

农业恐怖主义与国防：防微杜渐

Agroterrorism and National Defense: learning to deal with weak signals and avoiding surprises

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Abstract. The purpose of this article is to bring to the readers, scholars and practitioners in the areas of agribusiness and national security and defense elements relevant to the elaboration of joint projects, with the participation of the Brazilian Company of Agriculture (Embrapa), having as reference the past occurrence of agroterrorist actions in the country, which caused significant losses to the sector. Such projects require raising awareness about the relevance of the topic and learning how to deal with weak signals that help anticipate probable events so that surprises can be reduced by issuing early warnings.

Key words. agroterrorism; weak signals; early warnings; national security; national defense.

Introduction

Brazilian agriculture of the 21st century catapulted the country to the ten largest global economic powers. National farms and livestock provoked a chain reaction and influenced the whole system of businesses and industries, involving suppliers of goods and services, the food and fiber processing industry, the storage and transportation system, marketing, logistics, a complex of operations, known as Agribusiness. In Brazil, agribusiness accounted for 23.5% of GDP and 40.8% of the Brazilian trade balance in 2017, employing more than 19 million people in all sectors (RODRIGUES, 2018).

The disruption of the production chain, due to an event of contamination, for example, of the main agricultural products would not only affect Brazilian agricultural exports, a strong component of GDP and the Brazilian trade balance, but also domestic consumption.

Thus, in addition to the loss of capacity to generate foreign exchange, the government would fatally reallocate resources from other areas to pay for food imports. Meanwhile, in the psychosocial field, civil disturbances would be expected in the main urban centers due to the probable rationing of food, until the origin of the contamination could be determined. With panic spreading throughout the country, the Political and Military fields of National Power would be affected by the commitment of the Homeland Security, and the Technical-Scientific Field would be urged to solve the impact of the contamination itself in the shortest possible time, stressing all the involved structures.

The strategic importance of agribusiness, highlighted above in the five National Power Expressions suggests it should be included in the Brazilian National Defense Policy and Strategy. In this context, one of the major vulnerabilities of the food production chain is that it is a complex network which involves all processes from the actual production, harvesting, transportation, storage, processing, distribution, marketing in wholesale and retail chains until the consumer (FREDRICKSON, 2014). It is very difficult to monitor and protect each of these steps. And there are several motivations to contaminate the food production system, which may include: extortion, coercion, employee discontent, interpersonal conflicts and even terrorism, which in this case is now recognized as

agroterrorism.

Concerning to the possible actions aimed at terror implanting among the populations this study develops and focuses on the adoption of preventive measures, triggered by the identification of weak signals, the issuance of early warnings and reactive measures to the sneezing aggressions promoted by agroterrorism.

Material & Method

As to the delimitation of this study, it should be pointed out that its purpose is not to establish the exhaustive comparison and contrast of the definitions of National Security and National Defense. Nonetheless, a longitudinal survey is carried out to record the appearance and evolution of the agroterrorist threat, based on the period between the end of the Cold War to the present day.

This study is exploratory in nature because the authors have not identified studies in Brazil that associate national agribusiness, security and defense. A convenience sample of the available research material is used in the form of archives contained in the Lattes platform.

Discussion and Results

1. Food and National Security

After the Cold War, the food issue gained prominence with the public perception that global changes could exacerbate tensions in the face of the world's scarce and difficult access to food and water (CAMPBELL, 2008; CNA CORPORATION, 2007; SCHWARTZ, RANDALL, 2003). Facing conventional conflicts, occurred and ongoing in sub-Saharan Africa and the Middle East, world attention focused on: food availability, stability, access and consumption, which synthesize the concept of Food Security (FAO, 1996). It was necessary to provide people with a sense of security, at all times, regarding physical and economic access to adequate, safe and nutritious food to meet their needs and preferences for an active and healthy life (FAO, 2003)

The main issues involved were due to managerial and operational deficiencies, which required the improvement of the logistics employed and the decision-making process, in view of the trade off: increase production or promote the acquisition of food, in addition to the combination of these measures. In all situations, logistic operation proved to be an indispensable critical success factor (FCS) Rockart (1979).

