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Consumers' knowledge of food fraud and its impact on their purchasing behaviour of organic fresh produce.

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A research project submitted to the University of Pretoria, in partial fulfilment of the requirements for the degree of Master of Consumer Science.

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SUMMARY

"Food fraud" is a globally accepted concept used to refer to the purposeful consumer deception in the sale, advertising or labelling of food or food ingredients to achieve an economic benefit (Curll, 2015).

Within the food industry it refers to intentionally adulterating, substituting, diluting, mixing, or adding substances or ingredients to food to give a false perception of its authenticity, value, safety, or quality to obtain illicit financial gain, often to the detriment of consumers (Spink and Moyer, 2011). One of the most adulterated food categories is organics, and the rise in the sale of organic produce in South Africa is markable. Since the legislation that governs organic produce is still under development, it leaves consumers vulnerable to be defrauded financially, and exposes them to health risks.

The aim of this study was to make an academic contribution to the body of knowledge related to consumer science. The focus of this research project was to explore and describe consumers' knowledge of food fraud to identify how this impacts their purchasing behaviour of organic fresh produce.

A structured, self-administrated electronic questionnaire was used to collect quantifiable data from respondents recruited by beans of convenience sampling across Gauteng, South Africa. The data analysis made used of descriptive and inferential statistics to test for possible statistically significant differences between demographic groups. Factor analysis was then used to better understand respondents' subjective and objective knowledge about food fraud. Correlation analysis was used to identify possible underlying relationships between the respondent's food fraud knowledge and risk aversion/confidence when buying organic fresh produce.

Results indicated a statistically significant difference between respondents' subjective consumer knowledge (with an average score of 61.25%) and their objective consumer knowledge (with an average score of 46.65%).

Should these results be reviewed *in lieu* of the hypothetical cognitive bias described as "the Dunning-Kruger Effect", it might be deducted that the organic consumer is likely to be vulnerable to the various elements associated with "Food Fraud".

From this, key recommendations could be inferred for how an increased focus on ethical practices from suppliers, retailers, and brand owners would greatly benefit the end-consumer. The development and wide-spread adoption of a reliable accreditation system across the food sector value chain is suggested as mitigation for the psychological and physical risks consumers face due to an inherent knowledge deficit on the topic of "food fraud".

Keywords:
consumer knowledge
food fraud
organic produce
organic products
purchasing behaviour

I declare that this research project is my own work. It is submitted in partial fulfilment of the requirements for the degree *Master of Consumer Science* at the University of Pretoria. It has not been submitted before for any degree of examination at any other tertiary institution.

I further declare that I obtained the necessary authorisation and consent to carry out this research.

28.09.2021

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Date

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LIST OF FREQUENTLY USED ACRONYMS

AFRISCO	Africa's Farm Certified Organic
ANOVA	Analysis of Variance
BDOCA	Bio-Dynamic & Organic Certification Authority (SA)
DAFF	South African Department of Agriculture, Forestry and Fisheries
DTI	Department of Trade and Industry
EFA	Exploratory Factor Analysis
GDP	Gross Domestic Product
GFSI	Global Food Safety Initiative
IFOAM	International Federation of Organic Agriculture Movements
ISO	International Standards Organisation
LSM	Living Standards Measure
OAPP	Organic Agricultural Production and Processing
SANS	South African National Standards
SGS	Société Générale de Surveillance
SPSS	Statistical Package for Social Sciences
SSAFE	Safe, Secure and Affordable Food for Everyone
SANAS	South African National Accreditation System
WTP	Willingness to Pay

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CHAPTER 1: CONTEXT AND PERSPECTIVE

This chapter provides the background of the research that introduces the research problem, the justification, research design and methodology and highlights important constructs that are relevant throughout the study.

1.1. Introduction

"Of all the frauds practiced by mercenary dealers, there is none more reprehensible, and at the same time more prevalent, than the sophistication of the various articles of food".

Accum, 1820

"Food fraud" is a globally accepted and commonly used terminology when referring to purposeful consumer deception in the sale, advertising or labelling of food or food ingredients to achieve an economic benefit (Curll, 2015). It is generally accepted that food is the main source of sustenance to ensure the survival of mankind. It is therefore concerning that there are allegations of some entities and organisations in the modern food industry that intentionally adulterate, substitute, dilute, mix, or add substances or ingredients to food to give a false perception of its authenticity, value, safety, or quality for financial gain - often to the detriment of consumers (Spink and Moyer, 2011).

Although the concept of food fraud has gained traction in recent years, it is as old as the commerce itself. In 1820, a German chemist by the name of Frederick Accum identified food "adulterants" used to improve the taste or the appearance of food and

suggested detection methods (Curll, 2015). Examples of this included bakers bleaching bread with alum or sub-carbonate of ammonia; adding plaster of Paris to bread flour to make it whiter or sawdust to increase its weight. Brewers added strychnine to beer instead of hops - for a more bitter taste and to save costs. Lead, copper, or mercury were used to make brightly coloured sweets and jellies more attractive to children (Shears, 2010), and more recently the infamous case of baby formula that was adulterated with melamine in China (Curll, 2015).

Globally, food fraud has reached significant proportions and addressing food fraud, including the more defined subcategory of economically motivated adulteration, is therefore much needed (Spink and Moyer, 2011, Brucks, 1985).

In South Africa, FACTS (Food and Allergy Consulting and Testing Services), identified organic fresh produce to be one of the most vulnerable food products prone to food fraud (FACTS, 2021). Currently, the organic market is booming not only worldwide but particularly also in South Africa. This is of critical concern as current South African legislation regarding organic produce is still under development thus leaving room for consumers to be defrauded financially by inflated prices for products that are not fully certified as organic or expose them to health risks due to mislabeled products (Tung, 2016).

Perceived “food fraud” is often related to “irresponsible” or “uninformed” consumer behaviour and subsequent consumption. Marx-Pienaar and Erasmus (2014) noted that consumers seldom have the proper knowledge to evaluate food product's true intrinsic attributes (i.e., quality and safety). Therefore, consumers seemingly put “blind trust” in extrinsic attributes and presentation, such as catchy product labels, promotional material and or consumer trends designed by manufacturers who might not have the consumers' wellbeing at heart. Gunders and Bloom (2017) explain that consumers' trust in extrinsic attributes is unfortunate, because although consumers

might think they know what is implied by e.g., a specific promotion or product label, they still often misinterpret information, which exposes them to unnecessary risks. *Therefore, consumer knowledge (or lack thereof) of "food fraud" has direct impact on the purchase choices and consumption of food products, such as organic fresh produce* (Park *et al*., 1994).

Klerck and Sweeney (2007) identify two distinct types of knowledge applied in consumer decision making: **subjective knowledge** and **objective knowledge.**

Subjective knowledge is a person's perception of the amount of information about a specific topic that is stored in their memory (Brucks, 1985, Flynn, 1999, Park et al., 1994). For example, what consumers *think* food fraud is or how much they *think* they know about the topic compared to peers, such as friends and family. Subjective knowledge is also often the reason why consumers exhibit irresponsible consumer behaviour attributed to being overly confident about or overestimating their knowledge about a certain product (Vainauskiene and Vaitkiene, 2019). This is referred to as the **Dunning-Kruger Effect** [1].

Objective knowledge is to the actual amount of accurate information stored in a person's memory (Brucks, 1985, Park et al., 1994, Venter, 2017), for example, the actual definition of "Food Fraud" – a binary right or wrong answer. Objective knowledge is therefore independent of an individual's personal preference, interpretation, belief, or opinion. In terms of objective knowledge, researchers have noted that this should be viewed as a possible tool to improve consumers' ability to evaluate, purchase and consume products more responsibly (Graham-Rowe et al., 2014).

[1] **Dunning-Kruger Effect**, in psychology, a cognitive bias whereby people with limited knowledge or competence in each intellectual or social domain greatly overestimate their own knowledge or competence in that domain relative to objective criteria or to the performance of their peers or of people in general (Dunning, 2011).

Research shows that discrepancies between subjective and objective knowledge are detrimental to consumers (Vainauskiene and Vaitkiene, 2019). Venter (2017) noted that consumers are often placed in jeopardy due to misalignment between subjective and objective knowledge. Consumers often tend to be overly confident about what they know about issues such as food fraud, which could result in uninformed decision-making when buying organic produce.

Research regarding consumers' knowledge (objective and subjective) of food fraud in relation to consumers' purchasing of organic fresh produce within the South African context is limited. This product category is currently experiencing exponential growth (Yang, 2014), which might put consumers at risk unknowingly.

A better understanding of consumer knowledge of food fraud, and the possible influence it might have on consumer organic purchase behaviour, will therefore contribute to improved management of this product category. Further to this, these insights might contribute to improved decision making by consumers, ultimately enabling long term wellbeing.

1.2. Problem statement

A report published by the *UK National Audit Office* found that in 2012, English local authorities registered around 1,380 cases of food fraud, an increase of two–thirds since 2009 (Morse, 2013). As a result of the economic crunch worldwide, consumers and suppliers are progressively more concerned about price and less so about the quality and safety of food supply (Kamal et al., 2009). This creates opportunity for more product counterfeiting (Lotta, 2015) and in turn, exposes consumers to financial and health risks.

More recent research noted that food fraud is highest amongst product categories such as organic fresh produce (Lotta, 2015). This is concerning as this product

category's popularity amongst consumers is growing exponentially (Tung, 2016). Consumers are also vulnerable to misinformation and exploitation when it comes to trending or "superfoods" such as organic fresh produce. Due to uneven distribution of information, the likelihood of consumers over-estimating their knowledge and making irresponsible purchases might be even more probable in emerging markets and economies, such as South Africa.

The rationale for this research project was therefore to explore consumer knowledge of food fraud to advise on the possible influence and risks associated when consumers' purchase organic products.

1.3. Justification of the study

Organic fresh produce generally attracts a premium sales price (Barrena and Sánchez, 2010). Its exclusivity in comparison to non-organic products drives up its price (Pearson et al., 2010). Consumers of organic products buy these products for various reasons – health motivation, quality, and improved taste (Barrena and Sánchez, 2010).

Misinformation forms part of the food fraud concept. Research has shown that there is no significant health benefit to consuming organic produce (Pearson et al., 2010). Promoting these products as superior to regular produce will motivate consumers to buy them, leading them to be defrauded financially. A lack of local legislation of organic produce, combined with poor consumer knowledge about what food fraud entails, creates an opportunity for fraudsters to sell non-organic goods at a premium – an obvious example of food fraud.

The focus of this research project was to explore and describe consumers' knowledge of food fraud to identify how this impacts their purchasing behaviour of organic fresh

produce. The aim of this study was to make an academic contribution to the body of knowledge related to consumer science in three distinct areas:

- **Academic contribution:** The concept of "Food Fraud" have been widely covered, though little research has been done specifically about consumers' knowledge of food fraud and how it could possibly expose consumers to unnecessary risks when purchasing organic produce. Insights gained through this project might therefore be used to inform and justify further studies on this topic, or adjacent areas of interest.

- **Consumer contribution:** Previous research indicates that the higher price of organic food versus non-organic food might discourage consumers from buying the former (Yang, 2014). It might also affect consumer attitudes towards organic food (Yin et al., 2010). Consumers will benefit from this study if the findings might provide insights that contribute to educational material to enable them (and all of us as consumers!) to make better-informed, less risky decisions when buying organic produce.

- **Organic fresh produce industry- and retail-related contribution:** Organic farmers' markets do not always require certification to allow vendors to sell products as "organic" (Engel, 2009). Coupled with consumers buying these products based on the trust relationship they have with the farmers or vendors could possibly expose consumers to be financially defrauded by non-compliant vendors that will sell commercially produced items at a premium, claiming them to be organically certified. The results of this study might provide insight to vendors and retailers on how to improve the end-to-end value chain of this industry for everyone involved. Retailers and/or suppliers that commit to this approach will likely enjoy more consumer loyalty, which will result in market advantage.

1.4. Research aims and objectives

1.4.1. Research aims

The aims of this research project were to:

- explore and describe consumers' knowledge of food fraud; and to
- identify how this knowledge impacts their purchasing behaviour of organic fresh produce.

1.4.2. Research objectives

OBJECTIVE 1: To explore and describe consumers' *current purchasing behaviour* of organic fresh produce.

1.1. To explore and describe consumers' current purchasing practices (i.e., frequency of buying, person responsible for purchasing, consumption) in terms of organic produce.

OBJECTIVE 2: To explore consumers' *knowledge of food fraud* to identify possible elements of risk when purchasing organic produce.

2.1. To explore consumers' subjective knowledge of "Food Fraud".
2.2. To explore consumers' objective knowledge of "Food Fraud" (CFA).
  2.2.1. To identify possible areas of concern pertaining to consumers' objective knowledge.
2.3. To identify whether statistically significant differences exist between consumers' objective and subjective knowledge of "Food Fraud".

OBJECTIVE 3: To explore and describe consumers' food fraud knowledge and *how it relates to confident organic food purchasing practices*.

1.5. Study area

The participant population for this research project was contained to the province of Gauteng in South Africa. The province is considered the financial centre of South Africa and consists of three fast-growing metropolitan hubs – the City of Johannesburg, Ekurhuleni and Tshwane. Together, they generate just over 30% of the country's annual GDP (Dlamini et al., 2020). The citizens of this province present an almost even split of male (50.6%) and female (49.4%) inhabitants, of which 42% are young adults between the ages of 18 – 35 years (Dlamini et al., 2020).

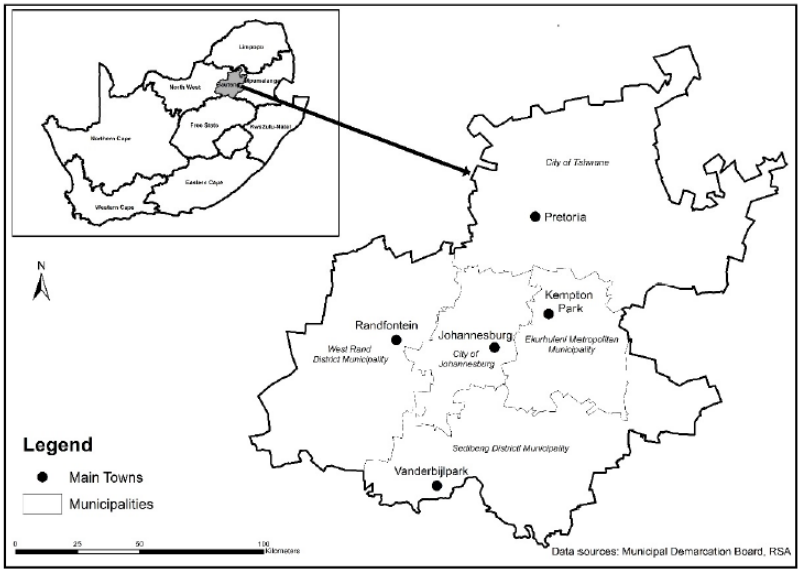

FIGURE 1.1.

GAUTENG PROVINCE:
METROPOLITAN MUNICIPALITIES, DISTRICT MUNICIPALITIES
AND MAJOR CITIES.

These demographics provided a relevant yet diverse consumer population for the purposes of this research project. Research shows younger consumers in urban areas are more likely to purchase organic food products (Tandon et al., 2020), and

consumers in this province are also more likely to have access to retailers and outlets that carry organic products. The research hypotheses might however postulate that this might make these consumers more vulnerable to be exposed to food fraud.

1.6. Conceptual framework

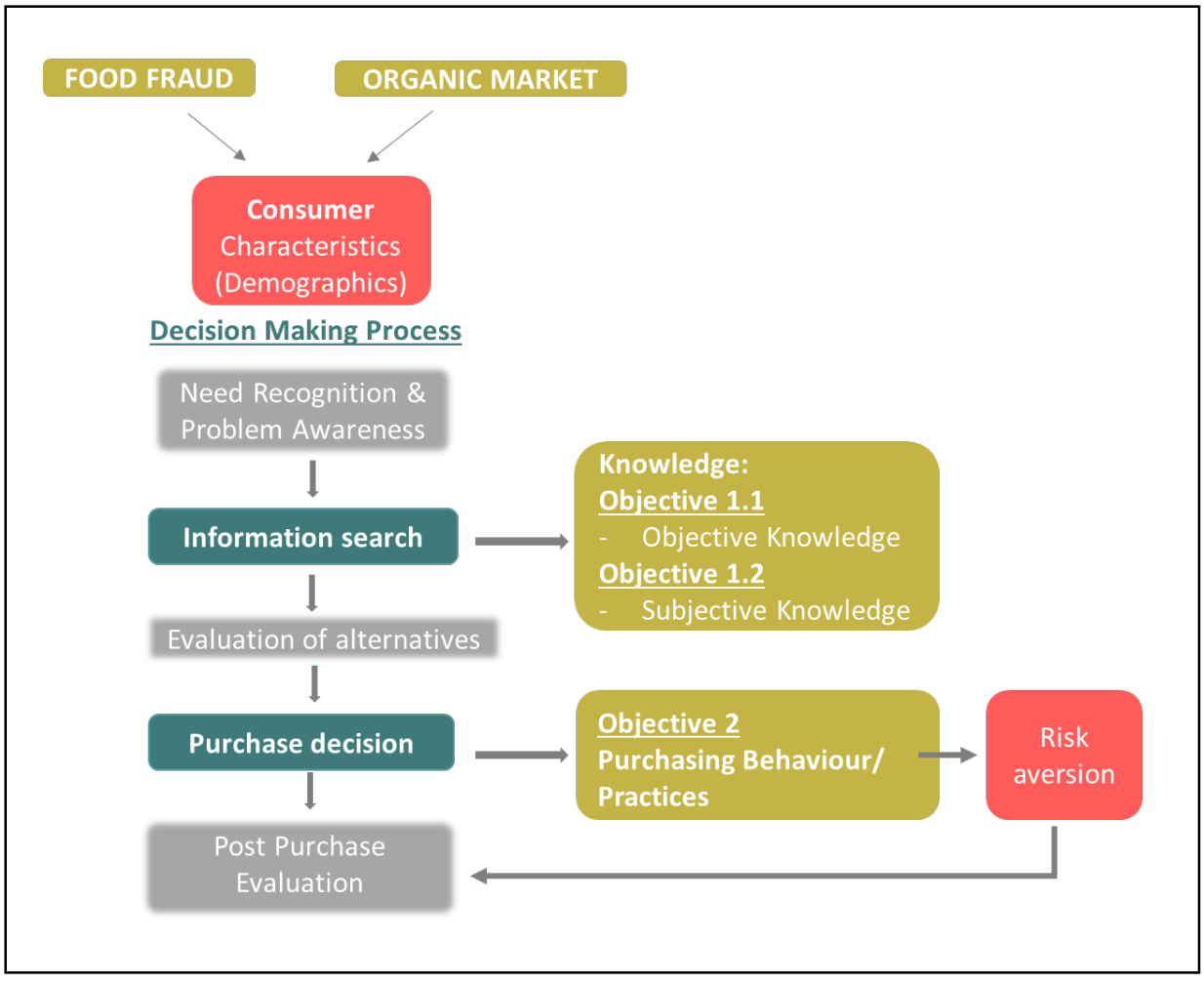

FIGURE 1.2.

CONCEPTUAL FRAMEWORK FOR DECISION-MAKING PROCESS

The diagram in **Figure 1.2.** presents the conceptual framework developed to frame the research objectives, guide the literature review, and provide impetus for the analytical approach.

Initial literature review indicated that consumers typically engage in a five-step decision-making process when considering the purchase of food products, including organic food products (Barrena and Sanchez, 2010; based on earlier research by Cox et al., 1983). Step 2 in this process – "information search" – is noted as particularly important, as it will has direct impact on the enablement of informed and responsible consumer behaviour.

Research shows that retailers and suppliers of consumer products are able to influence purchase behaviour through marketing and communication campaigns that focus on information that engender loyalty and trust (Citroen, 2011). The information consumers are exposed to, combined with their (perceived) personal knowledge and/or experience of a product category, will therefore likely have a fundamental influence on their purchasing confidence and ultimate post-purchase experience, for example considering potential cognitive dissonance due to possible exposure to unwanted risks (Spink et al., 2017).

1.7. Research design and methodology

A descriptive exploratory quanitative approach is useful in summarising and understanding an area of interest and was appropriately selected for this study to describe and explore consumers' knowledge of food fraud and its impact on their purchasing behaviour of organic fresh produce.

This type of research design is useful to uncover the nature of a little-understood phenomenon, or to explore a topic with limited coverage within literature (Polit and

Beck, 2012, Reid-Searl and Happell, 2012). It allows the participants of the study to contribute to the development of new knowledge in that area.

The study aimed to *explore* the purchasing practices of consumers in terms of organic produce (Objective 1), as well as their knowledge of food fraud (Objective 2). The statistical results and findings related to these objectives then provided input to further investigate how knowledge of food fraud (or the lack thereof) might result in uninformed decision making, ultimately exposing the consumer to financial and health risks due to fraudulent activities (Objective 3).

This sampling design was cross-sectional - it focused on a specific group of respondents at a specific time and was not repeated.

This study followed a single-phase quantitative approach and primary data was collected from the consumer population residing in the Gauteng province, South Africa, through a structured questionnaire comprised of close-ended questions (see attached in **Annexure A**).

Respondents were allowed to complete the electronic questionnaire in their own time, and on a suitable device of their choice, without the assistance of a field worker. The questionnaire was distributed through an e-mail link, as well as a generally used digital application (being WhatsApp), to provide multiple participation options available to respondents. This was especially helpful as data collection coincided with the 2020 COVID-19 lock-down period in South Africa.

1.7.1 The unit of analysis

The unit of analysis for the study included both adult male and female consumers residing in Gauteng, and at least twenty-one (21) years and older, as the researcher required insight from consumers who are responsible for

purchasing or are the primary decision-makers concerning food purchasing in their households. In terms of other demographics (i.e., income, population group and or education level), no restrictions were applied.

1.7.2 Sampling and data collection

The data collection for this research project was conducted using *Qualtrics* software as a survey platform (Version XM of *Qualtrics*; copyright ©2020 *Qualtrics*[2]).

Respondents were targeted by the principal researcher across Gauteng using convenience, non-probability sampling, from July to September 2020. This investigation used an electronic, self-administered questionnaire (see **Annexure A**).

The *Qualtrics* survey could be accessed through an anonymous link accessible on multiple online platforms, e.g., e-mail, social media applications, or a unique QR code. Social media platforms that were used to reach as wide of an audience as possible, included WhatsApp, Instagram, and Facebook.

1.8. Ethics

The University of Pretoria adheres to a formal code of conduct when considering social research. The methodology and approach used in this research project was reviewed and approved by the Ethics Committee of the Faculty of Natural and Agricultural Sciences of the University of Pretoria. Ethical clearance was granted on the 13th of March 2020 (reference number NAS474/2019) and a copy of the consent form submitted by the researcher is attached in **Annexure C**.

[2] *Qualtrics* and all other *Qualtrics* product or service names are registered trademarks or trademarks of *Qualtrics*, Provo, UT, USA [https://www.qualtrics.com].

Ethical consideration was given to the design of the participant engagement approach of this study, to ensure respondents are fully aware of the objectives of the research and not deceived in any way as to what is expected from them:

- The research questionnaire was accompanied by a cover letter (**see Annexure B**) that explained to participants that their responses would be treated as confidential.

- The anonymity of each respondent was ensured as no personal details were required, except for a request to voluntarily provide an e-mail address that could be used to contact respondents, should the respondent be interested in the results or willing to partake in future similar studies.

- Before respondents completed the questionnaire, they were asked to sign a consent form, to indicate their willing participation and confirm they fully understand the questionnaire and what would be expected of them during the study. Participants could withdraw from the study at any given time.

The researcher did not change or manipulate the results of the data. All academic sources were properly referenced to avoid plagiarism, which was also reviewed by a third party.

1.9. Structure of the study

Chapter 1: CONTEXT AND PERSPECTIVE

This chapter provides the background of the research, introduces the research problem, the justification thereof, the research design and methodology, and provides an overview of important constructs relevant to the study as well as its structure.

Chapter 2: LITERATURE REVIEW

This chapter presents a comprehensive review of the literature adopted for this study, starting with the definition of "food fraud" as the primary construct. The main themes that are discussed include the organic food industry, how it is affected by food fraud, the South African consumer and how their decision making is affected by their subjective and objective knowledge.

Chapter 3: RESEARCH DESIGN AND METHODOLOGY

Chapter 3 delves into the research design and elaborates on the methodology followed to perform the research. It includes the study population, measuring instruments, operationalisation table and data analysis.

Chapter 4: RESULTS AND DISCUSSION

This chapter presents the findings of the study gathered via an electronic questionnaire to ascertain the level of objective and subjective knowledge consumers possess on the research topic according to the objectives defined for this study.

Chapter 5: CONCLUSIONS OF STUDY

Chapter 5 encompasses the conclusions of the research related to the objectives laid out for this study. The recommendations and shortcomings are discussed to outline focus areas for possible future research.

1.10. Definitions

After review of relevant literature, it was clear that numerous terms and concepts are used by different researchers to describe similar concepts. In the interest of clarity and consistency, **Table 1.1** below provides a list of terms and conditions as is relevant to this study.

TABLE 1.1.

