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SUSTAINABLE FOOD CONSUMPTION IN GERMANY

Predicting consumers' intention of purchasing sustainable food products by applying an extended model of the theory of planned behavior

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Abstract

Purpose – The purpose of this paper is to study what influences consumers' intention to buy sustainable food products in Germany by applying an extended model of the theory of planned behavior (TPB).

Methodology – A questionnaire was developed based on previous research and the answers from a focus group. Data from 218 respondents were collected through convenient sampling by sharing the survey online on social media. The relationships between the variables environmental knowledge, sustainability concern, attitude, subjective norms, perceived behavioral control and intention were analyzed using structural equation modeling (SEM). By conducting a focus group beforehand, the aspects of the variable sustainability concern were constructed.

Findings – The proposed model revealed a strong positive relationship between attitude and intention. Moreover, attitude is positively influenced by environmental knowledge and sustainability concern and thus, is an important mediator. Furthermore, a positive effect of sustainability concern on subjective norms was identified and an indirect effect of sustainability concern on intention was found. No significant relationship was found between sustainability concern and perceived behavioral control, and between subjective norms, perceived behavioral control, environmental knowledge and intention. Nevertheless, the proposed model explained 74% of the variance of the construct intention to purchase sustainable food products.

Limitations – Due to the application of a non-probability sample, the findings are not generalizable to the German population. However, the findings are appropriate to explore variables which determine consumers' intention to buy sustainable food products. Another constraint is the limited capacity to reflect people's real level of the variables environmental knowledge and sustainability concern which provides room for improvement.

Implications – Environmental knowledge and sustainability concern are affecting attitude which is found to be the greatest determinant of intention in our model. Therefore, it is of great importance to educate people about sustainability issues in order to enhance their knowledge and concern and thus positively impact their attitude toward sustainable food consumption. In turn, their intention to buy sustainable alternatives is influenced which is the best predictor of behavior. The findings can give policymakers, marketers and industry practitioners the insights necessary to develop more effective strategies that can foster the field of sustainable food consumption.

Keywords – *Sustainable Food Consumption, Theory of Planned Behavior, TPB, Attitude, Intention, Structural Equation Model, SEM, Germany*

Outline

Abbreviations

AMOS	SPSS Analysis of moment structures
AT	Attitude
AVE	Average variance extracted
BMU	Bundesministerium für Umwelt, Naturschutz und nukleare Sicherheit (German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety)
CFA	Confirmatory factor analysis
CFI	Comparative fit index
CR	Composite reliability
EK	Environmental knowledge
GHG	Greenhouse gas
GOF	Goodness-of-fitness
IFI	Incremental fit index
IPCC	The Intergovernmental Panel on Climate Change
IT	Intention
PBC	Perceived behavioral control
RMSEA	Root mean square error approximation
SC	Sustainability concern
SCP	Sustainable consumption and production
SDGs	Sustainable development goals
SN	Subjective norms
SEM	Structural equation model
SPSS	Statistical Package for the Social Sciences
TBL	Triple bottom line
TLI	Tucker-Lewis Index
TPB	Theory of planned behavior
TRA	Theory of reasoned action
UN	United Nation

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1 Introduction to the Topic

1.1 Background

The consumption patterns of affluent societies account for around 80% of the world's total consumption, even though they represent only 20% of the world population (Tukker et al., 2008). The population is rising and the mass production of food, necessary to nourish the growing number of people, has a negative impact on the environment and thus, causes degradation of natural resources humanity depends on (Govindan, 2018; Tukker et al., 2008). Moreover, nature's capacity to regenerate has been surpassed by consumption by 30% due to the approximately tripled demand on Earth's resources within the last 50 years (Staniškis, 2012). Therefore, consumption has an important role in the debate of ensuring sustainable development. The most common definition of sustainable development was coined by Gro Harlem Brundtland in the Brundtland Report which defines sustainable development as development *"that meet[s] the needs and aspirations of the present generation without compromising the ability of future generations to meet their needs"* (WCED, 1987, p. 29). In 2015, the United Nation's Sustainable Development Goals (SDGs) have been adopted by all countries to achieve environmental, social and economic sustainability by 2030 (United Nations, n.d.-a). One of these 17 goals is Goal 12 – *Responsible Consumption and Production* aiming to *"[e]nsure sustainable consumption and production patterns"* (United Nations, n.d.-a), showing the societal importance of this topic.

1.1.1 Toward sustainable consumption

The definition of sustainable consumption and production was firstly presented by the United National Environment Program (UNEP) in 1994, as

> *"the use of services and related products which respond to basic needs and bring a better quality of life, while minimizing the use of natural resources and toxic materials as well as emissions of waste and pollutants"* (United Nations, n.d.-b, par. 3)

The definition above indicates an unprecedented concern over sustainable consumption which has gained international publicity. The attention on sustainable consumption is rising significantly because many researchers, scientific communities and other groups have claimed that the current consumption patterns of natural resources and operations are unsustainable (Lim, 2017) and that the level of consumption cannot be sustained at the current rate (Peattie & Collins, 2009). After researchers paid attention to consumption, there was a debate on the understanding of consumption itself. The traditional understanding was discussed in the context of purchasing (Wertenbroch, 1998; Westbrook, 1987). This caused some researchers to argue

that consumption is perceived as an anti-sustainability position (Gordon et al., 2011; Peattie & Collins, 2009). In order to resolve the controversy between consumption and sustainability, the view of consumption has been changed. Consumption is required to be understood from a holistic perspective of potential environmental, social, and economic impacts that take place through the entire production and consumption cycle of a product (Peter et al., 2008). Nowadays, sustainable consumption is understood as a lifestyle that rejects consumerism, especially unnecessary material consumption. It promotes the value of highlighting the needs, instead of wants. Moreover, sustainable consumption involves not only individual needs but also the consumer's social responsibility (Lim, 2017).

1.1.2 Sustainable food consumption

The areas of consumption that have the biggest environmental impact are food, housing, and mobility (Tukker et al., 2008; Tukker & Jansen, 2006). To narrow down the broad theme of consumption, this paper focuses on studying the phenomenon of sustainable food consumption because of its large impact on the environment, society and economy (Reisch et al., 2013). Within the EU, food and drink consumption accounts for approximately 30% of the total greenhouse gas (GHG) emissions of household's consumption (Liu et al., 2016; Reisch et al., 2013). Furthermore, food is one of six sectors with the greatest potential for reducing the environmental burden, according to the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) (BMU, n.d.).

Food's major impact on the environment occurs in the stage of production (Reisch et al., 2013), showing that sustainable consumption and sustainable production (SCP) are intertwined and cannot be separated (Liu et al., 2016; Reisch et al., 2013). Therefore, in order to achieve SCP the whole food supply chain must be rethought (Lorenz & Veenhoff, 2013). The current unsustainable agricultural practices lead to soil degradation through land usage, to the pollution of water and eutrophication due to the overuse of mineral fertilizer and synthetic pesticides and intensive animal husbandry (Reisch et al., 2013). Besides the environmental impact of agriculture, consumers are concerned about animal welfare (Lorenz & Veenhoff, 2013). According to the Umweltbundesamt (2019), the German Environment Agency, in 2018 agriculture accounted for 7.34% of Germany's total emissions, replacing the industry as the second-largest emitter of GHG, after the energy sector. Moreover, by using more than half of Germany's total area (51.1 %), the agricultural sector is the largest user of land, imposing a big environmental burden (German Environment Agency, 2018). Even though Germany had the largest market for organic products, in 2016 only 7.5% of Germany's agricultural land was cultivated using organic farming practices (German Environment Agency, 2018). Organic

farming is a part of sustainable land management which is does not use chemical fertilizers and pesticides and therefore, it is environmentally benign, saves resources and ensures animal welfare (Basha et al., 2015). However, organic food products are focusing on the environmental dimension of sustainability and for this reason, are representing only one part of sustainable food consumption.

