karany (around 80%) as well as Zelivka (around 20%). Daily, the water pump can pump over 25,000 cubed meters of water.[375] The station serves over 67,000 people and any attack to it would by extension affect the entirety of Prague. Further, a pumping system is the so-called last line of defense to catch any irregularities, in addition to it not being its main job; so, it would make sense to contaminate the last line instead of the source which has to go through several cleaning cycles as well as monitoring stations.

Figure 25 Map of Water Pump Station Bruska



Source: mapy.cz

[374] ČTK, 2016. PVK simulovaly teroristický útok na vodojem Bruska v Praze 6. Pražský deník.

[375] Nenápadná, ale důležitá. Čerpací stanice Bruska posílá vodu do stovek pražských domácností [WWW Document], 2014. . Rádio DAB Praha. URL https://dabpraha.rozhlas.cz/nenapadna-ale-dulezita-cerpaci-stanice-bruska-posila-vodu-do-stovek-prazskych-7329059 (accessed 3.18.22).

Table 8 Prague Water Supply Sources 2021 and Own Work

Water Type	Water Source	Amount in meters cubed
Drinking Water	Káraný water treatment plant	17,088,316
	Podoli water treatment plant	6,908,439
	Sojovice and Zelivka water treatment plant	81,653,237
	Drinking Water Total	105,649,992
	Water Used	16,094,690
Industrial Water	Industrial Water Supply	902,915
	Water Supplied to Network	90,458,217

Source: Prazske vodovody a kanalizace

Figure 26 Division of Water Supply Sources of Prague

Source: Prazske vodovody a kanalizace

- Accessibility: How accessible a facility or other target is to the adversary (i.e., disruptive, terrorist, or subversive elements); how easy is it for someone to enter, operate, collect information, and evade response forces?
- Adequacy: Adequacy of storage facilities, protection, and denial of access to valuable or sensitive assets such as hazardous materials, weapons, vehicles or heavy equipment, and explosives or other materials that some person or organization could use deliberately or in an opportunistic manner to cause harm.

There was a terrorist attack simulation called "Attack 2016" that was run to simulate an attack on the water source at the aforementioned Bruska water pumping station. This target was selected as there were prior incidents of a break in into another pumping station. Thankfully, at that time, water was not the target, but rather the thieves stole tools and other equipment.[376]

- Availability: Availability of equipment, adequacy of response forces and of general physical security measures

Drinking water is controlled by analytical methods in accordance with Decree No. 252/2004 Coll., which lays down the hygiene requirements for drinking and hot water and the frequency and scope of drinking water inspections. Drinking tap water is subject to more frequent and in some parameter's stricter quality control than bottled water control. About a hundred different parameters are determined for drinking water.[377]

During the simulation, the agent used was a crude choice – motor oil. According to after action plans from the simulation, a mere liter of motor oil in the water supply is enough to contaminate a million liters of water. The response was immediate, however, if something

[376] PVK cvičily připravenost na teroristický útok - Pražské vodovody a kanalizace, a.s. [WWW Document], n.d. URL https://www.pvk.cz/aktuality/pvk-cvicily-pripravenost-na-teroristicky-utok/ (accessed 3.18.22).

[377] Pitná voda - Pražské vodovody a kanalizace, a.s. [WWW Document], n.d. URL https://www.pvk.cz/vse-o-vode/pitna-voda/ (accessed 3.18.22).

like that were to happen, it would still take water supply out of commission for several days. The location of the attack was also selected due to its notoriety in traffic in the area.[378]

Moderately Vulnerable (3)	**A combination of two of the following:** - **Direct access to asset or facility is possible via one or more major highway systems, but road system is restricted or patrolled. Waterside access may be open or adjacent land areas unoccupied but mitigating geographic conditions may be present (e.g., lengthy channel access).** - **Asset or facility is open, uncontrolled or unlighted, or security is such that threat elements may meet some resistance, be detected, or activate a remotely monitored alarm. Access to collect intelligence, operate, and evade response forces is at least partially hampered. Patrols, electronic monitoring, or alarm systems may be easily defeated or provide incomplete coverage.** - **Individual items within the facility, such as hazardous materials, weapons, explosives, or vehicles, are accessible with moderate force, or tampering may result in detection.** - **Response units provide effective force to counter the experienced threat level. Physical security measures do not provide protection commensurate with the anticipated threat level.**

[378] televize, Č., n.d. Simulovaný útok na vodárnu v přímém přenosu [WWW Document]. ČT24 - Nejdůvěryhodnější zpravodajský web v ČR - Česká televize. URL https://ct24.ceskatelevize.cz/1938476-simulovany-utok-na-vodarnu-v-primem-prenosu (accessed 3.18.22).

Risk Equation Input

Risk= Threat x Criticality x Vulnerability

Threat	Criticality	Vulnerability	Risk
3	4	3	36

Risk = 36

Risk Matrix

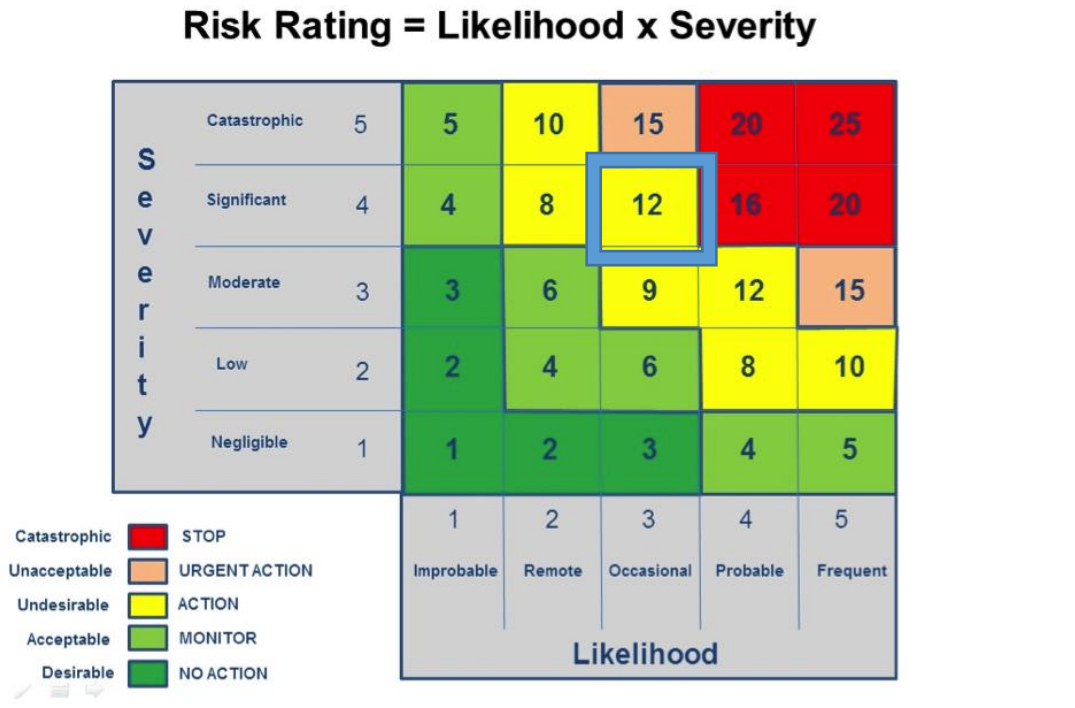
Risk = Probability x Impact

Probability = 3

Impact = 4

Risk = 12

Figure 27 Risk Assessment Matrix Attack on Water Supply.