TERMS AND CONCEPTS

TERMS AND CONCEPTS		
TERM/CONCEPT	**DEFINITION**	**REFERENCE**
Food fraud	At present, there is no statutory or unambiguous definition for the concept of "food fraud". A generally accepted definition developed by the *Food Fraud Initiative* of Michigan University, and used globally by various different bodies, is provided below: "**Food Fraud**: a collective term encompassing the **deliberate and intentional substitution**, **addition**, **tampering** or **misrepresentation** of food, food ingredients or food packaging, **labelling**, product **information** or false or **misleading statements** made about a product for **economic gain** that could impact consumer **health**".	Spink and Moyer, 2011
Substitution	A form of falsification where the ingredients of a foodstuff are substituted with a cheaper one and then sold at a higher or premium price.	Lotta, 2015
Tampering	A legitimate product and packaging used in a fraudulent way.	Spink and Moyer, 2011
Misrepresentation	The process of placing false claims on packaging for economic gain. A related concept is "mislabeling", which occurs when a food product's label does not accurately reflect its ingredients.	Spink, 2019
Addition	The process of adding unknown and undeclared materials (food or non-food items) to food products to enhance their quality attributes.	Spink (2019)
Objective knowledge	The actual amount of accurate information stored in a person's memory.	Brucks, 1985; Hudson and Bruckman, 2004
Subjective knowledge	A person's perception of the amount of information about a product class stored in his or her memory.	Brucks, 1985
Dunning-Kruger effect	People with substantial deficits in their knowledge or expertise who are unable to recognise these deficits. Simply put, "being ignorant of one's ignorance".	Dunning, 2011

CHAPTER 2: LITERATURE REVIEW

This chapter presents a comprehensive literature review that delves into the main constructs that supported the study. The discussion commences by introducing the construct of food fraud and its underlying dimensions. Following this, context about the organic food industry, fraudulent behaviour in the industry as well as consumers' interest and decision making regarding this product category is given. The literature review concludes with a discussion that highlights the possible effect and role of consumers' knowledge during organic fresh produce purchasing.

2.1. Food fraud: the oldest deception in the world

"**Food fraud**" a commonly used collective term that refers to "…the **deliberate and intentional substitution**, **addition**, **tampering** or **misrepresentation** of food, food ingredients, or food packaging; **labeling**, product **information** or false or **misleading statements** made about a product for **economic gain** that could impact consumer **health**" (Spink and Moyer, 2011).

In simple terms, "food fraud" is therefore "…a situation where a person has positively chosen to place a legally non-compliant foodstuff on the market…" (Gallagher and Thomas, 2010), or "…an illegal deception for economic gain using food" (Spink et al., 2016).

The concept of food fraud can be traced back as far as the Roman Empire, which lasted from 27BC to 286AD (Spink et al., 2017). During this time, French wine and olive oil were misrepresented as fruits of Roman descent. Archeologists found antique *amphorae* (characteristic Greek jars with two handles used to store foodstuff) with

counterfeit Roman seals, causing some to facetiously refer to food fraud as “the oldest profession in the world”.

Wine was also often diluted, coloured and artificially flavoured in ancient Rome and Greece (Lotta, 2015). This led to food laws being implemented as early as the 1500’s, involving food purity laws such as the *Reinheitsgebot* (Fortin, 2016, Spink et al., 2017). The German *Reinheitsgebot* stipulated that beer should only consist of four ingredients: hops, barley, water, and yeast. This rule was made after an epidemic in Manchester, England in 1516, caused by brewers adding strychnine to beer instead of hops (Curll, 2015, Hart, 1952) – a cost-effective way to provide the much-loved bitter taste of hops, but with more dire repercussions than a simple hangover!

This type of fraudulent behaviour continues in modern times, as evidenced by an extensive list of vulnerable product categories published by Johnson (2014). *Olive oil* is listed as number one on this list, with *fish* number two and *organic foods* number three. These commodities are vulnerable to fraud due to their perceived status as “high-value product categories” (Yan et al., 2020). Substituting and or selling less expensive varieties of these products are therefore seen as a lucrative business, as organic foodstuffs generally retail at a higher price compared to more conventional products. This is compounded by evidence that consumers have difficulty in distinguishing organics from conventional produce during in-store purchases (van Ruth and de Pagter-de Witte, 2020).

Government intervention aimed at addressing this challenge go as far back as the Chinese Zhou Dynasty in 1056 to 256 BC (Spink et al., 2017). with the first formal legislation against food fraud proclaimed in the thirteenth century (Lotta, 2015). The issue of food fraud is now on the agenda of both the *International Standards Organisation* (ISO) as well as the *Global Food Safety Initiative* (GFSI), who advocates that protection against food fraud should form an integral part of every company’s food safety management structure.

Due to the increasingly international production and distribution of food in the 21st century, food fraud is now a global issue (Spink and Moyer, 2011). A survey conducted in the UK estimated food fraud levels on individual food items to be as much as 10% of the UK's food sector, an industry estimated to be worth more than £70 billion per year (Shears, 2010). The global financial cost of food fraud is estimated to be somewhere between $6.2 billion and $40 billion per year (Cridland, 2020). Food fraud therefore not only poses a risk to consumer's health, but also results in financial loss globally (Esteki et al., 2019).

The eradication of food fraud is becoming increasingly challenging, as food fraudsters seemingly possess an uncanny level of "expertise" with which they practice their craft (Esteki et al., 2019, Kearney, 2010); being described as "clandestine, stealthy and diligent in seeking opportunities" (Spink, 2019). Fraudsters are often a step ahead of authorities and add adulterants or substances that are not currently on the watch list (Cridland, 2020, Spink and Moyer, 2013). They are often backed by benefactors with substantial financial means, have access to vast technological expertise and go to great lengths to avoid being exposed (Spink, 2019).

Furthermore, there is no global statutory or unambiguous definition of "food fraud", which hampers the development of standardised legislation or universal governance protocols (Bester, 2017, Spink and Moyer, 2013).

To better understand the impact of this challenge, it is therefore required to unpack and contextualise the different dimensions of food fraud, which include **substitution**, **tampering**, **misrepresentation** and **addition.**

2.2. The different dimensions of food fraud

2.2.1. Substitution

Substitution is a form of falsification where the ingredients of a foodstuff are substituted with a cheaper one and then sold at a higher or premium price (Lotta, 2015). For example, in meat products, substitution occurs when "…partial or full substitution of high commercial value meat such as beef is replaced/substituted with low value e.g., horse, buffalo or donkey for economic gain" (Premanandh, 2013). Between 2015 and 2016, authorities in Thailand seized four tons of falsely labelled meat that was being smuggled via India. Further investigations uncovered a smuggling network stretching across ten provinces, where more than thirty tons of illegal beef and buffalo meat that were unfit for human consumption were being sold in retail stores (Ellis et al., 2016).

According to the European Parliament's *Draft Report on the Food Crisis and Food Fraud* (1999) butter is just as frequently substituted. The report listed a case where 16 000 tons of margarine were being sold as butter before being exposed by the Italian authorities (Lotta, 2015).

In their 2010 article called *"Smoke, Mirrors, and Mislabeled Cod: Poor Transparency in the European Seafood Industry"*, Miller and Mariani (2010) reported that as much as 25% of cod- and haddock products could be genetically identified as a completely different species. This research was conducted based on randomly selected samples from supermarkets and takeaway restaurants in Dublin. Consumers are duped by perception - once the whitefish has been filleted, their similar appearance makes it hard to discern one species from another (Miller and Mariani, 2010).

In the same study, 28% of smoked fish products were found to be substituted with a species other than listed in the label. It might be argued that this seems like a lesser form of fraud as it does not affect the health of the consumer. However, if toxic fish species are used as substitutes for commercially acceptable species, it could result in food poisoning, or even death (Reilly, 2018). Also, this misrepresentation defrauds the consumer financially and has a dire effect on the survival of not only specific fish species such as cod, but also those that are identified as possible substitutes. Miller and Mariani (2010) points out that if consumers are consistently misinformed, continued demand for cod will result in completely depleting cod stocks, driving the demand for replacements, and ultimately promulgating the idea of an unsustainable global fish industry.

Reports of beef substituted with horse meat (because it is cheaper), caused an outcry from European consumers, and had a negative impact on the meat industry due to lost consumer confidence (Spink et al., 2017). Again, some might argue that, even though it is not a palatable idea, there were no health implications. It did however have a negative economic impact on the broader meat supply market, with country-wide recalls, the introduction of expensive product testing and an overall downturn in meat sales in the UK and Europe. Many smaller suppliers could not afford these additional expenses and their businesses folded under the pressure (Spink et al., 2017).

Locally, a study done by the University of Stellenbosch found that processed meat products such as sausages and burger patties sold as “beef”, contained donkey, water buffalo and goat meat (Cawthorn et al., 2013; Kempen, 2021). These tests provided evidence that substitution and mislabeling of processed meats seems to be commonplace in South Africa. Despite concluding that the above-mentioned practices and inclusion of other more common ingredients such as traces of soya, chicken and pork, present no harm to humans, it still

violates food labelling regulations in South Africa, and has economic, religious, ethical and health impacts (Edwards et al., 2020).

Food fraudsters are well aware that consumers have difficulty differentiating between organic and conventional produce, making it possible to substitute the entire product and/or mix organics with a small amount of certified organic produce (Benzing et al., 2021, van Ruth and de Pagter-de Witte, 2020). This poses significant challenges for a "niche" product category such as organics, that is in some countries still trying to enter the market (Naspetti and Bodini, 2008).

2.2.2. Tampering

"Tampering" is defined as "legitimate product and packaging used in a fraudulent way" (Spink and Moyer, 2011). In the case of organic produce, tampering occurs when organic production processes are falsely claimed, so that on further inspection, products are found to have been exposed to herbicides, pesticides and even sewerage sludge (Abraham and Beisel, 2015).

The *Global Food Safety Initiative* (GFSI) and *Safe Secure and Affordable Food for Everyone* (SSAFE) identified several examples of tampering. One form of tampering is concealment, which is described as "the process of hiding low-quality food ingredients or products" (Spink, 2019). Examples would be poultry injected with hormones to disguise disease or applying harmful colourants to fresh fruit to hide imperfections.

In 2014, an undercover reporter for a local Chinese newspaper recorded workers at a food processing plant in Shanghai that were adding "foul meat" into the processing machines with their bare hands (Erickson, 2016). The company in question – OSI - was also found guilty of changing the "date-codes",

i.e., misrepresenting sell-by dates to reflect that the meat was still within its usable time frame. After the investigation, numerous tests confirmed that there was no risk to public health and no health issues were reported, however, the damage was inflicted on product supply and the reputation of companies associated with the investigation.

Following this *exposé*, several multinational food chains had no meat supply and could not offer any meat products for sale in several countries. The most well-known fast-food chains affected by this were McDonald's, KFC and Starbucks. KFC and Starbucks immediately broke all ties with the OSI group, but McDonald's still supported them for some time. The McDonald's Corporation claimed that they were victims of food fraud. Forbes Magazine and The Wall Street Journal respectively estimated that the McDonalds' stock price plummeted by more than $500 million on the day the news was released. This culminated in a monthly global loss of more than $40 million (Spink et al., 2017).

In South Africa, an example of tampering was exposed in November 2016, when the SABC news reported on a raid by the Police Crime Intelligence Unit on a water bottling plant in the Crown Mines area, South of Johannesburg (Chawane, 2017). Police received a tip-off that seemingly authentic *Valpré* bottles were illegally filled from a source that was not spring water as the packaging claims. Upon investigation, the police found products worth R10 million on the retail market, that was already sealed and ready for distribution. The bottles were being filled from a fire hydrant in a factory and filtered through a dirty towel before being bottled. The police also found another 700 000 empty bottles that were in the process of being filled and labelled. The packaging was an exact copy of the Coca-Cola product and even bore the SABS stamp of approval.

Coco-Cola released a statement to confirm that this was not a genuine product and urged consumers to only buy from well-known and established retailers while they conclude the investigation. However, this incident had a severe impact on consumer trust. Given the importance of "relationship marketing", Berry (1996:42), asserts that consumer trust is perhaps the single most powerful relationship marketing tool available to a company. Any interference in terms of consumer trust will therefore have a negative impact on consumer loyalty (Sirdeshmukh et al., 2002).

Tampering might also be defined as a form of adulteration that includes counterfeiting, artificial enhancement, transshipment, intentional distribution of contaminated products and dilution (Marvin et al., 2016). This form of tampering seems to be particularly prevalent amongst beekeepers during periods of drought or when natural food sources are limited. Under these conditions, beekeepers are allowed to supplement bee feeding with sugar syrups, especially to assist growing bee colonies (Strayer et al., 2014).

Supplemental feeding should however be limited to the winter months or early spring and should be suspended once honey production starts. If supplemental feeding continues after the given time frame, it changes the sugar profile of honey and results in a product that is like honey but is adulterated by diluting it with sugar syrups. The *National Honey Board* in the United States reports that most honey farmers do test their product for purity, authenticity, and source. However, there are no clear guidelines on governance of test results, or repercussions if results are found to be substandard.

2.2.3. Misrepresentation

"Misrepresentation" refers to the mislabeling of products. Misrepresentation is defined by *Safe Secure and Affordable Food for Everyone* (SSAFE) as "the

process of placing false claims on packaging for economic gain" (Spink, 2019). According to Koen et al. (2016), the primary and most important role of food labels is to inform the consumer. Therefore, misrepresentation occurs when a food product's label does not accurately reflect its ingredients, presenting information that inhibits consumers from making informed and responsible decisions, exposing them to health and or financial risks.

Consumers have become more concerned about the quality of food that they are buying. They are therefore likely to be willing to pay a premium for products bearing certain registered trademarks and certification (e.g., country of origin, dolphin-friendly, organic etc.). With an escalating consumer awareness of sustainability and interest in making ethical purchasing decisions, most brands now need to invest in socially responsible practices to retain customer loyalty (Edelman, 2018), resulting in widespread certification of food products (Patton, 2018).

Counter-intuitively, increased certification requirements create an opportunity for food fraudsters. One common example is regular *Grana Padano* cheese mislabeled as its premium equivalent, *Parmigiano Reggiano*, thus defrauding consumers financially. A more serious instance occurred when the toxic Japanese star anise was incorrectly labelled as Chinese star anise (Spink, 2019). Because Chinese and Japanese star anise are identical in appearance, it is very difficult to differentiate between them. However, if Japanese star anise (instead of Chinese star anise) is used as a homeopathic treatment for colic in infants, it might result in death (Vermaak et al., 2013). Other examples include regular cake flour sold as organic flour, or where illegally harvested seafood products were sold to consumers through mislabeling for the sake of profit (Jacquet and Pauly, 2008).

The *South African National Consumer Commission* launched an investigation in 2014, a time when consumer confidence was at an all-time low. This study identified a number of well-known South African retailers that remove or alter food labels (Madisa, 2014). Guilty parties were issued with hefty fines, as the South African *Consumer Protection Act* (no. 68 of 2008) prohibits the tampering, alteration and/or falsification of any products and/or labelling. If found guilty, perpetrators might face imprisonment or a fine of as much as 10 percent of their annual turnover (Madisa, 2014).

Recent research indicates an increase of misrepresentation throughout organic products (Constable, 2021). This is because the labelling of produce as "organic" is as simple as adding a certification logo, which was often not awarded in the first instance (Ergönül and Ergönül, 2015). It was also found that suppliers falsely claim that their produce and products comply to standards as set out by the European Commission (Lotta, 2015).

In this instance, honey is a prime example of misrepresentation. The certification of honey as truly "organic" is almost impossible, as bees cannot be controlled in terms of where they source their food sources from (Olmsted, 2016). Source certification is also problematic, as honey suppliers have been found to filter their honey to remove any traces of pollen that might be used to trace geographical origin.

Decernis[3], a global food fraud database, lists products labelled as "organic" as being amongst the top ten food products most at risk of food fraud. Premanandh (2013) recommends that mislabeling and other fraudulent food practices need

[3] **Decernis** is a technologically enabled, global compliance management agency. The proprietary software tools it provides allows companies to track substances of concern, conduct trend analysis, issue management, regulations, and manage compliance.

to be more closely monitored by authorities throughout the entire supply chain, enabled by sophisticated technology to detect and combat food fraud attempts.

Research shows that consumers do not necessarily have the knowledge to accurately assess a product's intrinsic attributes - such as safety or quality - before they make a purchase (Marx-Pienaar and Erasmus, 2014). They therefore rely on extrinsic markers, such as the label on the product. Unfortunately, product labels are often subjected to food fraud in terms of mislabeling, which puts the consumer at risk. Consumer knowledge therefore plays a critical role during purchasing and consumption of food products, specifically as it pertains to organic fresh produce (Park et al., 1994).

2.2.4. Addition

Unapproved enhancements, referred to as "addition", is defined by *Safe, Secure and Affordable Food for Everyone* (SSAFE) as "the process of adding unknown and undeclared materials (food or non-food items) to food products to enhance their quality attributes" (Spink, 2019). With *substitution*, one ingredient is replaced by another of inferior quality and consumers are mostly defrauded financially. However, the *addition* of undeclared ingredients might pose severe health risks to consumers.

One of the most well-known cases of food fraud through addition would be the baby formula scandal in China 2007, where scientific testing indicated the addition of melamine to increase protein value. Melamine is a "plasticiser", used to manufacture products like inexpensive flooring, tabletop finishes, laminates or commercial glues and adhesives (Gossner et al., 2009). However, fraudsters discovered that during quality control testing, melamine mimics high-quality protein, required in certain food products.

Melamine is a molecule that contains a high amount of nitrogen. Ordinary analysis used to test for protein does not differentiate whether the source of nitrogen comes from a protein or a non-protein source. Melamine is therefore a less expensive ingredient than food-grade protein fortification that gives manufacturers a false test result to reflect a high protein content (Gossner et al., 2009). While the initial goal might have been economic gain, the result of this intentional adulteration was a widescale public health incident (Spink and Moyer, 2011). More than 300 000 babies and young children were affected by this contamination, which caused severe urinary tract disease, kidney stones, and in extreme cases, complete renal failure causing the death of six infants. More than twenty companies were found guilty of selling these adulterated products, including the Sanlu Group – a state-owned Chinese dairy product company. The formula was also widely exported, with evidence of it found in more than forty countries (Gossner et al., 2009).To date, it remains the largest recorded incident of deliberate food contamination by addition in the world.

Other examples of food products vulnerable to addition include oils and spices. Oil "deodorisation" is not only a prime example of food addition, but also adulteration[4] in particular. Oil deodorisation involves the removal of any unwanted smells or discolouration found during lipid oxidation[5] that could mark the product as mediocre (Gertz et al., 2020). Once the oil has been deodorized, it has virtually no flavour or colour, and is then added to superior oils and marketed and sold as *Extra Virgin Olive Oil* (Lotta, 2015).

[4] **Food adulteration** is a legal term referring to a food product that fails to meet legal standards. One form of adulteration is the addition of another substance to a food item to increase the quantity of the food item in raw form or prepared form, which may result in the loss of actual quality of food item.

[5] **Lipid oxidation** is a highly complex set of free radical reactions between fatty acids and oxygen, which results in **oxidative** degradation of **lipids**, also known as rancidity which in food products such as butters and oils result in an unfavorable taste and smell. (Frankel, 2014).

Saffron is the most expensive spice in the world, making it particularly vulnerable to food fraud. Additives such as glycerin, sandalwood dust, barium sulphate, borax and tartrazine are added to enhance the colour. Black pepper has been adulterated with papaya seeds, twigs and even millet (Johnson, 2014).

The lack of regulations regarding the labeling of a product as “organic” in South Africa, exposes the organic market to the fraudulent addition of undeclared pesticides (Tung, 2016). The Western Cape is the hub of organic farming in South Africa and significant portion of its produce is exported to foreign markets. Poor governance and controls result in substandard products making it to market, with a negative impact on consumer trust, and ultimately impacting sales in the entire “organic” category.

2.3. The organic food industry

2.3.1. A global perspective

Organic products are becoming increasingly popular amongst consumers but have been informally available for a long time. Focused “organic farming” started in the 1930s, primarily in Germany, due to resistance against the growing use of synthetic fertilisers in agriculture (Tung, 2016). In Switzerland, this practice was termed “ecological agriculture” or “biodynamic agriculture”, with “The Glass House” built by Rudolph Steiner in Dornach in 1914 considered as a watershed facility in the pursuit of this “new” approach to agriculture (Compagnoni, 2010).

The principles of “organic farming” as practiced today are mainly the result of the research on the relationship between soil and health conducted by Jerome Rodale, who published the first edition of *Organic Farming and Gardening* in

1942 in the USA (Paull, 2010), as well as the literature of Albert Howard and Eve Balfour in the UK (Pearson et al., 2011).

During the 1960's and 1970's, consumers became increasingly concerned about the impact of human interference on the natural environment, and it was during this time that the first governing body related to organic farming was established (Compagnoni, 2010). During the 1980's, the *International Federation of Organic Agriculture Movements* (IFOAM), provided a global coordination platform with their publication on *Basic Standards for Organic Production*. This guideline document was meant to guide members to define standards and certification requirements for organic agriculture, which was later adopted by countries such as France, Austria, and Italy (Compagnoni, 2010).

However, it was only in the 1990s that organic products received formal recognition (Pearson et al., 2010). Driven by the increasing connection between consumers and environmentalists, "organics" as an organised movement started to gain momentum, with category-specific retail sales growing from 20% to 35% during the mid-'90's throughout countries such as Europe, Asia, and the United States (Thompson, 2000). In 1992, the *Codex Alimentarius Commission on Food Labelling* published their definitive "Guidelines for the Production, Processing, Marketing and Labelling of Organically Produced Foods" (Codex Alimentarius Commission, 1999), which is still widely used today and revised on a biannual basis (Compagnoni, 2010).

The global revenue of the organic industry shows rapid year-on-year growth (Barrena and Sánchez, 2010). Most of this growth comes from developed agricultural economies.

A summarised factual timeline that demonstrates this is presented below:

2002 World organic agricultural land covered 24 million hectares equating to a total sale of $23 billion (Tung, 2016).

2004 An estimated area for organic farming covering 30.5 million hectares globally. During the first half of 2004, some organic farmers in South Africa reported a surge in sales of organic produce of 400% (Business Day, 2005).

2005 In just one year, the market grew drastically to a worth of $37 billion, implying a growth of $7 million per week (Shears, 2010).

2007 Total turnover for organic products (food and beverages) reached $46 billion (Organic Monitor UK, February 2009; Compagnoni, 2010).

2009 Global organic agriculture reaches 32.2 million hectares across 141 countries by 2009 (Yang, 2014, Compagnoni, 2010).

2013 The global value of the organic market is estimated to be more than $72 billion (Tung, 2016, Willer, 2015).
In 2013 Africa had the smallest production of organic agriculture worldwide – only 1.2 million hectares (Willer, 2015).

It should be noted that available market information and statistics is mainly based on information provided by the formal retail sector, as globally supermarkets still tend to dominate the distribution and sales of organic produce (Pearson et al., 2010). However, informal suppliers and small organic farmers that supply through online channels and home delivery should not be underestimated, especially given that smaller, alternative outlets are often supported by the local community.

Specialised organic suppliers increasingly use franchise models to extend their footprint and respond to growing demand (Compagnoni, 2010). This trend is especially notable in developing countries, such as South Africa, where organic sales tend to be slowly growing although it is mostly viewed as a niche product category (Tung, 2016).

The growth of the organic market has however been hampered by the high premiums that are imposed on products. Research indicates that some retailers in the United States apply a mark-up of as high as 250% on organic products like frozen peas (Pearson, 2010), making it difficult for the organic product market to move past its niche status.

Informal and smaller organic distributors often rely on "food networks" in their local communities, focusing on supplying organic products that not only support the environment, but also contribute to the social and economic goals of their immediate area. Network nodes, like farmers' markets and community-supported productive gardens, provide opportunities to test and market new products, while serving as a vehicle for local economic development (Pearson et al., 2010).

2.3.2. A South African perspective

The South African organic industry is still under-developed, especially compared to more mature markets like the USA, Germany, or the UK – where as much as 70% of organic produce is imported to keep up with the demand in a market with an annual growth rate of 30% (Engel, 2009). The estimated value of the South African organic industry is estimated between R70 million and R80 million *per annum*, with fresh produce contributing more than 70% to this

number. Despite this seemingly significant amount, the industry still only contributes 0.3% of the total food market in South Africa (Engel, 2009).

Research found that organic producers in South Africa are typically under the age of 41 and most have had tertiary education (Niemeyer and Lombard, 2003). Their conversion to organic production is often motivated by concern for the protection of the environment and to enhance soil fertility. However, the conversion process is typically costly and therefore hampered by financial constraints, which result in typical farm sizes being mostly smaller than that of conventional farms.

The South African organic product offering consists mostly of fresh fruit and vegetables, followed by herbs, spices and cane sugar (Engel, 2009). A study by Du Toit and Crafford (2003) on consumer demand for organic food in South Africa, indicated that consumers' beliefs about organic food were positive, as they consider it to be nutritious, healthier, more flavourful and tastier than conventional food (du Toit and Crafford, 2003).

Many South African consumers view organic products as a "luxury item", limiting consumer consumption to higher-income groups (Esterhuizen, 2021). Typically, countries with higher organic product consumption rates (like the USA and Japan), also have a higher per capita income (Thompson, 2000). To improve sales of organically produced products amongst a wider audience, a better understanding of food consumers is required, which will inform a change in marketing strategy to target South African consumers more successfully (Du Toit and Crafford, 2003).

2.4. Defining "organics" and "certification"

"Organic agriculture" is defined as "a production system that sustains the health of soils, ecosystems and people. It relies on ecological processes, biodiversity and cycles adapted to local conditions, rather than the use of inputs with adverse effects. Organic agriculture combines tradition, innovation and science to benefit the shared environment and promote fair relationships and good quality of life for all involved" (Morshedi et al., 2017, Compagnoni, 2010).

In South Africa, the definition of "organic farming" also refers to farming that excludes the use of synthetic fertilisers and pesticides, while targeting the optimisation of soil management and the environmental interaction of plants and soil (Tung, 2016). The end-goal of organic farming is to develop a sustainable cultivation system and a variety of high-quality products with an emphasis on environmental protection and the high standards of animal protection (Tung, 2016).

