



Assessment of food fraud vulnerability in the spices chain: An explorative study



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ABSTRACT

Recent scandals have increased the need to strengthen companies' ability to combat fraud within their own organizations and across their supply chain. Vulnerability assessments are a first step towards the inventory of fraud vulnerability and fraud mitigation plans. Spices are reported frequently in the international food fraud databases. In the current study the fraud vulnerabilities of various actors in the spices supply chain were examined. The SSAFE food fraud vulnerability assessment tool, which comprises of 50 indicators categorized in opportunities, motivations, and control measures was applied for getting insight into these fraud vulnerabilities. Eight companies participated in the study: a trader, two importers, two business to business companies, and three business-to-business/business-to-consumer enterprises. The ease to adulterate spices combined with the complexity of fraud detection create considerable opportunities to commit fraud (high vulnerability), whereas opportunities associated with supply chain transparency and fraudulent incidences in the past were judged as medium vulnerable. The high competition level in the sector together with the high added value of spices are perceived as important economic drivers to commit fraud (high vulnerability). Cultural/behavioural factors such as ethical business culture were considered to contribute to the actual fraud vulnerability to a lesser extent. The implementation of both the hard and soft control measures varied widely among the actors. Hard fraud specific measures are merely lacking or are at a very basic level. For soft control measures of the own company, the scores were higher. From the results of the full assessments can be concluded that the various actors perceived the level of food fraud vulnerability in the spices chain as medium vulnerable.

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1. Introduction

Food fraud scandals and issues in the last few years have reinforced the need to understand the vulnerability to fraud in food chains. The food industry is generally vulnerable to crime and the spice industry is mentioned as one of the most vulnerable ones, in addition to meat, fish, and olive oil industries (Morling & McNaughton, 2016). For example, in 2014, ground peanut shells were discovered in powdered cumin. This caused a major recall because of the allergenic properties of the peanut material, which is a severe risk to those that suffer from a peanut allergy (Sayers et al., 2016). Investigations revealed that fraudulent activity and not

accidental contamination was behind the incident. The main motivation of the company was the economic benefit from the addition of cheaper bulk material to the premium quality cumin.

Food fraud involves the deliberate substitution, addition, tampering or misrepresentation of food, food ingredients or food packaging, or false or misleading statements made about a product for economic gain (Spink & Moyer, 2011a). This definition has been widely adopted by various authors (e.g. Pustjens, Weesepoel, & van Ruth, 2016; Avery, 2014, pp. 1–7; GFSI, 2014), and by internationally acknowledged bodies such as the Global Food Safety Initiative (GFSI). The addition of a cheaper ingredient is the most common type of economically motivated adulteration (EMA) (Capuano & van Ruth, 2012), which can result in thousands of euros from illegal profits (Moyer, DeVries, & Spink, 2016). Food fraud can be committed by any individual person or group involved in the whole supply chain, including suppliers, food manufacturers, retailers and importers (Johnson, 2014). Adulteration is the preparation of foods for sale by replacing valuable with less valuable ingredients or

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constituents.

In general, herbs and spices represent an attractive category for potential offenders, because the products have a high value by weight and consumers have a limited capacity to detect adulteration (Moore, Spink, & Lipp, 2012; Schaarschmidt, 2016). Common authenticity issues associated with spices are the addition of lower value product foreign and product own material (Peter, 2011, p. 319), which may include addition of unapproved ‘enhancements’, such as dyes (Haughey, Galvin-King, Ho, Bell, & Elliott, 2015) to cover up the extension. Ground spices are particularly prone to adulteration, because the milling or grinding step changes the shape of both the spice and adulterant to a powder, which makes it difficult to detect adulterants in the final product.

Although it is the governments’ responsibility to set clear legal requirements it is the responsibility of the industry to mitigate food fraud risks (Spink & Moyer, 2011b).

However, such measures are not yet widely adopted in current food safety management systems. In the past few years, several initiatives to analyse, measure and/or mitigate food fraud risks have been developed because of the raised awareness. For example, the U.S. Pharmacopeia Convention (USP) developed the USP tool to assist food industries and regulators in developing and applying preventive management systems to identify the most vulnerable ingredients within their supply chains and to choose valid situation-specific mitigation measures (USP, 2014). Grocery Manufacturers Association (GMA) established a tool for the purpose of assuring the integrity of brand and safety of food products (Kerney, 2010). Moreover, the British Retail Consortium (BRC) version 7, a private food safety standard, added a module on food fraud and provides food companies guidance on how to do a vulnerability assessment (BRC, 2015). Furthermore, Food fraud vulnerability assessment (2016) has published a science-based food fraud vulnerability self-assessment tool (SSAFE FFVA tool), which is based on the routine activities theory (Cohen & Felson, 2016). It consists of 50 questions which consider the three theory’s key elements: opportunities (suitable target), motivations (motivated offender), and control measures, the scientific background has been reported by van Ruth, Huisman, and Luning (2017).