Source: Xenon Management and Own Work

Based on the risk matrix, the risk rating is undesirable, which mandates that action is required.

3.4.2 Attack on Livestock

Agents Used

As mentioned, based on the agriculture data, pork and poultry is the dominant livestock species in the Czech Republic. Therefore, any agroterrorism attack aimed at this sector would look to attack these.

Agents listed under the OIE that can affect livestock include:

Table 9 OIE List A Diseases Affecting Primarily Cattle, Swine, or Poultry.

Disease	Primary Modes of Transmission	Primary Animals Affected	Vaccine available?	Location	Affect humans?
Foot-and-mouth disease	Airborne aerosols; direct or indirect contact (via human clothing, equipment, vehicles, or through milk or partially cooked meat)	Cloven-hoofed animals, esp. cattle and swine	Y	Asia, Africa, Middle East, South America	Occasionally after prolonged exposure, humans can develop mild symptoms.
Vesicular stomatitis	Direct contact (i.e. shared feed and water troughs, milking machines); insect vectors	Cattle, swine, horses	Y	U.S., Mexico, Canada, the Caribbean, Central and South America	During epidemics humans can get a version resembling flu
Swine Vesicular Disease	Ingestion of infected meat	Swine	N	Hong Kong, Japan, Europe	Occasionally causes flu-like illness
Rinderpest ("cattle plague")	Direct contact with any animal secretions; airborne droplets	Cattle, sheep, goats	Y	Africa, Middle East, Asia	N
Contagious bovine pleuro-pneumonia	Inhalation of droplets of infected animal secretions	Cattle	Y	Asia, Central Africa, Spain, Portugal	N
Lumpyskin disease	Insect vectors	Cattle	Y	Africa	N
Rift Valley fever	Insect vectors, esp. mosquitoes; direct contact with blood or tissue	Sheep, cattle	Y	Africa	Humans very susceptible; disease is sometimes fatal (human vaccine available)
Bluetongue	Insect vectors	Sheep, cattle	Y	U.S., Africa, Europe	N
Bovine spongiform encephelopathy ("mad cow disease")	Ingestion of foods containing infected meat and bone meal	Cattle	N	Primarily Great Britain, some cases in Western Europe	Suspected precursor to new variant Creutzfeldt-Jakob disease (fatal)
African Swine Fever	Insect vectors (ticks); ingestion of infected meat; direct contact; airborne aerosols within buildings	Swine	N	Africa, Iberian Peninsula, Sardinia	N
Classical Swine Fever ("hog cholera")	Direct contact with animal secretions; indirect contact via shoes, clothing, equipment	Swine	Y	Africa, Asia, South and Central America, parts of Europe	N
Highly pathogenic avian influenza ("fowl plague")	Direct contact; airborne aerosols	Chickens, turkeys	Y	Worldwide	Usually rare, but 1997 Hong Kong epidemic killed six with influenza-like illness
Newcastle disease	Direct contact with animal secretions, esp. feces; contaminated feed, water, equipment, human clothing, etc.	Poultry, wild birds	Y	Worldwide	Occasionally causes transitory conjunctivitis after extensive exposure

Source; Source: Belfer Center for Science and International Affairs

3.4.2.1.1 Pork Diseases

Table 10 Diseases Affecting Pork

African Swine Fever
Classic Swine Fever
Nipah Virus
Porcine Cysticercoses
Porcine Reproductive and Respiratory Syndrome
Swine Influenza
Transmissible Gastroenteritis

Source; OIE and Own Work

3.4.2.1.2 Avian Diseases

Table 11 Avian Diseases

Avian Chlamydiosis
Avian Infectious Bronchitis
Avian Infectious Laryngotracheitis
Avian Influenza
Avian Mycoplasmosis
Duck Virus Hepatitis
Fowl Typhoid
Infection With Influenzas A Viruses of High Pathogenicity in Birds Other Than Poultry Including Wild Birds
Infectious Bursal Disease
Newcastle Disease
Pullorum Disease

Source; OIE and Own Work

Risk Equation Inputs

3.4.2.1.3 Threat

The threat assessment for an attack on livestock is estimated on the following factors:

- Existence: No known terrorist group is present but would be able to gain access.
- Capability: Capability to carry out an attack has not been demonstrated, but is possible
- Intent: No real evidence of terrorist group activity, including stated or assessed intent to conduct terrorist activity.
- History: No demonstrated terrorist activity in the past.

Based on the assessed factors. The threat assessment is estimated to be:

Low (2)	**Existence and capability are present. History may not be**

3.4.2.1.4 Criticality

The criticality assessment estimate for an attack due to the following factors:

Low (2)	**Some minor disruption to facility operations or capability; does not materially advantage the enemy. No loss of life**

3.4.2.1.5 Vulnerability

The vulnerability assessment for an attack is based on the following factors:

- Location: Geographic location of potential targets or facilities, and routes of ingress and egress; location of facility or target relative to public areas, transportation routes, or easily breached areas.
- Accessibility: How accessible a facility or other target is to the adversary (i.e., disruptive, terrorist, or subversive elements); how easy is it for someone to enter, operate, collect information, and evade response forces?
- Adequacy: Adequacy of storage facilities, protection, and denial of access to valuable or sensitive assets such as hazardous materials, weapons, vehicles or heavy equipment, and explosives or other materials that some person or organization could use deliberately or in an opportunistic manner to cause harm.

- Availability: Availability of equipment, adequacy of response forces and of general physical security measures

The most viable avenue of attack on the pork sector would be via the spread of African Swine Fever. It is a viral disease that affects swine domestic pigs and feral swine, it has a 100% mortality rate.[379] It is spread via direct contact with an infected pig, bodily fluids, or even contaminated objects such as farm equipment. Further, the disease is not zoonotic, meaning it cannot affect humans, therefore a person can handle contaminated objects and equipment with no reservations. In several studies, the disease proved to withstand a variety of temperatures and environments, meaning it is a fairly resilient virus.[380] It can survive up to months in contaminated soil, feces, urine, and other bodily fluids of pigs, making it very easy to obtain and in turn, weaponize. The above description lends itself as a very appealing agroterrorism tool.