2.4.1. Organic produce

Given the definition of "organic farming", the question is then whether a food product can be categorised as "organic" by default if it was not exposed to synthetic fertilisers, pesticides, growth regulators and additives? Research theory however identifies three basic dimensions that differentiate organic produce from conventional produce: health, fairness and environment impact and quality (Fetahovic, 2017). These factors also represent the key drivers for consumers to buy organic produce (Pearson et al., 2010).

i. Health

When considering organic produce, the concept of "health" refers to "the ability to sustain and enhance the health of soil, plants, animals and humans, now and in terms of future generations" (IFOAM, 2005). Organic produce is generally

promoted as being healthier, due to farming principles prohibiting the use of pesticides and fertilisers (MacMillan and Naftulin, 2017).

These claims remain a contentious issue, with research conducted by the *Food Standards Agency* finding “no evidence of a health benefit from consuming organic compared to conventional foodstuffs” (Barański et al, 2014). This indicates that a person that already has a healthy disposition, will not necessarily become “healthier” after consuming large quantities of organic produce.

Concerns about the presence of chemicals in commercially grown produce also bears further reflection. A number of chemicals are naturally present in fresh produce – and some of these “natural chemicals” are found to be toxic to humans (Pearson et al., 2010). Artificial chemicals are strictly regulated by governments according to the specified parameters of *maximum residue levels* (MRLs). Even though organic foodstuffs typically have lower MRLs, some are still not considered as beneficial to human health (Pearson et al., 2010).

Consumers regard organics as "fresher" and "better tasting" - and therefore it must be healthier (Macmillan & Naftulin, 2017). While the supposed superior nutritional value of organic produce is still being debated, there is evidence of statistically significant and meaningful differences in the composition of organic foods as opposed to non-organic crops/crop-based foods (Barański et al., 2014).

Research further indicates that “egocentric values” - such as health – often take precedence over concerns for animal welfare or the environment in consumer decision-making (Hamzaoui-Essoussi and Zahaf, 2011). Health motivation is typically driven by specific consumer profiles, for example, new mothers who want more "natural" or "pure" foods for their children, or someone that is

recovering from an illness and believe organic food will aid this process (Pearson et al., 2010). Studies also found that the presence of children in a household has a meaningful impact on consumers' organic food attitudes, as well as their purchasing behaviour (Fotopoulos and Krystallis, 2002, Iqbal, 2015). In order to better understand consumer decision-making when buying "credence[6] goods" such as organic produce, more research is still required (Pearson et al., 2010).

ii. Fairness & environmental impact

The dimension of fairness and environmental impact is influenced by perceptions of equity, respect, justice, and stewardship (IFOAM, 2005). This highlights the interrelationship between humans and nature and promulgates the preservation of natural resources for future generations.

"Sustainability" is defined as "a consumption pattern that meets the needs of present generations without compromising the needs of future generations" (Hamzaoui-Essoussi and Zahaf, 2011). Growing concerns about the impact of climate change, raised consumer awareness about their consumption patterns, putting pressure on suppliers to apply more sustainable practices. Environmentally conscious consumers are often willing to pay a premium for products that display environmentally friendly attributes (i.e., locally, and ethically produced products, and organics) (Brits, 2015). Also, "hardcore" organic food consumers will rather support local farmers' markets compared to formal retailers, as they believe farmers' markets are more sustainable and have a smaller carbon footprint that presents a more favourable "food mileage"[7] score (Hamzaoui-Essoussi and Zahaf, 2011).

[6] Credence goods describe product attributes which a consumer cannot evaluate, even after having consumed the goods eg. environmental impact

[7] **Food miles** is the distance food is transported from farm to fork. Food miles are one factor used when testing the environmental impact of food.

Animal welfare is another strong driver to buy organic food and might in some instances take precedence over organic practices, even if the motivation for the apparent concern can sometimes be a fashionable trend of the moment. Mass farming systems such as caged chickens for eggs or cattle kept in camps are also a pressure point for certain countries to pursue organic and free-range practices (Pearson et al., 2010).

With consumers becoming more educated and the sophistication with which they buy foods such as organics more apparent, the organic industry will have to work hard to retain consumer trust in organic food, and for this trust to be converted into sales (Hamzaoui-Essoussi and Zahaf, 2011). With high input costs and growing demand for this product category, supply becomes increasingly strained, opening a window for fraudulent attempts to fill the gap.

iii. Quality

The third dimension, “quality”, can be defined as “the totality of features and characteristics of a product or service that bear on its ability to satisfy given needs” (ISO, 2002).

Research found that consumers typically review a product based on inherent or distinguishing characteristics, using this as a base on which to assign a degree or grade of excellence i.e., quality (Venter, 2017). In terms of “credence products” such as organics, extrinsic factors like labelling and certification play a big role.

2.4.2. Organic certification

The first organic certification was awarded in 1927 by Demeter International and presented in the in the form of a seal, or "Demeter" [8] - aptly named after the Greek goddess of grain and fertility. This coveted stamp of approval was given to a biodynamic coffee plantation in Mexico (Compagnoni, 2010).

According to Luttikholt (2007), **organic certification** is intended to assure consumers that a product marketed as "organic" complies with the standards as stipulated by IFOAM. The *IFOAM Basic Standards for Organic Production and Processing* have been adopted internationally and provides a base framework of organic advancement. However, these standards only provide "a framework for certification bodies and standard-setting organisations worldwide to develop their own certification standards and cannot be used for certification on their own" (Compagnoni, 2010).

Since its inception, most private certification bodies have developed and portrayed organic certification as an assurance of quality and have trademarked the organic symbol for their specific associations to be used on packaging for organically produced food items (Compagnoni, 2010). This resulted in consumers assuming – and, in fact, expecting - certain quality aspects to be related to organic food. For example, it is widely believed that these certified products are fresher and taste better than their commercially produced counterparts (Pearson et al., 2010). Pearson et al. (2010) argue that consumers' expectations are not a measurable construct, thus – like the perception of health that was previously discussed – the expected standards of

[8] Biodynamic agricultural seal of approval (Compagnoni, 2010)

"quality" related to organic produce is still debatable and depends on the perspective of the consumer.

There is scant information available on the legislation and/or governing of the organic industry in South Africa. Tung (2016) stated that although some effort has been made by the South African Bureau of Standards (SABS) who in 2002 drafted the South African National Standards (SANS 1369) on Organic Agricultural Production and Processing (OAPP), no specific legislation about the control and sale of organic products have been made available. To date, the country still relies on private certification systems that consist of network certification and third-party certification in collaboration with global and local certification bodies, e.g., *Africa's Farm Certified Organic* (AFRISCO) and the *Bio-dynamic and Organic Certification Authority* (BODCA) (Irwin, 2002, Tung, 2016, Engel, 2009).

EcoCert Soil Association and the *Société Générale de Surveillance* (SGS) are other certifying bodies that adhere to international standards but are also recognised within the South African market. EcoCert is the most common certification found in farming (Irwin, 2002). Local producers also use self-declaratory vendor claims associated with organic labels.

It is then no wonder that Woolworths, the retailer with the largest market share in the local organic market, have initiated their own organic label. They also stock the largest variety of organic items. The "Woolworths Organic Journey" was developed to support previously disadvantaged farmers, which they claim, "naturally complied with criteria for growing organic crops" (Engel, 2009).

These products are however also certified by the same certifying bodies as organic products sold by other retailers in South Africa. Engel (2009) has found in her research that Woolworths dominate the organic market share with 94%

of their stores in the Western Cape stocking organic foods. They are then followed by Spar at 65% and PicknPay and Shoprite trail far behind at 20% each.

The organic public and private sector in South Africa are still guided by small informal groups (Tung, 2016). South Africa is one of thirty (30) African countries that currently produce certified organic produce; however, most of these products are being exported due to a higher price offered in the international market (Engel, 2009).

It is undeniable that consumers' purchasing behaviour of products such as organics are highly motivated by certification markers as these are often viewed as an indication of quality. However, Tung (2016) noted that the poor regulation in South Africa is unfortunate as it gives rise to fraudulent behaviour (i.e., selling conventional produce as certified organic) resulting in a serious lack of consumer trust/confidence in this product category (Fetahovic, 2017). This matter is concerning and needs to be addressed as it is believed that proper legislation and execution governance will foster an environment for positive industry growth(Sirdeshmukh et al., 2002, Tung, 2016).

Suggestions made by Tung (2016) include a united state accreditation body to certify farms or production facilities to ensure they meet with the standards set out by this committee and concedes that the *South African National Accreditation System* (SANAS) is making a valiant effort in the right direction. Further suggestions include the reduction in certification costs and strategic partnering with international counterparts to ensure accreditation meets both national and international standards.

Tung (2016) further feels this body should have the authority to investigate and monitor organic claims made on local and imported products. The *Bio-Dynamic*

& Organic Certification Authority (SA) (BDOCA) is at present responsible for annual inspections of products that claim organic status, but it is unclear at which step of the product's life this inspection takes place as well as which criteria they use to determine the validity of the product's organic status claim. A suggestion is to enforce documenting of the process from farm level for quality assurance purposes and annual surprise inspections to be compulsory. The Department of Trade and Industry has acknowledged that none of these actions will make any difference if offenders are not dealt with decisively and without compiling a clearly defined strategy for organic farmers to safeguard the "sustainable growth of organic products over the next ten years" (Engel, 2009).

2.5. Fraudulent practices in the organic market

2.5.1. A global perspective

To stimulate the growth of the organic market, many governments have instituted policies to obtain organic certification and to comply with organic labelling. However, with consumers' growing demand for more comprehensive information related to the products they buy, this has exposed the market to fraudulent practices such as labelling conventionally produced produce as organic (Giannakas, 2002).

In 1967, the *Soil Association* in the UK published the first private organic standards, urged by the necessity of organic farmers in a common region to have the same understanding of the organic definition that they can apply to their farming practices. This was also to cope with the growing customer demand and to maintain the credibility entrusted to organic labelling. Another big driver was to close the gap for fraudulent claims (Compagnoni, 2010).

Despite these standards designed “by farmers, for farmers”, most fraud factors can be found within the supply chain (Van Ruth et al., 2018). Van Ruth et al. (2018) found that supply chains with the highest occurrence of vulnerabilities to fraud were those of spices, olive oil, meat products (beef & fish), milk and organic bananas. The researchers also believed that most crimes are committed by legitimate food actors in the supply chain that simply make the most of criminal opportunities that present themselves. These do not include farmers as primary producers, but rather other entities within the supply chain such as wholesalers, importers, and distributors.

The UK consequently requires organic products to display a certification symbol or number reflecting compliance with government standards. The Soil Association is the UK’s leading certification logo, which is displayed on 70% of organic produce (Shears, 2010). With the absence of any conclusive tests that can prove a product has been organically produced, certification relies on a conclusive paper trail that shows due processes were followed (Johnson, 2014). The growing demand for organic food still far outweighs the capacity of the agricultural industry, leading to suppliers pretending to be producers of organic food or importers that bring foodstuffs from suppliers where the origin is hard to pinpoint.

Examples of these attempts in the UK have been highlighted in a report of prosecutions (Shears, 2010):

- Stephen Sains, owner of *Organic World* in an affluent London suburb, was fined £6 020 when it was found that much of the meat sold in his butchery was not organic, despite his claims. He was also ordered to change the name of his store.

- Andrew Portch had a stall at a farmer's market by the River Thames selling cheese, sausage, and game products at a premium, falsely claiming that they are certified organic. He was fined £3 130 and ordered to pay another £1 870 in legal fees.

The problem remains that there is still no sure-fire way to quickly assess whether products on supermarket shelves do indeed comply with organic regulations. A system of peer-policing is currently one of the more prevalent control measures, however, this would require actual farm visits to test soil samples. Whistle-blowers are also encouraged by naming non-compliant players to the media. In the meat industry, certain tests are being developed, where the presence of antibiotics administered to livestock can be detected (Shears, 2010). However, Shears (2010) mentioned that it is close to impossible to discern some synthetic fertilizers, forbidden within organic farming, from their natural equivalent, comparing definitive organic tests to finding the holy grail.

Food fraud concerning organic produce is not limited to single offenders. Orchestrated events between as many as seven different countries have been reported, related to several tons of wheat, corn, soy, and sunflower seeds that were imported from multiple non-EU countries, illegally mislabeled as organic, and then transshipped to EU countries via Italy and Malta (Ellis et al., 2016). Ellis et al. (2016) stresses the fact that with its international scope, no country will be safe from organic food fraud, especially when faced with not only opportunistic fraudsters but also poor governmental regulation.

In terms of some positive development and mitigation, recent studies have started exploring low cost 'Near-Infrared Spectroscopy' in combination with pattern recognition to differentiate between organic and non-organically grown Gala apples and have proved a 96% success rate so far (Song et al., 2016).

This can be extremely valuable to prevent future fraudulent attempts within the organic category.

2.5.2. A South African perspective

Fraudulent organic food products had been defined by Tung (2016) as products that "claim to be 'organic', but do not respect the organic rules of production, especially if the product bears a 'certified organic' label". This includes incorrect labelling, false representation (claiming "certified organic"), fraud and the application of a prohibited substance. Should the claims from a vendor be unsubstantiated, there is, unfortunately, no current organic standards against which the legitimacy of these claims can be measured. In South Africa, several laws govern the production, sale and manufacturing of traditionally grown food products and how fraudulent claims and descriptions pertaining to these items should be conducted, however as mentioned earlier there is no legally bound body to represent the interests of local organic farmers (Tung, 2016).

South African consumers do have some avenues to report fraudulent activities related to organic products. They can either file their complaint with the National Consumer Commission if they found the product or labelling to be misleading, or they can liaise with the *Advertising Standard Authority*, especially if a product is falsely marketed. The supplier can then be pressed to withdraw their misleading advertisement with immediate effect (Tung, 2016). Section 41(1)(a) of *The Consumer Protection Act* stipulates that "suppliers must not by word or conduct directly or indirectly express or imply a false, misleading, or deceptive representation concerning a material fact to a consumer"[9].

[9] See section 41 of *The Consumer Protection Act* (No.68 of 2008).

On the surface it does not seem as if any of these recourses offer substantial teeth to discourage fraudulent attempts, however, the High Court does have the jurisdiction to order entry, investigation, sampling, and seizure related to inspection into fraudulent organic practices and claims (Tung, 2016). Penalties can start at a fine but can also merit imprisonment for a maximum of four years. Tung (2016) does however recommend that the State takes further measures when non-compliance is discovered, such as recalling products to remove them from the market, suspension of the organic certification from the offender, and removing the guilty producer from the list of certified organic producers.
Food fraud committed by South Africans within the organic food market is not always limited to South African borders. In 2017 fraudulent certificates for apples, grapes and blueberries were found for products imported to the United States. Though they were found to come from different areas such as China and Russia, South Africa was found on the list of perpetrators (Raszap Skorbiansky and Ferreira, 2018).

A common practice amongst organic farmers' markets in South Africa is that they seldom require certification to allow vendors to sell products as organic. Despite this, consumers still buy from these suppliers - not only do they trust the farmers/vendors, but they also tend to sympathise with the high cost of certification (Janssen and Hamm, 2012, Engel, 2009). This does of course expose consumers to be financially defrauded by non-compliant vendors that will sell commercially produced items at a premium, claiming them to be organically certified.

A study done by Naidoo and Ramatsetse (2016) at the Hazel Organic Market in Pretoria, found that there were still some respondents who didn't trust the organic product quality and perceived it as fraud. Continued regulation of the organic food market and more stringent inspections of the certification and

labelling of organic labels and logos were suggested to provide peace of mind and guaranteed quality for the consumer.

From the literature reviewed on the organic industry in South Africa, it is evident that this product category shows great potential but that some concerns regarding certification which stem from fraudulent behaviour need to be addressed. Building a strong consumer confidence is essential in terms of a profitable organic market (Hamzaoui-Essoussi and Zahaf, 2008). For this reason, more insight in terms of the South African consumers' decision-making within this context is needed.

2.6. Consumer decision-making and the matter of trust

The term "consumer" is defined by Tyagi and Kumar (2004) as "anyone engaging in any activities of evaluating, acquiring, using or disposing of goods and services". That includes not only those that purchase economic goods or services but also those who adopt ideas and/ or philosophies. Consumer behaviour refers to the consumer's buying decisions and consumption patterns (Priest et al., 2013).

To satisfy their wants and needs, consumers make decisions (routine[10], limited[11] or extensive[12]) that are characterised by the amount of time and effort which is often related to the perception of risk (Stankevich, 2017). "Perceived risk" refers to the nature and amount of risk perceived by a consumer when contemplating a particular

[10] **Routine consumer behaviour** - a buying situation in which the buyer has had considerable prior experience; also called *automatic response behaviour* or *habitual response behaviour* (Solomon *et al.*, 2012).

[11] **Limited consumer behaviour** – evident when consumers make limited decisions. They take a small amount of time to consider the decision, relying on memory, past experiences, and word-of-mouth references to make decisions based on perceived logical deductions (Solomon *et al.*, 2012).

[12] **Extensive consumer behaviour** – used to describe a highly involved consumer decision regarding whether or not to purchase a product (Solomon *et al.*, 2012).

purchase decision. Perceived risk is thus a consumers' belief about whether the purchase of a product will lead to negative consequences. Bauer (1960) defined perceived risk as the risk that consumers actively perceive because they do not understand a product.

Solomon (2012:339) found that consumer **risk aversion** is influenced by various internal (psychological/personal) factors of which knowledge is a prime influential example. Hence, consumers' experience and or prior knowledge play an active role in terms of responsible consumer decision-making as the complexity of a decision can be limited by a consumer's level of expertise in a matter.

According to Li et al. (2020), an understanding of consumer risk perception, knowledge and ultimate decision-making is useful in terms of explaining barriers that contribute towards consumers distrust and ultimate non-purchase behaviour of food products.

Fynn-Green et al. (2019) explained that consumers' decision-making and ultimate trust in organics is highly dependent on contextual factors such as demographics, awareness, and risk aversion. In terms of the South African consumer, this is not a simple matter as the market presents a unique complexity of forty-seven (47) million people, five (5) different race groups speaking eleven (11) official languages, across nine (9) provinces (Martins, 2007). These provinces are furthermore vastly different in terms of their population composition and disposable income, which affects their respective consumer's decision-making and buying behaviour.

Kisaka-Lwayo and Obi (2014) postulates that, despite a general profile of the South African organic consumer (younger female with a mid- to higher-level income), much could still be learned about understanding their decision-making, consumption and ultimate trust/confidence in this products category.

2.6.1. The consumer decision-making process

Although the previous section might have underscored the complexity of consumer decisions and ultimate behaviour, the evidence presents that all consumers follow a similar five-step process that according to Barrena and Sánchez (2010), can be seen as a particular form of cost-benefit analysis in the presence of multiple alternatives.

The consumer decision-making process typically involves the following steps:

1. Problem recognition and/or awareness of a need.
2. Searching for information regarding this problem.
3. Evaluation of alternatives found or presented.
4. The purchase decision, once a choice has been made between alternatives; and
5. The post-purchase evaluation, where the consumer decides whether they were satisfied or not by the outcome or product that the process must lead them to.

The five-stage model was initially proposed by Cox et al. (1983) and can be summarised as follows:

i. Step 1: Problem recognition

During this first step, the consumer becomes aware of either a need or a problem that they are experiencing. Often a situation arises where the individual experience an imbalance between their current situation and their desired state of affairs, which is brought on by some sort of stimuli (internal or external) (Munthiu, 2009, Hibić and Poturak, 2016).

Tyagi and Kumar (2004) explain that the consumer might initially not even be aware that they need a specific product until they are repeatedly exposed to it, be it via "window shopping", advertisements and or a formal public campaign. In terms of organics, the consumer might become aware of the need for this product category through either informal/personal aspiration (internal stimuli) for a healthier lifestyle or more formal manners i.e., a marketing campaign (external stimuli) that promotes organics as being more sustainable in terms of the environment.

ii. Step 2: Information search

Step 2 typically consists of two parts - internal search and external search (Stankevich, 2017, Dudovskiy, 2013). Munthiu (2009), Stankevich (2017) Dudovskiy (2013) states that consumers' reliance on either of these respective sources will depend on the risk perceived, underlying knowledge and previous experience. In general, when shopping for grocery items, consumers usually search for information in a passive manner. This is characterised by relying on mostly internal, personal sources of information, such as memory of previous experiences. This process typically occurs with frequently purchased products i.e., routine/habitual products (e.g., bread and milk) (Alsibai, 2014).

A more active approach requires consumers to consult a wider variety of resources, which is typically more external in nature (e.g., commercial advertising and marketing-controlled sources such as reviews, blogs, and websites) (Alsibai, 2014, Munthiu, 2009). This type of behaviour is frequently viewed during purchase decision that presents a higher risk, e.g., more expensive and or less familiar products.

Uzonwanne (2016) highlights that whichever form the gathering of information takes, the crux remains "to be properly informed (which) is at the centre of

effective rational decision-making". This is corroborated by Munthiu (2009) who stated that the quality and accuracy of the information is crucial in terms of responsible decision-making.

In terms of organics, it is therefore plausible that misleading information and consumer ignorance about fraudulent certification could result in foolish purchase decisions, hence the importance of this step as a focal point in this study.

iii. Step 3: Evaluation of alternatives

Seeking alternatives is part of the cognitive decision sequence of the decision-making process, where the consumer is aware of all the product alternatives, and via a rational decision process will rank the alternatives against benefits and disadvantages to ultimately decide on the best possible alternative to satisfy their need (Erasmus et al., 2001). This is critical step in the decision-making process, as it is the last barrier before making the actual purchase.

During this step, the consumer will use the information collected during Step 2 to establish a set of criteria that will allow the benchmarking of product alternatives to find the most suitable option (Dudovskiy, 2013).
When considering organics, consumers will inevitably compare this product category in terms of a set of attributes - intrinsic (taste, texture, nutritional value) and or extrinsic (price, packaging, store) against the conventional counterpart. A final decision in terms of purchasing will depend on the outcome of this comparison.

iv. Step 4: The purchase decision

Once the consumer concluded the evaluation of all the alternatives, a purchase is likely to be made (Munthiu, 2009, Alsibai, 2014). It is during this step that consumers are most vulnerable in terms of any associated risks if they underestimated the importance of Step 2: Information search.

For example, if a consumer lacked in terms of objective knowledge or overestimated his or her knowledge pertaining to the product line (e.g., organics) and possible fraudulent behaviour in said product category the risk of being defrauded is highly plausible.

This outcome will then revert to their knowledge base and affect the rationale/confidence presented during their next purchase and/ or ultimate risk aversion.

v. Step 5: Post-purchase

The final stage of the decision-making process is a post-purchase review of the product. During this step the consumer reflects on the purchase decision and review the experience in terms of the performance of the products and if it met the envisaged expectations (i.e., did the product satisfy) (Stankevich, 2017).

Organic produce is categorised as “credence goods”, thus the consumer will only know that the product is organic once they are told that it is (Giannakas, 2002). Credence qualities, for example, environmental impact, are difficult to establish after every purchase (Pearson et al., 2010), meaning the consumer will not necessarily know if their choice in picking a product that was labelled “organic” benefited themselves or the environment. Likewise, it might take time to establish whether they were exposed to any health and or financial risk by consuming products that might have been deceivingly labelled as organic.

Consumers' knowledge about organically produced food items and possible fraudulent behaviour is therefore critical throughout the decision-making process, as it will enable responsible decision making, as consumers often perceive organic products to be safer, healthier and more environmentally friendly (Kamal et al., 2009). Consumer knowledge will therefore not only affect the purchasing decision, but also the post-purchase evaluation of the product.

"Cognitive dissonance" is the term used to describe the mental discomfort that results from a post-purchase evaluation that might conflict with preconceived ideas or expectations. Solomon et al. (2012) states that consumers tend to seek consistency and or confirmation of their expectations (i.e., satisfaction). Therefore, if a post-purchase evaluation fails to meet expectations, feelings of unease or discomfort are likely to be to the detriment of future consumer purchase behaviour and loyalty (Dudovskiy, 2013).

2.7. The influence of consumer knowledge on consumers purchasing behaviour

It is known that consumer knowledge plays an essential role throughout consumers' decision-making affecting not only satisfaction but also their loyalty in terms of future patronage (Pearson et al., 2010, Park et al., 1994). According to Klerck and Sweeney (2007), it is important to note that behaviour is often directed by two distinct types of knowledge: **subjective knowledge** (i.e., personal sense about the topic) and **objective knowledge** (i.e., actual knowledge).

Venter (2017) noted that consumers are often placed in jeopardy due to misaligned subjective knowledge and explain that consumers are often overly confident about what they think they know about a particular topic and that this can result in unnecessary risks being taken when buying credence produce such as organics. In

contrast to subjective knowledge, researchers identified objective knowledge as a possible tool to improve consumers' ability to evaluate, purchase and consume organic produce more wisely / responsibly (Graham-Rowe et al., 2014).

The depth and maturity of product knowledge can also affect how consumers process new information about a product. Previous studies have simplified consumer knowledge to a single-layered objective for example product experience or how familiar they are with a brand (Barrena and Sánchez, 2010).

However, more recent research has revealed that knowledge is a multi-dimensional construct that is characterised by the structure and the content of information stored in memory (Scribner and Weun, 2000). Knowledge can thus not be defined as a single construct but is divided into objective knowledge and subjective knowledge.

2.7.1. Subjective knowledge

"Subjective knowledge" is defined as "a person's perception of the amount of information about a product class stored in his or her memory" (Brucks, 1985, Flynn, 1999, Park et al., 1994). It therefore refers to the construct of what consumers *think* organic and food fraud is; or how much they *think* they know about the topic, compared to friends and family.