Using the definition of sustainable products by Vermeir and Verbeke (2006, 2008) which follows the Triple Bottom Line (TBL) by Elkington (1994), ecological, economic and social sustainability are included. The ecological dimension refers to preserving the environment by using and managing resources sustainably and ensuring good conditions for animals in livestock production. Economic sustainability includes a fair price for the producers but also affordable prices for the consumers, while social sustainability involves *"an integration of agriculture in the priorities and needs of the society/citizens and an appreciation and support for the agro-food sector from the society as well as from government"* (Vermeir & Verbeke, 2006, p. 170). In order to take a holistic approach to sustainable food consumption, we have decided to focus on sustainable products which encompass besides the environmental dimension, also the economic and social dimension of sustainability. However, sustainable products do not necessarily consist of all three dimensions but contribute to **one or a combination** of these dimensions (Reheul et al., 2001 see Vermeir & Verbeke, 2006) and thus, support the SDGs through their attributes (Verain et al., 2012; Vermeir & Verbeke, 2006).

Following the definition of sustainable products, we performed a literature review, including peer-reviewed journals written in English, distinguishing the ecological, economic and social dimension of sustainable food consumption. It becomes obvious, that most literature deals with the ecological dimension researching *organic food* (Reisch et al., 2013; Sustainable Consumption Roundtable [SCR], 2006; Vermeir & Verbeke, 2008), *seasonal food* (SCR, 2006), *locally produced products* (Hoff et al., 2014; Reisch et al., 2013; SCR, 2006; Verain et al., 2012; Vermeir & Verbeke, 2008), the *reduced consumption of meat* (Reisch et al., 2013; SCR, 2006) and *dairy products* (Reisch et al., 2013), *sustainably harvested fish* (Hoff et al., 2014; Reisch et al., 2013; SCR, 2006; Verain et al., 2012; Vermeir & Verbeke, 2008), *waste prevention* (de Hooge et al., 2017; Schmidt, 2019), *packaging* (SCR, 2006), as well as the *water, CO_2 and nitrogen footprint of products* (Hoff et al., 2014; Liu et al., 2016). For the economic dimension, only the *Fairtrade* label and *supporting the local economy* are mentioned (Vermeir & Verbeke, 2008), whereas the *animal-friendly production* (Verain et al., 2012; Vermeir & Verbeke, 2008) and *nutritional value* of food (SCR, 2006) are counted under the social dimension.

1.2 Problematization

Although many researchers have proposed frameworks for integrating consumption in a more sustainable production process (Tukker et al., 2008), and provided guidelines for policymakers in governments and entrepreneurs (Tseng et al., 2013), current consumption patterns and unsustainable production activities indicate that previous efforts are insufficient (Wang et al., 2019). As mentioned before, this paper focuses on sustainable food consumption as a case of sustainable consumption. Agriculture plays the main role in food production. While agriculture is negatively affected by global warming, conventional agricultural practices are also having a huge impact on climate change, accelerating it and making it a vicious cycle (IPCC, 2014). Consequently, patterns of consumption need to be changed or reduced worldwide because of the finite resources on Earth (Staniškis, 2012) in order to ensure that emissions are reduced on a global level and not just shifted abroad (German Environment Agency, 2018). The SDGs operate on a macro level urging countries to take action. The question is how people as individuals can act in accordance with them on a micro-level. The issues of climate change and sustainability have been around for a while, and most people acknowledge the need to change consumption patterns and systems. The awareness of consumers about sustainability issues in food production and consumption is growing and more and more people search for sustainable alternatives as opposed to conventional products, such as organic, fair trade, locally produced and/or environmentally and animal-friendly products (Staniškis, 2012; Vermeir & Verbeke, 2008). However, the awareness of these problems does not necessarily translate into changing behavior. Due to the market-driven economy, consumers' purchasing behavior is a crucial factor in demanding a more sustainable production of food (Annunziata & Scarpato, 2014; Govindan, 2018). Thus, a deeper insight of what are the influencing factors for the current sustainable food consumption pattern and their relationships is required to orient the development of sustainable food production (Annunziata & Scarpato, 2014). In our study, we want to discover what is influencing consumers' intention to purchase sustainable food products in Germany.

Many studies that examine consumers' behavior concerning food consumption are related to the environmental dimension of sustainability, such as organic food (Irianto, 2015; Paul & Rana, 2012; Rana & Paul, 2017; Shepherd et al., 2005; Zanoli & Naspetti, 2002), local products (Aprile et al., 2016; Feldmann & Hamm, 2015; Meyerding et al., 2019) or green products (Liobikienė et al., 2016; Maniatis, 2016; Paul et al., 2016). However, not much research covers sustainable food consumption in more general terms (Annunziata & Scarpato, 2014; Vermeir & Verbeke, 2006, 2008). This paper contributes to the academic research about sustainable

food consumption by summarizing previous literature and thus, providing a clearer scope of sustainable food products, and by constructing the variable sustainability concern which includes 16 aspects of sustainability issues. By examining sustainable food consumption incorporating all three dimensions of sustainability (the ecological, social and economic dimension), this paper intends to take a holistic approach. The country of interest in this study is Germany because it was the largest market for organic food products on a European level in 2016. Moreover, Germany adopted the *"National Program for Sustainable Consumption"* aiming to make sustainable consumption mainstream, while increasing the competence of consumers. Simultaneously, the participation in sustainable consumption of all social classes, including low-income classes, should be guaranteed (BMU, n.d.). These points make Germany an interesting case to study sustainable food consumption. By applying a quantitative approach, the aim is to identify variables that affect consumers' intentions toward buying sustainable food consumption in Germany through an online questionnaire. The study focuses on consumers' intention because the actual behavior cannot be studied quantitatively and need to be approached qualitatively by observation or experiments to obtain reliable findings that mirror people's behavior.

Sustainable consumption is discussed from many different angles, whereby the two perspectives of economic and social psychology, which take a mostly individual approach, prevail. The theory of planned behavior (TPB) is used as a theoretical framework to predict consumers' intentions of purchasing sustainable food products and to explain influencing factors (Ajzen, 2015). The theory belongs to the social-psychological perspective (Ajzen, 2015; Liu et al., 2016). However, insights into individual perspectives are limited in a way that consumers are locked in unsustainable patterns of consumption because of prevalent infrastructures, social norms and habits that in practice restrict choices and thus may hinder intended behavior (Tukker et al., 2008). The TPB which includes attitude, subjective norms and perceived behavioral control is extended in this study by sustainability concern and environmental knowledge as predictors of intention. A structural equation mode is used to study the relationships between the variables. Understanding these determinants of the intention to purchasing sustainable food products, assists policymakers, manufacturers and marketers to foster sustainable habits which have less impact on the environment (Liobikienė et al., 2016). Moreover, it supports the 'triangle of change' consisting of consumers, businesses and government (SCR, 2006; Tukker et al., 2008).

1.3 Research aim and questions

This empirical study aims to identify the factors that affect the purchase intention of consumers toward sustainable food products, such as organic, seasonal, locally produced, plant-based food and products with low or zero (plastic) packaging. The study predicts the purchase intention of consumers based on the influences of the variable sustainability concern, environmental knowledge, attitude toward sustainable food, subjective norms and perceived behavioral control. The research questions of the paper are the following:

1. *How does sustainability concern influence attitude, subjective norms and perceived behavioral control of purchasing sustainable food products?*
2. *What indirect effect does sustainability concern have on the intention to buy sustainable food products?*
3. *What role play attitude, subjective norms, perceived behavioral control and environmental knowledge for consumers' intention to purchase sustainable food products?*

By finding answers to these questions this paper seeks to provide useful implications to policy makers and marketers in the field of sustainable food products in order to support the development of effective strategies that enhance the consumption of sustainable food.

1.4 Structure of the thesis

The thesis is divided into six chapters beginning with our introduction, which gives an overview of sustainable consumption, explaining why sustainable food consumption is suitable to narrow down sustainable consumption, and including the research gap, the aim of the paper and research questions. The second chapter introduces the theoretical framework by first presenting a literature review of existing research and then explaining the theoretical relationship between attitude, intention and behavior. It furthermore provides the fundamentals of the theory of planned behavior (TPB), its extension by sustainability concern and environmental knowledge and the hypotheses derived from literature. Afterwards the constructed theoretical model which is used in this study is displayed. The third chapter presents the methodology by describing the research design, the procedure, data collection and data analysis, as well as ethical considerations and the limitations of the method. Chapter four focuses on the results of the collected data, whereas the fifth chapter deals with analyzing and discussing these results based on the extended TPB. Moreover, limitations of the research are included and suggestions for future research are given. The last chapter provides a conclusion.