Regarding the exact method of introduction or spread – due to the high contagiousness, a mere contaminated tissue thrown into a pig pen or onto a pig farm is enough to infect some pigs. Another, more conventional idea is to transport known infected pigs and let them go into the wild. Other, more out of the box ideas include using drones to drop infected pork meat or infected objects over pig pens. Given the fact that this is a disease, the first thought would be that the outbreak is natural. If a terrorist group launched several small-scale attacks onto a handful of pig farms across the country, there is a real chance for widespread impact.

There of course exists plans in place to mitigate an African Swine Fever outbreak, but this is based on the fact that it has been reported and is actively already spreading. The fact is that if there was truly a nefarious intent, this attack is almost indefensible. Most biosecurity plans in place are concerned with the import of uninfected pigs. Due to the contagiousness of the disease, security at farms is simply not good enough when a contaminated tissue can be thrown from a car passing a farm on the side of the road.

[379] Davies, K., Goatley, L.C., Guinat, C., Netherton, C.L., Gubbins, S., Dixon, L.K., Reis, A.L., 2017. Survival of African Swine Fever Virus in Excretions from Pigs Experimentally Infected with the Georgia 2007/1 Isolate. Transboundary and Emerging Diseases 64, 425. https://doi.org/10.1111/tbed.12381

[380] ibid

As seen in the maps below in Figures 28 and 29, the disease is already within the borders of the European Union and in the Schengen Zone, therefore transport of an obtained contaminated object would be easy.

Figure 28 Map of African Swine Fever occurrence in domestic pigs in Europe in 2022 according to The EU Animal Diseases Information System (ADIS) - status as of 14.3.2022.

Source: Statni veterarni sprava

Figure 29 Map of African Swine Fever occurrence in feral pigs in Europe in 2022 according to The EU Animal Diseases Information System (ADIS) - status as of 14.3.2022.

Source: Statni veterarni sprava

Lastly, as mentioned, the mortality rate for pigs is 100%; however, another aspect to take into account is that the virus mutates and so there always exists the possibility for it to evolve and to infect humans. 61% of diseases that affect humans have a zoonotic origin, and zoonotic diseases account for 70 percent of emerging diseases.[381]

Moderately Vulnerable (3)	**A combination of two of the following:** - **Direct access to asset or facility is possible via one or more major highway systems, but road system is restricted or patrolled. Waterside access may be open or adjacent land areas unoccupied but mitigating geographic conditions may be present (e.g., lengthy channel access).** - **Asset or facility is open, uncontrolled or unlighted, or security is such that threat elements may meet some resistance, be detected, or activate a remotely monitored alarm. Access to collect intelligence, operate, and evade response forces is at least partially hampered. Patrols, electronic monitoring, or alarm systems may be easily defeated or provide incomplete coverage.** - **Individual items within the facility, such as hazardous materials, weapons, explosives, or vehicles, are accessible with moderate force, or tampering may result in detection.** - **Response units provide effective force to counter the experienced threat level. Physical security measures do not provide protection commensurate with the anticipated threat level.**

[381] Nákazová situace AMP v Evropě a v ČR [WWW Document], n.d. . Státní veterinární správa. URL https://www.svscr.cz/zdravi-zvirat/nakazova-situace-amp-v-evrope-a-v-cr/ (accessed 3.18.22).

Risk Equation Input

Risk= Threat x Criticality x Vulnerability

Threat	Criticality	Vulnerability	Risk
2	3	3	18

Risk = 18

Risk Matrix

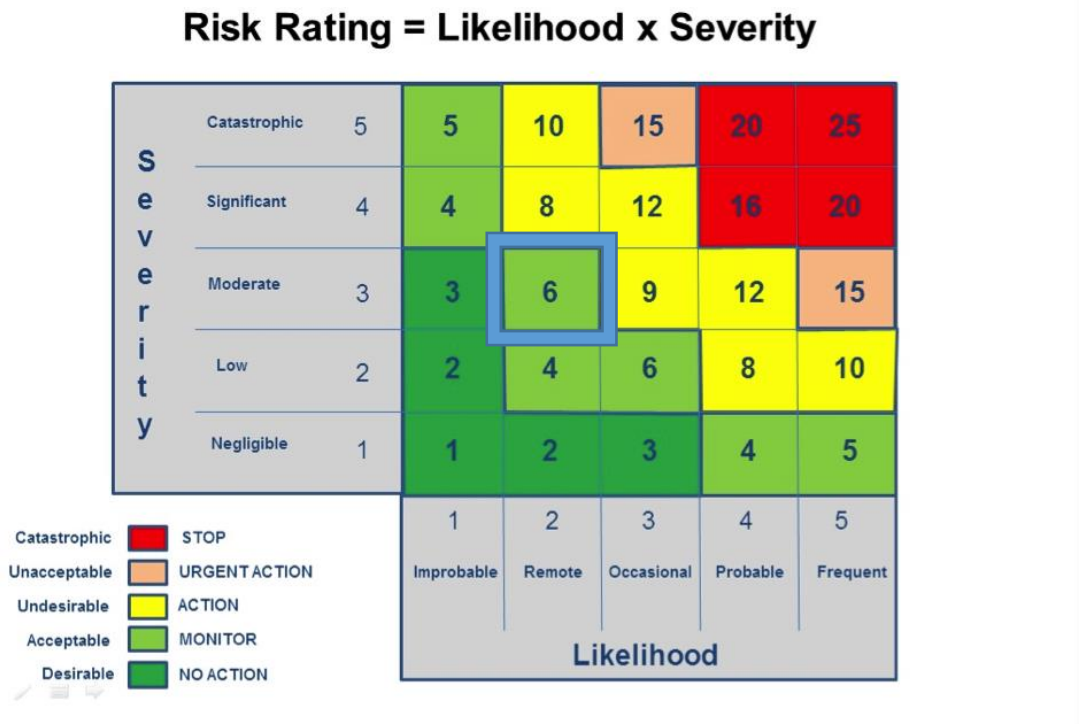
Risk = Probability x Impact

Probability = 2

Impact = 3

Risk = 6

Figure 30 Risk Assessment Matrix Attack on Livestock



Source; Xenon Management and Own Work

3.4.3 Attack on Crops

Agents Used

The crop that would have biggest impact on the economy in case of an attack would be cereals. The following diseases are most likely to affect cereals:

Table 12 Crop Diseases of Particular Agroterrorist Concern

Crop Affected	Pathogen Type	Pathogen	Disease	Primary Mode of Transmission
Cereals (wheat, barley, rye)	Fungus	*Puccinia graminis**	Stem rust of wheat	Airborne spores
	Fungus	*Puccinia glumarum**	Stripe rust of cereals	Airborne spores
	Fungus	*Erysiphe graminis*	Powdery mildew of cereals	Airborne spores
Corn	Bacteria	*Pseudomonas alboprecipitans*	Corn blight	Waterborne cells
Rice	Fungus	*Pyricularia oryzae**	Rice blast	Airborne spores
	Bacteria	*Xanthomonas oryzae*	Rice blight	Waterborne cells
	Fungus	*Helminthosporium oryzae*	Rice brown-spot disease	Airborne spores
Potato	Fungus	*Phytophthora infestans*	Late blight of potato	Airborne spores

Source: Belfer Center for Science and International Affairs

Risk Equation Inputs

3.4.3.1.1 Threat

The threat assessment for an attack on crops is estimated on the following factors:

- Existence: No known terrorist group is present but would be able to gain access.
- Capability: Capability to carry out an attack has not been demonstrated, but is possible
- Intent: No real evidence of terrorist group activity, including stated or assessed intent to conduct terrorist activity.
- History: No demonstrated terrorist activity in the past.