Scribner and Weun (2000) refer to previous research that has been done to define subjective knowledge as "an individual's perceived knowledge of a product, including brands, attributes, evaluations, decision heuristics and usage situations" (Brucks, 1985, Flynn, 1999, Park, 1981). Following Brucks and Flynn (1999), subjective knowledge can be summarised as "the feeling of knowing".
During her research Venter (2017) summarised the work of Aertsens et al. (2011),Ellen (1994) and House et al. (2004) where she concluded that

subjective knowledge does not only have a positive correlation between consumers' confidence in their knowledge but will also allow a "significant and positive" influence on their attitude towards a certain product, especially when compared to objective knowledge. For example, the likelihood of a consumer purchasing organic produce will be greatly influenced by what they *think* they know about food fraud and how it relates to organic produce. This perceived knowledge exposes the consumer to risky buying behaviour, which shall be further discussed by the researcher in chapter four during the data analysis.

2.7.2. Objective knowledge

In contrast to "subjective knowledge", **"**objective knowledge" is described as "the actual amount of accurate information stored in a person's memory" (Brucks, 1985, Park et al., 1994, Venter, 2017), with specific referral to the knowledge of "facts" about topic areas in question.

Brucks (1985) defined "objective knowledge" as "an actual knowledge construct operationalized as the ability to perform product-related tasks as measured by some sort of test, which is also related to the previous experience of the product" or "a consumers' confidence or experience in shopping" (Fox and Hoch, 2005).

Fox and Hoch (2005) explain that these consumers are well informed, making them comfortable in sharing this knowledge with their peers and are often seen as a good reference for information.

Venter (2017) noted that consumers are often placed in jeopardy due to misaligned subjective knowledge - often consumers tend to be overly confident about what they know about products such as organic produce. Here, too, is where consumers are exposed to risk. The effect of both subjective and

objective knowledge on the consumers' buying behaviour of organic produce will be further supported in the findings discussed in chapter four.

2.8. Conclusion

Developed countries typically have stricter, more advanced legislation related to the certification of organic farmers and organic produce, generally regulated by the *Codex Alimentarius Commission Guidelines regarding* organic food (Commission, 1999). However, it is a concern that within the South African legislation there are no clear specifications as to what constitutes an organic product. This potentially contributes to an environment where consumers might be defrauded financially by inflated prices for products that are not fully certified as organic, which can be avoided.

There is currently no specific legislation on organic products in South Africa, while draft regulations on the control and sale of organic products are yet to be published. However, there are laws and policies which apply to the production and sale of organic food products in South Africa (Tung, 2016).

Unfortunately, little research regarding consumers' knowledge (objective and subjective) of food fraud concerning consumers' purchasing of organic fresh produce has been done within the South African context and a contextual gap exists in the literature available regarding consumers' knowledge of food fraud. This is concerning as this product category is currently experiencing exponential growth (Yang, 2014).

Addressing food fraud within the organic market is therefore not only essential in terms of consumers' wellbeing but also ultimately for this product category's survival.

CHAPTER 3: RESEARCH DESIGN AND METHODOLOGY

This chapter specifies, describes, and justifies the research design and methodology used to conduct the study.

3.1. Research design

Research design is the systematic blueprint that maps out the research methods to be followed to address the objectives that were previously defined by the researcher (Kumar, 2014). It provides the researcher with a set of criteria against which approach, and procedures can be checked as the research process progresses (Black, 1999). The end goal is to ensure that research questions are answered in a manner that is valid, objective, accurate and economically sound (Kumar, 2014).

Research investigating consumers' knowledge of food fraud, specifically when buying organic produce, is scarce. Reid-Searl and Happell (2012) suggest an *exploratory-descriptive* approach to research design when the researcher wants to explore a topic with limited academic literature coverage. Exploratory-descriptive research design are particularly useful when knowledge on a specific market aspect is vague and unclear (Wiid and Diggines, 2009).

This study intended to contribute to this body of knowledge by *exploring* consumers' purchasing behaviour as related to organic produce, as well as their knowledge pertaining to food fraud. The selected research design allows the participants of the study to also contribute to the creation of new knowledge in this area of interest. Data provided by participant responses would then be subjected to statistical analysis to

describe how a consumer's knowledge of food fraud might expose them to unnecessary risks when engaging with this product category.

3.2. Methodology

3.2.1. Population and sampling

A population is viewed as a group of individuals with similar characteristics (Zikmund & Babin, 2007:265). Sampling is the process of selecting a few respondents i.e. a sample and particular unit of analysis (that reflects the characteristics required by the study) from a bigger group (the sampling population), so that a few respondents can provide a view of a much larger population (Wiid & Diggines, 2009:181).

Sandelowski (2000) recommends "purposeful sampling" as the most appropriate strategy for descriptive research. Ultimately, the researcher must obtain participants who can provide the information required to address the objectives of the study (Hunter, McCallum and Howes, 2019).

For the purposes of this research project, Gauteng was chosen as the target population from which a smaller specific unit of analysis was drawn. A sample drawn from this population, would present a more manageable subsection of the larger population that the researcher aims to examine (Salkind 2012:85; Cooper & Schindler, 2014:84; Leedy & Omrod, 2013:114), however due to logistical reasons it was impossible to target the entire Gauteng. Gauteng as a target population was considered as an area that presented possible research respondents (i.e. unit of analysis) that fit the criteria of consumers whom had some experience with this particular product category i.e. organics.

The research sample comprised of adult, male and female consumers; residing in Gauteng; at least 21 years old, or older; and who are responsible for household food purchases or are the primary decision-makers concerning food purchases. No other restrictions were placed in terms of any other demographic characteristics.

3.2.2. Sampling technique/method

This research study used *convenience sampling*, a type of non-probability sampling that involves the selection of convenient, easily accessible, and available individuals that suited the description of the target population (De Vos, 2011). This was specifically chosen due to financial, time constraints and the niche consumer market that was under investigation i.e. organics. Furthermore, due to covid-19 restrictions, consumers shopping behaviour was greatly impacted and therefore data collection was difficult, which further supported the need for convenience sampling.

Convenience sampling was combined with *snowballing*. Applying this approach meant that initial respondents were selected based on their fit with pre-defined target group criteria.[13] Subsequently, these respondents would then be requested to forward the questionnaire to friends and family members (De Vos, 2011).

Even though both *convenience sampling* and *snowballing* typically enable faster data collection, both methods are subject to bias. Results are therefore generally not representative of the greater population (Areni, 2003, Salkind, 2008). It should however be noted that the intention of this research project was

[13] Gauteng was chosen as a target population but only a small, specific unit of analysis was drawn i.e. consumers whom had experience/exposure to buying organics. Recent research states that organic consumers are mostly younger, females from higher income and higher education levels.

not to conclude on representative findings, but to rather provide insight in terms of consumers food fraud knowledge (particularly those purchasing organics).

3.2.3. Sample size

Swanepoel, (2015:77) states that *sample size* refers to "the number of respondents who participated in a research study". Quantitative research studies typically require a larger sample size, as the aim is to *quantify* the patterns in the group to represent the population of interest and to generalize the set of findings (Kumar, 2014).

The recommendations regarding the appropriate sample size to use when conducting a factor analysis vary widely. Suggested minimums for sample size range from three (3) to twenty (20) times the number of variables, and absolute ranges from one hundred (100) to over one thousand (1,000) (Giannoulis, 2021). Since the study intended to apply factor analysis, the particular or unit of analysis that was of interest was consumers responsible for grocery shopping and that have had previously bought organics. The intention of this study was never to include a representative sample neither to target the whole of Gauteng.

The criterion summary based on sample size as compiled by Grace-Martin (2021) is therefore particularly helpful:

- "…one hundred (100) subjects sufficient if clear structure; more is better…" (Kline, 2014).
- "…one hundred (100) subjects = *POOR*; three hundred (300) = *GOOD*; one thousand, or more (1000+) = *EXCELLENT*…" (Comrey and Lee, 1992).
- "…three hundred (300) subjects…though fewer works if correlations are high among variables…" (Tabachnick and Fidell, 2001).

This was decided for two reasons; the first was based on a sample size calculation of the population of Gauteng estimated at 12 million. Several different sample size calculations and calculators showed a required sample of 385 based on a 95% confidence level with 5% error.

The second consideration was the specific statistical analyses required to test the objectives. A sample of 250 - 350 was estimated to be sufficient for the tests to be performed using the IBM® SPSS®.

The aim was to garner feedback from at least three hundred (300) respondents within the defined population. The final number of successfully completed and captured questionnaires was *n*=323. Based on best practice research requirements as cited above, this was deemed sufficient for the purposes of this study. From the data collected, it was found that several males started the questionnaire, however they did not finish, and therefore their responses could not be include in the statistical tests. The Researcher deleted responses which were more than 20% incomplete, (the 80% was based on the demographics and secondly the most important questions needed for specific tests). The respondents with missing data were excluded from the analysis by implementing the 'exclude listwise' function within SPSS. Therefore, only complete responses were used. This yielded 218 responses, which was still sufficient for the prescribed statistical analyses.

3.2.4. Measuring instrument

The measuring instrument was a self-administered electronic questionnaire to collect structured, quantifiable data.

The questionnaire was hosted on the Qualtrics online system. The program generated a link to the questionnaire, that could easily be sent to participants to follow. Respondents were required to have access to the internet or mobile data to access and complete the questionnaire.

The design and compilation of the questionnaire entailed using existing as well as self-developed scale items that fit the objectives formulated for this study.

The final questionnaire was structured around five (5) main sections, as described below:

Section A

This section included the cover page that described the purpose of the questionnaire to the respondent. Participants had to confirm that they willingly agree to participate. It also explained that the questionnaire conformed to the ethical requirements as set by the University of Pretoria.

Section B

This section collected sociodemographic information from the respondents, which enabled the profiling of the sample (Li et al., 2020). A combination of linear numeric, visual analogue and dichotomous scales were used to capture demographic information.

Section C

This section collected information relating to consumers' organic purchasing and consumption practices.

Aspects investigated included frequency, preferred organic food product, and outlet as well as some reasons for buying organic:

Frequency	This question asked the respondent to choose from a tick box how often they buy organic fresh produce (how). The statements were coded where one indicated "daily", two "weekly", three "every time I buy groceries" and four "never". The convenience to access a certain food choice is an important factor to customers. The growth areas and distribution of organic produce are still somewhat limited, which can affect the frequency of consumers buying

	organic produce. This question was self-designed and developed specifically to determine the frequency with which consumers buy organic produce.
Preferred products	This question presented several options of organic fresh produce currently available in retail. Respondents were not limited in terms of their choices and could choose as many as they wanted. Each option had a coded value, which was used to calculate which products were chosen more often.
Preferred outlet	This question presented a drop-down menu from which respondents had to select the supplier or supermarket from whom they buy their organic food products (where). The options were randomised to prevent the respondent to be led to a specific answer.
Reasons for organic purchasing	This question allowed respondents to justify why they buy organic fresh produce by selecting one of the options available. Although this question was self-designed the options presented were retrieved from relevant literature (Barrena and Sánchez, 2010).

Section D

This section investigated respondents' subjective knowledge of food fraud using a 5-point scale Likert scale as previously designed by House et al. (2004). Four questions were posed to respondents, representing all four dimensions of food fraud (i.e. substitution, tampering, misrepresentation, and addition). Respondents were asked to rate their subjective knowledge of these dimensions on a five-point Likert scale where 1 described their knowledge as poor or not knowledgeable at all and 5 indicated that they considered themselves as extremely knowledgeable.

Section E

This section aimed at investigating respondents' objective knowledge of food fraud. Respondents were prompted to respond to 58 scale items using a three-point multiple-choice scale presenting True, False or Unsure as options were used to capture the responses. Included scale items reflected on the four main dimensions of food fraud (i.e. substitution, tampering, misrepresentation and addition)

3.2.5. Operationalisation

"Operationalisation" involves identifying and defining key constructs relevant to the research study, as well as appropriate dimensions of measure and indicators. This process supports the proper formulation of objectives and ensures that the design of the measuring instrument can be deemed as reliable and valid (Kumar, 2014:50).

Key constructs identified for this study included organic produce (Objective 1), food fraud (Objective 2), as well as consumer decision-making - particularly their information search and possible risk aversion during product purchasing (Objective 3).

Table 3.1. provides an overview of the operationalisation that underpinned this study.

TABLE 3.1.

CONCEPTUALISATION AND OPERATIONALISATION TABLE

CONCEPT	DIMENSIONS	INDICATORS	MEASURING INSTRUMENT	DATA ANALYSIS
Objective 1: To explore and describe consumers' current purchasing behaviour of organic fresh produce				
Organic produce	▪ Consumers' purchasing practices ▪ Consumers' consumption practices	▪ Frequency ▪ Preferred products ▪ Preferred outlets ▪ Motivation or reason for consumption	Section C	**Descriptive statistics** ▪ Mean values, percentage values and cross-tabulations
Objective 2: To explore consumers' knowledge of food fraud in order to identify possible elements of risk when purchasing organic produce				
Food fraud	▪ Substitution ▪ Tampering ▪ Misrepresentation ▪ Addition	▪ Subjective knowledge ▪ Objective knowledge	Section D & E	**Descriptive statistics** ▪ Mean value, percentage values **Inferential statistics** ▪ Analysis of Variance (ANOVA) ▪ Factor analysis
Objective 3: To explore and describe consumers' food fraud knowledge and how it relates to confident organic food purchasing practices that are less risky				
Consumer decision-making process	Based on a five (5)-step process, with specific focus on: ▪ Information search ▪ Purchase decision	▪ Consumer confidence ▪ Risk aversion	Section B, C & D	**Descriptive statistics** ▪ Mean value, percentage values and cross-tabulations **Inferential statistics** ▪ Analysis of Variance (ANOVA)

3.2.6. Pilot testing

To pilot the questionnaire, fifteen (15) respondents representing the unit of analysis within the target population and the research environment were approached to serve as a test group.

Respondents' completion rate (i.e., the time it took to complete), as well as their understanding of the survey, were key evaluation criteria. This approach helped to identify any ambiguous, offensive, or biased questions; and to ensure an optimal response rate (Kumar, 2014:11; Cooper & Schindler, 2014:108).

As part of the pilot, the respondents were asked to provide feedback on the complexity and time required to complete the questionnaire. Out of the test group of fifteen (15), three (3) respondents indicated that they felt the questionnaire was too long, and the questions were too ambiguous. Care was taken to clarify and simplify the specific questions highlighted during feedback.

3.2.7. Data collection

Primary data for the purposes of this study was collected during the period of July to September 2020. Data was collected through an electronic survey, from consumers residing in the Gauteng region.

Respondents could complete the questionnaire on an electronic device of their choosing, in their own time, and without the assistance of a fieldworker. The self-administered electronic questionnaire was distributed through e-mail, or multiple social media platforms (e.g., Facebook, LinkedIn and Instagram). This allowed for a wider reach of possible respondents.

Online research is deemed to be as effective as traditional research methods if conducted under strict guidelines (Creswell, 2014). In the case of this study, electronic questionnaires allowed the researcher access to respondents without requiring proximity. This was especially helpful during the quarantine period in South Africa due to the COVID-19 outbreak, as well as the fact that the researcher relocated to Australia while conducting the study.

3.3. Data analysis

Data analysis makes it easier to interpret larger data sets. The *Qualtrics* software that was used automatically captured that data and coded it electronically. Coding and the use of scores were used to group data responses. This would later assist in interpreting the data and understanding the results. The coded data were then transferred to SPSS (Statistical Package for the Social Sciences), a statistical software program, for further analysis. After the data was captured, the principal researcher was provided with the opportunity to review it.

Descriptive statistics were then used for initial statistical analysis. Descriptive statistics provide simple summaries of the observations that have been made (Kaushik and Mathur, 2014) and aid in better understanding the data by presenting it with the help of visual aids, including simple-to-understand graphs. Descriptive statistics helped interpret and make sense of results to make the key concepts easily understandable (Christensen et al., 2015). Results were presented in the forms of percentages, graphs, data distributions and histograms where applicable.

To delve deeper into the data, **inferential statistics** were applied to see how the data that was collected related to the research objective (Salkind, 2008). Christensen et al. (2015) recommend inferential statistics for researchers who want to go beyond just describing their data.

Inferential statistics performed in this study included:

- ***Factor analysis*** which deals with the relationship between observed measures or specific indicators e.g., test scores, and latent variables or factors (Brown and Moore, 2012). It allowed for the interrogation of respondents' objective knowledge.
- ***Correlation analysis*** was used to identify possible underlying relationships between the respondents' food fraud knowledge and risk aversion/confidence when buying organic fresh produce.

3.4. Quality of the data

For the study to be factually correct, and to carry enough weight to be considered for future reference within academia, the quality of the data was a vital consideration.

The accuracy and reliability of the data will also warrant the importance of this study to be published or not.

3.5. Validity

Validity can be defined as the "truthfulness or accuracy within the score of a test or interpretation of an experiment" (Salkind, 2008). It determines whether the research can scientifically answer the question that it is intended to or the ability of a measuring instrument to measure what the researcher has predetermined it to measure as stated in his/her aims and objectives (Kumar, 2014, Leedy, 2005).

To ensure the validity of the research, other researchers, and academics with specialised knowledge in this field were requested to read through the research. By conducting this step, it enabled the researcher to make improvements and further develop questions before they were distributed. Leedy (2005) stresses that the validity

of your study must assist you to “obtain statistical significance in your data analysis, and the extent to which you can draw meaningful conclusions from your data”.

Kumar (2014) and Salkind (2008) both list various types of validity, of which the most established are content validity, face validity, criterion validity, and construct validity. For this research, the following types of validity were considered:

3.5.1. Face validity

Kumar (2014) explains that to establish whether your measurement instrument is measuring what it’s supposed to, it can be judged based on the logical link between the questions and the objectives of the study. This link is called face validity.

The questions in this study were formulated to establish a logical link between the objectives listed in **Table 3.1.**, to ensure they were measuring the dimensions and indicators that were included in the questionnaire.

3.5.2. Construct Validity

Construct validity is a technique applied to ascertain if the researcher’s measuring instrument truly tests what it is intended to, based on statistical procedures. It links each construct of the test result to the underlying theory that the researcher has presented (Kumar, 2014, Salkind and Rainwater, 2012).

This type of validity is the most time consuming but also the most popular for its accuracy. Construct validity was achieved through a comprehensive literature review that outlined the applicable concepts, as well as thorough proper operationalisation.

3.6. Ethical considerations

Ethical considerations are important when conducting research (Creswell, 2014). Ethical behaviour is based on a set of beliefs about what is morally right and wrong(McIntosh, 2013). De Vos (2011) defined ethics as an acceptable set of principles and morals expected from a researcher towards study respondents.

Ethical consideration, therefore, aims to ensure that participants in the study are not deceived in any way and that they are fully aware of the objectives and expectations during their participation in this study.

- Participants were assured of their anonymity or in the case where their anonymity could not be guaranteed due to the nature of the study or contact with the researcher, that their information and opinions would be held confidential. The anonymity of each respondent was preserved as no personal details were required except for supplying an email address that was voluntary to assist in the identification process. Should they be identifiable through their email address, the confidential storage of this information was also ensured.

- All participants willingly took part in completing the questionnaire and were in no way coached or intimated.

- Participants were made aware that should they want to withdraw from participation at any time, they could do so without discrimination or victimization. For transparency, the aims and objectives of the study were thoroughly communicated and clearly explained.

- A consent form was compiled by the researcher and first approved by the Ethics Committee of the Natural and Agricultural Faculty of the University of Pretoria. Ethical clearance was granted on the 13th of March 2020, reference number

NAS474/2019 – attached as **Annexure C**. Before respondents completed the questionnaire, they were asked to sign this consent form, agreeing that they fully understand the questionnaire and what would be expected of them during the study.

- The methodology and research design were disclosed. The researcher did not change or manipulate the results of the data. If any of the respondents were interested, they were welcome to view the results of the study.

3.7. Conclusion

This chapter explained that the appropriate research design and data collection methods were carefully considered for the purpose of this study to ensure that the resources available were optimised. The necessary data was collected in a single-phase employing an electronic questionnaire from consumers residing in the Gauteng region. The study followed a cross-sectional approach, where respondents were gathered via a combination of convenience and snowballing.

The data collection and analysis were conducted in a way that focused on the implementation of reliability and validity throughout all the processes of the study. Ethical clearance was first sought from the Ethics Committee at the University of Pretoria before the study commenced. Furthermore, ethical guidelines were implemented to ensure the quality of the study.

Chapter 4 presents the results and discussion of the study considering the aims, objectives, and research questions set out in this study.

CHAPTER 4: RESULTS AND DISCUSSION

This chapter presents the results of the study in terms of the formulated objectives and sub-objectives. The results are introduced by providing an overview of the demographic characteristics of the population sample. It then details the findings related to the first two research objectives: findings on behaviour pertaining to organics as a food product category (Objective 1); findings on consumers' level of objective and subjective knowledge of food fraud (Objective 2). To conclude, Section 4.4. then synthesises findings on consumers' vulnerability when buying organics by exploring the underlying relationship between consumers' food fraud knowledge and their current confidence in this said product category (Objective 3).

4.1. Introduction

The information presented in this chapter was collected via an electronic survey that was distributed amongst Gauteng residents during June to Sept 2021. The data collection process gathered 323 responses which were filtered for completeness and yielded a sample with 218 responses (N=218).

Section 4.2 presents the demographic characteristics of the sample. This is followed by a presentation of the results in terms of the objectives formulated.

4.2. Demographic profile of the sample

TABLE 4.1.

DEMOGRAPHIC CHARACTERISTICS OF THE SAMPLE

DIMENSION	FREQUENCY	PERCENTAGE
Gender (*n*=218)		
Male	48	22%
Female	166	76.1%
Other	4	1.8%
Age (*n*=217)		
Generation Z (18-24 years)	13	6%
Millennials (25-40 years)	127	58.8%
Generation X (41-56 years)	77	35%
Population group (*n*=217)		
White	210	96.8%
Black African	1	0.5%
Indian	3	1.4%
Asian	1	0.5%
Coloured	1	0.5%
Other	1	0.5%
Level of education (*n*=217)		
Grade 12 completed	21	9.7%
Grade 12 plus a degree or diploma	92	42.4%
Postgraduate completed	104	47.9%
Home language (*n*=203)		
English	81	39.9%
Afrikaans	118	58.1%
Ethnic South African Languages	1	0.5%
Average monthly household income (*n*=178)		
<= R15 000	11	6.2%
R15 001 - R25 000	15	8.4%
R25 001 - R35 000	28	15.7%
R35 001 - R45 000	25	14.0%
R45 001 - R55 000	28	15.75
R55 001 - R65 000	30	16.9%
R65 001 - R75 000	18	10.1%
R75 001 - R85 000	23	12.9%
Marital status (*n*=215)		
Single without children/divorced/widowed	59	27.1%
Single with children	9	4.2%
Couple/Married (without children)	52	24.2%
Couple/Married (with children)	95	44.2%

The gender, age, marital status, household income, education level, home language, population group and the number of members in a household formed part of the demographic information requested from respondents in **Section B** of the questionnaire (see **Annexure A**). This data was used to not only characterise and profile the sample but also allow for further statistical analysis (e.g., cross-tabulations).

4.2.1. Gender distribution

The findings regarding the gender distribution indicated that the sample was dominated by female respondents at 76.1% (*n*=166) compared to the males, who comprised of 22% (*n*=48). Four respondents did not indicate their gender (n=4).

Data from the Department of Statistics South Africa concluded that in SA the female population exceeds the male population by 1 million. The latest data indicated females represent 28.86 million (51.02%) compared to males representing 27.7 million (48.97%) (Stats SA, 2019). Even though there have been some changes over the years in the male breadwinner/ female homemaker family model, research done by Cunningham (2008), indicated that women are still viewed as the primary caretakers of the family, therefore their purchasing patterns and knowledge of areas such as food fraud is considered as valuable.

In a study on South African consumer's "willingness to pay" (WTP) for organic produce, Engel (2009) found that females are often still identified as being primarily responsible for not only grocery shopping but also for the general wellbeing of their households. The study furthermore indicated that due to this they are more prone to consider products such as organics and are also more willing to pay a premium for these products compared to men. This might explain why females were more likely to partake in the survey willingly and complete it

to the end. Due to the non-completion of questionnaires filled in by male respondents, the demographics showed a skewed sample, especially towards white respondents, thus care was taken not to falsely make any conclusions.

4.2.2. Age

This study required all participants to be at least twenty-one (21) years or older as the researcher required insight from consumers who are responsible for purchasing or are the primary decision-makers concerning food purchasing. Respondents could select their age using a sliding scale. The results were then grouped into the universally known generational cohorts[14] (Lissitsa and Kol, 2016, Gurău, 2012) to simplify comparison with other studies.

Martins et al. (2011) explain that industry role-players often use this information to target consumer segments with a personalised marketing mix. Thus, age categories can be useful to indicate which age groups might be more willing to engage with products such as organics (Chaney et al., 2017).

Engel (2009) found that the consumers who are the most willing to buy organic produce fall within the late twenty- to forty-year-old group. This is fortunate for the current study as 58.8% (*n*=127) of the respondents fall within the Millennials cohort, who are aged 25-40 years in the year 2021. The X Generation (41–56-year-olds) makes up 35% (*n*=77) of the sample while Generation Z is only 6%.