2 Theoretical Framework

This chapter presents the theoretical framework of this study. As a quantitative research, it takes the epistemological position of critical realism which believes that social sciences should use the same approach for data collection as natural sciences. Moreover, critical realism pursues the goal of obtaining a deeper understanding of structures of events (McEvoy & Richards, 2006), as a precondition to change these structures (Bryman, 2012). This aligns with the goal of our study to identify variables that influence people's intention to purchase sustainable food products to understand how it can be shaped positively. The ontological orientation is objectivism which means that an external reality exists independently from social actors (Bryman, 2012). First a literature review is conducted to determine existing research on the topic of sustainable food consumption and to identify gaps in research. Afterwards the difference and relationship between attitude, intention and behavior is examined in order to clarify the distinction of these concepts and why intention is suitable to predict behavior. In the next step the variables of the theory of planned behavior (TPB) and the extended model are explained, existing research on their relationships are presented and hypotheses are formulated accordingly. Finally, the hypothesized relationships between the variables are depicted in the extended TPB model of purchasing intention of sustainable food products.

2.1 Literature review

Previous research discusses consumers' motivations for consuming sustainable food but also related obstacles. As mentioned before, sustainable food consumption includes different aspects, and consequently, previous studies focus on various facets. The aspects of consumption of organic, local or green products are prevailing and thus, are discussed in more detail.

Organic food consumption:

Some researchers state that focusing on organic food consumption is an appropriate approach to study sustainable food consumption. Sazvar et al. (2018) point out that with the close interrelation of organic food and sustainable food, the terms are used as a substitute for each other sometimes. Irianto (2015) applies TPB to study the variables affecting the consumer attitude to purchase organic food, which in turn affects the purchasing intention of consumers in Surakarta City, Indonesia. Health consciousness, environmental consciousness, price and gender are considered as extended variables that may affect consumers' attitude and intention toward organic food products. Organic food is defined as organics that involves the philosophy to provide support to human health, the ecosystem, and the soil (Chekima et al., 2017). This is the reason why health consciousness and environmental consciousness are selected as variables that affect consumers' attitude. Similar studies are also conducted by Chen (2009) in Taiwan

and Feil et al. (2020) in Brazil. All of these studies above indicate that the consumers' concerns about health and the environment are the main determinants that can shape a positive attitude toward organic food purchasing because they are important to individuals themselves and are reducing the environmental impact. Annunziata et al. (2019) undertake the study in a slightly different approach by selecting a general sustainability concern as a variable instead of specific variables. The finding indicates a similar result concerning health and environmental incidents which positively affect consumers' attitude toward purchasing organic food in Campania (a region in the south of Italy).

However, the result of Tarkiainen and Sundqvist (2005) is inconsistent with these findings. Their study shows that the relationship between health consciousness and attitudes toward organic food purchasing was not significant in Finland, showing that health consciousness does not have a positive effect on the general attitudes toward organic food. This opposite result may be caused by different target countries. Since studies are conducted in various countries or regions, the availability of organic food product choices in the supermarkets may also differ. This may also relate to the observed differences in perceived behavioral control which is another perspective included in the theory of planned behavior. The differences can be caused by the different degree of the availability, convenience and price of the products and the individual ability to purchase products. These factors may have an influence on consumers' consumption intention.

Local food consumption:

Local food is another food product, typically considered sustainable. Consumers usually prefer local food because of expected benefits regarding freshness, higher safety and animal living standards as well as a lower environmental impact (Jensen et al., 2019). Therefore, local food has many expected benefits which are fairly similar to the preferred benefits of organic food (Denver & Jensen, 2014; Wägeli & Hamm, 2016). Meanwhile, many researchers indicate that the feature of local origin is one of the most important additional attributes beyond organic food production (Mennecke et al., 2007; Zander & Hamm, 2010). This explains why some variables in studies focusing on local food products are similar to the variables considered in research about organic food products. Previous studies identify different variables that may affect local food choices including consumers' perception and attitude of what local food implies (Dunne et al., 2011; Feldmann & Hamm, 2015), personal values and benefits that relate to local food products (Roininen et al., 2006).

Many studies consider different variables based on the theory of reasoned action (TRA) and the theory of planned behavior (TPB). For example, Jensen et al. (2019) assume that behavioral variables are determined by the interaction between attitudes and perceived attributes of the food products. Aprile et al. (2016) consider five perspectives to study consumers' purchasing patterns toward local food including food consumption styles, sociodemographic characteristics, perception of local food, purchasing motives and perceived quality of local food. Among all these five perspectives, food consumption styles and sociodemographic characteristics are the basis for studying consumers' shopping behavior, the remaining three perspectives are part of TPB. The results indicate that sustaining local farmland and keeping traditional production methods are the main drivers for people to choose local food products. Even though many researchers do not use the completely identical terminologies from TRA and TPB, the initial ideas are rather similar. Meanwhile, the benefit of local food and organic food is to some extend intersected and related to each other. It is difficult to draw a clear border between organic food and local food. This brings some difficulties and limitations in conducting a study which concentrates on only a particular type of sustainable food.

Consumption of green products:

Under the operational perspective, sustainable food consumption may also be studied by focusing on green products. Green products are understood as products that do not generate pollution to the Earth or exploit natural resources, and can be recycled and preserved (Shamdasani et al., 1993). Therefore, green products are a general category for environmental-friendly products that are not limited to only food products. Paul et al. (2016) argue that there is a need to study consumers' green product purchase behavior in developing countries to reduce further environmental impacts. Previous studies cover developing countries in Asia such as India (Biswas & Roy, 2015; Paul et al., 2016), Malaysia (Tan, 2011), China (Qi & Ploeger, 2019; Zhao et al., 2014), as well as Brazil (Ritter et al., 2015) and other countries. Among them, one of the most widely applied theories is TPB and many scholars use extended TPB as a more powerful tool to study consumers' intention. However, Lee and Green (1991), Mancha and Yoder (2015), Qi and Ploeger (2019) argue that the cultural dimension usually was not emphasized to predict the behavioral intentions in cross-cultural cases. In many developing countries, there are varied cultural values, beliefs and attitudes when compared to their counterparts across the world (Singh & Gupta, 2013).

According to Hofstede et al. (2005) and Triandis (2000), there are generally two types of culture: Individualist and collectivist cultures. Although the individualism-collectivism comparison is criticized by many scholars for overlooking values that serve the interest of both

the person and group, such as wisdom (Schwartz, 1990), it provides valuable insights when studying people in different cultural contexts. Individualist cultures exist mostly in America and in Western Europe where the people emphasize personal self-esteem enhancement, while collectivist cultures are commonly identified in developing countries, particularly in Asian countries where the focus lies on maintaining social group esteem. This cultural difference can be summarized by descriptive norms which appoint to the perception of the trend of behavior and injunctive norms which refer to the behavior commonly approved (Cialdini et al., 1990). According to the theory of planned behavior (TPB), subjective norms are understood as the perceived social force to conduct a particular behavior. Subjective norms focus more on social pressure which captures injunctive norms but may not capture descriptive norms. Even though some studies have not applied TPB, some dimensions are similar to the perspectives in TPB. For example, Mohd Suki and Mohd Suki (2015) and Biswas and Roy (2015) use social value to measure perceived value acquired from the association of one or more social groups. The main concept of social value is to some extent like subjective norms in TPB. Therefore, subjective norms can be regarded as one part of the cultural dimension.

Many studies on developing countries show that the cultural dimension is one of the most significant factors for green product consumption (Biswas & Roy, 2015; Qi & Ploeger, 2019). However, Liobikienė et al. (2016) find that the cultural dimension does not have a direct significant influence in all countries in the European Union according to their conducted cross-cultural research. One of the reasons to explain this opposite result may be related to the two different cultural systems, individualist and collectivist, that have been mentioned above. Therefore, considering which variable should be included depends on the geographical difference. This also explain why the models structured under TPB are country-specific or region-specific and results are disabled to be generally applicable outside their country or region (Lee & Green, 1991).

2.2 Differentiation and relationship between attitude, intention and behavior

There is a necessity to understand the difference and the relationship between attitude, intention and behavior. The definition of attitude is widely accepted as a mental and physiological state of readiness through experience, and it can exert a direct or dynamic influence on people's response to objects or behavior (Allport & Lindzey, 1954). Initially, many scholars believe that attitude is the key element to understand behavior (Tardiff, 1977; Tischer & Phillips, 1979). Meanwhile, other scholars argue that there is an inconsistency between attitude and behavior (Wicker, 1969) and TPB is often criticized for the relationship between attitude and behavior, and the so-called "attitude-behavior gap" (Liu et al., 2016; Vermeir & Verbeke, 2006, p. 170).