From the occurrence of unintentional food contamination events, in the different stages of the production and logistics chains in the 1980s and 1990s (KASS; RIEMANN, 2006), it was necessary to create, standardize and regulate the processes, to establish acceptance parameters and ensure the quality of food. All of this set of procedures aimed at providing the consumer market with safe and

proper food for human and animal consumption, becoming known as Food Safety (FREDRICKSON, 2014; SEWARD II, 2003).

At the beginning of the 21st century, the resurgence of terrorist actions and their geographical dispersion led governments to study the vulnerability of the production and logistics chains of agribusiness inputs and products to intentional contamination, which resulted in the elaboration of norms, regulations and actions which give practical meaning to the concept of Food Defense (VEIGA, 2011).

It is worth noting that a more holistic view is already being discussed in Europe, involving the three concepts with the aim of guaranteeing nutritionally adequate and safe food for the consumer, which means foods free from natural, accidental or intentional contamination (DAVIDSON et al., 2017).

2. The Agroterrorism

After the terrorist attack on the United States, on September 11, 2001, the world awakened to the possibility of repeated terrorist attacks (BARRETO, 2013; HOFFMAN, KENNEDY, 2007).

Among the most varied forms of attack, according to Robbins, Olexa and Grant (2017) one of the most difficult to detect and prevent is the one based on the use of pathogenic biological material (bioterrorism) which cause high impact. However, Casagrande (2000) and Gooding (2007) note that developing human pathogens with potential danger requires very high expertise and therefore, it is easier to track.

Although, hazardous pathogens for animals and plants are easier to grow and disseminate in the environment. Several authors (PARKER, 2013, HOFFMAN, KENNEDY, 2007; HOMELAND SECURITY, 2014; SPELLMAN, 2016) mention the fact that the Al Qaeda terrorist group was considering using agricultural airplanes (sprayers) to spread toxins and pathogens on cultivated fields and populated areas. But this is only one side of the coin.

In this way, the concept of agroterrorism arises. The definition that will be followed in this text is the one given by the United States Department of Agriculture (2017) with a modification: "the deliberate introduction of an animal or plant disease / pest for the purpose of generating fear, causing economic loss, or undermining social stability". In the present work, insects, as well as pathogen vehicles, may also be responsible for the destruction of crops and for direct action on animal and human health (MONTHEI et al., 2010).

The relatively indirect and indiscriminate nature of an agroterrorist attack network fits the perceived shift in the goals of terrorism, which, instead of attempting to achieve specific political results, seeks

the destruction of "enemy" societies. This shift in perspective led Foxell Jr. (2001) to a comprehensive study on: access to agroterrorist weapons; vulnerability of agricultural infrastructure; lack of requirements for notification of outbreaks of plant diseases; change in terrorist motives; and the purpose of terrorist acts. The different perspectives explored by the author indicate that agroterrorism is an increasingly likely threat.

The evolution of the actions performed by terrorist groups points to the growing threat that some may resort to strategies focused on agribusiness, in case they consider that their conventional weapons are no longer satisfactory, possibly including experimentation with weapons against the flocks, cultures and ground.

It is possible that after years of fighting, these groups have progressed to a negligible extent, which may encourage them to adopt strategies like Armageddon, to condemn their opponents, and possibly the rest of the world.

In order to give veracity to the possibility of attack, a variety of toxins, pests and contaminants are available commercially and within reach of terrorists.

In addition, connections with some states may lead to recruitment of more sophisticated agents. The risk that this represents is compounded by the ease of preparation of bio-agricultural weapons and by the fact that such devices can be obtained through field collection of natural pathogens, some highly lethal.