[14] Inglehart,1977

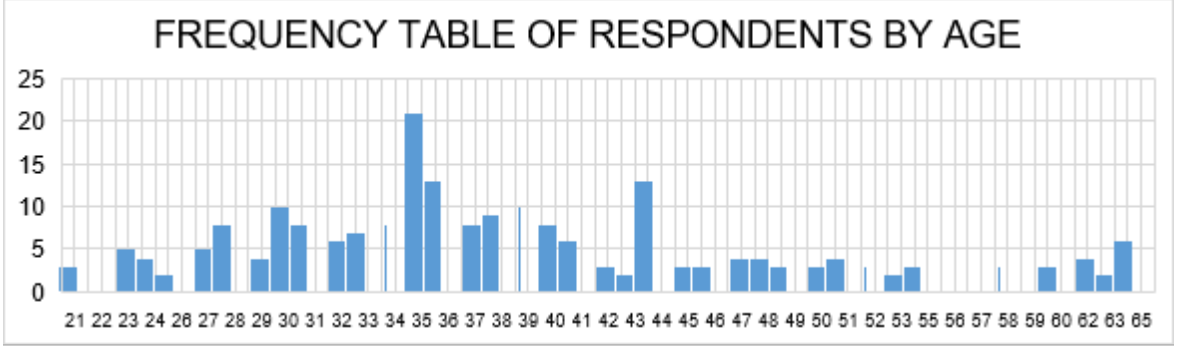

FIGURE 4.1

AGE DISTRIBUTION OF RESPONDENTS

Figure 4.1. above presents the age distribution. Results indicate that the mean age for the sample is 39.25, while the median is 37 and the most prevalent age (mode) is thirty-five (35) years.

4.2.3. Marital status

In terms of marital status, most respondents were couples or married with children at 44.2% (*n*=95). Single, divorced or widowed but without children contributed to 27.1% (*n*=59) of the respondents, which was closely followed by couples or married without children at 24.2% (*n*=52).

Sekhampu (2012) presented that household size is a significant contributor to food consumption behaviour in South Africa, particularly in terms of food expenditure where larger households, tend to spend more in terms of grocery shopping (Sekhampu, 2012).

(Katz-Wise et al., 2010) noted that a significant division of household chores occur after the birth of the first child and that household labour is often subjected to gender differentiation. Currently, in South Africa, the bulk of housework is still

performed by women and as mentioned earlier, women as caregivers, are often prone to buy organic produce as it is perceived as “better or healthier options” (Engel, 2009). This does not only expose women but also their households to a higher level of risk when considering food fraud in this organic product category.

4.2.4. Household income

Respondents were asked to specify their average monthly household income on a sliding scale question rounded up to the nearest R1000. This question was optional as disclosing income may be viewed as private information. The research results presented in **Table 4.1** indicate that only 6.2% (*n*=11) of the sample fell within the lowest income group (0 - R15 000). This income group also falls below the national average.

The next group stated that they earn between R15 001 – R25 000 (8.4%) and earns an average income for the middle-class. Almost 30% of the sample earns between R25 001 - R35 000 (15.7%), and R35 001 - R40 000 (14%), which would allow them to afford an above-average lifestyle. The majority of respondents (55.55%) in the sample earned well above the R40 000-level, which would enable them to live an affluent lifestyle and afford more luxury items (Lissitsa and Kol, 2016).

Research by Pearson et al. (2011) found that even though organic buyers are represented by all demographic segments, a few micro-trends are identified, highlighting that these consumers tend to be more affluent, females with young children that may have a higher level of education. This socio-economic placement enables these consumers to adopt more “expensive purchasing and consumption behaviour” (Ferreira, 2014) of which organic fresh produce forms a part. Thompson (2000) has confirmed this and presented that there is a

positive correlation between per capita income and procurement of organic food, suggesting that it is still considered a luxury item that is mostly purchased by higher income groups.

4.2.5. Level of education

The level of education is often viewed as an influencing factor in product purchase and consumption decisions (Simon, 2018, Golub and Binkley, 2005, Hallström et al., 2011, Bogue and Yu, 2016). Respondents in this study were asked to provide their highest level of education in a drop-down multiple-choice question. As seen in Table 4.1, most of the sample completed at least secondary levels, namely Grade 12, with 9.7% (*n*=21). 42.4% (*n*=92) of the respondents completed a tertiary level qualification, namely a diploma or a university degree and 47.9%(n=104) achieved the highest level of education, a postgraduate degree. Compared to the general South African population, of which 55.9% have not completed secondary i.e., Grade 12 levels in 2020, this sample presented the higher educated group of respondents (Statista, 2020c).

Studies done globally and nationally confirmed that a higher level of education is often viewed as a precursor for “greener, healthier and in particular organic” consumer behaviour (Engel, 2009).

4.2.6. Home language

Respondents were asked to select their home language from a drop-down, multiple-choice question. As seen in **Table 4.1.**, more than half of the respondents (58.1%) spoke Afrikaans, followed closely by English speaking respondents who represented 39.9% (n=81) of the sample. Other languages were not strongly represented; hence they were grouped together, accounting for 0.5% of the respondents. Although it was not the intention of the study to

represent the greater South African population, this is not in line with the latest national language distribution. The latest official data from 2018 indicates the home languages as follows; English 8%, Afrikaans 12%, Zulu 25%, and the other official languages at 55% (Statista, 2020e).

4.2.7. Population group

The population group is indicated by (Cullen et al., 2007) as a significant precursor for food product selection and consumption decisions. Respondents in this study were asked to indicate to which population group they belonged (according to the *Employment Equity Act* No.55 of 1998) using a drop-down multiple-choice scale.

The population group of the study was predominantly White (96.8%, *n*=210). Black African, Indian, Asian and Coloured respondents comprised less than 4% of the sample. This is not in line with the population distribution at the last census in 2011 which specified that the South African population was 79% Black African consumers, 9% White, 9% Coloured and 3% Indian or Asian (StatsSA, 2016), it should thus be noted that it was never the intention to represent the greater South African population. The skewness of the sample could be attributed to the sampling technique that was implemented. One of the limitations of convenient sampling is that it could lead to misrepresentation of population groups (Wiid and Diggines, 2009).

Because the sample was not representative of the population, the researcher did not attempt to run ANOVAs on the data pertaining to population groups.

4.3. Results related to the objectives of the study

The following discussion is guided by the objectives formulated for the study:

- **Section 4.3.1.** starts by providing an overview of the sample's behaviour and engagement with organics as a food product category (Objective 1).

- **Section 4.3.2.** presents findings on consumers' knowledge of food fraud (Objective 2), exploring possible results differences in terms of subjective and objective knowledge. This section also includes the identification of how these dimensions might be miss-aligned and could therefore expose consumers to unnecessary risks of food fraud.

- **Section 4.3.3.** presents findings on the underlying relationship between consumers' knowledge and self-reported confidence in this said product category to establish if consumers might be exposed to risks when buying organic produce.

4.3.1. Consumer behaviour within the organic produce market (Objective 1)

In South Africa, a rise in the sale of organic produce is evident (Mordor Intelligence, 2019). This could be attributed to better access and availability as well as prevailing consumer trends such as health and wellness (Kaur & Singh, 2014; Deloitte & Brands' Eye, 2020). Consumers' needs for products with healthier and more sustainable traits such as organics coupled with the industry growth have created a highly competitive environment. Industry role players that want to gain a competitive edge, therefore, need to understand how their target market purchases and consumes their products (Ratneshwar et al., 1999). It is therefore important to explore and describe consumers' purchasing patterns within this product category.

Section C of the questionnaire captured information on consumers' behaviour within the organic product category.

It should be noted that the data for this study were collected between July and September of 2020, which fell within the South African COVID-19 nationwide lock-down (Level 4 and 5) which not only limited consumer movement but also their purchasing practices.

TABLE 4.2.

CONSUMER BEHAVIOUR AND ENGAGEMENT WITH ORGANICS

DIMENSION	FREQUENCY	PERCENTAGE
Primary grocery shopper (*n*=218)		
Myself	17	77.9%
Partner	2	12.8%
Other	2	9.17%
Organic produce purchase frequency (*n*=218)		
Daily		2.8%
Weekly	10	49.3%
Monthly	8	36.9%
Never	2	11%
Preferred purchasing outlet for organics (*n*=209)		
Formal retail chain (Woolworths, Checkers, PnP, Spar)	16	78.9%
Farmers' market		2.8%
Online & Home delivery Service		1.4%
Other	3	16.7%

This section presents an overview of the sample's behaviour and engagement with this product category. Results are presented in the following order: the primary grocery shopper, purchase frequency, preferred outlet, product preference main reason for consuming organics. In specific instances, significant values are highlighted in yellow.

i. Primary grocery shopper

Recent research indicated that during 2019, most households in developed countries such as the USA and the UK shared the responsibility of grocery shopping between partners and that men were becoming more involved and responsible for decisions on grocery shopping (Statista, 2021). To investigate the main decision-makers and target market of organic produce in South Africa, respondents were asked to select the primary household member responsible for grocery shopping on a drop-down multiple-choice question.

As seen in **Table 4.2.**, 78% (n=170) of respondents indicated that they were primarily responsible for their household grocery shopping, whereas 12.8%(n=28) selected the partner and 9.17%(n=20) selected that someone else is responsible for this. Compared to the gender distribution of the sample (that comprised mostly of female respondents), this was not considered a distortion of the data. However, to confirm this and to review if and how this South African sample compared to global standards i.e., shared or transfer of grocery shopping to spouses/partners in particularly male counterparts, a more detailed cross-tabulation was performed.

The results presented in **Table 4.3.** confirm that, in terms of grocery shopping, compared to global standards, South African consumers still conform to traditional values where grocery shopping is still commonly done by one person who is likely to be female (Ferreira, 2014).

TABLE 4.3.

GENDER DISTRIBUTION AMONGST PRIMARY GROCERY SHOPPERS (CROSS-TABULATION)

		PRIMARY GROCERY SHOPPER					
		Myself	**Mother**	**Father**	**Other**	**Partner**	**TOTAL**
GENDER	**Male**	25	3	2	1	17	**48**
	Female	144	9	1	2	10	**166**
	Other	1	1	0	1	1	**4**
	TOTAL	**170**	**13**	**3**	**4**	**28**	**218**

Cant and Scheers (2012) confirmed this by stating that although the scales of gender equality in South Africa has become slightly more balanced over the years, women are still considered to be the primary caregivers in a household and the responsibility of buying groceries are still seen as a "female task". In table 4.3, the gender division is shown to be consistent with the literature. In the row for Female, 144 respondents reported that they do the purchasing, 9 reported that the mother is responsible, while 17 males reported that their partner (assumed female) is responsible. We can therefore calculate that 170 of the 218 buyers are female (77%), 37 of the 218 are male (16.9%) and 11(5.04%) are not calculable using the current data.

ii. Purchase frequency of organic fresh produce

Pearson et al[15], (2013), noted that purchase frequency amongst the organic produce market still tend to be limited and suggests that more research is needed to discover why this is the case. To investigate the sample's purchase

[15] https://www.organic-systems.org/journal/82/8206.pdf

frequency, respondents were asked to specify the number of times per week that they purchased organics on a sliding scale question.

Results presented in **Table 4.2.** indicate that 49.3% (*n*=107) of respondents predominantly buy organics weekly compared to 36% of the respondents who purchase organics monthly (*n*=80). A mere 2.8% of respondents said they buy organic goods daily (*n*=6), whereas 11.1% of the respondents indicated that they never buy organic food (*n*=24).

Buder et al. (2014) has found that one of the greatest barriers to consumers buying organic produce regularly is supply shortages of products. High price premiums are also one of the main purchasing barriers, followed by lack of information, poor presentation of products in-store and mistrust in the organic labelling. Pearson et al., (2013) also confirm that if consumer trust and loyalty is not fostered early or during the adoption phase of this product category consumers tend to easily revert to conventionally produced items, affecting the growth potential of this product category.

Interestingly multiple authors did note that although purchase frequency amongst the general consumer population might be considered as low, loyalty and interest is evident amongst younger consumer groups, such as Generation Z and Millennials (Pearson et al., 2011, Barrena and Sánchez, 2010). To confirm this and to review if and how respondents from this sample compared to the findings presented in the above-mentioned studies a cross-tabulation was performed.

TABLE 4.4.

AGE DISTRIBUTION VS SHOPPING FREQUENCY

(CROSS-TABULATION)

		How often do you buy organic food?				
		Daily	**Weekly**	**Monthly**	**Never**	**TOTAL**
Generation Z (18-24years)	Count	0	5	7	1	13
	% of total	0.0%	2.3%	3.2%	0.5%	6.0%
Millennials (25-40 years)	Count	1	58	54	14	127
	% of total	0.5%	26.9%	25.0%	6.5%	58.8%
Generation X (41-56 years)	Count	4	44	19	9	76
	% of total	1.9%	20.4%	8.8%	4.2%	35.2%
TOTAL	**Count**	**5**	**107**	**80**	**24**	**216**
	% of Total	**2.3%**	**49.5%**	**37.0%**	**11.1%**	**100.0%**

The results presented in **Table 4.4.** indicate that in terms of shopping frequency, respondents from this sample that mostly purchased organics and hence could be viewed as a possible target market tend to be from the age group 25-40 years i.e., the Millennials (58.8%), who prefer to purchase organics weekly (26.9%) and monthly (25%). Results furthermore indicated that Generation X, (41–56-year-old), also prefer to make weekly purchases (20.4%).

Barrena and Sánchez (2010) also found a positive correlation between consumers organic shopping frequency and age, their results particularly showed that younger age segments were more willing to pay the premium associated with organic goods.

iii. Preferred outlet for organic produce

Recent research highlighted that retailer attributes such as those found in the marketing mix (i.e., place) plays a fundamental role in consumer decision-

making and ultimately product selection (Makhitha and Khumalo, 2019). To investigate consumers' preference in terms of "place" when buying organics respondents were asked to select their preferred outlet from a list of options that included both formal and informal retailing outlets. Results (as presented in **Table 4.2.**) indicated that respondents were more likely to purchase organics from formal retail outlets (*n*=165, 78.9%) compared to less conventional/informal options i.e., farmer's markets (*n*=6; 2.8%).

This is unfortunate, as these markets often offer a wide variety of organic fresh produce at very reasonable prices (Tung, 2016). The fact that these markets are predominantly only open over weekends might also affect consumers patronage, as they are not as convenient as more formal retailers. McGuirt et al. (2018) support this theory, stating that "accessibility to healthy food, primarily measured using distance to food outlets such as supermarkets and farmers' markets, impacts population-level dietary behaviours". Their research also suggests that the more accessible a food outlet is, the larger the influence will be on shoppers shopping and dietary behaviours.

Vukasovič (2016) had similar findings during his research, which indicated that 45% of his respondents chose the convenience of shopping malls to purchase their fresh produce, where only 23% chose open-air markets. The rest of the respondents chose health shops or buying directly from the producer.

In terms of online and home deliveries, this study indicated that only three (3) respondents (1.06%) opted to buy their organics via this option, it was interesting to note this due to the widespread sudden surge in online grocery shopping in South Africa (due to COVID-19 restrictions).

4.3.2. Preference and purchasing of organic products

Expansion of the organic food market over recent decades can largely be attributed to consumers choosing it as an expression of their concern for their health and well-being (Smith-Spangler et al., 2012). Despite this interest and rise in consumption, most consumers remain resistant to purchasing a wide array of goods in this product category. Pearson et al. (2011) noted that consumption is mostly focused on product lines such as fruit and vegetables. Vukasovič (2016) concluded that fruit and vegetables are perceived as "the most valuable category" for the future of organic products as consumers tend to perceive organic fruit and vegetables to be healthier, tastier and of better quality than their conventionally grown counterparts.

To investigate organic product purchases amongst this sample, respondents were asked to select the products they mostly buy from a list of 25 organic food products widely available in South Africa.

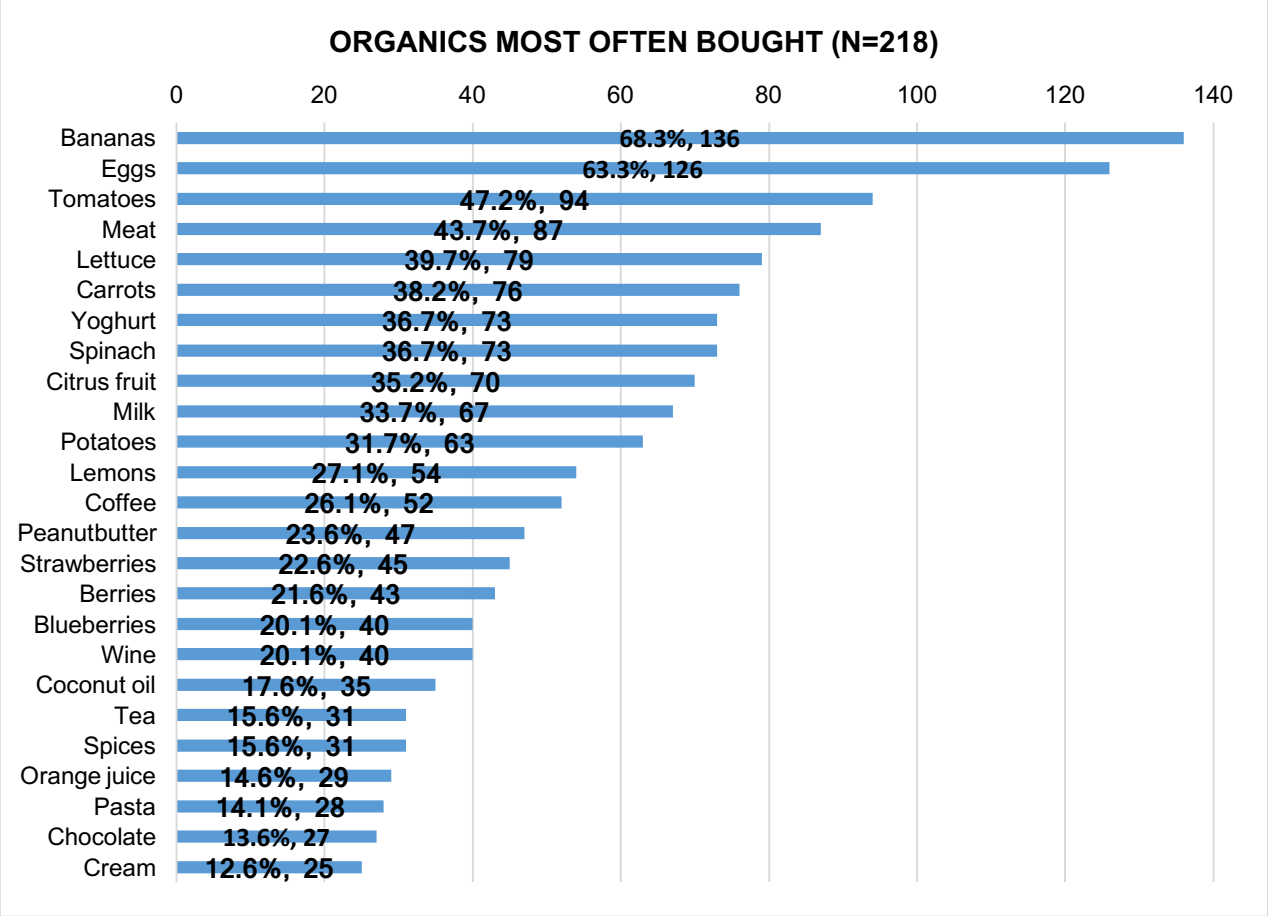

FIGURE 4.2.

ORGANIC FOOD ITEMS MOST OFTEN BOUGHT BY CONSUMERS

Results as presented in **Figure 4.2.** above, confirmed findings as presented in Pearson et al (2011) and Vukasovič (2016) as it indicated that respondents mostly purchased fresh produce compared to other ambient items such as tea, spices and pasta.

Overall organic bananas were purchased the most with 68.3% of the sample selecting this product. Eggs were the second highest, with 63.3% of respondents claiming they buy organic Eggs. Upon closer inspection, the researcher found that a possible reason for the high level of support for organic

bananas amongst this sample might have been a slight price difference compared to the conventional alternative. At the time that this research was done, the cost of 1.2kg organically certified bananas at a prominent retailer was less than their non-organic alternatives, albeit by an exceedingly small margin.

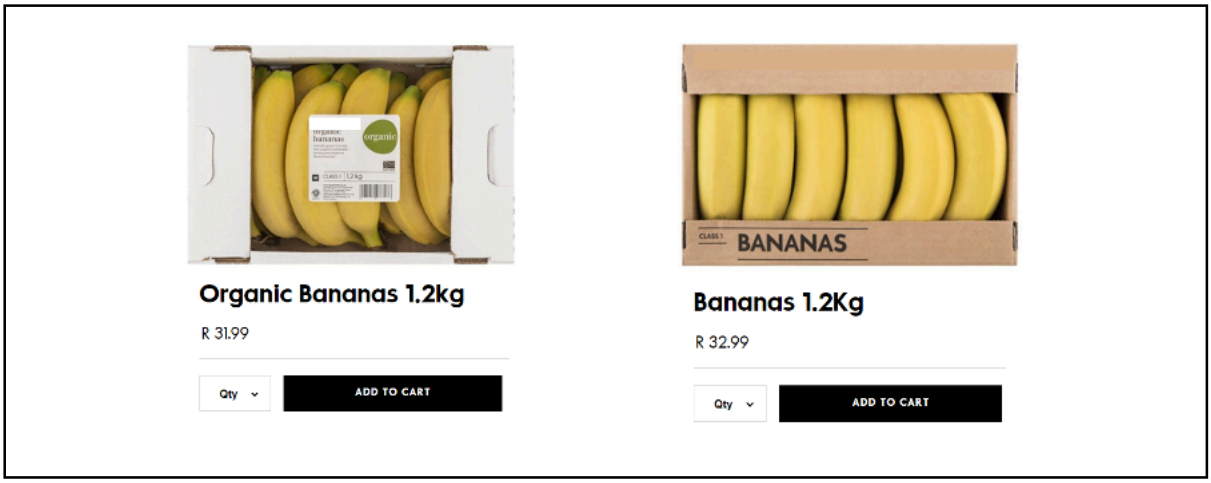

FIGURE 4.3.

PRICE COMPARISON OF ORGANIC VS COMMERCIALLY GROWN BANANAS

4.3.3. Reasons for buying organic

Pearson et al. (2011) found that the three most common reasons (in descending order) for purchasing organic foods are, seeking healthy food products, concern for the natural environment, and desire for superior food quality. However, it was also noted that these reasons varied amongst consumers due to different demographic characteristics. For marketing purposes, it is useful to note these differences to segment and target consumers more successfully (Pearson et al., 2011).

To identify possible reasons for purchasing and consuming organics respondents in this study were asked to select their main reason from a list of 8 possible options. Scale items for this question were identified and conceptualized from relevant literature.

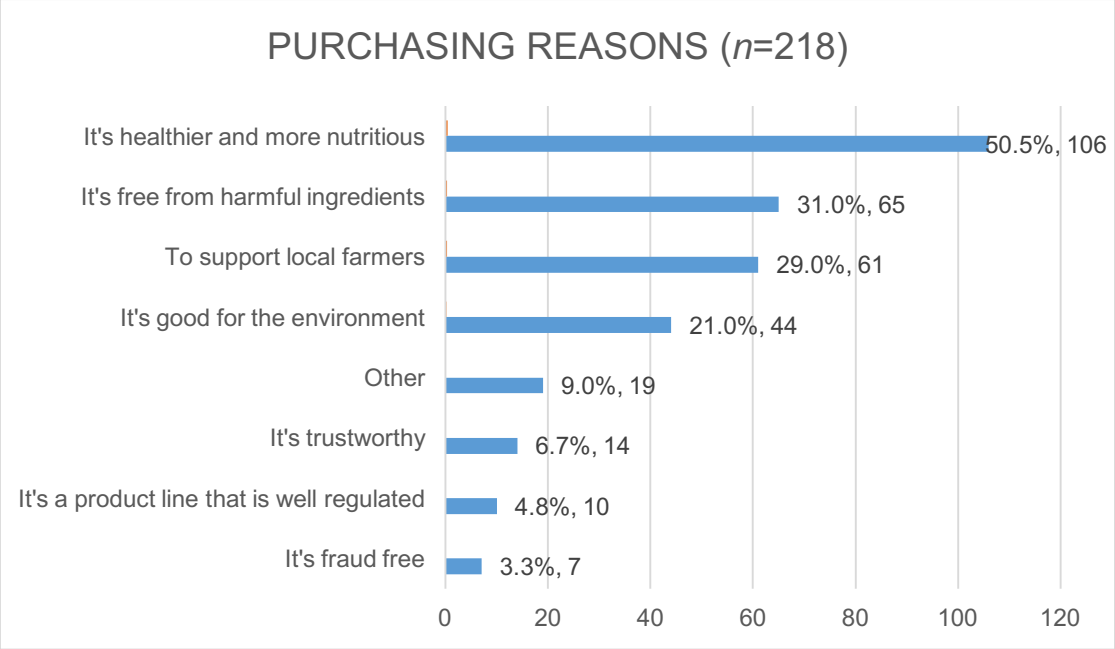

FIGURE 4.4.

REASONS FOR RESPONDENTS TO BUY ORGANIC PRODUCE

Results presented in Figure 4.5 indicate that amongst this sample the most popular reason for purchasing and consuming organics is a need for healthier and more nutritious products (n=106; 50.5%), because it is free from harmful ingredients (n=65, 31%), and because they wish to support local farmers (n=61, 29%). This corroborates the findings as highlighted in Pearson et al. (2013).

Noting the reasons for organic purchasing and consumption in this study was important as it revealed avenues that could be used to improve consumers' knowledge about this product category. By doing so consumers become more

empowered and exposure to unnecessary risks are limited. Barrena and Sánchez (2010) confirmed that consumer knowledge of products such as organics is directly related to their engagement and ultimate confidence when buying these products.

4.4. Consumers' knowledge of food fraud and consequential misalignment between knowledge dimensions

The previous section of the study was allocated to presenting and describing the demographic and consumption behaviour of the respondents as well as the profile of the sample.

The following section will present the sample's knowledge of food fraud, particularly their subjective and objective knowledge as well as possible miss-alignment between knowledge dimensions. The latter is important as this could identify a possible existence of the Dunning-Kruger effect amongst the sample, which according to literature often result in overly confident consumers and ultimately contribute towards consumers being less risk-averse hence, more vulnerable when buying products such as organics.