Based on the assessed factors. The threat assessment is estimated to be:

Low (2)	**Existence and capability are present. History may not be**

3.4.3.1.2 Criticality

The criticality assessment estimate for an attack due to the following factors:

Medium (3)	**Disruptive to facility operations for a moderate period of time; repairs—although costly—would not result in significant loss of facility capability. No loss of life.**

3.4.3.1.3 Vulnerability

The vulnerability assessment for an attack is based on the following factors:

- Location: Geographic location of potential targets or facilities, and routes of ingress and egress; location of facility or target relative to public areas, transportation routes, or easily breached areas.
- Accessibility: How accessible a facility or other target is to the adversary (i.e., disruptive, terrorist, or subversive elements); how easy is it for someone to enter, operate, collect information, and evade response forces?
- Adequacy: Adequacy of storage facilities, protection, and denial of access to valuable or sensitive assets such as hazardous materials, weapons, vehicles or heavy equipment, and explosives or other materials that some person or organization could use deliberately or in an opportunistic manner to cause harm.
- Availability: Availability of equipment, adequacy of response forces and of general physical security measures

The lowest threat level is estimated to be an attack on crops. The main reason is the logistics of actually dispersing an agent over such a large area. Crop fields are indeed arguably the easiest to target, as they are practically everywhere, with little to no security. These fields span large, open areas, and do allow for an actor to disperse an agent with no attention; however, to do so in an impactful way, it would have to be done in a mass effort. Further, the above listed diseases are not like diseases on livestock, as they are not immediately seen, and so it can be hard for a terrorist group to get credit. Also, due to the vastness of the fields, it can take a while for a disease to even be identified. By the time it is reported, and actions are put into motion, it might be too late. The actual disease is carried and spread by wind, as spores can fly over long distances.

Wheat rusts are diseased are characterized by yellow leaves, black stems, and shriveled grains. The disease is a serious problem in many countries, hitting small holders especially hard. Wheat stem rust appears in Europe, Asia and Africa and has the potential to affect food sources of over 2 billion people, with some incidents causing losses of 100% of the crop production. Rust disease is dangerous in the sense that it can wipe out 70% or more of the crop mere weeks before harvest. It is estimated that global annual losses to wheat rust pathogens range between US$ 4.3 to 5 billion.[382] Per year, on average, 20 % of the global wheat production is lost to disease. The risks are also growing as more modern disease versions are more potent. There are little wheat resistant strains, so an outbreak would have great affect. Even if a wheat resistant strain were to be developed today, it would take up to 10 years to become widely available.

The threat to crops can also be extended to storage, as well as transport of the product.

Moderately Vulnerable (3)	**A combination of two of the following:** - **Direct access to asset or facility is possible via one or more major highway systems, but road system is restricted or patrolled. Waterside access may be open or adjacent land areas unoccupied but mitigating geographic conditions may be present (e.g., lengthy channel access).** - **Asset or facility is open, uncontrolled or unlighted, or security is such that threat elements may meet some resistance, be detected, or activate a remotely monitored alarm. Access to collect intelligence, operate, and evade response forces is at least partially hampered. Patrols,**

[382] Threats, I. of M. (US) F. on M., 2007. Surveillance Strategies, Global Infectious Disease Surveillance and Detection: Assessing the Challenges—Finding Solutions, Workshop Summary. National Academies Press (US).

	electronic monitoring, or alarm systems may be easily defeated or provide incomplete coverage. - **Individual items within the facility, such as hazardous materials, weapons, explosives, or vehicles, are accessible with moderate force, or tampering may result in detection.** - **Response units provide effective force to counter the experienced threat level. Physical security measures do not provide protection commensurate with the anticipated threat level.**