This means that even if consumers hold a positive attitude toward a product, such attitudes are not necessarily translated into action and thus, are not reflected in the observed consumption patterns in the marketplace (Adrita & Mohiuddin, 2020). Later, Fishbein (1975) demonstrates that social pressure is also one dominant element having an impact upon behavior, and other determinants including personal norms and personal behavioral control are playing key roles in behavior (Ajzen, 1991). Therefore, it cannot be argued that attitude is a direct predictor of behavior (Bagozzi et al., 1989).

Intention has been widely accepted as a transforming variable which mediates the effects of attitudes on behavior. Intention is defined as a particular sort of volition that is transforming the psychological perspective into the conducted physical responses (Ajzen & Fishbein, 1980). In this context, intention means the process of people transforming their favorable attitude into a certain action. Behavioral intentions include 'commitment' to conduct a behavior additionally to what people wish to do (Fujii & Gärling, 2003). Choo et al. (2004) find that attitudes significantly affect behavioral intention in the study of new food product purchasing behavior. Intention is accepted to be the best predictor for behavior (Kim & Han, 2010). According to Robinson and Smith (2002), barriers such as price, inconvenience, lack of availability, habit and trust are the reason why more than a half of the consumers that showed interest in buying sustainable foods, did not translate their positive attitude into behavior. Consequently, a favorable purchasing context can fortify the attitude-behavior relationship, whereas unfavorable conditions hinder bringing intention into action (Adrita & Mohiuddin, 2020; Vermeir & Verbeke, 2006). Thus, situational, possibly constraining, factors should be considered. This is why we chose to include convenience, availability and price in our construct perceived behavioral control.

2.3 The theory of planned behavior

The theory of planned behavior (TPB) is a social-psychological approach to sustainable consumption (Liu et al. 2016) and enjoys high popularity for predicting and understanding purchase behavior (Ajzen, 2015). The TPB is based on the theory of reasoned action (TRA) which was firstly proposed by Ajzen and Fishbein (1980) and which includes attitude, subjective norms and intention as determinants of individual behavior. Later this theory was extended by the variable of perceived behavioral control to predict behavior. Therefore, in the TPB, behavior is determined by the stated behavioral intention which in turn is assumed to be predicted by the three constructs *attitude, subjective norms* and *perceived behavioral control.* These variables are informed by three types of beliefs: The *behavioral, normative* and *control belief* (Ajzen, 2015). The behavior is said to be planned in the sense that the intentions and

behaviors of people are assumed to be consistent with their beliefs, even though these beliefs can be informed poorly, may reflect an unconscious bias or are based on wishful thinking. This means, that it is not assumed that people behave rationally but just following their beliefs consistently (Ajzen, 2015). The extended TPB provides researchers with the flexibility to select appropriate variables from various dimensions depending on the characteristics and nature of the research object as well as the country where the study is conducted.

The following two reasons show, why the (extended) TPB is suitable as a theoretical framework to study consumers' purchasing intentions of sustainable food products. Firstly, TPB is accepted to be a proper tool to study consumers' intention and behavior. Many researchers apply TPB to study consumers' preference and behavior toward sustainable food such as organic food, local food and green products, among others. For example, Qi and Ploeger (2019) indicate that the TPB model with extended variables has successfully explained 71%-83% of the total variance for consumers' green food product purchase intention. Secondly, TPB includes not only consumers' internal perspectives but also the external perspectives derived from the context. Perceived behavioral control includes the external variables from the context such as the convenience and price of the food products as well as individuals' ability to purchase products which vary in different regions or countries. Meanwhile, due to its flexibility, the extended TPB provides the possibility to study sustainable food in general instead of concentrating on a specific sustainable food category.

2.3.1 Attitude

Attitude toward a behavior is informed by the *behavioral beliefs* and refers to the perceived result of a certain behavior, answering the question if the performed behavior has positive or negative consequences. In this study, attitude is understood as the degree to which a person has a favorable position of purchasing sustainable food products. Research identifies attitude as a strong determinant of intention, for example when purchasing green products (Paul et al., 2016) or buying sustainable dairy products (Vermeir & Verbeke, 2006). Moreover, De Groot and Steg (2007) find that a positive attitude increases the intention to use a park-and-ride facility (transferium) – a more sustainable way of mobility. However, Lehmann and Sheffi (2020) state that attitude has only a slightly positive effect on purchase intentions and hence, is overestimated in predicting behavior. Nevertheless, we propose the following hypothesis:

H_1: Attitude toward purchasing sustainable food positively affects the intention of consumers to buy sustainable food.

Demographic characteristics (age, gender, race, religion, education, income), personality traits and values are background factors that affect attitude, which in turn affect behavior. Thus, background factors are indirectly influencing consumers' intention and behavior (Ajzen, 2015).

2.3.2 Subjective norms

Subjective norms, informed by *normative beliefs,* incorporate the perceived expectations of referent persons, such as family, friends and partners and the motivation to correspond to their expectation or behavior which can result in felt social pressure. Subjective norms can be comprehended as the perceived social or group force that influence the intention to purchase sustainable food products. The influence of the variable of subjective norms on intention is found to be inconsistent in literature (Irianto, 2015). According to Paul et al. (2016) subjective norms are not significant in predicting the intention of buying green products. Tarkiainen and Sundqvist (2005) find that subjective norms influence the intention only indirectly through attitude. On the contrary, subjective norms are positively related to the intention to use the transferium (De Groot & Steg, 2007) and social pressure is found to increase the intention to purchase sustainable food, despite a negative attitude toward sustainable products (Vermeir & Verbeke, 2006). This is supported by Lehmann and Sheffi (2020), who found that social norms have a strong impact on consumers' intention to buy sustainable products. These inconsistent findings make it interesting to study the influence of social norms on the intention of purchasing sustainable products. Thus, we propose that:

H_2: Subjective norms positively affect the intentions of consumers to buy sustainable food products.

2.3.3 Perceived behavioral control

Perceived behavioral control (PBC) is informed by the *control belief* which deals with how much influence a person feels to possess. It includes aspects that are perceived constraints on the control over the behavior, such as limited resources, the ability of the person to carry out the behavior and the opportunity to perform it (Ajzen, 2015). PBC emphasizes external and general factors (Armitage & Conner, 2001), such as the availability, the price of sustainable food, and sustainable labels, that affect people's intention to buy sustainable food products. For the intention to use the transferium, De Groot and Steg (2007) find a high PBC to influence intention positively. Also, for the intention of purchasing green products PBC is a significant predictor (Paul et al., 2016). On the other hand, Lehmann and Sheffi (2020) identify an insignificant relationship suggesting that consumers are capable to buy sustainable food products due to the abundance and availability of sustainable alternatives in modern

supermarkets. On the other hand, the lack of availability may hinder the intention of purchasing sustainable food products (Vermeir & Verbeke, 2006). Another aspect of PBC that may constitute a barrier to the purchase intention is price because it is related to purchasing power which is depending on an individual's income (Irianto, 2015). Hence, in our analysis, we include convenience, availability and price as factors of PBC and suggest that:

H_3: Perceived behavioral control positively affects intentions of consumers to buy sustainable food.

2.4 The extended theory of planned behavior

The extended theory of planned behavior (TPB) is applied to various aspects of pro-environmental behavior, such as expired food (Schmidt, 2019), organic food purchases (Basha et al., 2015; Irianto, 2015), intentions to purchase green products (Liobikienė et al., 2016; Paul et al., 2016) and sustainable mobility (De Groot & Steg, 2007). Even though in the field of environmental psychology the TPB is often utilized as theoretical framework, limitations of the predicting power of behavior are pointed out by existing research (Schmidt, 2019). Paul et al. (2016) demonstrate in their study that the extended TPB has a higher predictability than the original TPB. To improve the predicting power of our model, we chose to extend the model by including the variables sustainability concern and environmental knowledge which are derived from previous literature. However, sustainability concern itself was newly constructed since earlier research only uses environmental concern.