Although vulnerability is the main criteria for selecting a target, urban office buildings, cruise ships, passenger planes, Olympic village and embassies are left relatively unprotected because they are considered less prone to attack. Likewise, farms, agricultural and animal products are easy targets for invaders, whether by the vastness of the agricultural infrastructure, or by the concentration of agricultural properties of a given specialty, which increases the potential for devastation if an attack succeeds.

Analysis of gaps in the review of legislation on compulsory reporting of plant disease outbreaks, unlike human disease, expedites the occurrence of damage, since medium-sized cities have restricted capacity to store food.

According to Foxell Jr. (2001), the relatively indirect and indiscriminate nature of an agroterrorism attack, makes it more likely, from the perception of the change in the objectives of terrorism, which apparently deviate from the attempt to achieve specific political results, to seek more and more the destruction of "enemy" societies. This phase transition can be seen in a number of terrorist acts

aimed at undermining the ethnic enemies that characterize an increasing number of actions by mass terrorist groups, particularly in Kashmir, Sri Lanka, Chechnya, Afghanistan and Sub-Saharan Africa.

Dalziel (2009) surveyed in various information bases opened between 1950 and 2008 all incidents involving intentional and malicious contamination of food. Of the 365 cases surveyed, most are related to chemical agents, with 8 cases with radionuclides. Only 9 cases were associated with biological agents. And more than 40% were economically motivated. Almost 98% of the cases involve contamination at the consumer level (home, work, and specific retail market) and reduce dispersion in the food production and supply chain. The closer to the productive stage is the attack, the greater the extent and more difficult its control, and the greater the fear and panic spread of the population, and the destruction of the entire production chain may occur.

Several authors have used real situations of natural and accidental contamination to evaluate the economic and psychosocial impact in the population. Veiga (2011) comments that in 1989 the US embassy in Santiago de Chile received an anonymous phone call informing about the cyanide contamination of the Chilean grapes being exported. Five countries, including the US, have stopped importing Chilean fruit. The estimated loss was \$300 million. Chemical analysis carried out a posteriori by the US Food and Drug Administration (FDA) revealed that only two rounds of grapes showed traces of cyanide and at non-lethal levels. Casagrande (2000) cites the issue of avian flu as an analogy to what would occur in a bioterrorist attack on the poultry and egg production chain. The immediate impact is the inexorable rise in meat prices, followed by the distrust of the population over the sanity of consuming meat and chicken products. In that sense, nations that base their food on only one type of agricultural crop, such as rice for most Asians, would be more prone to a deeper and more lasting crisis in the event of terrorist attacks. However, one of the most notorious cases concerns the foot-and-mouth disease that occurred in the United Kingdom in 2001. (BOISVERT; KAY; TURVEY, 2012; BREEZE, 2004; GOODING, 2007) show that the impact due to the eradication of the disease, is less than the indirect impact, related to the loss of consumer confidence and the loss of income of associated sectors, such as rural tourism.

The US is a pioneer in recognizing the agroterrorist threat since agriculture is considered one of the 16 critical US infrastructure (U.S. DEPARTMENT OF HOMELAND SECURITY, 2013). About 1/8 of Americans work in jobs directly or indirectly related to food production; agricultural exports are the largest positive contributor to the US trade balance; and thanks to efficiency and productivity, the US population is the one that spends the least (11%) on food (PARKER, 2013).