Risk Equation Input

Risk= Threat x Criticality x Vulnerability

Threat	Criticality	Vulnerability	Risk
2	3	3	12

Risk = 12

Risk Matrix

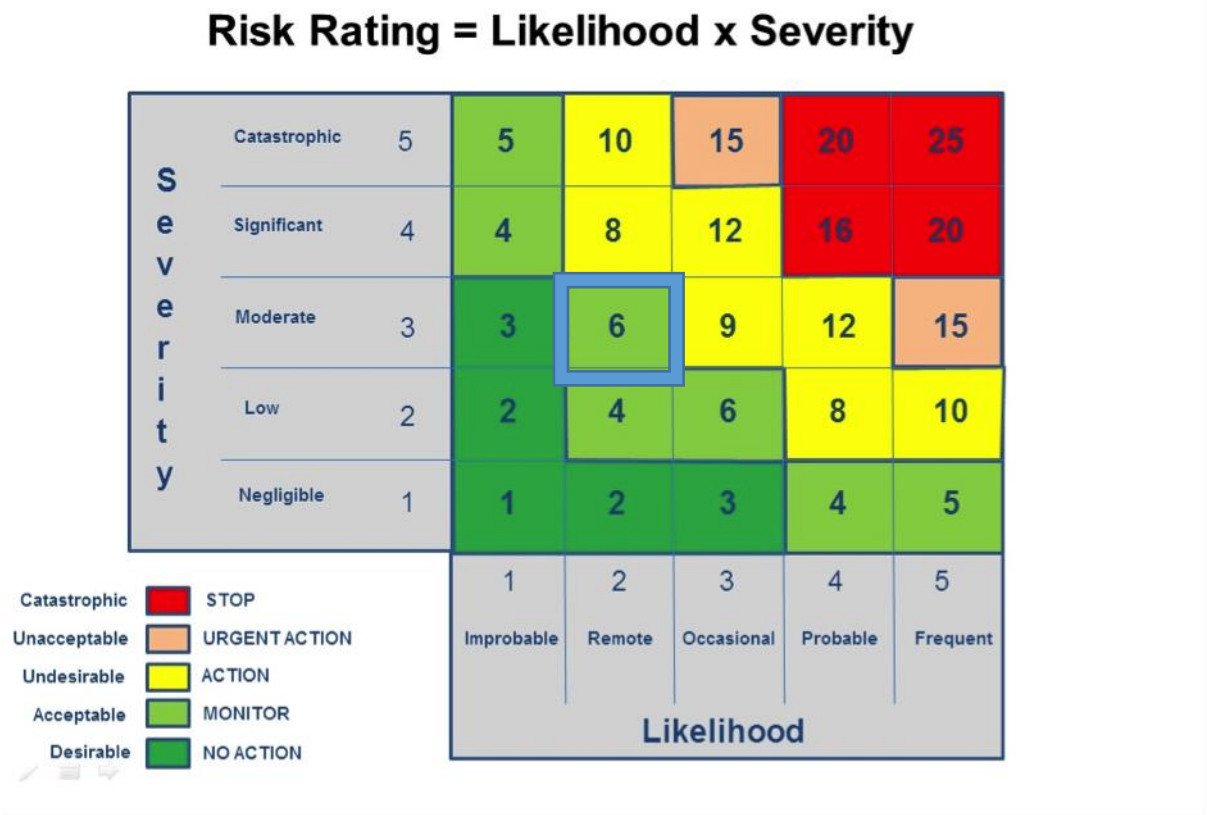
Risk = Probability x Impact

Probability = 2

Impact = 3

Risk = 6

Figure 31 Risk Assessment Matrix Attack on Crops



Source: Xenon Management and Own work

3.5 Review of the Risk Assessment Scores

Table 13 Overview of Risk Assessment Scores

Impacted Sector	Risk Equation Score	Risk Matrix Score	**Total Score**
Attack on Water Supply	36	12	**48**
Attack on Livestock	18	6	**24**
Attack on Crops	12	6	**18**

.Source; Own Work

To better compare all three sectors, the scores of the risk equation and risk matrix were added together to make a single numerical score. Based on the risk assessment results, an attack on the water supply is deemed the top target of an agroterrorist attack based on the probability of attack, vulnerability, and potential to cause the most impact.

4. Results and Discussion

As the results show, there is no acute, catastrophic agroterrorism threat facing the Czech Republic. The results of the risk equation show that from a maximum score of 125, the highest rated risk level was an attack on water supply with a score of 36, not a particularly high score; in comparison, a conventional terrorist attack would rate much higher. This is confirmed by the risk matrix, as there is no risk rating above the yellow color indicating action. In neither of the three threats is there an unacceptable risk rating needing urgent action, much less a catastrophic risk rating. Therefore, we can conclude that based on the current risk assessment and threat of an agroterrorism incident in the Czech Republic is relatively low. However, this comes with a caveat, as will be shown below.

4 Interviews Conducted

As mentioned, the interviews were conducted in open-ended question, discussion form, allowing the topics discussed to naturally flow. Topics discussed were:

- General overview and views - How do they see agroterrorism? Is it perceived as a real threat?
- Any personal experiences?
- Familiarity with plans in place? Response mechanism on the Czech and EU level.
- Recommendations to improve response.

Interview outputs were extensively used in the risk assessment of each threat, and the other outputs are discussed below.

4.1.1 Interview Output Discussion: Overall Threat and Feasibility of an Agroterrorist Attack

The general appeal of targeting agriculture was mentioned in all interviews. In times of war, agriculture and food supply was always one of the first targets attack. This can be seen with siege tactics of starving out the enemy or poisoning of the water supply.

Another recurring theme during the interviews was a debate on how exactly an attack would occur. Contrary to some research presented that agroterrorism is a low tech and high impact method, this is sometimes not translated into reality. Some of the

proposed attacks are not particularly technically easy to achieve for a variety of reasons, and success is not guaranteed, nor is the "fame" and attention associated with conventional terrorism.

In my interview with Luděk Moravec, he ranked CBRN agents based on ease of obtainability, and biological agents were ranked third. They are one of the hardest to obtain due to several factors – there needs to be a sizable investment upfront with some kind of biolab, in addition to the recurring fees. This massive operation is not something a terrorist group is looking for as all these factors increase the risk of a terrorist being caught. Frankly, the risks outweigh the benefits.

When asked to assess the agroterrorism threat in general, Mr. Moravec said that the threat is relativity low. There is a significantly higher chance that if a terrorist group does obtain a kind of CBRN weapon, they will gravitate towards the method of old school dirty bombs and place a biological weapon into an air conditioning vent in a mall or other soft target, over planning to attack the agriculture sector. He went on further to ask why a terrorist group would look to these methods, as one of the only successful biological terrorist attacks occurred in Tokyo in 1995 when members of a cult released sarin gas into the metro. The attack was highly publicized, yes, but it also led to the demise of the group, utterly destroying them, as they crossed a so-called red line.

Mr. Moravec came to the conclusion that an attack on the water supply is by far the most realistic threat and can be carried out from several angles – bombing of a facility, cyber-attack, and introduction of an agent. Although he disagrees with introduction of a pathogen being successful due to robust monitoring practices; the introduction of a chemical agent or cyber-attack is much more likely - more specifically, a chemical cyber-attack. This means that an actor could hack into the monitoring system of a water facility and either disable the sensors to show false results, allowing for a chemical agent to pass through; or actually use the cleaning systems in place to cause an imbalance of chemicals in the water, for example, up the chlorine levels into an unsafe range.

Petr Ježek, an agricultural diplomat working at the Czech Embassy in Washington DC, as well as Jan Paďourek, a security expert, leans on the side that agroterrorism is a sure threat and does not get the attention it really deserves. Mr. Paďourek stresses that hybrid wars are the new norm – meaning total war is a thing of the past. Now, hybrid attacks combining cyber, as well as surgical strikes against key targets and infrastructure is modern

warfare. Among these targets are of course agricultural targets, more specifically ones that can affect trade, geopolitics, or the domestic economy. In addition to this, social media, the media, and disinformation campaigns are embedded within our lives now, allowing for information of dubious source to be circulated. In addition to this, even factual information that is the 24/7 news cycle can lead to distrust and decrease confidence in a product due to panic. The threat for the Czech Republic is low, but the overall probability of an attack within the EU grows every day.

4.1.2 Interview Output Discussion: Plans in Place in Case of Agroterrorist Attack

The conducted interviews show a consensus that there are plans in place, and effective plans at that, in case of an agroterrorist attack. However, the sheer impact of a successful attack cannot be mitigated. There will always be wide-spread consequences. The agreement among the interviews was that there is only hope that it will not be so successful. As we saw with COVID-19, although the situation was under control so to speak, with plans being implemented, there was still confusion and uncertainty, both in implementation as well as legal standing.