2.4.1 Sustainability concern

Sustainability concern includes the concern for the environment, society and economy (Annunziata et al., 2019). Many studies simply include the variable environmental concern, a subset of sustainability concern, in their research. Therefore, identified effects of environmental concern in the literature are described next. According to Fransson and Gärling (1999, p. 370), environmental concern is the *"evaluation of, or an attitude towards facts, one's own behavior, or others' behavior with consequences for the environment".* Thus, environmentally friendly behaviors are significantly affected by environmental concern (Pagiaslis & Krontalis, 2014; Shin et al., 2017). However, findings remain conflicting because of the weak relationship between environmental concern and actual behavior. Consequently, it is argued that the impact of environmental concern on intention is mediated through other variables and thus, is only indirect (Bamberg, 2003). Various research includes a variable related to the environment in their extended TPB model, even though it is called differently. For example, De Groot and Steg (2007) distinguish three reasons for being concerned about the environment: Egoistic

(individuals are concerned about themselves), altruistic (individuals are concerned about others) and biospheric (individuals are concerned about the ecosystems on Earth) concerns. In the case of purchasing organic products, Irianto (2015) claims that the environmental consciousness of consumers influences their attitude toward buying organic goods positively. This is supported by Basha et al. (2015), who states that environmental care is one of the major determinants of purchasing organic products. The extended TPB by Paul et al. (2016) includes environmental concern in order to predict consumption of green products. They argue that encouraging the consumption of green products may help to support the achievement of sustainable consumption. Moreover, environmental concern has a positive relationship toward attitude, subjective norms and perceived behavioral control and is discovered to be significant (Paul et al., 2016). We have chosen to extend the TPB by environmental concern because empirical evidence is growing that it is a predictor of specific pro-environmental behavior (De Groot & Steg, 2007; Paul et al., 2016). However, in our theoretical model, we decide to use it as a sub-variable. Mostly neglected in research are the social and economic concerns of sustainable food consumption, such as fair prices for producers and fair working conditions. As we intend to take a holistic approach to sustainable food consumption, we argue that it is necessary to include the aspects of economic and social concern besides the often-studied variable of environmental concern. As a result, environmental, economic and social concern build the basis for the umbrella variable sustainability concern. Hence, we propose that:

- **H_{4a}**: Sustainability concern has a positive effect on consumer attitude toward sustainable food products.
- **H_{4b}**: Sustainability concern has a positive effect on subjective norms.
- **H_{4c}**: Sustainability concern has a positive effect on perceived behavioral control.
- **H_{4d}**: Sustainability concern has an indirect positive effect on purchase intention of sustainable food products.

2.4.2 Environmental knowledge

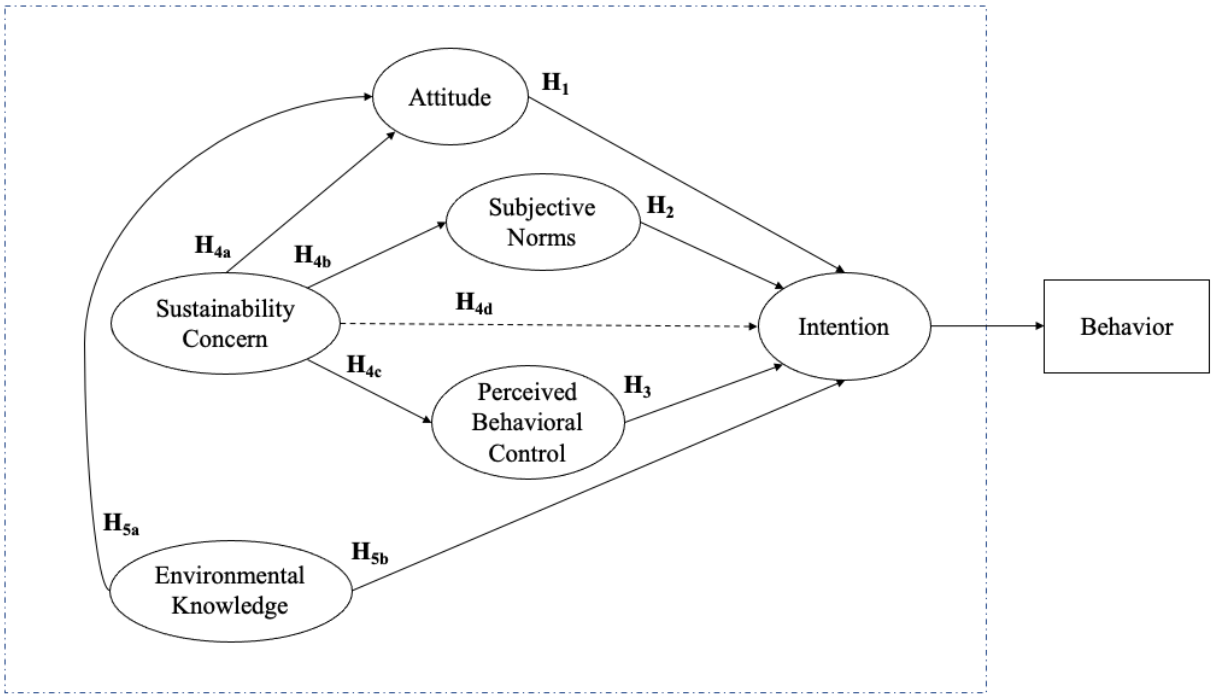
Knowledge is defined as the information reserved in mind pertained to a certain problem or situation (Bagheri et al., 2019). Knowledge itself can affect behavioral intention because it provides people with information that assist their attitudes toward i.e., environmental protection issues (Kallgren & Wood, 1986; McFarlane & Boxall, 2003; Pieniak et al., 2010). In this study, environmental knowledge refers to the information individuals have concerning environmental issues of sustainable food consumption as well as their ability to evaluate the impact of food products on the environment and society (Chekima & Chekima, 2019). People who are holding a higher level of environmental knowledge tend to have a stronger understanding of the positive

or negative consequences of their actions and hence, have a better attitude toward pro-environmental behavior (Bang et al., 2000; Flamm, 2009; Liobikienė et al., 2016). Moreover, more knowledgeable individuals can reduce uncertainty and thus, knowledge influences the intention to engage in pro-environmental behavior favorably (Pagiaslis & Krontalis, 2014; Vermeir & Verbeke, 2006). Consequently, the lack of knowledge can hinder such a behavior (Pagiaslis & Krontalis, 2014). Therefore, we propose that:

H_{5a}: Environmental knowledge positively affects attitude toward buying sustainable food products.

H_{5b}: Environmental knowledge positively affects intentions of consumers to buy sustainable food products.

2.5 Summary of the theoretical model



Note: Only the relationships between variables within the dashed rectangle are studied in this paper

Figure 1: Extended TPB model of purchasing intention of sustainable food products

This study aims to examine the variables that are influencing consumers' intention to purchase sustainable food products. In our model five variables are considered to affect intention. Based on previous research it is assumed that attitude, subjective norms and perceived behavioral control have a direct positive effect on intention and are in turn influenced positively by sustainability concern. Consequently, sustainability concern has an indirect effect on intention. Moreover, our model suggests that environmental knowledge is influencing attitude and intention positively. **Figure 1** shows the constructed model of the extended theory of planned

behavior (TPB), providing an overview of the hypothesized relationships between the six variables.

Table 1 gives an overview of the connection between the hypotheses and the research questions. The first research question is answered by analyzing the hypothesis H4a, H4b and H4c regarding the direct influence of sustainability concern on attitude, subjective norms and perceived behavioral control. The second research question relates to H4d, the indirect effect of sustainability concern on intention. The third research question deals with the influence of environmental knowledge on attitude (H5a) and the relationships between attitude, subjective norms, perceived behavioral control and environmental knowledge toward intention (H1, H2, H3 and H5b).