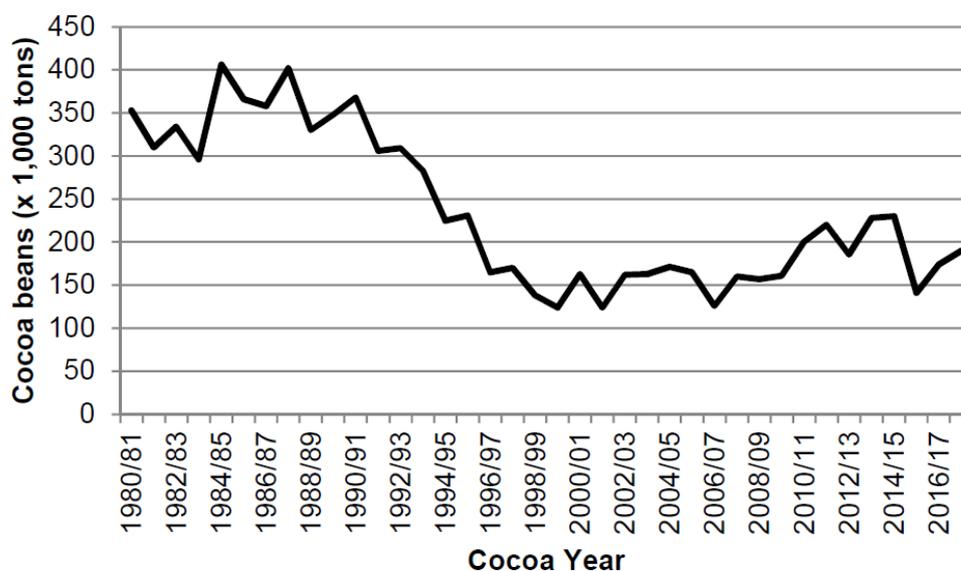
Preparing for possible agroterrorist attacks begins with the publication of the Public Health Security and Bioterrorism Preparedness and Response Act and the Homeland Security Act, both in 2002. In 2006, the United States Department of Agriculture (USDA) defines the Food Defense plans (VEIGA,

2011). In 2006, the EU also established two systems for the exchange of information on health threats involving contamination of food and feed (KJELLÉN, 2007; VEIGA, 2011): Rapid Alert System for Food and Feed (RASFF) and Rapid Alert System for Biological and Chemical and Agent Attacks (RAS-BICHAT). In 2007, the EU created the ARGUS (Secure General Rapid Alert System) that integrates the two previous systems and six others related to public health (KJELLÉN, 2007).

The threat of agroterrorism is so seriously considered in the United States that a bill (S. 616), known as the Food Security is National Security Act of 2017, processes in the Senate with the general intention of requiring the US Foreign Investment Committee to analyze the security of US food and agriculture systems for purposes of foreign investment decisions (UNITED STATES CONGRESS, 2017). In addition, the model of preparedness against weapons of mass destruction, related to agriculture and food, is now the object of interest of the National Security Council (NSC) (PARKER, 2013).

3. Agroterrorism in Brazil

Valois (2016) cites several intentional cases of introduction of pathogens or pests, for example: the cotton-tipped insect that has devastated cotton plantations in Paraná state and Northeast region of Brazil (1970s); of the witch-broom that decimated cocoa plantations in southern Bahia (1989); and soybean rust caused by the fungus *Phakopsora pachyrhizi* (2003). Of these, the one that had more international prominence was the one of the witches' broom (CALDAS; PERZ, 2013). The extent of economic damage can be assessed by Figure 1.



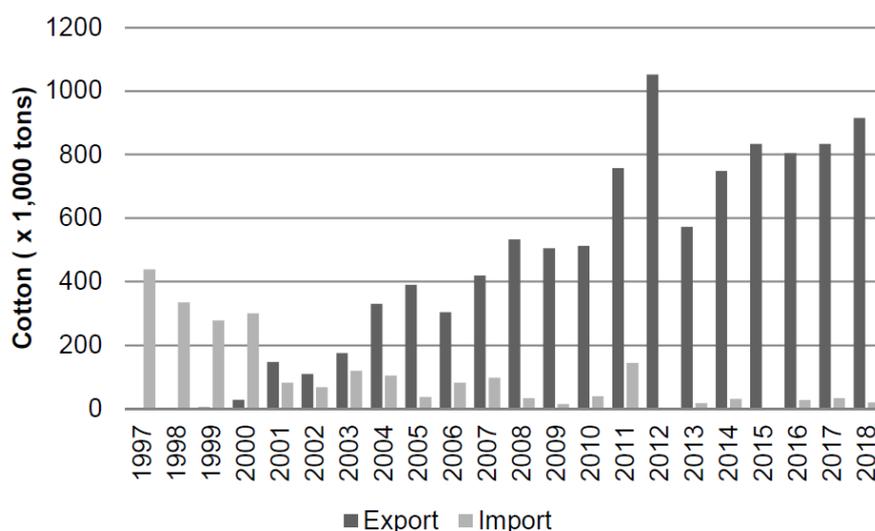
Source: ICO (2009, 2017, 2018)