Mr. Moravec expanded and labeled crisis plans as bets on how likely something will happen exactly the way you plan it. Using the COVID-19 pandemic as an example again, the Czech Republic had an epidemical plan in place that was tailored to a flu-like illness, with treatments available, and not a novel coronavirus. According to plans, the expectation was that it would all be over in a span of weeks or a month, so long-term plans for a constant and long-term action plan over the course of years was just not available nor accounted for. Similarly, this can be seen in the field of counter-agroterrorism as we can only bet on what we think is the most likely threat. It is not feasible in a lot of ways to be prepared for every imaginable threat. On this note, Mr. Moravec labeled the term agroterrorism itself a fad, something that was coined to "just be interesting."

In the Czech Republic, plans are divided into three main categories – epiphytotic (plants), epidemic (disease) and epizootic (animal). Among these plans are so called "typove plany," plans which identify key actors, key responsibilities, capabilities within scenarios and simulations.

One of the more problematic plans in place that there is no real counterbalance for, are the state material reserves. Although reserves of gas, oil and the likes can be slowly released for use over the course of weeks or even months, it is difficult to have foodstuffs on hand for more than a few weeks in advance. This is mainly because it is perishable and needs to be rotated often – the current reserve for foodstuffs is in the range of several days, not weeks. The state material reserves, and crisis plans are of course classified, but there are specific farms that breed and grow livestock and crops purely for supplying the state material reserves.

In effort to respond to an agroterrorism event, Mr. Ježek talked about the need for the European Union to heavily collaborate. The onus is on the individual member states to identify, contain and mitigate the threat, and a new regulation in biosecurity would help with improving the response. In terms of a bio-incident, an effective response requires evidence collection that ensures early identification, which in turn allows for quick determination if the incident was an accident, man-made or natural – each one of those having different responses. It is in the early stages of spread that officials can differentiate between natural and man-made. Once the disease progresses, it becomes more and more difficult. This can be seen with the investigations into the origins of COVID-19, trying to determine whether it was leaked from a lab, or if it emerged naturally. Perhaps it will never be fully known. According to Mr. Ježek, agroterrorism is a bit like doping in sports – you are always reacting to the finding, never really proacting. He mentioned that the regional veterinary and hygiene stations are the forefront of this and said that the good news is that the veterinary system of the Czech Republic is ranked above average.

Regarding obtaining a biological agent, per Mr. Moravec, among one of the main ways of obtaining a biological agent is through a leak from a lab or biological facility. The research of biological agents in the Czech Republic is limited, and most areas of research are located in Asia. Further, there is no real bio research regulation or laws in the Czech Republic in comparison to for example the United States. In the US, labs apply for licenses, and must pass through a series of internal and external procedures to gain approval for research of an agent. An oversight government committee is in charge of risk analysis, giving the go ahead or pulling the project if deemed too dangerous. There is no such apparatus in the Czech Republic and no real audit mechanism of existing projects and research.

4.1.3 Interview Output Discussion: Vulnerabilities Identified

There are several important vulnerabilities of the agriculture sector that make it easier to target. Among these include:[383]

- One of the major vulnerabilities of agriculture and preparedness to face a threat is that agriculture is inherently slow. Change in production or change in methods as a reaction to a new threat takes a while, as usually harvest is once per year.
- Livestock are living and moving organisms and are very susceptible to diseases.
- Heavily concentrated breeding practices of poultry or pork. These are perfect petri dishes for an outbreak of a disease and allow for easy spread due to the compact quarters.
- The absence of a major agroterrorism attack has led to some farmers, veterinarians and other officials having no real-world experience, but only have seen the disease in theory or on paper. This can lead to a delay in recognition if something is wrong and hinder the ability to respond to an outbreak.
- By extension, this has led to inefficient disease reporting. Farmers are usually the ones that first see a disease and carry the responsibility for reporting incidents. Due to the lack of incentive, and fear of losing their product for no reimbursement, some cases go under or even unreported.
- The geography and characteristics of farms forces them to be dispersed in rather unsecure environments like open fields and pastures in the countryside. Farms rarely have dynamic means of restricting access. Food processing and packing plants especially have lax security.
- Crop and forest wise, the vulnerability is present there again due to the sheer vastness of areas with low levels of security. Yes, these areas are somewhat more monitored in Europe than in other regions of the world, but attacks still cannot be prevented through perimeter security.
- Human error or judgment is another vulnerability that brings up an interesting point. A real-life example of this can be seen in the US, when residents received unsolicited

[383] Chalk, P., 2004. Agroterrorism: What Is the Threat and What Can Be Done About It? RAND Corporation https://www.rand.org/pubs/research_briefs/RB7565.html

packages from China, labeled as jewelry in customs declarations, but contained seeds.[384]

Figure 32 Picture of the Received Unknown Seeds and Envelopes

Source: Credit...Washington State Department of Agriculture and New York Times

- Many of the recipients planted the seeds, much to the dismay of agriculture officials who warned that they can be invasive with potential diseases or show harmful to livestock. The threat was so seriously taken that recipients in Texas were told to "Treat them like they are radioactive, like they are Kryptonite."[385] Among officials there was also the worry that China started using unconventional tactics of ecological warfare in addition to the conventional economic warfare, lawfare, information warfare, and cyber warfare.

[384] Waller, A., 2020. 27 States Issue Warnings About Seed Packets From China. The New York Times. https://www.nytimes.com/2020/07/26/us/seeds-from-china-mail.html

[385] ibid

4.1 Impact on the Czech Republic Discussion

Due to the interconnectedness of today's global economy, as well as the extensive integration of the EU, it is best to summarize the findings and assess the impact from three main angles. First, from the angle that an attack would be carried out in the Czech Republic, and discuss the impact aboard – this includes trade, as well as EU response. Second, an attack carried out in the Czech Republic, and the impact domestically and domestic response, and lastly, an attack abroad and the impact it might have on the Czech Republic.

4.1.1 Attack Carried Out in the Czech Republic and the Impact Aboard

If any agroterrorism attack would be carried out within the Czech Republic, the impact abroad would be relatively low, primarily due to the fact that there is no country that is fundamentally dependent on Czech goods or products. Of course, any attack and the impact can cause disease in countries abroad, but the consequences would not be disastrous.

The widespread economic consequences domestically will be talked about an upcoming section. However, on the international trade market, following any identification or even threat to basic commodities like livestock, grain and other food products, there is a high chance of some form of disruption to the markets, leading to a halt in exports, in turn leading to domestic consumption drops and overall hit to the economy. These can take years to recover from, if ever. Therefore, another obstacle to overcome would be how to regain trust of the impacted product as well as trust of the country and their products overall, after an incident.

The greatest affects would be felt domestically and for citizens in the Czech Republic.