The following findings and discussions are organised under the following objectives:

- Consumers' subjective knowledge of food fraud (Objective 2.1).
- Consumers' objective knowledge of food fraud (Objective 2.2).
- Possible areas of concern pertaining to consumers' objective knowledge (Objective 2.2.1).
- Possible miss-alignment between consumers' objective and subjective knowledge of Food Fraud (Objective 2.3).

- To explore and describe consumers' food fraud knowledge and how it relates to confident organic food purchasing practices (Objective 3).

4.4.1. Consumers' subjective knowledge (Objective 2.1)

When considering consumers' understanding of food fraud, Scribner and Weun (2000) describe *subjective knowledge* as "an individual's **perception** of how much they know about a product category, including brands, attributes, evaluations, decision heuristics and usage situations".

Figure 4.5. presents the specific scale items and the mean results.

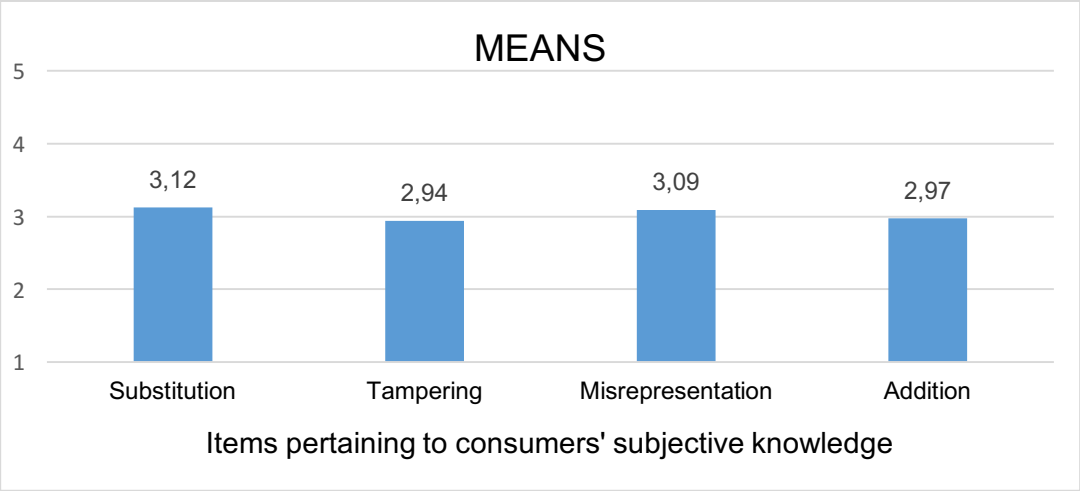

FIGURE 4.5.

CONSUMERS' SUBJECTIVE KNOWLEDGE OF FOOD FRAUD CONSTRUCTS

Participants were requested to respond to four scale items that compared their perceived knowledge to that of their peers. Scale items represented the four constructs of food fraud – *Addition*, *Misrepresentation*, *Substitution* and *Tampering*. A 5-point Likert type scale ranging from 1 (Not knowledgeable at all) to 5 (Extremely knowledgeable) was used.

Any mean higher than 2.5 were considered as an indication that the respondents have a favourable view of their subjective knowledge. Overall, the data indicate that in their own opinion, the respondents were confident about their subjective knowledge on three of the four constructs of food fraud when compared to that of their peers. The respective means revealed that the respondents perceived themselves as most knowledgeable about *Substitution* (3.12) and *Misrepresentation*, (3.09), while the mean of the scale items *Addition* (2.97) and *Tampering* (2.94) had the lowest means. All the dimensions had means that were very close to the "moderately knowledgeable" level at Likert scale anchor point 3.

It was interesting to note that *Substitution* was an area where the respondents felt that they were not more knowledgeable compared to their peers. Recent media articles have focused on *Misrepresentation* in the form of labelling, which could result in consumers finding it easier to identify it as they are more often exposed to the subject, for example, Muslim foods where gelatin is used (Ruslan et al., 2018).

Substitution is not necessarily a popular media topic and will not be an obvious topic of discussion to consumers. In conclusion, as most respondents reported their subjective knowledge compared to their peers was moderate, and therefore admitting they have limited knowledge, they might expose themselves to uninformed purchasing decisions which could put them at risk of buying tampered, misrepresented, substituted products or products that have been subjected to added ingredients.

4.4.2. Consumers' objective knowledge (Objective 2.2)

It is said that consumers' knowledge in particularly their objective knowledge plays an important role during purchasing and consumption of food products such as organic fresh produce (Park et al., 1994). **Objective knowledge** pertains to the actual amount of accurate information stored in a person's memory (Brucks, 1985, Park et al., 1994, Venter, 2017). i.e., the actual definition of food fraud (only a right or wrong answer).

In terms of this study, the goal of Objective 2.1 was to ascertain the objective knowledge that consumers have of food fraud. Because objective knowledge is viewed as a possible tool to improve consumers' ability to evaluate, purchase and consume organic produce more wisely and responsibly" (Graham-Rowe et al., 2014), this investigation hoped to not only provide valuable insight regarding consumers actual understanding of food fraud but also identify possible areas of concern that could expose consumers to unnecessary risks when selecting and purchasing of organic products.

To measure consumers' objective knowledge, the participants were asked to respond to a list of fifty-eight (58) self-designed questions/scale items that represented the four (4) main dimensions identified for food fraud i.e., *Addition*, *Misrepresentation*, *Substitution* and *Tampering*. Each dimension was represented by at least fourteen (14) scale items that were identified from the literature. A three-point multiple-choice scale presenting *True*, *False* or *Unsure* as options were used to capture the responses.

Initial data analysis included calculation of a total score for respondents' objective knowledge by summing the number of factually correct for each of the *True*, *False* or *Unsure* statements. Thereafter the mean value was calculated for each dimension.

A summary of the *Objective Knowledge* results is presented in **Table 4.5**.

Results were interpreted as follows:

- a score < 50% was interpreted as a poor reflection of *Objective Knowledge*.
- 50 > 59%: average.
- 60 > 69%: above average.
- 70 > 79%: good.
- 80 > 89%; very good, and
- ≥ 90% excellent.

TABLE 4.5.

CONSUMERS' OBJECTIVE KNOWLEDGE SCORES

Dimension	Sample size	Scale items as per questionnaire	% correct answers	Level of knowledge
Misrepresentation	217	Q36-Q49	60%	Above Average
Substitution	217	Q65-Q80	52%	Average
Tampering	217	Q50-Q59, Q61-Q64	51%	Average
Addition	217	Q22-Q35	43%	Poor
Overall Knowledge	**217**	**Q22-Q80** (excl. Q60, duplicate)	**52%**	**Average**

Results as presented in **Table 4.5.** indicate that respondents' *Objective Knowledge* of food fraud is average (52%). The average score for *Misrepresentation* is above average (60%), while the average score for *Addition* is poor (43%). This is concerning, as the literature review indicated that lower levels of objective knowledge could potentially expose consumers to unnecessary risks when buying credence products such as organics (Pearson et al., 2011).

In the next section, we explore the scores for each dimension and further elaborate on the objective knowledge of respondents.

i. Addition

TABLE 4.6.

CONSUMERS' OBJECTIVE KNOWLEDGE SCORE FOR *ADDITION* (*n*=217)

Item	Evaluation statement	Total correct	% correct
25	Peanuts may be added to basil pesto without declaring it on the label	179	82.5%
29	Organic produce means it is free from the addition of pesticides	158	72.8%
28	If less than 10% of horsemeat is added to beef patties it doesn't need to be declared on the label	126	58.1%
24	Dextrose or maltodextrin must be declared as bulking agents on product labels	112	51.6%
34	An example of food fraud is copper added to paprika for a brighter colour	107	49.3%
32	Lead bromate is an approved colourant to make turmeric a bright yellow	89	41.0%
26	Ascorbic acid is a natural preservative and may be added to baby food to prevent browning	84	38.7%
30	Sudan red is an accepted food colouring used to colour cakes and pastries	79	36.4%
31	Melamine is an approved flavour enhancer for pet food	76	35.0%
22	Natural colours are legally added to red wine	73	33.6%
35	10% of flour can be added to cinnamon to prevent lumping	70	32.3%
33	Copper sulfate is an illegal additive used to dye table olives	67	30.9%
23	Soybean meal can be added to milk powder to increase the protein content	54	24.9%
27	A small percentage of stabilizer can be added to 100% fruit juice to suspend orange cells	46	21.2%
	AVERAGE SCORE		**43.45%**

When considering the results on *Addition* as presented in **Table 4.6.**, it is noted that respondents achieved the lowest overall score on this dimension, yet

individually, respondents appeared to be well informed about organic produce. A possible reason for this might be recent sustainability campaigns highlighting the fact that organics are beneficial towards ecosystems due to them being free from pesticides (Barański et al., 2014).

ii. Misrepresentation

TABLE 4.7.

RESPONDENTS' OBJECTIVE KNOWLEDGE SCORE FOR *MISREPRESENTATION* (*n*=217)

Item	Evaluation statement	Total correct	% correct
47	Misrepresentation is a form of food fraud where a false or misleading statement is made about a product for economic gain	198	91.2%
49	Food misrepresentation occurs when a food product's label does not accurately reflect its ingredients	197	90.8%
39	Misdeclaration of the country of origin is illegal	191	88.0%
38	Marketing conventionally produced agricultural products as organic is a form of misrepresentation	180	82.9%
48	All dairy components must be represented on the product label	178	82.0%
45	The botanical origin of honey is often misrepresented for economic gain	154	71.0%
43	Organic food is often misrepresented as more nutritious than conventionally produced food	153	70.5%
41	To falsely claim that commercially grown cashew nuts are "fairtrade" is a form of misrepresentation	146	67.3%
42	Yoghurt labels often misrepresent containing live probiotic bacteria	116	53.5%
36	Reverse osmosis water can be labelled and represented as mineral water	103	47.5%
46	Fish may be labelled as "fresh" even if it has been frozen	99	45.6%
40	Apricot kernels can be used to produce marzipan	55	25.3%
44	The green leaf logo on fresh produce represents its organic status	37	17.1%
37	Milk powder that has been reconstituted with water and sold as long-life milk is categorised as misrepresentation	14	6.5%
	AVERAGE SCORE		**59.9%**

The results on *Misrepresentation* as presented in **Table 4.7.** indicate that respondents appear to be more informed about labeling, but less informed on

issues related to ingredients. This finding is supported by the literature on "credence goods" (Barrena and Sánchez, 2010), which indicates that the value of a product cannot be evaluated against the claims on the packaging. With high-value items such as organics, consumers rely heavily on the packaging information to guide their decisions.

iii. Tampering

TABLE 4.8.

CONSUMERS' OBJECTIVE KNOWLEDGE SCORE FOR *TAMPERING* (*n*=217)

Item	Evaluation statement	Total correct	% correct
56	Pure honey will crystallize over time	165	76.0%
61	Artificially increasing the colour of saffron is a form of food fraud	157	72.4%
57	Food tampering takes place when an inferior ingredient is used to produce a product	156	71.9%
53	Indirect tampering occurs when bees are fed on sugar water rather than obtaining their food from flowers	153	70.5%
62	The following products are most at risk of food tampering: olive oil, milk, fish, honey, and coffee	144	66.4%
63	An example of food tampering is washing chicken and illegally extending its shelf-life	133	61.3%
55	An example of food tampering is using pharmaceutical grade talcum powder to dust marshmallows	127	58.5%
54	To add a small amount of fructose to make 100% orange juice sweeter is not tampering	126	58.1%
59	Using methanol in the production of vodka is an example of tampering	120	55.3%
50	Adding Rhodamine B to colour food red is considered tampering	79	36.4%
51	It is legal to use corn syrup to dilute genuine agave syrup	73	33.6%
52	To add a small percentage of water to dilute yoghurt to a drinking yoghurt is not food tampering	73	33.6%
64	Food tampering is falsely improving the visual appearance of a food product	29	13.4%
58	Turkish apricots can be sold at a premium if it accurately declares the country of origin and is therefore not classified as product tampering	20	9.2%
	AVERAGE SCORE		**51.2%**

The results related to Tampering as presented in Table 4.8. indicates that respondents are generally more informed about the issue of tampering as it occurs in the market for honey products. This might be the result of recent public discourse on falsification and tampering with honey products (Clarke and Ndip, 2011), which might have equipped consumers with more knowledge and insight.

iv. Substitution

TABLE 4.9.

CONSUMERS' OBJECTIVE KNOWLEDGE SCORE FOR SUBSTITUTION (*n*=217)

Item	Evaluation statement	Total correct	% correct
72	An example of fraudulent substitution is beef patties that contain water buffalo meat	163	75.1%
73	Smoked salmon and salmon trout can legally be used to describe the same products	161	74.2%
79	A manufacturer is allowed to replace pecan nuts with peanuts in a product	161	74.2%
75	Ingredient substitution is classified as food fraud	142	65.4%
68	Hazelnuts can be substituted with peanuts as a cheaper alternative	136	62.7%
76	Fructose syrup can be used as a substitution in honey	134	61.8%
69	Sugar can be substituted with Aspartame for diabetic-friendly beverages	122	56.2%
71	Ascorbic acid can be substituted with Vitamin C in citrus drinks	121	55.8%
78	Extra virgin olive oil may be replaced with 10% alternative plant oils	116	53.5%
70	The word "Boerewors" and "Braai wors" are different names for the same product and can be substituted at any time	108	49.8%
80	Tilapia may not be used as a substitute in canned tuna	106	48.8%
67	Not all nuts are allergens	84	38.7%
65	Sodium Benzoate can be substituted with formaldehyde as a preservative for milk	77	35.5%
74	Rye flour is a gluten-free substitution for regular wheat flour	72	33.2%
66	Coconut sugar is a natural sugar substitution for diabetics	68	31.3%
77	10% percent of chicory may be substituted into to ground coffee to still fall into the "coffee" category	44	20.3%
	AVERAGE SCORE		**51.3%**

When considering the results on *Substitution* as presented in **Table 4.9.** above, respondents seemed well informed about matters relating to beef and fish substitution. This was also a topic that was thoroughly covered by the media ever since a study done by students at the University of Stellenbosch discovered unconventional species such as donkey, goat and water buffalo were also discovered in several meat products including sausages, burger patties and deli meats at a well-known retailer (Cawthorn et al., 2013).

4.4.3. Possible areas of concern pertaining to consumers' knowledge of food fraud (Objective 2.2.1)

In South Africa, little research has been done regarding consumers' knowledge of food fraud (Edwards et al., 2020). The initial results presented in **Section 4.4.** were used to identify ***possible*** *areas of concern* about consumers' knowledge of food fraud (Objective 2.2).

Factor analysis was then used to further explore relationships and potentially identify underlying constructs that might point to ***prominent*** *areas of concern* about consumers' knowledge of food fraud. More specifically, the use of *Exploratory Factor Analysis* (EFA) allowed the researcher to examine numerous variables and reduce them to a smaller, more manageable set of underlying concepts (Portney and Watkins, 2000).

Respondents were asked to rate a set of fifty-eight (58) statements (referred to as "*Items*") related to the four (4) main dimensions of food fraud. The item statements were developed by the researcher from the based on the literature review presented in **Chapter 2**. A three-point Likert-type scale (with increments ranging from true to false) was used as a rating mechanism.

Factor extraction was conducted using the *Principal Components* (PC) approach, following which the *Oblimin with Kaizer normalisation* approach was used for factor rotation with the goal of achieving a simpler structure and improve interpretability. Various criteria were considered, including Eigenvalues > 1, which indicated that the data followed a normal distribution, and testing for $p>0.05$ as a key criterion.

The respondents with missing data were excluded from the analysis by implementing the 'exclude listwise' function within SPSS. Therefore, only complete responses were used. Please refer to the operationalisation summary in **Table 3.1.** for more detail regarding the scale design, and **Annexure A** for an example of the questionnaire.

The preliminary EFA indicated eighteen (18) possible factors, using the PC approach for extraction (requiring Eigenvalues <1), with an Oblimin rotation. Because the data did not fit the expected four (4) dimensions of food fraud as presented in the literature, a second analysis was done. This time, the items were forced into four (4) factors. This rotation converged in twenty-seven (27) rotations, while the Eigenvalue for the four (4) factors was 1.826. Loadings smaller than .200 were omitted from the report.

Suitable factor labels were identified for each factor as follows:

- Factor 1: Addition
- Factor 2: Misrepresentation
- Factor 3: Tampering
- Factor 4: Substitution

Further detail on these results is presented in **Table 4.10.** below.

TABLE 4.10.

EFA PRESENTING POSSIBLE AREAS OF CONCERN PERTAINING TO CONSUMERS' KNOWLEDGE OF FOOD FRAUD

PATTERN MATRIX

ITEMS	FACTORS			
	F1: ADDITION	F2: MISREPRESENTATION	F3: TAMPERING	F4: SUBSTITUTION
Sudan red is an accepted food colouring used to colour cakes and pastries	.731			
Lead bromate is an approved colourant to make turmeric a bright yellow	.712		.201	
Melamine is an approved flavour enhancer for pet food	.696		.226	
Soybean meal can be added to milk powder to increase the protein content	.671			
10% of flour can be added to cinnamon to prevent lumping	.669			
Sodium Benzoate can be substituted with formaldehyde as a preservative for milk	.547			
If less than 10% of horsemeat is added to beef patties it doesn't need to be declared on the label	.528			
A small percentage of stabilizer can be added to 100% fruit juice to suspend orange cells	.507		-.277	
Reverse osmosis water can be labelled and represented as mineral water	.504	.212		-.247
Apricot kernels can be used to produce marzipan	.484		.313	
Copper sulfate is an illegal additive used to dye table olives	.457			
Adding Rhodamine B to colour food red is considered tampering	.451		-.205	
Extra virgin olive oil may be replaced with 10% alternative plant oils	.448		-.229	
It is legal to use corn syrup to dilute genuine agave syrup	.444		-.269	
Fructose syrup can be used as a substitution in honey	.437			.263
Coconut sugar is a natural sugar substitution for diabetics	.424			
Natural colours are legally added to red wine	.416			
An example of food fraud is copper added to paprika for a brighter colour	.387			
10% percent of chicory may be substituted into to ground coffee to still fall into the "coffee" category	.380		-.267	
Hazelnuts can be substituted with peanuts as a cheaper alternative	.326			
Ascorbic acid can be substituted with Vitamin C in citrus drinks	.313		.232	.246
Tilapia may not be used as a substitute in canned tuna	.293			
Fish may be labelled as "fresh" even if it has been frozen	-.276	.208	.269	

Misrepresentation is a form of food fraud where a false or misleading statement is made about a product for economic gain		.764		
Food misrepresentation occurs when a food product's label does not accurately reflect its ingredients		.669		
Misdeclaration of the country of origin is illegal		.601		-.201
Marketing conventionally produced agricultural products as organic is a form of misrepresentation		.601		
All dairy components must be represented on the product label		.593		-.347
To falsely claim that commercially grown cashew nuts are "Fairtrade" is a form of misrepresentation		.478		
Indirect tampering occurs when bees are fed on sugar water rather than obtaining their food from flowers		.472		
The botanical origin of honey is often misrepresented for economic gain		.462		.262
An example of fraudulent substitution is beef patties that contain water buffalo meat	.236	.431		
Organic food is often misrepresented as more nutritious than conventionally produced food		.402		
Artificially increasing the colour of saffron is a form of food fraud		.390		
A manufacturer is allowed to replace pecan nuts with peanuts in a product	.273	.375		
An example of food tampering is using pharmaceutical grade talcum powder to dust marshmallows		.352	-.201	
The following products are most at risk of food tampering: olive oil, milk, fish, honey and coffee		.349		.295
Dextrose or maltodextrin must be declared as bulking agents on product labels	.249	.324		
Pure honey will crystallize over time		.312		
Smoked salmon and salmon trout can legally be used to describe the same products		.311		.303
~~Food tampering is falsely improving the visual appearance of a food product~~			~~.536~~	
Food tampering takes place when an inferior ingredient is used to produce a product		.398	-.401	
To add a small amount of fructose to make 100% orange juice sweeter is not tampering			-.398	
Ingredient substitution is classified as food fraud		.359	-.361	
An example of food tampering is washing chicken and illegally extending its shelf-life		.275	-.339	
~~69 Sugar can be substituted with Aspartame for diabetic friendly beverages~~	~~.221~~	~~.221~~	~~.292~~	
To add a small percentage of water to dilute yoghurt to a drinking yoghurt is not food tampering	.236		-.256	
Rye flour is a gluten-free substitution for regular wheat flour	.363			.414
The word "Boerewors" and "Braai wors" are different names for the same product and can be substituted at any time	.274		.291	.411
Milk powder that has been reconstituted with water and sold as long-life milk is categorised as misrepresentation				.382
Using methanol in the production of vodka is an example of tampering	.341			.373
Turkish apricots can be sold at a premium if it accurately declares the country of origin and is therefore not classified as product tampering				.337
Peanuts may be added to basil pesto without declaring it on the label	.290	.259		-.306
~~Organic produce means it is free from the addition of pesticides~~				~~-.300~~
Ascorbic acid is a natural preservative and may be added to baby food to prevent browning	.284			.295
The green leaf logo on fresh produce represents its organic status				.288
Yoghurt labels often misrepresent containing live probiotic bacteria		.253		.265
~~Not all nuts are allergens~~				~~.295~~

% Variance Explained	17.488	5.326	3.936	3.148
Eigen Value	10.143	3.089	2.283	1.826

SCALE STATISTICS

Cronbach's Alpha	.862	.828	.468	.304
Scale Mean of summated items	9.162	12.568	2.889	1.908
Variance	29.622	14.071	1.822	1.051
Standard deviation	5.443	3.751	1.350	1.025
Number of items	23	17	5	4

Each factor was subjected to a reliability test, testing the fit of each item in its factor. The Cronbach's alpha (α) and means were determined for each of the factors:

- Factors 1 and 2 showed good internal reliability, with the alpha's α>0.80 for both.
- Factors 3 and 4 both yielded alpha's of α< 0.50, which is considered poor for internal reliability and indicated that the respective scale items need to be reviewed.
- To increase Cronbach's alpha for Factors 3 and 4, items 64, 69, 29 and 67 were deleted, with no significant improvement.
- Factor 3 (*Tampering*) and Factor 4 (*Substitution*) are therefore identified as possible areas of concern.

When considering the scale items in these factors, it was interesting to note that respondents scored poorly on these specific items (mean=46%). It is therefore proposed that future investigation into food fraud dimensions as represented in Factor 3 and Factor 4, should be considered as areas of concern, as consumers might be confused or lack knowledge in these aspects. In terms of industry recommendations, these dimensions of food fraud could therefore be viewed as areas that could benefit from scrutiny and possible consumer education.

4.4.4. Identification of possible misalignment between consumers' objective and subjective knowledge of food fraud (Objective 2.3)

As presented in the literature review, the "Dunning-Kruger effect" refers to observed instances where a person's lack of "objective knowledge" in a certain area causes them to overestimate their competence in that area (referred to as "subjective knowledge"). In terms of consumer behaviour, this might contribute potentially irresponsible decision making when considering "credence products", such as organics.

In order to test for possible evidence of the Dunning-Kruger effect, the researcher was therefore interested to explore the relationship (or lack thereof) between consumers' *Objective Knowledge* and *Subjective Knowledge* of food fraud, as well as the direction of any statistically significant relationship(s).

Cohen (1988) explains that a bivariate Pearson Correlation produces a **sample correlation coefficient** (*r)*, which measures the strength and direction of linear relationships between pairs of continuous variables. It is further used to evaluate whether there is statistical evidence for a linear relationship among the same pairs of variables in the population, represented by a **population correlation coefficient**, (ρ). This was therefore an appropriate test to apply to the data, and the results are presented in **Table 4.11.** below.

TABLE 4.11.

PEARSON'S CORRELATION BETWEEN SUBJECTIVE AND OBJECTIVE KNOWLEDGE OF FOOD FRAUD CONSTRUCTS

			SUBJECTIVE KNOWLEDGE				OBJECTIVE KNOWLEDGE			
			Addition	Misrepresentation	Tampering	Substitution	Addition	Misrepresentation	Tampering	Substitution
SUBJECTIVE KNOWLEDGE	Substitution	Pearson Correlation	.828**	.826**	.859**	1	.373**	.219**[1]	.383**	.283**
		Sig.(2-tailed)	.000	.000	.000		.000	.001	.000	.000
		N	216	216	215	217	217	216	216	216
	Tampering	Pearson Correlation	.831**	.853**	1	.859**	.383**	.232**	.402**	.292**
		Sig.(2-tailed)	.000	.000		.000	.000	.001	.000	.000
		N	215	215	216	215	216	215	215	215
	Misrepresentation	Pearson Correlation	.813**	1	.853**	.826**	.384**	.263**	.388**	.254**
		Sig.(2-tailed)	.000		.000	.000	.000	.000	.000	.000
		N	217	217	215	216	217	216	216	216
	Addition	Pearson Correlation	1	.813**	.831**	.828**	.360**	.286**	.404**	.280**
		Sig.(2-tailed)		.000	.000	.000	.000	.000	.000	.000
		N	217	217	215	216	217	216	216	216

**. Correlation is significant at the 0.01 level (2-tailed).

[1] Significant and low.
[2] ALL P values are <0.05 – therefore Coefficient is significant. High correlations = relationship exist = Pearsons' value >.6, thus variables are related.
Low correlation - <.3 almost no correlation. 0= zero correlation. 1.00 is 100% correlation.