Figure 1. Evolution of cocoa production in the period from 1980 to 2017.

The apex of cocoa production was reached in the 1984/85 crop, with an estimated production of 400 thousand tons (Figure 1), with Brazilian participation in world production at around 21%. With the

arrival of the witch's broom between 1988/1989 in the main Brazilian cacao region, production was reduced to levels close to 120 thousand tons in the 1999/2000 harvest and a participation in the international market reduced to 4%, which remains until today. That was the first known domestic terrorist attack in Brazil.

In the case of cotton, the entrance of the boll weevil in the production areas was one of the factors that contributed the most to Brazil becoming a major exporter (1970s and 1980s), the great importer of cotton (1990s), which affected, the national textile industry (NAGAY, 1999). Only recently, with cotton planting in the Cerrado region, has this situation been reversed (Figure 2).



Source: MDIC (2019)

Figure 2. Evolution of the trade balance of cotton in the period from 1997 to 2018.

Another more recent fact allows us to estimate, by analogy, the impact of communication as a vehicle for malicious actions to affect a food chain. The operation started on March 17, 2017, by the Federal Police, called "Carne Fraca", charged a fraction of the Brazilian slaughterhouses for various irregularities, some sanitary. However, the inadequate and sensationalist communication by the media caused the accumulated fall of 41% of meat exports in the months of March / April / May 2017, taking as reference the volume of exports in 2016 (ASSOCIAÇÃO BRASILEIRA DAS INDÚSTRIAS EXPORTADORAS DE CARNES, 2017). The rapid response of the Ministry of Agriculture, Livestock and Supply (MAPA in Portuguese abbreviation) prevented greater losses in 2017.

At the governmental level, the review of MAPA's Strategic Plan (BRASIL, 2018b) does not consider the risks of agroterrorism actions. The strategic projects outlined after this review basically aim to increase agricultural production. There is nothing about the traceability of production chains, known as a prevention tool widely used in cases of contamination (KJELLÉN, 2007; VEIGA, 2011). In

MAPA's Strategic Planning (BRASIL, 2018b) there is only one plan for structuring sanitary, phytosanitary and border control fraud actions, whose objective is to maintain agribusiness competitiveness, but not to track possible threats.

Considering the bibliographic research carried out in the governmental area, only the Brazilian Information Agency (Abin) showed concern, with the issue of agroterrorism. In a public hearing (25/04/2018), in the Committee on Foreign Relations and National Defense, which had as its theme the threat of chemical and biological weapons, the representative of Abin stressed that Brazil should prepare itself better to tackle agroterrorism and sabotage in agriculture (HAJE, 2018). It is worth mentioning that Brazil does not have a list of chemical-biological agents that should be subject to control and internal public policies (HAJE, 2018). Nevertheless, on the first quarter of 2019, the Ministry of Agriculture, Livestock and Food Supply, had authorized 28 active principles to be used on new agro-products that will be joined to lethal arsenal, within reach of terrorists to potential attacks, and farmers misuse due to the lack of proper information, awareness and training for high-risk pesticides storage and handling.

For the strategic importance of agrobusiness activities results for the country, it is necessary to adopt precautionary measures and protection by the Ministry of Defense, with its insertion in the National Defense and Security Policy.

