Article
https://doi.org/**10.61900/SPJVS.2023.03.08**

FOOD DEFENSE, FOOD SAFETY AND FOOD INDUSTRY

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Abstract

The potential of this study is to investigate issues regarding potential application of Food Defense concepts for Food Industry. According to Larson (2023), consumers face the risk that their food is unsafe because of natural and accidental contamination (traditional food safety problems) or deliberate contamination (food defense problems). Food Safety refers to a potential accidental hazard (physical, chemical, or microbiological) that may occur and Food Defense concerns a hazard that may be intentionally introduced, including by acts of terrorism. The study is based on exploratory research. A qualitative approach based on interviews with the Managers from the Food Industry. Other secondary data were collected through a private certification database.

Key words: Food Defense, Food Safety, Food Industry

According to Bogadi et al., (2016), at present, food business operators are increasingly required to comply with food quality and safety management systems to expand their business at national and international level. The main initiators of food defense implementation in the food supply chain are retail networks, who condition their producers' certifications in accordance with one of the food safety systems' standards.

Food defense is the effort to protect food from causing harm to the consumer, encompassing active steps, protection activities and/or security assurance procedures that deliver product safety regarding intentional acts of adulteration (Manning & Soon, 2016). Intentional adulteration may take several forms, such as acts of terrorism, tampering by discontented employees, consumers, or competitors, as well as economically driven adulteration (Bogadi et al., 2016).

In recent years, thorough measures to improve food safety in the food chain for consumers have become a necessity (Sarno, 2021)

To avoid the risk of food-related health hazards, it is necessary for businesses to promote food protection measures and for consumers at the end of the food chain to adopt the appropriate measures, such as food hygiene measures (Riaz, 2016).

The potential of this study is to investigate issues regarding potential application of Food Defense concepts based on ethics and protected against food fraud.

The approach is based on a study case which implements Food Safety procedures that are more open to ethics principles and then protected against Food Fraud or incorrect labeling, etc.

Food Safety refers to a potential accidental hazard (physical, chemical, or microbiological) that may occur and Food Defense concerns a hazard that may be intentionally introduced, including by acts of terrorism.

With frequent incidents of falsified expiration dates and contamination of food with foreign substances, the interest in food safety has increased considerably. Both situations are criminal incidents that involve employees from Food Industry. These incidents show the reality of "using food to cause health problems" and "contaminating food with foreign substances out of dissatisfaction with the company."

Moreover, they clearly demonstrate that food safety measures that only assume external crimes are insufficient. As a result, the term food defense has been repeatedly used in the media and is now a concept common not only in the food industry but also among consumers. Food defense is a countermeasure against food contamination caused by the intentional introduction of foreign substances (Newkirk, 2011; Kanagawa,2014).

Intentional adulteration incidents have been recorded at every major point along the farm-to-fork continuum: pre-harvest, processing, transportation, retail and at the consumer level (Fredrickson, 2014).

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Food-related companies and businesses must implement not only food hygiene measures but also food defense measures to ensure food safety. Food defense refers to practicing "safety management to protect against attacks on food, such as intentional contamination of food with foreign substances or contaminants" (Jurica, 2019; Xirasagar, 2010).

For implementing a Food Defense Plan, three major conditions must be implemented: Regulation, Food Safety Procedures, and a Contingency Plan.

A Food Defense Plan should be implemented based on Assessment Vulnerability - a process used to identify specific points in the food supply chain where intentional contamination has the greatest potential to cause economic and public health harm or to identify and prioritize the weaknesses (vulnerabilities) in a specific food operation chain.

Food Defense is an improvement for Food Safety Procedures. Food Safety represents one of the most important topics for the Food Industry.

Public health pays an important contribution to protect citizen's health through public health policies, laws and procedures based on risk analysis (Jensen and Sandoe, 2002).

Ethics will have a great contribution to food safety in three levels of risk analysis: first stage - risk assessment with value judgments in the process of risk assessment, the second - risk management, involving the process of weighing policy and technological alternatives to accept, minimize, or reduce assessed risks, to select and implement options by facilitate decision making, and the third stage, risk communication. Other contributions of ethics on risk management includes risk reduction (Sperling, 2010). These principles and values of public health ethics will also help balance various proposals to deal with the scientific food risk and determine the best (or least harmful) solution.

These principles and values include the salience of population health, safety, and welfare; fairness and equity in the distribution of services; and respect for the human rights of individuals and groups (Gostin, 2003).

Ethics of food safety is a dynamic area that continues challenging our perceptions of food consumption, health risks, and public responsibility for food borne illness. Food ethics may involve, for example, genetically modified organisms used in food (GMO), incorrect labeling or food fraud (substances that can change the composition or interfere with the biological states or processes in food).