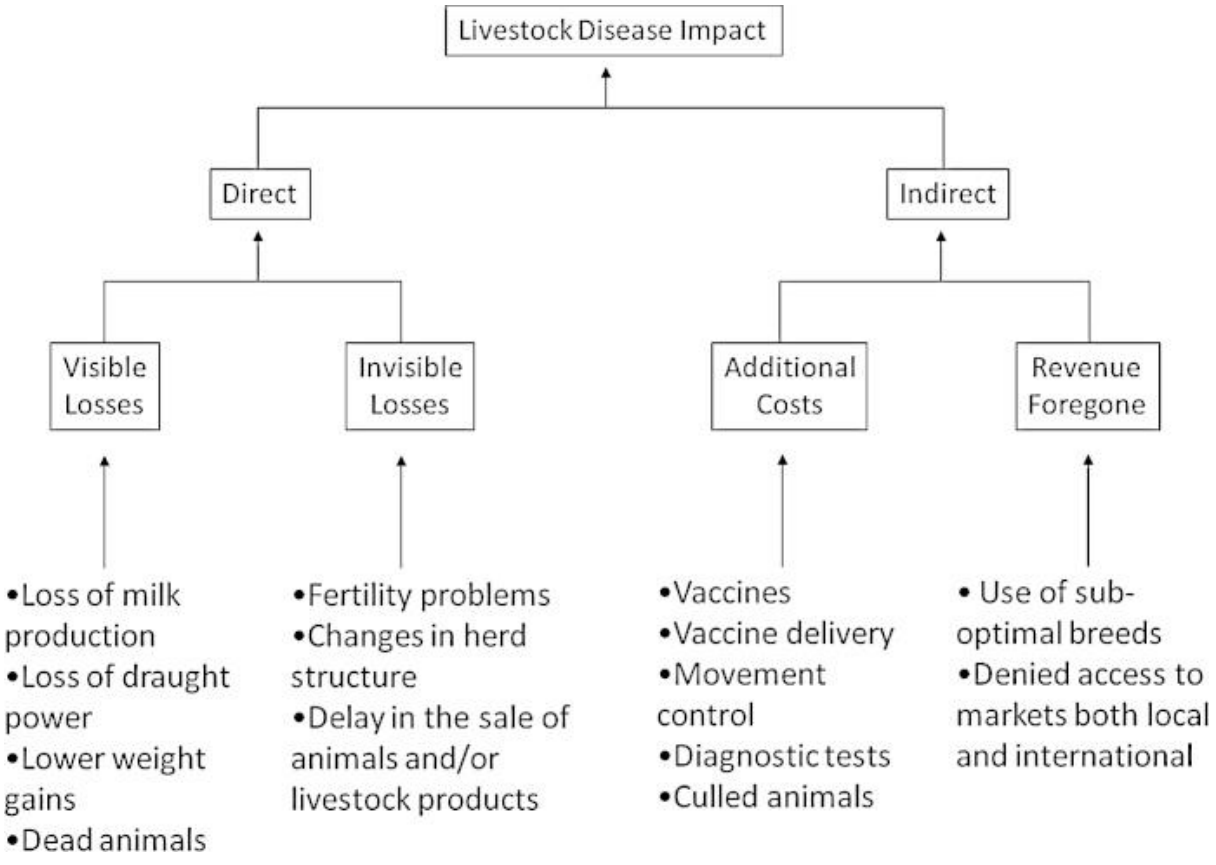
4.1.2 Attack Carried Out in the Czech Republic and the Domestic Impact

As mentioned, the threat of an agroterrorism attack on Czech soil is rather low, as with the EU in general, but the impacts would ripple through society. The threat is low primarily due to the difficulty in obtaining a biological agent, as well as the reality of a muted effect an attack would cause, as compared to something like a bomb or the sought-after dirty bomb.

However, in case of an agroterrorist attack, first, it would lead to losses in the value of lost production in addition to the loss of the actual product. Mitigation and response efforts would also result in high cost of destroying or killing the diseased crops or livestock, as well as rehabilitation and containment efforts. To further showcase the widespread impact of an agroterrorist attack, multiplier effects would ripple through the economy due to decreased sales by agriculturally dependent businesses. These include farm suppliers, food manufacturing, transportation, retail and grocery, and food service. Tourism can be affected, as some destinations within the country are dependent on the supply of food such as remote places or cruises. Depending on the incident, confidence in the product or export value, as well as overall price, can drop.

Below is a chart of the domestic impact of an attack on livestock.

Figure 33 Impacts of a Livestock Disease.



Source: National Center for Biotechnology Information (NCBI)

From the risk assessment, it was concluded that the water supply is most at risk. But it can be argued that a more fundamental threat is confidence and trust in the products, as

well as in the ability to maintain product safety. The threat of a similar situation of increased methanol in alcohol, and the subsequent prohibition and product recalls are with us still today. Any food or product is a target. An attack, and diminished confidence in beer could be detrimental domestically as well as abroad.

We experienced first-hand the chaos that an unprecedented event would cause with the COVID-19 pandemic and the crisis situation has indeed showed shortcomings. As mentioned, the state material reserves only have supplies for a few days or weeks in advance. In addition to this, other types of agroterrorism such as attack on storage or transportation of agriculture products can be just as effective, in some instances even more so.

4.1.3 Attack Carried Out Abroad and Impact on the Czech Republic

An attack that has been carried out in a country abroad has the risk of being imported into the Czech Republic via trade, travel, or natural ways. Among most at risk is food safety with contaminated meat or vegetables leading to illness and product recalls. This in turn would then cascade into fear and mistrust of a certain product or even specific country.

Through the years there have been instances of products from certain regions that have been contaminated and as a result have been avoided for some time. In my interview with Mr. Ježek, as agriculture attaché, part of his work is to be the main point of contact for an impacted country and the Czech Republic. Some notable examples he mentioned was that he was approached by the Japanese ambassador in 2011 to continue imports of Japanese agricultural products, as fear that radiation from the Fukishima region spread to other parts.

These channels work to build back confidence and trust in the products. Another good example of this projected confidence he also mentioned occurred during the Mad Cow scares from meat particularly from the United Kingdom. At that time, people in the Czech Republic were hesitant to eat meat, so the Ministry of Agriculture invited TV crews and cameras to capture and interview employees in the ministry cafeteria during their lunch, to show that they are eating meat, and everything is ok. It is through these events, or even perceptions, that consumer habits can change and, in some cases, ruin a sector in a country.

Lastly, perhaps most importantly, depending on the impacted commodity, food security of the Czech Republic would be affected. It can be argued that self-sufficiency of

the EU is a national security issue. Not only is basic agricultural self-sufficiency vital, but as recently seen with the Russian-Ukraine conflict, so is geopolitical and energy independence. As mentioned before, agriculture not only spans several economic sectors, but is prominent in social and political spheres as well – due to this, the importance of agriculture exceeds its GDP share. Food security is vital for any country, and the recent COVID-19 pandemic has been a wakeup call for several countries. The self-sufficiency of the Czech Republic with regards to pork production is around 40%, in poultry it is around 60%, and in eggs it is also 60%. One of the worst products are potatoes or vegetables where self-sufficiency is around 30%.[386]

All this is highly dependent on the country of origin of the outbreak, as well as the product. However, it is safe to say that an incident concerning a product that the Czech Republic is not self-sufficient in, will have an economic and societal impact.