In principle, the SSAFE FFVA tool is developed as a basis for companies to self-assess their business, but it can also be used to compare companies (multiple respondents) and to analyse a specific chain.

The aim of the current study is to get insight in potential fraud vulnerabilities of various actors in the spices supply chain by applying this new tool.

2. Materials and methods

2.1. The food fraud vulnerability assessment (FFVA) approach

2.1.1. Theoretical aspects of the FFVA

The principal structure of the FFVA is based on the routine activities theory (Cohen & Felson, 2016) and the “design rules” as used in the development of diagnostic tools for Food Safety Management System (FSMS) assessment (Kirezieva, Jaxsens, Uyttendaele, Van Boekel, & Luning, 2013; Luning, Bango, Kussaga, Rovira, & Marcelis, 2008; Luning et al., 2009). The routine activities theory defines the three key elements leading to crime: a suitable target, a motivated offender, and the absence of guardianship. These key elements were modified to suit food fraud and are the centre of the FFVA: i.e. opportunities, motivations and control measures. The “design rules” include focus on key factors/activities, identify indicators to analyse crucial aspects of these factors/activities, formulate questions linked to the

indicators, and develop grids to enable a differentiated assessment. Grids depict typical descriptions that reflect for example, a high, medium, or low risk situation for the particular factor/activity. The situations are linked to a score system to enable the development of spider web diagrams to visualise the profiles (Luning et al., 2011; Sampers et al., 2010). The overall principle of the FFVA tool is reflected in the formula: opportunities x motivations x control measures = actual fraud vulnerability. So, more opportunities and motivations will increase fraud vulnerability, whereas control measures can counteract these vulnerabilities. The terms “risk” and “vulnerability” are used interchangeably and are therefore defined explicitly. The following definition of vulnerability applies and originate from USA food regulations (DHS, 2015): “A physical feature or operational attribute that renders an entity open to exploitation or susceptible to a given hazard.”

The tool was tested, discussed and adapted based on multiple workshops in The Netherlands (Zaandam), USA (Washington), and Singapore (Singapore) with representatives of global food industry actors.

2.1.2. Practical aspects of the FFVA

The FFVA consists of 50 indicators (Table 1) each with a related question and corresponding assessment grid to enable companies to judge their actual situation with respect to the key risk factors related to opportunities, motivations, and control measures, which provide an overall profile of their fraud vulnerability. Potential opportunities, motivations, and control measures for food fraud are assessed related to both the internal organization and the external environment of the company. The environment consists of multiple levels: i.e. the company, the direct suppliers and customers, the industry segment, and the national and/or international environment. The various environmental levels are all considered in the FFVA.

Opportunities related fraud factors of raw material and final product include indicators, such as the complexity of adulterating spices and whether the technology to adulterate is common knowledge or complex. In addition to these technical indicators, there are indicators to analyse opportunities in time and space, such as the accessibility to materials in production and the transparency of the network. The questions and answers have the following template. The question linked to the indicator “complexity of adulteration” reads: “Is it simple or complex to adulterate the raw material”? The assumption is that easy alteration of the composition of raw materials provides opportunities for potential offenders to commit fraud. Three answer options are provided, one of which need to be selected. Low vulnerability answer option 1 is: “Composition of the materials cannot be modified and products can only be replaced, i.e. it concerns large objects such as fruit”. Medium vulnerability answer option 2 is: “Composition of the raw materials can be modified by mixing with low-quality product-own material or foreign material, i.e. as is feasible with grinded products (e.g. powders, grinded beef, etc.)” and high vulnerability answer option 3 is: “Composition of the raw materials can be modified by mixing with low-quality or foreign material (e.g. powders, ground meat, etc.) and by altering valuable food components (e.g. protein content)”.

Motivations related fraud factors concern economic aspects as well as cultural and behavioural facets. For instance, prices, supply and demand, and value-adding attributes of the materials are important economic factors, as well as the level of competition in the sector and the economic health of the business. Behaviour and culture related aspects include for instance business strategy, ethical business culture, and corruption level of the country in which the company and/or supplier is based. These factors can

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