4. Weak Signals, Anticipated Alerts and Risk Mitigation

From the concepts of Food and Nutrition Security, Food Defense and Food Sovereignty (Brasil, 2018a), it is relevant to adopt the practices related to the C3I concept and the integration of the Strategic Intelligence System of MAPA, via Embrapa and the Secretary of Agricultural Defense (SDA), with the MD's top Think Tanks.

As a starting point, it seems productive to carry out a Planning exercise that broadens the strategic vision beyond the economic risk.

Scenarios can be constructed and studied from hypothetical events in which agribusiness is threatened or represents a threat to the other countries interests, taking into account aspects such as food sovereignty, competition for international markets, risks of contamination, theft of knowledge related to cultures, specimens, technologies, patents and other value elements to be preserved.

From a strategic approach, MAPA should encourage the tracking of the value chain of national agricultural production, whose analysis should allow the monitoring of quality assurance schemes. In addition, tracking should become an instrument of observation of weaknesses along the production and logistics chains, facilitating the identification of weak signals for early alerts to be

issued.

In an event of contamination or agro-terrorist attack, the identification and isolation of sources of contamination must be carried out with agility and safety (BANTHAM, OLDHAM, 2003; SILVA; TRICHES; MALAFAIA, 2011). For example, in 2018, in the United States, an unintentional incident of contamination by *Salmonella enterica* subsp. *Enterica* serovar Braenderup (U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, 2018) of about 207 million eggs from a farm in North Carolina occurred and was detected on March 5 by the U.S. Food and Drug Administration (FDA) from diagnostics in some US states. On April 13, the origin of contaminated eggs was identified, shipments were tracked and wholesalers and retailers who received them were instructed to suspend sales. Consumers were alerted as well as prophylaxis of the disease was performed. Such actions began by identifying the weak signals that accused the abnormality.

The cost of these procedures indicates the need for governments to provide resources for the operation of an early warning system; plan mitigation measures; and improved compliance standards for food producers in the case of Food Defense (GRANT, 2012).

RAND Corporation and the US National Security Research Division conducted an analysis of capabilities and vulnerabilities in the US agricultural system. As a result, RAND Corporation (2016) proposed some recommendations for improving the defense infrastructure, listed in Table 1.

Table 1: Preventive and response measures:

Preventive measures	Response measures
Preventive Measures, Response Measures and Intelligence Measures (identify potential threats, understand motivations, predict behavior)	Early detection of exotic / foreign pathogens
Monitoring programs (detect / track pathogens / specific diseases)	Early prediction of disease dispersion patterns
Creation of laboratories to investigate the most aggressive diseases	Early containment procedures
International treaties, protocols and agreements of counter-proliferation	Epidemiology and treatment
Creation of agent-specific resistance in cattle	Depopulation and elimination of carcasses
Specific vaccination against the most threatening animal disease agents	Diplomatic / legal / economic / political responses
Modification (when possible) of vulnerable food / agricultural practices	Compensation and indemnification
Biosafety and surveillance	Education and training
Education and training (federal, state and local)	Public awareness and outreach programs
	Production of vaccines and pharmaceutical storage
SOURCE: Most of the above are from: PARKER, Henry S. Agricultural bioterrorism: a federal strategy to meet the threat. Washington, D.C.: NDU, June 2013. (McNair Paper 65).	

Source: Faltas (2016)

Levin, J. et al. (2005) carried out research aimed at identifying the steps to be taken to increase the protection of the agribusiness sector, whose results are summarized in table 2, and emphasize that the participation of community workshops is essential to raise awareness about agroterrorism.

Table 2: Summary of the preparation priorities for the planning of community participation (by event phase).