Table 1: Allocation of the hypotheses to the research questions

Research question and related hypotheses
1. *How does sustainability concern influence attitude, subjective norms and perceived behavioral control of purchasing sustainable food products?*
H_{4a}: Sustainability concern has a positive effect on consumer attitude toward sustainable food products.
H_{4b}: Sustainability concern has a positive effect on subjective norms.
H_{4c}: Sustainability concern has a positive effect on perceived behavioral control.
2. *What indirect effect does sustainability concern have on the intention to buy sustainable food products?*
H_{4d}: Sustainability concern has an indirect positive effect on purchase intention of sustainable food products.
3. *What role play attitude, subjective norms, perceived behavioral control and environmental knowledge for consumers' intention to purchase sustainable food products?*
H_1: Attitude toward purchasing sustainable food positively affects the intention of consumers to buy sustainable food.
H_2: Subjective norms positively affect the intentions of consumers to buy sustainable food products.
H_3: Perceived behavioral control positively affects intentions of consumers to buy sustainable food.
H_{5a}: Environmental knowledge positively affects attitude toward buying sustainable food products.
H_{5b}: Environmental knowledge positively affects intentions of consumers to buy sustainable food products.

3 Methodology

This chapter aims to provide the reader with an understanding of the process of the conducted study and an opportunity to evaluate its reliability, validity and trustworthiness. When using a quantitative method, it is easy to evaluate the instruments' reliability which tests the overall consistency of the measurement. However, it is hard to assess the validity, meaning if it actually measures what it is supposed to measure (Bryman, 2012). For this reason, a pilot study was carried out to test the questionnaire. The logic of conducting the research is presented by giving a detailed demonstration of the individual steps taken and the methodological tools used. The main purpose of using a quantitative research method is the production of true, valid or unbiased inferences regarding the phenomenon sustainable food consumption in Germany (Michael & Dean, 2017). This chapter is divided into six parts. In the first part the research design, including the ontological and epistemological orientation of this study, and its importance for this study is explained. Moreover, it is described why a deductive, explorative approach is applied. The second part is about the procedure of this study which includes the focus group, the survey design and the questionnaire construction. The third part presents the data collection by sharing an online survey on social media and a website. The fourth part deals with data analysis and explains the use of the structural equation modeling to examine the relationship between the variables in the structural model. In this part, Statistical Package for the Social Sciences (SPSS) and SPSS Analysis of Moment Structures (AMOS) are used as data analysis tools to test the reliability, validity and model goodness fit of the measurement model. The fifth part describes the ethical principles that are considered in this study with regards to the focus group and the online survey. In the last part, the chosen methodology is critically reflected acknowledging limitation of the quantitative method.

3.1 Research design

This study takes the epistemological position of critical realism with objectivism as ontological orientation. Critical realism is claimed to enable to combine and accept ontological realism, epistemological relativism and judgmental rationality (Archer et al., 2013). Similar to positivism, *realism* represents the belief that social sciences should use the same approach for data collection as natural sciences and that scientist pay attention to an external reality (Bryman, 2012). Critical realism is claimed to enable to combine and accept ontological realism, epistemological relativism and judgmental rationality (Archer et al., 2013). The goal of *critical realism*, as a particular form of realism, is not to establish generalizable laws as positivism, but to develop deeper insight and understanding (McEvoy & Richards, 2006). Therefore, structures that generate events need to be identified and understood in order to change them (Bryman,

2012). *Objectivism* argues that phenomena and structures are existing independently from social actors (Bryman, 2012). The perspective of critical realism does not refuse that a real world exists and argues that we can try to understand it through philosophy and social science. However, some knowledge or theory can describe the reality better than others (Fletcher, 2017). It determines the methodology of this explorative study that aims to conduct the most relevant theory, which is the closest to the reality, as well as to obtain a deeper understanding of the phenomenon of sustainable food consumption on an empirical level.

In our study, we use a *deductive* approach. This means that previous research on sustainable food consumption and consumer behavior builds the foundation for the nine hypotheses which determine the method of data collection (Bryman, 2012; May, 2011). Conducting a survey for data collection is regarded as an appropriate method because the target of this study is to identify the factors that influence consumers' intention toward sustainable food consumption in Germany. Afterwards, the hypotheses regarding the relationships between the six variables (*attitude, subjective norms, perceived behavioral control, sustainability concern, environmental knowledge* and *intention*) that are explained in the theoretical framework are tested using the collected data from the questionnaire. A cross-sectional design is suitable because the data is collected at a specific time and respondents are selected based on desired attributes (May, 2011). Furthermore, a cross-sectional approach allows to collect quantitative or quantifiable data concerning the chosen variables and finally, to identify the relationship between them (Bryman, 2012). The quantitative method is defined as an approach that utilizes systematic data to indicate human behavior (Mike et al., 2009). In the next step, the findings from the structural equation model (which is explained later in the text) show existing and non-existent relationships between the variables which lead to a confirmation or rejection of the formulated hypotheses (Bryman, 2012). What is more, to explore the sustainability concerns of consumers in purchasing food, answers of a focus group were generated beforehand to validate the questionnaire, using an inductive and qualitative approach, which is explained later in this chapter (see **3.2.1 Validity from the focus group**).

3.2 Procedure

This section explains the procedure of the construction of our questionnaire. First, the reason for conducting a focus group and the outcome of it is presented, then the used questionnaire type is explained, and which questions and statements have been developed in order to measure the six variables of interest.

3.2.1 Validity from the focus group

The aim of carrying out preliminary qualitative interviews with a focus group was to get the respondents' insights about their concerns regarding sustainable food consumption by applying an explorative approach. This pursues the goal of making the questions about the general sustainability concern regarding food more valid compared to only deriving them using research, where it is more likely that the questions do not fit the sample. Moreover, to our knowledge in previous literature a variable of sustainability concern was not specified but, in our opinion, concretizing the broad topic of sustainable concern is necessary when studying sustainable food consumption. In order to explore respondents' sustainability concerns when purchasing sustainable food, the following three questions have been asked:

Q1: *What does sustainable food consumption mean for you personally?*

Q2: *To what aspects do you pay attention to when shopping for groceries?*

Q3: *How would you describe your diet and for which reasons do you choose this certain diet? E.g., for environmental reasons, health, animal welfare…*

Participants have been selected by reaching out to friends that are considered to be part of the population. In sum, eight persons answered our questions, both orally and written. One person answered in German, which was translated by one of the authors into English. The share of female and male respondents was evenly distributed (50%/50%), and they are between 22 and 25 years old. In order to keep participants of the focus group anonymous and ensure their confidentiality, their names have been changed in the transcript using pseudonyms (Bryman, 2012).

The answers of the focus group were screened for keywords identified in the literature and for additionally mentioned factors (see **Appendix 1 – Focus group answers**), in order to complement key aspects of the literature with the answers of the focus group. These aspects have been categorized according to the three dimensions of sustainability: Ecological/environmental, economic and social dimension. As in the literature, most aspects named by the focus group are connected to the environmental dimension, however, besides organic and locally produced food, reducing the consumption of meat and dairy products as well as environmentally friendly packaging and seasonality play an important role for the respondents. These findings are in line with the aim of the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) to establish sustainable food by promoting organic, local and seasonal food as well as plant-based products and low or zero packaging goods (BMU, 2018). Moreover, social considerations of food production were mentioned more often by the respondents than researched in literature. Aspects important to

respondents are animal welfare, good working and production conditions and the quality of food, such as the nutritional value. Another aspect related to the health aspect of food is the question of whether it is processed or not. The economic dimension was mentioned the least, with the aspects of fair paid producers, support for local farmers and affordable prices for consumers. However, it was also mentioned that price does not play a role when purchasing sustainable food. For an overview of concerns regarding sustainable food consumption named by the focus group, see **Table 2**.

Table 2: Aspects of sustainable food consumption mentioned by the focus group

Dimension	Aspect	Reference	Count
Ecological	Local (reduce food miles)[1]	Mark, Carolin, Lisa, Juli, Tom, Jana, Luis	7
	Packaging	Mark, Carolin, Lisa, King, Tom, Juli, Jana	7
	Organic	Mark, Carolin, King, Jana, Luis	5
	- without the use of chemicals	- Lisa	(6)
	Reduce meat consumption	Mark, King, Tom, Juli, Jana	5
	- Vegetarian	- Carolin	(6)
	Reduce dairy products	Carolin, Lisa, King, Tom, Jana	5
	Seasonal	Mark, Carolin, Lisa, Luis	4
	Water footprint, emissions (from energy consumption & methane)	King, Jana, Luis	3
	Waste prevention	Carolin, Juli	2
	Avoid air transport	Jana	1
	Sustainably harvested fish	Tom	1
Economic	Local (support local farmers)[1]	Mark, Jana, Luis	3
	Fair paid	Mark, Jana	2
	Price (affordability)	Mark, Juli	2
Social	Animal-friendly/ welfare	Mark, Carolin, Lisa, King, Tom, Jana, Luis	7
	Good working conditions	Mark, Tom, King, Luis, Jana	5
	Production conditions	Carolin, King, Tom, Jana	4
	Nutritional/Unprocessed	Mark, King, Tom, Juli	4
	Food quality	Carolin	1
	Without antibiotics e.g., meat	Lisa	1

Note: Aspects in grey font were not included in the questionnaire due to minor mentioning

Including the aspects obtained by the explorative approach helps to fill the gap of perspectives that are not or only covered little in the literature. Since the questionnaire consists mostly of closed questions, for the preparation of the questionnaire, the open questions answered by the focus group are utilized to develop the optional answers of the variable sustainability concern (Bryman, 2012).