			SUBJECTIVE KNOWLEDGE				OBJECTIVE KNOWLEDGE			
			Addition	Misrepresentation	Tampering	Substitution	Addition	Misrepresentation	Tampering	Substitution
OBJECTIVE KNOWLEDGE	Substitution	Pearson Correlation	.280**	.254**	.292**	.283**	.322**	.392**	.659**	1
		Sig.(2-tailed)	.000	.000	.000	.000	.000	.000	.000	
		N	216	216	215	216	217	217	217	217
	Tampering	Pearson Correlation	.404**	.388**	.402**	.383**	.453**	.455**	1	.659**
		Sig.(2-tailed)	.000	.000	.000	.000	.000	.000		.000
		N	216	216	215	216	217	217	217	217
	Misrepresentation	Pearson Correlation	.286**	.263**	.232**	.219**	.326**	1	.455**	.392**
		Sig.(2-tailed)	.000	.000	.001	.001	.000		.000	.000
		N	216	216	215	216	217	217	217	217
	Addition	Pearson Correlation	.373**	.383**	.384**	.360**	.322**	.453**	1	.326**
		Sig.(2-tailed)	.000	.000	.000	.000	.000	.000		.000
		N	217	216	217	217	217	217	218	217

**. Correlation is significant at the 0.01 level (2-tailed).

[1] Significant and low.
[2] ALL P values are <0.05 – therefore Coefficient is significant. High correlations = relationship exist = Pearsons' value >.6, thus variables are related.
Low correlation - <.3 almost no correlation. 0= zero correlation. 1.00 is 100% correlation.

The results of this test indicate a statistically significant positive correlation between the factors associated with *Subjective Knowledge* and *Objective Knowledge* was found to be statistically significant for comparisons, $r(213)>.5$, $p<.01$, two-tailed.

This included multiple Pearson correlation coefficients at a significance level of 0.01 (based on a minimum of 215 complete data sets), as indicated by two asterisks in the SSPS report.

Respondents in this sample show moderate levels of *Subjective Knowledge* and attained an average of 46% during the *Objective Knowledge* test. Therefore, their levels of *Objective Knowledge* are low, while *Subjective Knowledge* is moderate. This indicates that respondents know less than what they think they do and are overly confident in the amount of correct and factual knowledge that they possess. This proves that they are at risk when buying organics, as they depend on prior knowledge to avoid or limit exposure to risky products. In terms of this study, these results were deemed as significant as they confirmed the presence of a Dunning-Kruger effect.

In summary, results indicate that respondents in this sample, therefore, present an *Objective Knowledge* score that is low, while *Subjective Knowledge* is presented as moderate. These results therefore indicate that the respondents in this sample know less than what they think they do and are therefore likely to be overly confident in the amount of correct and factual knowledge they have. This indicates that they might be at risk when buying organics as their knowledge scores are not aligned.

4.4.5. To explore and describe consumers' food fraud knowledge and how it relates to confident organic food purchasing practices (Objective 3)

The findings in **Section 4.4.** detail the deficit between consumers' subjective and objective knowledge of food fraud and how it can be attributed to the Dunning-Kruger effect. In terms of this study, the goal of Objective 3 was to determine consumers' food fraud knowledge and how that related to confident

organic purchasing practices. Respondents seemed to think that they have sufficient knowledge of food fraud to determine which products would put them at risk, but the study wanted to establish whether this knowledge would be translated into confident purchasing and trust in the organic category.

To measure Objective 3, a five-point Likert-type scale was used, with increments ranging from one (1) being "Extremely Unlikely" to five (5) being "Extremely Likely". Respondents were asked to indicate how likely food fraud within the four defined dimensions would occur in the organic produce category. The data is presented in **Table 4.12.** below.

TABLE 4.12.

CONSUMERS' PERCEIVED LEVEL OF FOOD FRAUD IN ORGANICS WITHIN THE FOUR DIMENSIONS

		Substitution of ingredients in organics	Tampering with organic products	Misrepresentation of information in organics	Addition of unwanted ingredients in organics
N	Valid	163	160	163	160
	Missing	55	58	55	58
Mean		3.14	2.86	3.33	2.96
Median		3.00	3.00	4.00	3.00
Mode		4	2[a]	4	4
Std. Deviation		1.281	1.179	1.222	1.243
Variance		1.640	1.390	1.492	1.546

a. Multiple modes exist. The smallest value is shown

The results in **Table 4.12.** can be interpreted as follows:

- a mean score lower than 2.5 indicated that respondents felt that a particular dimension of food fraud (i.e., misrepresentation, addition, tampering and or substitution) was less likely to be present in organics, hence it is an indication of a positive confidence interval.

- Overall results indicate that respondents felt fraudulent behaviour within the organic product category is highly likely (mean > 3). This could therefore be equated to consumers having a low level of confidence in this product category.

TABLE 4.13.

CONSUMERS' PERCEIVED LEVEL OF FOOD FRAUD IN ORGANICS RELATED TO *TAMPERING*

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Extremely unlikely	21	9.6	13.1	13.1
	Somewhat unlikely	50	22.9	31.3	44.4
	Neither likely nor unlikely	29	13.3	18.1	62.5
	Somewhat likely	50	22.9	31.3	93.8
	Extremely likely	10	4.6	6.3	100.0
	Total	160	73.4	100.0	
Missing	System	58	26.6		
Total		218	100.0		

In terms of specifics, it was interesting to note that consumers' confidence in *Tampering* was higher when compared to the other constructs. However, 62.5% chose "Neither likely nor unlikely", which could indicate that they were still unsure or didn't fully understand the question.

When reviewing the data relating to *Substitution*, a mean of 3.14 was achieved. This would indicate that consumers are highly suspicious of *Substitution* taking place within organics. This is in line with the literature that identified a need for organic produce to be better regulated to prevent it from being substituted with conventionally grown produce, while still being sold for the organic premium (Tung, 2016).

TABLE 4.14.

CONSUMERS' PERCEIVED LEVEL OF FOOD FRAUD IN ORGANICS RELATED TO *SUBSTITUTION*

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Extremely unlikely	20	9.2	12.3	12.3
	Somewhat unlikely	40	18.3	24.5	36.8
	Neither likely nor unlikely	23	10.6	14.1	50.9
	Somewhat likely	57	26.1	35.0	85.9
	Extremely likely	23	10.6	14.1	100.0
	Total	163	74.8	100.0	
Missing	System	55	25.2		
Total		218	100.0		

TABLE 4.15.

CONSUMERS' PERCEIVED LEVEL OF FOOD FRAUD IN ORGANICS RELATED TO *MISREPRESENTATION*

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Extremely unlikely	15	6.9	9.2	9.2
	Somewhat unlikely	35	16.1	21.5	30.7
	Neither likely nor unlikely	18	8.3	11.0	41.7
	Somewhat likely	72	33.0	44.2	85.9
	Extremely likely	23	10.6	14.1	100.0
	Total	163	74.8	100.0	
Missing	System	55	25.2		
Total		218	100.0		

The data relating to *Misrepresentation* presented a low level of confidence in the dimension with a mean of 3.3. This would mean that the higher the mean, the higher their suspicion of the food fraud dimension being present in the organics category and the lower their confidence.

TABLE 4.16.

CONSUMERS' PERCEIVED LEVEL OF FOOD FRAUD IN ORGANICS RELATED TO *ADDITION*

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Extremely unlikely	23	10.6	14.4	14.4
	Somewhat unlikely	44	20.2	27.5	41.9
	Neither likely nor unlikely	22	10.1	13.8	55.6
	Somewhat likely	58	26.6	36.3	91.9
	Extremely likely	13	6.0	8.1	100.0
	Total	160	73.4	100.0	
Missing	System	58	26.6		
Total		218	100.0		

After reviewing the data for *Addition*, even though 55% indicated a low level of commitment by choosing "Neither likely nor unlikely", 41.9% still chose "Somewhat unlikely", meaning they had a higher level of confidence that this dimension would not be present within organic produce.

TABLE 4.17.

SPEARMAN'S CORRELATION BETWEEN SUBJECTIVE AND OBJECTIVE KNOWLEDGE SCORES AND RESPONDENTS' CONFIDENCE IN ORGANICS

Correlations

			Please indicate the likelihood of the following in terms of organic produce **Substitution** of ingredients	Please indicate the likelihood of the following in terms of organic produce - **Tampering** with products	Please indicate the likelihood of the following in terms of organic produce - **Misrepresentation** of information	Please indicate the likelihood of the following in terms of organic produce - **Addition** of unwanted ingredients	***Objective Knowledge* Score (Binned)**
Spearman's cohort	Please indicate the likelihood of the following in terms of organic produce - **Substitution** of ingredients	Correlation Coefficient	1.000	.475**	.270**	.418**	**.032**
		Sig. (2-tailed)	.	.000	.001	.000	**.681**
		N	163	160	162	160	**163**
	Please indicate the likelihood of the following in terms of organic produce - **Tampering** with products	Correlation Coefficient	.475**	1.000	.607**	.679**	**.113**
		Sig. (2-tailed)	.000	.	.000	.000	**.156**
		N	160	160	160	159	**160**
	Please indicate the likelihood of the following in terms of organic produce - **Misrepresentation** of information	Correlation Coefficient	.270**	.607**	1.000	.601**	**.130**
		Sig. (2-tailed)	.001	.000	.	.000	**.098**
		N	162	160	163	160	**163**
	Please indicate the likelihood of the following in terms of organic produce - **Addition** of unwanted ingredients	Correlation Coefficient	.418**	.679**	.601**	1.000	**-.042**
		Sig. (2-tailed)	.000	.000	.000	.	**.597**
		N	160	159	160	160	**160**
	***Objective Knowledge* Score (Binned)**	Correlation Coefficient	**.032**	**.113**	**.130**	**-.042**	**1.000**
		Sig. (2-tailed)	**.681**	**.156**	**.098**	**.597**	**.**
		N	**163**	**160**	**163**	**160**	**217**

**. Correlation is significant at the 0.01 level (2-tailed).

When considering respondents' confidence in the product category (organics) against the backdrop of their knowledge of food fraud to identify the possibility of risk exposure a Spearman's Correlation test indicated no statistically significant relationship, Thus, there is no significant relationship between respondents' knowledge and their confidence in the said product category.

To conclude it can therefore be inferred that, even though respondents had a statistically significant low level of confidence in organics (i.e., they believed that this category is prone to fraud), one cannot contribute this to their current level of knowledge pertaining to food fraud.

This is a possible area to investigate in further studies, and how suspicion/ lack of suspicion/ e.g., brand confidence might result in more – or less - critical thinking when making buying decisions. This area is still far under researched.

4.5. Summary

The results were gathered by using quantitative data collection techniques. The results were presented according to the objectives of the study obtained during each phase. The research focused on consumers' knowledge of food fraud and its impact on their purchasing behaviour of organic fresh produce.

Demographic data that helped to characterise the sample group as consumers that have a specific level of knowledge of food fraud was collected to allow for inferential statistics and to conduct statistical analyses.

The data indicated that in their own opinion, respondents were confident in their subjective knowledge, which amounted to a *Subjective Knowledge* score of 61.25%. This was compared with their *Objective Knowledge* score and reflected a poor level of knowledge – 46.65%.

For the second part of exploring and describing the objective knowledge of the consumer and to further investigate the validity of the *Objective Knowledge* test, Cronbach's alpha was calculated. Thereafter the data was subjected to Exploratory Factor Analysis.

To investigate the differences in respondents' subjective knowledge level and their objective knowledge score, Pearson's correlation test was used, and a table was drafted using SPSS. There was a statistically significant correlation between the objective and subjective knowledge scores, which could indicate that subjects have a lower level of knowledge than what they perceive themselves to have. This could be attributed to the Dunning-Kruger effect. The deficit between the *Subjective Knowledge* test score and *Objective Knowledge* test score signifies a gap in consumer knowledge that can be addressed by further consumer education.

The following chapter concludes the study with a summary of the findings reached for each objective, the limitations of the study, and recommendations for further research to address the concerns that were highlighted.

CHAPTER 5: CONCLUSIONS OF STUDY

Chapter 5 presents the conclusions of this research project, as related to the objectives presented in Chapter 1. The recommendations and shortcomings are used to identify recommended focus areas for potential future research.

5.1 Introduction

Research indicates that food fraud incidents have increased significantly over the last few years (Lotta, 2015). Globally, food fraud has reached significant proportions and addressing food fraud is therefore much needed (Spink and Moyer, 2011, Brucks, 1985).

The market for organic produce – locally, as well as internationally – is showing significant growth. This issue is of critical concern as current South African legislation regarding organic produce is still under development. This allows room for consumers to be defrauded financially by inflated prices for products that are not fully certified as organic or expose them to health risks due to mislabelled products (Tung, 2016).

The South African legislation meant to govern the organic produce industry has been in draft format since 2002, meaning that nearly twenty years later there is still no official definition and requirements for organic produce in South Africa (Irwin, 2002).The situation is exacerbated by consumers' "irresponsible" consumption behaviour and that they blindly trust extrinsic factors such as catchy product labels specifically designed by manufacturers with an ill attempt to trap unsuspecting shoppers (Marx-Pienaar and Erasmus, 2014).

The study has however found that consumers' trust in organic products and novelty product claims are waning. Misinformation forms a large part of the food fraud construct, and by promoting these products as superior to their conventionally produced counterparts, these claims motivate consumers to buy products at inflated prices, ultimately defrauding them financially. This current situation, therefore, presents an opportunity for retailers to not only educate their consumers but to regain consumer trust by supplying responsibly and ethically labelled products, thereby protecting consumers against food fraud transgressions.

5.2 Conclusions reached for each objective

5.2.1 Objective 1: Consumers' current purchasing behaviour of organic fresh produce

A defined profile of the organics consumer has not been established as their motivation for buying organic goods remain complex (Pearson et al., 2011). Research results following the last 20 years have indicated slight trends that organic buyers tend to be female, with a higher level of education and more affluent with young children. The results of the study correspond with this trend, verifying that 77% of the respondents who indicated that they buy organics regularly were female Millennials (aged 25-40) of which 47% had completed a postgraduate degree, which supported the findings of Jolly and Norris (1991) as well as Engel (2009).

The overall findings were that women are willing to pay more for organic items as opposed to men, and they only purchase organic items once a week, preferring to buy organic fresh produce from premium retail suppliers. Despite this interest and rise in consumption, most consumers remain resistant to purchasing a wide array of goods in this product category, with organic bananas dominating the figures of organic items bought. Pearson et al. (2011) noted that

the purchase frequency of organics was still limited, with high price premiums and mistrust in organic labelling. This would suggest that the organic fresh produce market can be penetrated further by finding resonance with younger, more affluent females. In terms of other literature, this picture of the South African consumer is not much different to what Vukasovič (2016) found during his study, where the majority of his respondents preferred organic fresh produce to long life or dried goods products such as tea, spices and pasta.

Pearson et al (2011) identified the three most common reasons for purchasing organic foods as seeking healthy food products, concern for the natural environment, and desire for superior food quality, which was supported by the results of this study. More than half of the respondents indicated that their reason for buying organics was that they believe it to be healthier and more nutritious. Consistent data about the share that organic fresh produce contributes to a consumers basket is still unavailable (Thompson, 2000).

Thompson relates this to several factors. Firstly, many organic product sales are still taking place outside of traditional retail chains, such as farmer's markets, roadside stands, and direct deliveries. Secondly, even if products are being sold via retail channels, they are not necessarily tracked via barcodes, for example, a head of lettuce, making it virtually impossible to distinguish between organic and non-organic product sales. Conjoined, these problems prove how difficult it still is to establish the size of the organic market, even with sophisticated sales processes. Continuous research in the field of organic produce and the organic consumer will be required before a conclusive picture can be drawn up of the consumer.

5.2.2 Objective 2: Consumers' knowledge of food fraud

Subjective knowledge refers to a person's perception of the amount of information about a specific topic that is stored in his or her memory (Brucks, 1985, Flynn, 1999, Park et al., 1994), i.e., what consumers *think* food fraud is or how much they *think* they know about the topic compared to peers such as friends and family. **Objective knowledge** pertains to the actual amount of accurate information stored in a person's memory (Brucks, 1985, Park et al., 1994, Venter, 2017). This research has discovered a large disparity between consumer's subjective and objective knowledge of food fraud.

This research study was conducted to investigate and describe consumers' current knowledge on the subject and the risks that they are exposed to due to this knowledge deficit.

South African consumers tend to make uneducated purchasing choices when it comes to organic produce and is often confused by other categories such as "fair trade" or "free-from"(Lobo et al., 2014). This overconfidence in their perceived knowledge of food fraud exposes the consumer to risky buying behaviour, which was discussed by the researcher in chapter four during the data analysis.

Marx-Pienaar and Erasmus (2014) also found that consumers do not necessarily have the necessary knowledge to determine the safety or quality before they make a food purchase, and thus relied on extrinsic factors, such as the label on the product which are often subjected to food fraud in terms of mislabeling, which puts the consumer at risk. Consumers' knowledge has, therefore, an important role to play during purchasing and consumption of food products such as organic fresh produce (Park et al., 1994).

The findings of this study indicate that consumers have moderate subjective knowledge and poor objective knowledge, proving the misalignment outlined in Objective 2.3, and confirming the presence of the Dunning-Kruger effect amongst the sample – creating overconfident consumers. This ultimately contributes to consumers being less risk-averse hence, more vulnerable when buying products such as organics.

The factor analysis discussed in Objective 2.2.1 identified Tampering and Substitution as areas of concern that would require the most amount of attention due to respondents scoring poorly on specific items relating to these two Food Fraud dimensions. Possible reasons for these poor scores could be that consumers couldn't differentiate between these two factors and also the fact that Addition and Substitution have been widely covered in the media, including the scandal of addition of melamine in baby food, buffalo meat in beef burgers and honey being substituted by corn syrup (Curll, 2015, Olmsted, 2016, Cawthorn et al., 2013, Kempen, 2021). These two dimensions could benefit from further scrutiny and customer education.

5.2.3 Objective 3: Consumer confidence in organics in relation to their knowledge of food fraud

The research findings of Cant and Scheers (2012) indicated that should a consumer have a high level of knowledge on a specific topic or item, this would lead to a higher confidence interval, where they would consider themselves to be a reliable source of information on the relevant topic or item. Inversely, the results of this study initially indicated that a lower level of Food Fraud knowledge could ultimately lead to a lower confidence interval.

However, the findings that compared consumers subjective knowledge and their perception of food fraud within the four dimensions, showed very low

means, indicating a positive confidence interval. This suggested that the lower the consumers level of knowledge on a food fraud dimension, the higher their confidence interval and the less likely they believe any foul play to be involved. Further statistical tests were applied via Spearman's correlation to compare the sample's confidence in the organic category versus their knowledge of food fraud taking place within this category and no significant relationship was found. It can therefore be deduced that even though consumers have a very low confidence interval relating to organics, it cannot be contributed to their similarly low level of knowledge relating to food fraud. Both their low level of knowledge as well as their low level of confidence was thus not related.

The data did however indicate a low level of commitment, with half of the respondents choosing "neither likely nor unlikely" when presented with a question to indicate the likelihood of a food fraud construct to be present within the organics category, which could indicate that they were unsure or didn't fully understand the topic under investigation. Whether this is due to ignorance or lack of knowledge on the topic, it still leaves the consumer exposed and vulnerable to possible defrauding. Should the industry choose to heed these findings and address this knowledge deficit, they can only benefit from regaining and building consumer trust in their products and loyalty to their brands.

Klerck and Sweeney (2007) observed the effect of objective and subjective knowledge on the perception of risk throughout their research. Their results revealed that objective knowledge could reduce psychological risk, whereas subjective knowledge could potentially protect consumers against physical risks.

When applying their hypothesis to this study, it creates a troubling landscape for South African consumers. Since the respondents showed a low level of both subjective and objective knowledge, paired with the presence of the Dunning-

Kruger effect, consumers are vulnerable and at risk of being subjected to all dimensions of Food Fraud. Consumers will therefore greatly benefit from food suppliers and retailers who take ownership and driving ethical practices. By developing and supporting a symbiotic and reliable accreditation system, the food sector can protect its consumers against both psychological and physical risks caused by their knowledge deficit.

5.3 The research in retrospect

The researcher needs to evaluate the study objectively at the end of the investigation to determine all the objectives set for this study have been addressed.

Globally, food fraud has reached significant proportions and addressing food fraud, including the more defined subcategory of economically motivated adulteration, is therefore much needed (Spink and Moyer, 2011, Brucks, 1985). Food fraud is not only an international issue but also affects developing countries such as South Africa.

This study has highlighted that consumers are vulnerable to food fraud, not only due to their low level of knowledge on the subject but also due to the level of trust that they put in certification of credence goods, such as organics (Janssen and Hamm, 2012). The literature has indicated credence goods are prone to food fraud and opportunistic behaviour by forging certification throughout the supply chain, which will lead to a lack of consumer trust in organic products (Darby and Karni, 1973). This can be overcome by third-party accreditors or customer education on authentic organic certification to regain their trust.

Since there is no current legislation in place to police organics in South Africa, the findings presented in **Section 5.2.2.** (indicating low levels of consumers' subjective and objective knowledge) and **Section 5.2.3.** (indicating a perceived lack of consumer

trust in organic certification), this is an area of concern and stresses the importance of future research.

Because consumers rely so heavily on certification logos, it is important to educate the consumer and to ensure that their trust and loyalty is rewarded. It is therefore important to substantiate the regulations behind organic produce. Should the organic sector fail to do this, it will not only disturb the ultimate loyalty of the consumer, but organic products will also lose their competitive advantage. Suppliers that do not apply themselves to trustworthy certification and heed this warning will ultimately face a decline in sales as consumers are already sceptical about organic logos.

Even though the results of the study did not indicate a significant relationship between consumers' knowledge of food fraud and their confidence in the organic category it is still an indication of consumers mistrust in this product category. This is an area of concern that needs to be addressed and could also be a possible reason why the organic category has started to plateau. The findings of the study provided sufficient information on the gaps in consumers knowledge of food fraud and the legislation to protect consumers against food fraud, especially in the organic produce sector. This information can be used to possibly drive government legislation on organic produce and for retailers to not only educate their consumers but to also act more ethically.

5.3.1 Achievement of the objectives set out for this research

The researcher is confident that all the objectives were attended to and addressed satisfactorily. The conclusions that were drawn were relevant and accurately reflected the main objectives formulated for the study. The researcher did not encounter any unexpected issues during the study in general and the data collection and respondents did not have any issues with the structure or content of the questionnaire. The researcher, therefore, hopes that

this study will contribute to the literature defining consumers' knowledge of food fraud and its impact on their purchasing behaviour of organic fresh produce.

5.4 Limitations of the study

It was imperative to the researcher to follow trusted research methods to ensure the study was conducted ethically to obtain accurate, reliable data.

Despite all efforts, the study was still subjected to certain limitations:

1. The data collection coincided with the onset of the initial COVID-19 lock-down period in South Africa, thus the researcher was restricted to online questionnaires. Although this did permit respondents to possibly have more time to complete the questionnaires, it had an adverse effect on many of the respondents and they had to be prompted several times to complete the questionnaire. This also influenced the data collection methods, as the researcher did not have access to certain demographic groups that tend to require or prefer face-to-face surveys such as low-income groups that do not necessarily have access to an online environment, which could have skewed the research results. The researcher also relocated to Australia during the study and data collection had to be managed from there, which complicated matters, especially due to the significant time difference which restrained access to respondents and the study leader.

2. The prerequisites for respondents were that they had to be 21 years or older and be responsible for the food purchasing in their household. This restricted the audience to the primary member in the household responsible for food procurement and therefore excluded the insights of other household members that are not primarily responsible for buying groceries.

3. Convenience sampling was applied to the study for fast, easy access to the necessary data that had to be collected. This did limit the inclusion of all the South African population groups and was not representative of the South African populace. Future studies could explore more in-depth data collection from a larger, more suitably representative sample.

5.5 Recommendations for future research

The study aimed to investigate consumers' knowledge of food fraud and its impact on their purchasing behaviour of organic fresh produce. This was done to highlight possible areas of concern in consumers knowledge and the underlying relationships that could put consumers at risk.

This research only focused on the organic produce category. Future research could focus on other product categories that are susceptible to food fraud, such as honey or coffee.

- Based on the results of the study, the following recommendations can be made: Further research can explore organic produce regulations within the South African context to be able to propose standardized guidelines for producers and retailers when determining the requirements for produce to be certified as organic.

- The suggestions could be used to implement new regulatory requirements and to urge the South African government to conclude the legislation of organic produce that is still in draft format.

- Based on previous conclusions it is important to review the current regulation of certification logos and the design of a more credible policy. Future studies could investigate consumers' attitudes towards current certification emblems and investigate the possibility of launching a more credible certification logo that should

be affiliated with a reliable governing body to re-establish consumer trust. The implementation of Neuro-scientific methods (i.e. eye tracking and biomarkers) is viewed as a possible option as it is known to circumvent confirmation bias.

- A uniform emblem or logo identifying products as organic on their packaging could be developed and tested in future by leading retailers in conjunction with the relevant governing bodies once they've been established and used throughout all retailers to avoid confusing customers.

Although this study focused on organic produce, further research can also be applied to other food categories to develop strategies to protect consumers against food fraud.

5.6 Implications of the findings

5.6.1 Implications for the consumer

The organic market is booming worldwide but also in South Africa which is of critical concern as current South African legislation regarding organic produce is still under development. This leaves room for consumers to be defrauded financially by inflated prices for products that are not fully certified as organic or expose them to health risks due to mislabeled products (Tung, 2016).

A study by Marx-Pienaar and Erasmus (2014) observed that consumers often lack the proper knowledge to evaluate food product's true intrinsic attributes (i.e., quality and safety) and often blindly trust extrinsic attributes such as catchy product labels, promotional material and or consumer trends designed by manufacturers who might not have the consumers' wellbeing at heart.