4.2 Recommendations from Interview Output and Research

In the last portion, the conducted interviews were used to put forward several recommendations that can be implemented to further reduce the threat of an agroterrorism attack, or to mitigate the consequences of an incident. Recommendations are divided into three main sections. The first, is a holistic top to bottom overview on what is recommended to be done at what level, second, are short to medium term recommendations and third, potential improved proactive and response measures.

The current environment must be imagined as four levels – first, the actual organism, then the farm or farmer, third, region or sector, and fourth, the national level.

- To best prepare the actual organism for an agroterrorism threat, the recommendation is to either vaccinate if dealing with livestock, or invest in research to produce disease resistant strains of crops.
- On a farm or farmer level: Focus on biosecurity training programs and work to better and, more importantly, more quickly identify any issues or scares.

[386] Potravinová soběstačnost v Česku aneb jak jí docílit?, 2020. URL https://tyvka.cz/potravinova-sobestacnost-v-cesku-aneb-jak-ji-docilit/ (accessed 3.18.22).

- On a sector level: More funding and investment into disease detection, surveillance, and diagnostics.
- On a national level: Be prepared to offer assistance to an impacted sector with available plans, equipment, medicines; as well as the ability and action plan on how to deal with any public outcry or panic.

Second, this then allows for several meaningful short to medium term recommendations on a local, state and EU level including:[387]

- Establish and maintain more coordinated links between the agriculture and intelligence sectors.
- Improve internal quality control, and emergency response at farms, food processing and storage facilities. Swallow the higher upfront costs in return for long term security.
- Conduct a comprehensive needs analysis to determine investment requirements in the bio-security apparatus.
- This would then be implemented in increasing the cooperation between EU member states, ideally with the formation of a special investigative team or taskforce in case of any incident. This would standardize the investigation and allow for coordinated response.
- Stemming from that, push for use of more forensic methods allowing for quicker source and motive identification
- Locally, provide more practical training, and exposure to increase the skill level of personal to identify diseases or outbreaks in their infancy
- Focus on assessing the effectiveness of a voluntary disease reporting system as well as providing incentive for farmers to be upfront with any incidents. Provide some form of reimbursement for product eliminated in mitigation and containment efforts.

More long-term measures include standardizing the food-supply and agriculture safety measures within the EU by establishing a single strategy via a framework. This would allow

[387] Gullino, M.L., Stack, J.P., Fletcher, J., Mumford, J.D., 2017. Practical Tools for Plant and Food Biosecurity: Results from a European Network of Excellence. Springer.

for a streamlined approach to identify issues, and to respond on the local level, state level and EU level in tandem.

On a similar note, other recommended measures are divided into proactive and response measures.

Proactive measures to be prepared for an incident include:

- Monitoring and detection including increased biosecurity and surveillance
- Establishment and regulation of laboratories researching agents and diseases
- The holy grail would be to find an agent that is resistant to nefarious agents used on crops. For protection of livestock, continued vaccination against diseases as well as further research is vital.
- To be truly predictive, mitigation of potential or vulnerable food practices should be practiced.
- Further education and training as well as increased public awareness and outreach is a fairly inexpensive way to increase security

Once an attack is identified, improvement in response measures include:[388]

- Early detection of agents, early prediction, early containment process. The earlier the agent is identified, and countermeasures put in place, the less impact.
- Holistic response plans including plans in the field of economic, legal, political, economic, diplomatic
- Public awareness and public outreach. This can involve everything form educating the public on the possibility of the threat, to recommendations how to evade disinformation campaigns
- Increased and stocked vaccine and medical stockpile including personal protective equipment.

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[388] Henry Parker, *Agricultural Bioterrorism: A Federal Strategy to Meet the Threat*, McNair Paper 65, Washington, D.C.: Institute for National Strategic Studies, National Defense University, March 2000.

5. Conclusion

The main aim of this thesis, to assess the threat of an agroterrorist attack to the Czech Republic, as well as the other questions regarding top targets, and threat preparedness, was fulfilled. Although, the threat was deemed relatively low on the risk assessment metric, especially in comparison to more conventional terrorist attack, it seems that the threat of an agroterrorist attack within the EU is really a question of when, not if.

As repeatedly mentioned, a successful and thought-out agroterrorism attack would lead to huge impact spanning several sectors and rippling through everything – economy, politics, society, culture; akin to the recent COVID-19 pandemic where effects cascaded and caused disruption of trade, movement, economic losses, and restrictions. Life changed, and crisis plans, and response strategies were completely transformed - similarly to how the security landscape changed after the terrorist attacks of September 11, 2001. A terrorist attack on the agricultural sector combines both of these. The agriculture economy and the modern environment of globalization allows for any disruption to send shockwaves around the world.

Today, with a more nuanced and surgical approach to conflict, with more hybrid methods and non-direct efforts preferred, unconventional targets will become bigger, and the threat will quickly increase. As seen, an attack on the water supply, livestock or crops is enough to change a country's trade policy, economic situation, or geopolitical situation. An attack on water was judged as the biggest threat, mainly due to the relative ease and impact scored. However, an attack on livestock and crops carries with it several high dangers of their own, each with the ability to effectively paralyze a state. Trust, and confidence in the product was considered to be a massive part of the threat; where even if the acute, physical threat is mitigated or eliminated, the psychological impact was done and can linger.

The outlined attacks included – contamination of a water pumping station in Prague using even a crude agent such as motor oil; the purposeful introduction of the African Swine Fever virus into a spread out and open pig farm on the side of the road; and lastly, contamination of wheat using a rust disease that would quickly spread and ruin harvest. In addition to this, there are countless other methods, many out of the box, such as, the bombing of a water facility building; using drones to spray crops, tossing contaminated objects onto livestock pens, or the import of an invasive species or pest by sending random people seeds to their addresses in envelopes.

Moreover, food safety is indeed a risk to the Czech Republic. As was seen with the methanol poisoning in 2012, where an incident in the food and beverage sector had a major impact. Other risks facing the Czech Republic in this regard are the import of contaminated products, whether it be contaminated meats, fruits, or vegetables.

The Czech Republic, or any country for that matter does have plans in place to fight an agroterrorism attack. However, the success of those plans is partially out of the planners' hands, and the most that can be done is to be prepared for the most likely of situations or threats. In the event of an incident with a threat that was deemed of lower risk, but has now become a real situation, the issue becomes more difficult, as was mentioned with epidemic planning prior to COVID-19.

Applying the aforementioned listed recommendations would help in other sectors besides solely as an agroterrorism response. Some recommendations would lead to better epidemiological response, increased food safety and others could overall reshape crisis communication and public relations during an emergency.

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