[1] In general, locally produced products are associated with reducing CO_2 emissions connected with transportation. Moreover, local goods could be more environmentally or animal friendly, involving organic practices or supporting the local economy and thus, the local community (Vermeir & Verbeke, 2008). However, these aspects are not necessarily guaranteed, this is why we focus on the aspects of reduced transport emissions as part of the ecological dimension and supporting the local economy as part of the economic dimension.

3.2.2 Survey design

There are two types of sampling methods: The probability sample, also often referred to as random sample and the non-probability sample. The aim of random sampling is to generate representations with the highest probability of correlation (Michael & Dean, 2017). From the probability sample, it is possible to generalize the result from the sample to the population because persons were picked randomly from an (almost) complete list of the population, giving everyone the same chance to participate in the survey. It enables researchers to reduce the probability of a systematic bias and is preferred in research. However, as students we are constraint and neither such a sampling frame is available to us, nor is the population size *n* known (May, 2011). Due to the issue of accessibility, we chose the *availability/convenience sample* as a type of non-probability sample because it enables us to ask people we know or are readily available to us to participate in our study. We acknowledge that generalization from the sample to a population is not possible and thus, the findings are rather directive than representative (Bryman, 2012; May, 2011). However, because convenience sampling is commonly used in social research, this is an appropriate method to use in a more explorative manner (Bryman, 2012). An online *self-completion questionnaire* is applied, where respondents fill out the questionnaire on their own. Besides its limitations of the need of keeping questions simple to understand and easy to answer, researchers not having a possibility to ask follow-up questions, and a low response rate, self-completion questionnaires bring several benefits. For example, a greater geographical area can be covered at a lower cost than face-to-face interviews, there is an advantage of greater anonymity and people can choose the time flexibly to fill out the questionnaire (May, 2011). Moreover, one disadvantage is also an advantage. Since researchers are not on-site to answer occurring questions, all respondents have the same formulations, and the same information are available to them. This is one condition for getting a reliable study (Bryman, 2012). The self-completion questionnaire also helps us in the time of the COVID-19 pandemic to reach out to more people in a wider area without the need to be in personal contact with them on-site.

3.2.3 Questionnaire construction

The questionnaire was designed to measure the variables of the theoretical model as presented in **Figure 1**: Attitude toward sustainable food products, subjective norms, perceived behavioral control, sustainability concerns regarding food, environmental knowledge and intentions to purchase sustainable food products.

The questions and statements have been developed after conducting an in-depth literature review on sustainable food (see **2.1 Literature**) and after obtaining preliminarily data from the

focus group (see **3.2.1 Validity from the focus group**). The purpose of the literature review was to obtain a knowledge foundation of the essential aspects that have been mentioned in previous studies. Moreover, the questionnaires of other studies about green products and sustainable products have been used as background knowledge and have been altered in order to measure a certain variable regarding to sustainable food in general (such as Annunziata & Scarpato, 2014; Grunert et al., 2014; Lehmann & Sheffi, 2020; Liobikienė et al., 2016; Paul et al., 2016). Based on the answers given by the focus group, the variable sustainability concern was constructed. The questionnaire structure is the same for every respondent and is divided into nine sections: 1. Instructions and declaration of consent; 2. Demographic background; 3. Attitude; 4. Subjective norms; 5. Perceived behavioral control; 6. Sustainability concerns; 7. Environmental knowledge; 8. Intentions; 9. Space for comments. In order to lower the drop-out rate, a progress bar was added to the questionnaire to show the progress to the respondents (Welker et al., 2014).

The questionnaire was translated by one of the authors into German in order to reduce language barriers but was also shared in English to include English-speaking individuals living in Germany. As mentioned before a disadvantage of self-completion questionnaires is that the researcher is not on-site to ask follow-up questions or to solve any occurring issues, such as unclear questions or statements. Therefore, a pilot study was conducted to ensure that the questions are clear to the respondents and that the questionnaire operates well as a research instrument. The feedback obtained was incorporated into the questionnaire to make instructions clearer and statements easy to understand and rate. Moreover, academic wording was avoided to reduce the language barrier answering the questions (Bryman, 2012).

Instructions and declaration of consent

The first section of the questionnaire makes clear that the study is aimed exclusively at people who are at least 16 years old and live in Germany. It introduces what the survey is about, and how long it will take to complete the questionnaire. Moreover, it informs the respondents that participation is voluntary, and the data collection serves exclusively the aim to gain scientific knowledge and thus, data evaluation is anonymized and aggregated. Respondents need to declare consent and confirm that they are living in Germany.

Demographic background

The questions in the second section include information about the demographic background of respondents, such as gender, age, education, employment status and monthly income before tax. Whether a respondent belongs to the desired age group is checked by asking the age as a

ratio variable. Biological sex, education and employment status are nominal variables where respondents can be divided into two or more categories. The advantage of dividing people into different categories is that the background of respondents is identifiable and thus, the result can be more directive for a certain group. The last question in this section is monthly income before tax and is constructed as an interval variable. Interval variables as an extension of ordinal variables can be used to define values measured along a scale, with each option pointed at an equal distance from one another. The scope is placed by considering the minimum annual salary and the average salary for majorities in Germany. The minimum monthly wage in Germany is around 1593 € but considering the group of people who are students and part-time employed, eventually, 0-800 € has been set as the first option. A monthly salary below 5000 € is covering 81% of Germans (Rudnicka, 2021). Therefore, excepting the monthly income below 800 € and above 5000 €, 1000 € has been set as a standardized scale for the interval. However, Germans are known to dislike the disclosure of their income, so the option 'I don't want to answer' was also included to avoid respondents quitting the questionnaire because of this issue.

Attitude

In the third section of the questionnaire, it is shortly explained that the three dimensions of sustainability are the ecological, social and economic dimension and that *"Sustainable products are defined as products that, due to their attributes, contribute to one of these dimensions or to a combination of the three dimensions of sustainability"*, providing organic, regional, seasonal or fairtrade food products as examples. Four statements regarding respondents' attitude toward sustainable food consumption were asked, as **Table 3** shows. Three of the statements have a positive framing, such as '*I have a favorable attitude toward purchasing sustainable versions of food products.*' and one has a negative framing: '*I don't care whether a food product is sustainable or not.*' Attitude was measured on a 5-point Likert scale with 1='I do not agree at all' and 5='I completely agree'.

Table 3: Items used to measure the variable attitude

Variable	Code	Formulation	Answer options
Attitude (AT)	AT1	I have a favorable attitude toward purchasing sustainable versions of a food product.	(1) I do not agree at all - (5) I completely agree
	AT2	I like the idea of purchasing sustainable food products.	
	AT3	I don't care whether a food product is sustainable or not. *(reversed scale)*	
	AT4	Buying sustainable food products is important for me.	

Subjective norms

The fourth section aims to determine to what extent beliefs about expected behavior are important and whether social pressure plays a role. Subjective norms are measured by asking four statements related to whether the opinion of people a person cares about is influencing the purchasing behavior of sustainable food products, as displayed in **Table 4**. Three statements have a positive framing, for example, '*My family and friends prefer that I purchase sustainable food products.*' and one has a negative framing: '*People's negative opinions toward sustainable products makes me want to buy less sustainable food products*.' Subjective norms was measured using a 5-point Likert scale from 1='I do not agree at all' to 5='I completely agree'.