Table 1

Assessing the implementation of food defense requirements in industrial food processors

Requirement description	Proportion of compliance (number of industries)
Compliance proportion of food defense requirements in industries (n=38) certified by the IFS standard (International Featured Standards, 2014)	
Food defense responsibilities are clearly defined. Those responsible should be key staff/ have access to top management team. Sufficient knowledge in this area should be demonstrated.	27/38 (71%)
A food defense hazard analysis and associated risks assessment must be performed and documented. Based on this assessment and on legal requirements, critical security areas must be identified. Food defense hazard analysis and risk assessment should be conducted annually, or upon changes affecting food integrity. An appropriate alert system must be defined and periodically checked for effectiveness.	0/38 (0%)
If legislation makes registration or on-site inspections necessary, evidence of these must be provided.	38/38 (100%)
Based on a hazards analysis and assessment of associated risks, critical security areas should be adequately protected to prevent unauthorized access. Access points should be controlled.	24/38 (63%)
Procedures must be in place to prevent tampering and/or allow identification of tampering.	28/38 (74%)
Visitor policy must include aspects of food defense plan. Delivery and loading staff in contact with the product must be identified and must comply with company's access rules. Visitors and external services providers must be identified in product storage areas and should be registered upon access. They should be informed about site policies and their access controlled accordingly.	35/38 (92%)
All employees must be trained in food defense on an annual basis or when significant program changes occur. Training sessions must be documented. Employee hiring and termination practices should consider security aspects as permitted by law.	20/38 (53%)
A documented procedure should exist for managing external inspections and regulatory visits. Relevant personnel must be trained to execute the procedure.	36/38 (95%)

Compliance proportion of food defense requirements in certified industries (n=6) by the FSSC 22000 standard (Foundation Food Safety System Certification 22000, 2019).	
Each organization shall assess the potential danger of acts of sabotage, vandalism, or terrorism to their products and should establish protection measures.	5/6 (83%)
The organization shall identify, preferably in the facilities plan, the areas considered more sensitive or susceptible to vandalism, sabotage and terrorism. Access to these places should be denied to unauthorized personnel using locks or electronic keys.	5/6 (83%)

MATERIAL AND METHOD

The study is based on exploratory research. A qualitative approach based on interviews with the Managers from the Food Industry. Other secondary data were collected through a private certification database. Food defense audit of the industrial units and then comparison of food defense vulnerabilities in the audited industries with those of other certified companies.

Interviews with 20 managers was conducted with questions based on requirements of IFS, BRC and FSSC 22000 (British Retail Consortium, 2015; Foundation Food Safety System Certification 22000, 2019; International Featured Standards, 2014). The questions with yes and no like an answer mixed into four groups: 10 external security; 2) internal security; 3) personnel security and 4) general requirements. Each interview was completed by un audit that included: facilities assessment, staff interviews, documents examinations, closing meeting with main findings, assess of probable causes and conclusions.

The selection criteria for the audited food industries included: being a meat-based food producing industry officially approved for food processing and regularly inspected by food authorities and having a food safety management certification system according to standards that included food defense requirements.

To compare the food defense audit results with those of other industries certified according to standards that consider food defense requirements (BRC, IFS and FSSC 22000), a consultation to a national private database was carried out. This database belongs to a private organization which operates globally and is concerned with certification of management systems, services, products, and individuals, providing audit, inspection, and training services.

RESULTS AND DISCUSSIONS

Analyzing the responses of the managers we also find out only 2 cases of incorrect labeling and addition of preservatives where reported, but due applicable procedures where corrected and 8 of food fraud were reported and the products where recall from the markets.

Based on Pilot Project EIR report' Analysis of food integrity in Romania (MADR, 2015), the top 10 of products most at risk of fraud in the Romanian food sector is: Olive oil, Fish, Organic food, Milk, cereals, Honey and maple syrup, Tea and coffee, Spices, Wine, and Certain fruit juice.

Analyzing the Food Fraud Network reports we find out that most incorrect labeling cases are connected with (place of origin; addition of water; dates; health claim; nutrition claim; denomination; ingredients; treatment and/or process; weight and/or volume; others) is the principal cause of the alleged violation in 2014 and 2015, followed by falsified documents, substitution, prohibited substances (additives; growth promoters; pesticides; veterinary medicines; others) and the suspicion of illegal export.

Auditing food defense requirements for the case studies contains: 1) external security assessment- external perimeter, building and structure, shipping, and dispatching; 2) internal security - storage of raw and subsidiary materials; 3) personnel security assessment- employee hiring, visitors or washing uniforms and 4) general requirements – preventive maintenance for premises and equipment, water distribution, mail, pest control, traceability, supplier control and emergency contacts.

To compare the food defense audit results of industries, audit reports on other previously certified food industries (according to at least one standard including food defense requirements: BRC, IFS and/or FSSC 22000) were assessed. Thus, a total of 45 food industries were considered, of which 38 were certified by the IFS standard, 6 by the FSSC 22000 and 1 by the BRC standard. All industries assessed had mature food safety management systems.

Considering the IFS and FSSC 22000 standard, Table 1 displays the proportion of compliance of the food industries certified by that standard.

CONCLUSIONS

If food intentionally contaminated with a foreign substance is sold and delivered to consumers, it is possible that consumers will eat it and experience health problems. Therefore, it is crucial for not only food manufacturers but also food delivery service providers to consider food

defense measures. Additionally, promoting consumer education and awareness regarding food defense can contribute to enhancing food safety throughout the food chain.

Food defense is a relatively unexplored concept. Several reasons seem to explain these observations, namely the novelty of food defense requirements as part of food safety management systems and the familiar character of food businesses. As an initial intervention strategy, food defense training, to get both the staff and managers acquainted with the concept, would be of upmost importance for these industries, pointing out tat the personnel is the most important resource.

ACKNOWLEGMENTS

International database for the study includes companies certified between January 2014 and September 2016

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