Some producers might explicitly try to confuse consumers with a leading logo e.g., a green leaf or globe logo, insinuating organic or sustainably sourced

products, however, such a certified logo does not currently exist in the South African market. Organic produce is categorized as credence goods, meaning consumers cannot absolutely confirm its claimed attributes even after consumption and therefore trust the packaging claims to be authentic(Pearson et al., 2011).

The study also proved that there is a deficit between consumers' subjective and objective knowledge, hence they *think* they know more about food fraud than what they really do, a phenomenon attributed to the Dunning-Kruger effect. If consumers are not properly educated and informed on the issue of food fraud, especially related to the organic produce category, they cannot make informed decisions and are likely to be defrauded financially, or products could have adverse effects on their health. This leaves consumers vulnerable and at-risk to be subjected to other food fraud elements. The results of this study can further be used to hold retailers accountable and prevent the exploitation of consumers.

5.6.2 Implications for retailers and the government

During the research done by this study, it has become apparent that the government is still lagging with legislation to regulate organic produce in the South African market, with the law still in draft format for almost 20 years. Since there is currently no legislation or regulatory bodies in place to control and manage organic labelling, consumers must depend on producers and retailers to act responsibly.

The study has found that it is imperative to educate the consumer and this onus will possibly fall upon the retailer as the current status quo seems to indicate that there is no sense of urgency from the government to do so. It will also be detrimental to organic producers and retail distributors if consumers' lack of

trust in their organic claims lead to sales losses. Therefore, it will benefit retailers to educate consumers and enable them to make more informed decisions on organic produce, thereby protecting them from being defrauded and instilling trust in them as a supplier.

Retailers can also serve as a catalyst for the government to develop a universally recognized organic logo, which can only be used if the supplier complies with all the necessary policies.

5.7 Concluding remarks

The purpose of the study was to establish consumers' knowledge of food fraud and how it could affect their purchasing behaviour of organic fresh produce. From the research conducted it became evident that consumers lack the necessary knowledge of food fraud to make an informed buying decision, which exposes them to risk. Literature on the subject has established that knowledge is essential to avoiding risk and Hamzaoui-Essoussi and Zahaf (2011) referred to the "trust orientations" where consumers adopt risk-reducing strategies, such as referring to label references. Since organic labelling is still being legislated, this leaves not only the consumer but also the organics industry vulnerable in terms of food fraud. If this situation persists, the confidence levels of consumers will deteriorate even further, which is to the detriment of this specific product category.

This could be a terrific opportunity for government and retailers to collaborate on an educational campaign, not only to inform consumers but to also protect them and stimulate the growth of the organic produce category. This growth can lead to job creation and vested consumers who trust and support local producers.

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ANNEXURE A: QUESTIONNAIRE

DEPARTMENT OF FOOD AND CONSUMER SCIENCE

Consumers' knowledge of food fraud and its impact on their purchasing behaviour of organic fresh produce.

"Food Fraud": Consumers' knowledge and purchasing behaviour of organic fresh produce.
A case study of urban households in Gauteng, South Africa

Informed Consent Form

Dear respondent

The purpose of this study is to gain insight into the consumers' knowledge of food fraud in South Africa. The study is particularly interested in what consumers perceive as food fraud related to organic produce. Through this research project, we would like to identify problem areas and to subsequently provide guidelines so that both retailers and consumers would know how to differentiate between authentic food products and to identify high-risk products that might be subjected to food fraud or product adulteration. Thank you for taking the time to share your perspectives and views in this regard.

Participants in this study will be asked to answer several questions regarding their food consumption and decision making when buying organic produce. All answers will be recorded for further use by the investigators only. Respondents are welcome to refrain from answering any questions that they view to be the cause of any discomfort

or infringement of their privacy. Refusal to participate or withdrawal of consent, or discontinued participation in the study will not result in any penalty.

Please note that your participation is voluntary and does in no way release the researchers or involved institutions from their legal and professional responsibilities. All information will be treated as highly confidential, and the identity of respondents need not be disclosed and will remain anonymous. The results of this study will be presented in an aggregated format.

Your decision to respond to the questions posed will be interpreted as confirmation that you have agreed to participate.

Should you wish to partake in future research projects such as focus group discussions pertaining to this study, please provide your email address and mobile phone number in the spaces provided.

Please provide your e-mail address in the space below:

_____

Q3 Please tick one of the following boxes as an agreement of your participation

- ○ yes (1)
- ○ no (2)

End of Block: Section A : Contact person

Start of Block: Section B : Demographics

Q4 What is your **gender**?

▼Male (1) ... Other (3)

Q5 What was your **age** at your most recent birthday?

21232526283032333537394042444647495153545658606163 65

Age ()

Q6 What is your **highest level of education**?

▼Lower than grade 12 (1) ... Post graduate degree (4)

Q7 Please indicate your area of **residence within Gauteng** (please be specific regarding the **City and suburb** e.g. Pretoria, Garsfontein)

_____

Q8 Please indicate your **specific area of residence** on the following map of Gauteng	Dislike (1)	Neutral (2)	Like (3)
Buffelsdrift (4)			
Rust De Winter (5)			
Hammanskraal (6)			
Roodeplaat (7)			
De Wagensdrift (8)			
Boekenhoutskloof (9)			
Leeuwkloof Valley (10)			
Rayton (12)			
Cullinan (13)			
Bronkhorstspruit (14)			
Centurion (15)			
Randjesfontein (16)			
Kemptonpark (17)			
Midrand (18)			
Fourways (19)			
Lanseria (20)			
Edenvale (21)			
Benoni (22)			
Nigel (23)			
Springs (24)			
Heidelberg (25)			
Meyerton (26)			
Henley-on-klip (27)			
Vereeniging (28)			
Vanderbijlpark (29)			
Walkerville (30)			
Lenasia (31)			
Mulbarton (32)			

Alberton (33)

Brakpan (34)

Boksburg (35)

Isando (36)

Sandton (37)

Randburg (38)

Soweto (39)

Oakdene (40)

Germiston (41)

Ormonde (42)

Roodepoort (43)

Randfontein (44)

Krugersdorp (45)

Ruimsig (46)

Muldersdrift (47)

Kromdraai (48)

Magaliesburg (49)

Carltonville (50)

Elandsdrift (51)

Cradle of humankind (52)

Hekpoort (53)

Doornhoek (54)

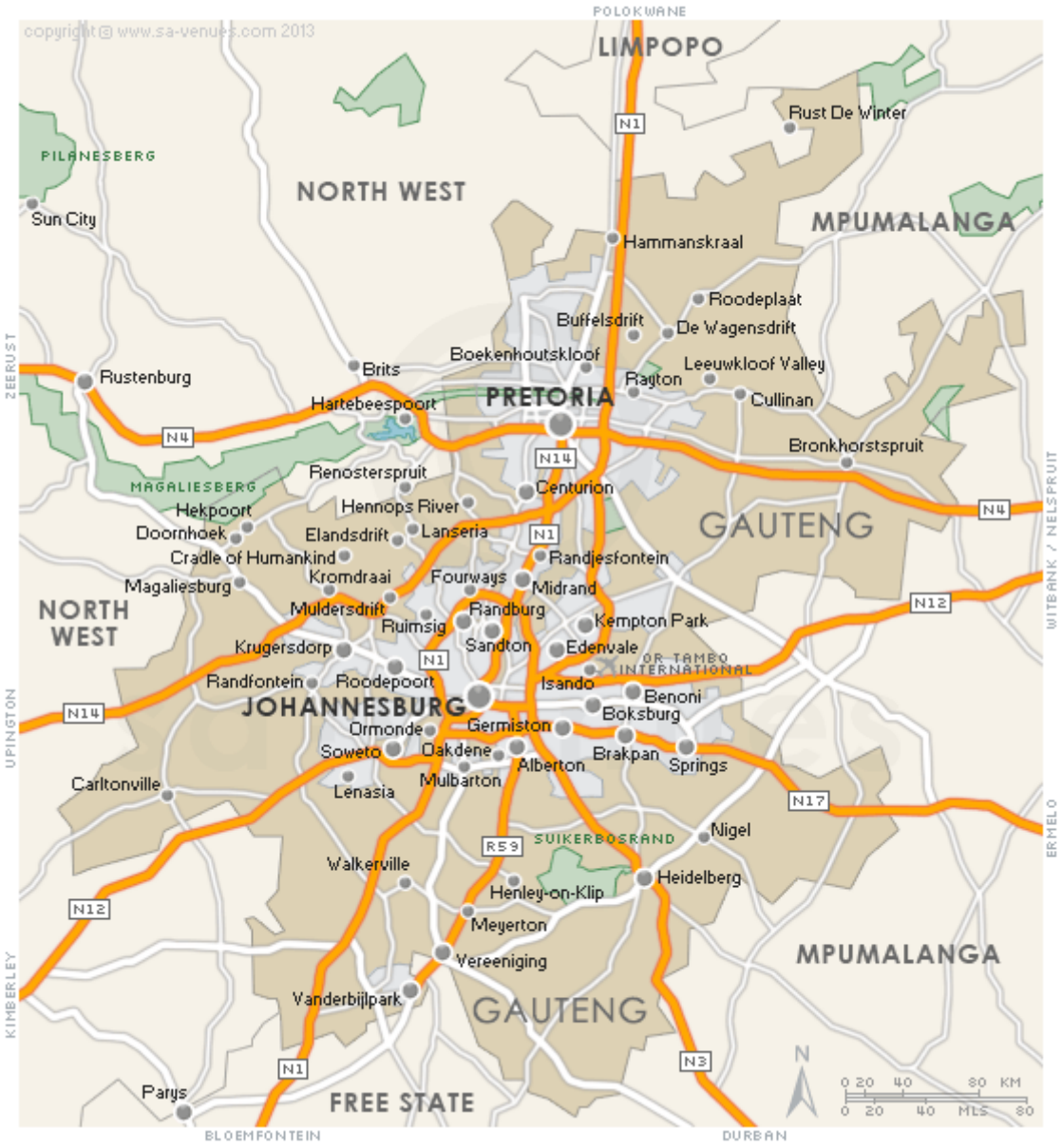
Hennops River (55)

Renosterspruit (56)

Pretoria (57)

Suikerbosrand (58)

JohannesburgCBD (59)



Q9 How many **members** are there in your current household? (Total number of people living together)

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Household size ()	

Q10 In terms of the employment Equity Act of SA, to which **population group** do **you** (as person / not household per se) belong to?

▼African (1) ... Other (6)

Q11 What is your approximate total **monthly household income** rounded up to the nearest R1000?

0 10000200003000040000500006000070000800090000100000

Monthly household income ()	

Q12 What is your preferred home **language**?

- ○ Afrikaans (1)
- ○ English (2)
- ○ Ndebele (3)
- ○ Northern Sotho (4)
- ○ Sotho (5)
- ○ Swazi (6)
- ○ Tsonga (7)
- ○ Tswana (8)
- ○ Venda (9)
- ○ Xhosa (10)
- ○ Zulu (11)
- ○ Other (12)

Q13 Please indicate your **marital status**

▼Single without children / divorced / widowed (1) ... Couple / Married (with children) (4)

Q14 Please indicate **the number of dependent children** who are part of your household

Not Applicable

0 1 2 3 4 5 6 7 8 9 10

Children in household ()

Q15 Please indicate how many **children of the following age groups** are currently part of your household

	Not Applicable 0 1 2 3 4 5 6 7 8 9 10
Infants (0-2 years of age) ()	
Toddlers and pre schoolers (>2 - 6 years of age) ()	
Primary schoolers (>6 - 12 years of age) ()	
Secondary schoolers (>12 - 18 years of age) ()	
Number of adults that are currently part of your household (more than 18 years of age) ()	

Q16 Who primarily buys the groceries in your household?

- ○ Myself (1)
- ○ Mother (2)
- ○ Father (3)
- ○ Sibling (4)
- ○ Domestic helper (5)
- ○ Other (6)
- ○ Partner (7)

End of Block: Section B : Demographics

Start of Block: Section C : Organic Purchasing

Q17 How often do you buy organic food?

- Daily (1)
- Weekly (2)
- Monthly (3)
- Never (4)

Q18 Which organic food products do you normally buy?

- Bananas (1)
- Lettuce (2)
- Spinach (3)
- Wine (4)
- Meat (5)
- Coffee (6)
- Yoghurt (7)
- Milk (8)
- Carrots (9)
- Strawberries (10)
- Tomatoes (11)
- Lemons (12)
- Orange juice (13)

- Chocolate (14)
- Peanutbutter (15)
- Pasta (16)
- Spices (17)
- Coconut oil (18)
- Blueberries (19)
- Tea (20)
- Potatoes (21)
- Cream (22)
- Eggs (23)
- Citrus fruit (Oranges, Naartjies, Grapefruit) (24)
- Berries (25)

Q19 Where do you normally buy your organic food products?

▼Woolworths (1) ... Other (8)

Q20 Why do you prefer to buy organic food products?

- ○ It's good for the environment (1)
- ○ It's healthier and more nutritious (2)
- ○ I want to impress people (3)
- ○ To support local farmers (4)
- ○ It's fraud free (5)
- ○ It's trustworthy (6)
- ○ It's free from harmful ingredients (7)
- ○ It's a product line that is well regulated (8)
- ○ Other (9) _____

Q101 Please indicate the likelihood of the following in terms of Organic produce

	Extremely likely (5)	Somewhat likely (4)	Neither likely nor unlikely (3)	Somewhat unlikely (2)	Extremely unlikely (1)
Substitution of ingredients (1)	○	○	○	○	○
Tampering with products (2)	○	○	○	○	○
Misrepresentation of information (3)	○	○	○	○	○
Addition of unwanted ingredients (18)	○	○	○	○	○

End of Block: Section C : Organic Purchasing

Start of Block: Section D : Consumers' Subjective Knowledge

Q21
How knowledgeable would you say you are about the following terms / definitions?
SUBSTITUTION
Definition : Substitution occurs when an ingredient / product is substituted for another, mostly less expensive, ingredient/product for example substituting coffee with chicory
TAMPERING
Definition: Tampering is the process where you lower the quality of food by adding a different ingredient without declaring it for example the famous case of melanin that was added to baby formula
MISREPRESENTATION
Definition: Misrepresentation also known as mislabeling occurs when a food products label does not accurately reflects ingredients for example selling reverse- osmosis water as mineral water or labeling a product as organic whilst it was conventionally cultivated
ADDITION
Definition: Addition is the process of adding an ingredient to a product illegally or without declaring it on the label for example adding horse meat to beef mince
How knowledgeable would you say you are about the above mentioned **terms /definitions**?

	Not knowledgeable at all (1)	Slightly knowledgeable (2)	Moderately knowledgeable (3)	Very knowledgeable (4)	Extremely knowledgeable (5)
Compared to others I am..... about **substitution** (1)	○	○	○	○	○
Compared to others I am ..... about **tampering** (2)	○	○	○	○	○
Compared to others I am ..... about **misrepresentation** (4)	○	○	○	○	○
Compared to others I am ..... about **addition** (5)	○	○	○	○	○

End of Block: Section D : Consumers' Subjective Knowledge

Start of Block: Section E : Consumer Objective knowledge

Q22 **Please answer the following questions pertaining to food fraud.**

Natural colour are legally added to red wine

- True (0)
- False (1)
- Unsure (2)

Q23 Soybean meal can be added to milk powder to increase the protein content

- True (0)
- False (1)
- Unsure (2)

Q24 Dextrose or maltodextrin must be declared as bulking agents on product labels

- True (1)
- False (0)
- Unsure (2)

Q25 Peanuts may be added to basil pesto without declaring it on the label

- True (0)
- False (1)
- Unsure (2)

Q26 Ascorbic acid is a natural preservative and may be added to baby food to prevent browning

- True (1)
- False (0)
- Unsure (2)

Q27 A small percentage of stabilizer can be added to 100% fruit juice to suspend orange cells

- True (0)
- False (1)
- Unsure (2)

Q28 If less than 10% of horsemeat is added to beef patties it doesn't need to be declared on the label

- True (0)
- False (1)
- Unsure (2)

Q29 Organic produce means it is free from the addition of pesticides

- True (1)
- False (0)
- Unsure (2)

Q30 Sudan red is an accepted food colouring used to colour cakes and pastries

- True (0)
- False (1)
- Unsure (2)

Q31 Melamine is a an approved flavour enhancer for pet food

- True (0)
- False (1)
- Unsure (2)

Q32 Lead bromate is an approved colourant to make turmeric a bright yellow

- True (0)

- False (1)
- Unsure (2)

Q33 Copper sulfate is an illegal additive used to dye table olives

- True (1)
- False (0)
- Unsure (2)

Q34 An example of food fraud is copper added to paprika for a brighter colour

- True (1)
- False (0)
- Unsure (2)

Q35 10% of flour can be added to cinnamon to prevent lumping

- True (0)
- False (1)
- Unsure (2)

Q36 Reverse-osmosis water can be labelled and represented as mineral water

- True (0)
- False (1)
- Unsure (2)

Q37 Milk powder that has been reconstituted with water and sold as long-life milk is categorised as misrepresentation

- True (0)
- False (1)

- Unsure (2)

Q38 Marketing conventionally produced agricultural products as organic is a form of misrepresentation

- True (1)
- False (0)
- Unsure (2)

Q39 Misdeclaration of country of origin is illegal

- True (1)
- False (0)
- Unsure (2)

Q40 Apricot kernels can be used to produce marzipan

- True (0)
- False (1)
- Unsure (2)

Q41 To falsely claim that commercially grown cashew nuts are "Fair trade" is a form of misrepresentation

- True (1)
- False (0)
- Unsure (2)

Q42 Yogurt labels often misrepresent containing live probiotic bacteria

- True (1)
- False (0)
- Unsure (2)

Q43 Organic food is often misrepresented as more nutritious than conventionally produced food

- True (1)
- False (0)
- Unsure (2)

Q44 The green leaf logo on fresh produce represents its organic status

- True (0)
- False (1)
- Unsure (2)

Q45 The botanical origin of honey is often misrepresented for economic gain

- True (1)
- False (0)
- Unsure (2)

Q46 Fish may be labelled as "fresh" even if it has been frozen

- True (1)
- False (0)
- Unsure (2)

Q47 Misrepresentation is a form of food fraud where a false or misleading statement is made about a product for economic gain

- True (1)
- False (0)
- Unsure (2)

Q48 All dairy components must be represented on the product label

- True (1)
- False (0)
- Unsure (2)

Q49 Food misrepresentation occurs when a food product's label does not accurately reflect its ingredients

- True (1)
- False (0)
- Unsure (2)

Q50 Adding Rhodamine B to colour food red is considered tampering

- True (1)
- False (0)
- Unsure (2)

Q51 It is legal to use corn syrup to dilute genuine agave syrup

- True (0)
- False (1)
- Unsure (2)

Q52 To add a small percentage of water to dilute yogurt to a drinking yogurt is not food tampering

- True (0)
- False (1)
- Unsure (2)

Q53 Indirect tampering occurs when bees are fed on sugar water rather than obtaining their food from flowers

- True (1)
- False (0)
- Unsure (2)

Q54 To add a small amount of fructose to make 100% orange juice sweeter is not tampering

- True (0)
- False (1)
- Unsure (2)

Q55 An example of food tampering is using pharmaceutical grade talcum powder to dust marshmallows

- True (1)
- False (0)
- Unsure (2)

Q56 Pure honey will crystallize over time

- True (1)
- False (0)
- Unsure (2)

Q57 Food tampering takes place when an inferior ingredient is used to produce a product

- True (1)
- False (0)
- Unsure (2)

Q58 "Turkish apricots"can be sold at a premium if it accurately declares the country of origin and is therefor not classified as product tampering

- True (0)
- False (1)
- Unsure (2)

Q59 Using methanol in the production of vodka is an example of tampering

- True (1)
- False (0)
- Unsure (2)

Q60 Using methanol in the production of vodka is an example of tampering

- True (0)
- False (1)
- Unsure (2)

Q61 Artificially increasing the colour of saffron is a form of food fraud

- True (1)
- False (0)
- Unsure (2)

Q62 The following products are most at risk of food tampering : olive oil, milk, fish, honey and coffee

- True (1)
- False (0)
- Unsure (2)

Q63 An example of food tampering is washing chicken and illegally extending its shelf-life

- True (1)
- False (0)
- Unsure (2)

Q64 Food tampering is falsely improving the visual appearance a food product

- True (0)
- False (1)
- Unsure (2)

Q65 Sodium Benzoate can be subsituted with formaldehyde as a preservative for milk

- True (0)
- False (1)
- Unsure (2)

Q66 Coconut sugar is a natural sugar substitution for diabetics

- True (0)
- False (1)
- Unsure (2)

Q67 Not all nuts are allergens

- True (1)
- False (0)
- Unsure (2)

Q68 Hazelnuts can be substituted with peanuts as a cheaper alternative

- True (0)

- False (1)
- Unsure (2)

Q69 Sugar can be substituted with Aspartame for a diabetic-friendly beverages

- True (1)
- False (0)
- Unsure (2)

Q70 The word "Boerewors" and "Braai wors" are different names for the same product and can be substituted at any time

- True (0)
- False (1)
- Unsure (2)

Q71 Ascorbic acid can be substituted with Vitamin C in citrus drinks

- True (1)
- False (0)
- Unsure (2)

Q72 An example of fraudulent substitution is beef patties that contain water buffalo meat

- True (1)
- False (0)
- Unsure (2)

Q73 Smoked salmon and salmon trout can legally be used to describe the same products

- True (0)
- False (1)

- Unsure (2)

Q74 Rye flour is a gluten-free substitution for regular wheat flour

- True (0)
- False (1)
- Unsure (2)

Q75 Ingredient substitution is classified as food fraud

- True (1)
- False (0)
- Unsure (2)

Q76 Fructose syrup can be used as a substitution in honey

- True (0)
- False (1)
- Unsure (2)

Q77 10% percent of chicory may be substitued into to ground coffee to still fall into the "coffee" category

- True (0)
- False (1)
- Unsure (2)

Q78 Extra virgin olive oil may be replaced with 10% alternative plant oils

- True (0)
- False (1)
- Unsure (2)

Q79 A manufacturer is allowed to replace pecan nuts with peanuts in a product

- True (0)
- False (1)
- Unsure (2)

Q80 Tilapia may not be used as a substitute in canned tuna

- True (1)
- False (0)
- Unsure (2)

End of Block: Section E : Consumer Objective knowledge

Start of Block: Block 5

ANNEXURE B: LETTER OF CONSENT

DEPARTMENT OF FOOD AND CONSUMER SCIENCE

Consumers' knowledge of food fraud and its impact on their purchasing behaviour of organic fresh produce.

Food Fraud: Consumers' knowledge and purchasing behaviour of organic fresh produce. A case study of urban households in Gauteng, South Africa

Informed Consent Form

Dear respondent The purpose of this study is to gain insight into the consumers' knowledge of food fraud in South Africa. The study is particularly interested in what consumers perceive as food fraud related to organic produce. Through this research project, we would like to identify problem areas and to subsequently provide guidelines so that both retailers and consumers would know how to differentiate between authentic food products and to identify high-risk products that might be subjected to food fraud or product adulteration. Thank you for taking the time to share your perspectives and views in this regard.

Participants in this study will be asked to answer several questions regarding their food consumption and decision making when buying organic produce. All answers will be recorded for further use by the investigators only. Respondents are welcome to refrain from answering any questions that they view to be the cause of any discomfort or infringement of their privacy. Refusal to participate or withdrawal of consent, or discontinued participation in the study will not result in any penalty. Please note that your participation is voluntary and does in no way release the researchers or involved institutions from their legal and professional responsibilities. All information will be treated as highly confidential and the identity of respondents need not be disclosed and will remain anonymous. The results of this study will be presented in an aggregated format.

Your decision to respond to the questions posed will be interpreted as confirmation that you have agreed to participate.

Should you wish to partake in future research projects such as focus group discussions pertaining to this study, please provide your email address and mobile phone number in the spaces provided.

Please provide your e-mail address in the space below:

_____

ANNEXURE C: ETHICAL CLEARANCE

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Faculty of Natural and Agricultural Sciences
Ethics Committee

E-mail: ethics.nas@up.ac.za

13 March 2020

ETHICS SUBMISSION: LETTER OF APPROVAL

Mrs C Venter
Department of Consumer and Food Sciences
Faculty of Natural and Agricultural Science
University of Pretoria

Reference number: NAS474/2019
Project title: FOOD FRAUD : CONSUMERS' KNOWLEDGE AND PURCHASING BEHAVIOUR OF ORGANIC FRESH PRODUCE

Dear Mrs C Venter,

We are pleased to inform you that your submission conforms to the requirements of the Faculty of Natural and Agricultural Sciences Research Ethics committee.

Please note the following about your ethics approval:

- Please use your reference number (NAS474/2019) on any documents or correspondence with the Research Ethics Committee regarding your research.
- Please note that the Research Ethics Committee may ask further questions, seek additional information, require further modification, monitor the conduct of your research, or suspend or withdraw ethics approval.
- Please note that ethical approval is granted for the duration of the research (e.g. Honours studies: 1 year, Masters studies: two years, and PhD studies: three years) and should be extended when the approval period lapses.
- The digital archiving of data is a requirement of the University of Pretoria. The data should be accessible in the event of an enquiry or further analysis of the data.

Ethics approval is subject to the following:

- The ethics approval is conditional on the research being conducted as stipulated by the details of all documents submitted to the Committee. In the event that a further need arises to change who the investigators are, the methods or any other aspect, such changes must be submitted as an Amendment for approval by the Committee.
- **Applications using Animals:** NAS ethics recommendation does not imply that AEC approval is granted. The application has been pre-screened and recommended for review by the AEC. Research may not proceed until AEC approval is granted.

Post approval submissions including application for ethics extension and amendments to the approved application should be submitted online via the Ethics work centre.

We wish you the best with your research.

Yours sincerely,

Chairperson: NAS Ethics Committee