Event Phase	Priority
Pre-event	Identify existing emergency management plans and guidelines for agroterrorism and apply them at the appropriate geographical level; identification and monitoring of weak signals; issuing early warning
Response	Identify the agencies and / or groups that should take part in the imminent crisis management, and establish contact in the event of a suspected agroterrorism act
	Evaluate the efficiency and effectiveness of response measures to the event and subsequently produce knowledge from the learned lessons
Recovery	Inform the public after an event
Resources	Access data sources that lead to evidence-based policies and educational approaches
	Identify the participants in the crisis office, in the face of an agroterrorism event

Source: Levin, J. et al. (2005)

Karolefski (2005) explores joint action among agencies so that the state can offer protection to agribusiness by relying on a group of government agencies such as the Department of Agriculture, the Department of Health and Human Services, the Food and Drug Administration, the Department of Homeland Security and the Federal Bureau of Investigation (FBI), which are collaborating with states and private industry to protect the country's food supply from terrorist threats (OLSON, 2012). The Strategic Partnership Against Agro-Terrorism (SPAAT) initiative supported President Bush's demands that the federal government work closely with states and industry to increase food security from farm to table of meals.

Valois (2016, p. 45) proposes a set of measures to be adopted in analogous situations that can be adapted to the Brazilian reality:

- a) to prepare a study to carry out the risk analysis, in order to identify and assign degrees of vulnerability and criticality to all the members of the logistic chain, upstream and downstream of the producers, from the creation of a Protection, Surveillance and Sanitary Barrier Program, (PSSBP), in addition to quarantine stations, with the participation of MAPA, MD, Ministry of Justice (MJ), Ministry of Planning and Economy and Ministry of Health;
- b) to identify and establish the priority and most vulnerable sectors, taking into account:
 - i) demand, food and production processes in which there is no difficulty in penetration

- and infiltration; ii) products which are most vulnerable to acts that are difficult to detect;
- iii) products and less supervised production areas and processes;
- c) to prepare the organizations and agents involved in the monitoring system to identify weak signals, to monitor their progress so as to give early warning, when threats are recognized;
- d) to elaborate and execute contingency plans as part of the measures to mitigate the results of incidents and attacks, taking into account the danger and biotic damage to agribusiness;
- e) to create mechanisms and procedures to carry out diagnoses, based on the National Program for the Protection of Knowledge (PNPC in Portuguese abbreviation), with the cooperation of the Brazilian Intelligence Agency (Abin in Portuguese abbreviation), to be applied in the chain of agricultural products and logistic chain.

It is worth mentioning that the Institutional Security Office (GSI in Portuguese abbreviation), through Abin, should participate in the design and operation of a national food safety and food security system, which should be managed by the Ministry of Defense (MD in Portuguese abbreviation) through the Brazilian Army.

Conclusion

The increased risks associated with production, logistics and consumption bring new demands to exporting countries such as Brazil. The intensification of global competition eventually results in unfair conduct aimed at harming or eliminating competitors from the intentional dissemination of plant / animal diseases, fake news, in order to raise suspicions about quality or environmental compliance in food production and inspection. The country is the target of unfair conduct, but most of the time, it acts only in a reactive way.

Considering the framework presented in this study, the Brazilian agribusiness comprehensively influences the five expressions of National Power and corresponds to one of the main factors for the economic and social development of the country, which requires the adoption of a joint strategic vision between the MD and the MAPA, based on analyzes of potential threats to agribusiness in the field of National Security and Defense. As a reference, not only the US, as pointed out in this study, but also Russia (RUSSIAN FEDERATION, 2016) and China (WOOD, 2017) invoke Security and Defense to protect their interests in agribusiness.

In this way, it is suggested that the Brazilian Government considers in its planning process the use of scenarios studies, in order to assist decision making in each of the areas covered by the five expressions of national power discussed here, on agribusiness beyond commercial efforts.

In order to carry out the necessary studies, in the fields of Security and Defense, the Escola Superior de Guerra may be employed as an instrument of support to the Ministry of Defense in the joint formulation with the other ministries referenced in this study.

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