Table 4: Items used to measure the variable subjective norms

Variable	Code	Formulation	Answer options
Subjective norms (SN)	SN1	People who are important to me think that it is a good thing when I buy sustainable food products.	(1) I do not agree at all - (5) I completely agree
	SN2	My family and friends prefer that I purchase sustainable food products.	
	SN3	People's negative opinions toward sustainable products makes me want to buy less sustainable food products. *(reversed scale)*	
	SN4	The people around me motivate me to purchase sustainable food products.	

Perceived behavioral control

The fifth section deals with contextual factors that may affect the purchase of sustainable food. As **Table 5** demonstrates, six statements were asked to rate on a 5-point Likert scale from 1='I do not agree at all' to 5='I completely agree'. Four of the statements are positively framed and two negatively. Two statements are specifically about the convenience to differentiate sustainable from conventional food products, one of them is framed positively '*It is easy to distinguish sustainable food products from conventional products.*', the other one is framed negatively '*Labels on sustainable food products confuse me*.' The other three are related to trustworthiness, availability and price of sustainable foods.

Table 5: Items used to measure the variable perceived behavioral control

Variable	Code	Formulation	Answer options
Perceived behavioral control (PBC)	PBC 1	It is easy to distinguish sustainable food products from conventional products.	(1) I do not agree at all - (5) I completely agree
	PBC 2	Labels on sustainable food products confuse me. *(reversed scale)*	
	PBC 3	Food with sustainable labelling is trustworthy.	
	PBC 4	Sustainable food products are always available for buying.	
	PBC 5	Sustainable food products are expensive for me. *(reversed scale)*	
	PBC 6	In general, I think I can buy sustainable food products as I wish.	

The last statement asks how the overall ability to purchase sustainable food products is perceived: '*In general, I think I can buy sustainable food products as I wish.*'

Sustainability concern

Statements about sustainability concern have been included in section six to measure people's apprehension about sustainability issues that are connected to food. Sustainability concern was measured in three dimensions: Environmental, economic and social concern. As mentioned before, the three dimensions are based on the literature and the relevant aspects of these dimensions are mainly derived from personal communication with people of the population i.e., the focus group. In order to reduce the complexity, aspects have been chosen according to the following principles: For the ecological concern aspects mentioned more than four times by the focus group are included in the questionnaire. Moreover, waste prevention was added even though it has only two references, due to the big issues related to food waste and loss in Germany (one third of food is wasted in Germany per year, equivalent to 18 million tons of food) (WWF Germany, 2015). Regarding the economic aspects, all of them have been included since only three have been mentioned, whereas for the social dimension, aspects with more than four counts have been included. Statements have been added to the economic and social dimension of sustainability to balance the number of statements between the dimensions more.

In order to identify participants' concern related to sustainability issues connected to food consumption, respondents have been asked to rate the importance of the final 16 aspects of sustainability from 1-5 (1='Not important at all'; 5='Very important'). These include seven statements for the environmental dimension, four for the economic and five for the social dimension, as **Table 6** shows. Statements in the environmental dimension aim at organic, seasonal and local products, reducing the consumption of meat and dairy products and packaging and food waste, for example: '*Organic farming practices are used in the production (organic products).*', '*Food products are not packaged or packaged in an environmentally friendly way.*' or '*Food waste is reduced.*' The economic dimension deals with fair payment to farmers for their products, a fair wage for employees, fair prices for consumers and the support for the local economy. Statements to rate are for instance '*The farmers receive a fair payment for their product.*' and '*Sustainable food products are affordable (reasonable price).*' The social dimension includes nutritional value of food, animal welfare, human rights, good working conditions and gender equality. Included statements are for example '*The employees have good working conditions.*' and '*The food has high nutritional value and is good for health.*' Additionally, participants have been asked to name their top three items of concern.

Table 6: Items used to measure the variable sustainability concern

Variable	Code	Formulation	Answer options
Sustainability concern (SC)		Environment	(1) Not important at all - (5) Very important
	SC1	Organic farming practices are used in the production (organic products).	
	SC2	It is a seasonal product.	
	SC3	It is a local product.	
	SC4	Reducing the consumption of meat products.	
	SC5	Reducing the consumption of dairy products.	
	SC6	Food products are not packaged or packaged in an environmentally friendly way.	
	SC7	Food waste is reduced.	
		Economy	
	SC8	The farmers receive a fair payment for their product.	
	SC9	Workers are paid fair wages.	
	SC10	The local economy is supported.	
	SC11	Sustainable food products are affordable (reasonable price).	
		Society	
	SC12	The food has high nutritional value and is good for health.	
	SC13	The animals' welfare in food production is ensured.	
	SC14	The employees have good working conditions.	
	SC15	Human rights are respected along the entire food value chain.	
	SC16	Gender equality is guaranteed.	

Environmental knowledge

In section seven, respondents are asked to rate three statements on a 5-point Likert scale, from 1='I know very little' to 5='I know a lot'. These statements are '*Please rate your knowledge of environmental problems in general.*'; '*Please rate your knowledge about the environmental impacts of the food products you buy.*' and '*Please rate your knowledge of what makes sustainable food products different from conventional food.*', displayed in **Table 7.**

Table 7: Items used to measure the variable environmental knowledge

Variable	Code	Formulation	Answer options
Environmental knowledge (EK)	EK1	Please rate your knowledge of environmental problems in general.	(1) I know very little - (5) I know a lot
	EK2	Please rate your knowledge about the environmental impacts of the food products you buy.	
	EK3	Please rate your knowledge of what makes sustainable food products different from conventional food.	

Intention

Section eight contains statements regarding respondents' intention to purchase sustainable food products and was measured on a 5-point Likert scale with 1='I do not agree at all' and 5='I

completely agree'. **Table 8** demonstrates that three statements have a positive wording, such as '*I intend to buy (more) sustainable food products.*' and '*I will put more effort to choose sustainable food products when shopping.*' '*I don't want to buy sustainable food products.*' is one statement that has a negative framing.

Table 8: Items used to measure the variable intention

Variable	Code	Formulation	Answer options
Intention (IT)	IT1	I intend to buy (more) sustainable food products.	(1) I do not agree at all - (5) I completely agree
	IT2	I don't want to buy sustainable food products. *(reversed scale)*	
	IT3	I will put more effort to choose sustainable food products when shopping.	
	IT4	I am planning to spend more money on sustainable food products.	

Space for comments

The last section informs that the questionnaire is completed and provides the respondents with the possibility to write a comment regarding the questionnaire. The comments are summarized in **Table 18** in Appendix 4.

3.3 Data collection and sample

We aimed for a sample as large as possible to increase the explanatory power of the real parameter estimates. Various social media websites have been used to share the online self-completion questionnaire. The link leading to the survey was posted on our personal profiles on Facebook and LinkedIn and was shared in Facebook groups that operate on the principle 'I complete your questionnaire and you complete mine' and on SurveyCircle which works similarly. Moreover, the link was shared on WhatsApp with personal contacts. The population targeted are consumers in Germany who are at least 16 years old or older. Due to the strong Fridays for Future movement of pupils and students in Germany, we decided to include 16-17 years old in our study and to not use 18 years as a minimum age. The survey aimed for an equal share between males and females.

Between March 26th and April 12th, 241 responses have been received. However, not all of them were suitable for analysis. Four respondents answered to not live in Germany, in turn the questionnaire closed for them not collecting further information. Therefore, these four answers are excluded. Additionally, 19 responses need to be deleted because they were detected to appear twice, three times or four times in the Google sheet. Consequently, the final sample size includes 218 respondents. 211 questionnaires were completed in German and 7 in English. In order to calculate the response rate a bit.ly short link was constructed which enabled us to track

how many times the links were opened. In sum, 343 clicks on both links have been counted, resulting in a response rate of 63.6% (218/343).

The required sample size for this study was conducted based on the recommendation of Tabachnick and Fidell (2013) who mention a desired sample size of N>50+8m, where m is the number of independent variables for standard multiple regression. As there are 5 variables attitude (AT), subjective norms (SN), perceived behavioral control (PBC), sustainability concern (SC) and environmental knowledge (EK), a condition of at least 90 responses is required. In the end, 218 responses were valid for analysis, which is much higher than the required value of 90. More specifically for SEM, earlier research suggests a minimum of 100 observations (Boomsma, 1985). In a different paper, Bentler and Chou (1987) notice that the number of observations should be considered relative to the number of parameters and the minimum standard of the ratio of observations (N) to parameters (p) should be 5:1. Our study includes 6 constructs (4 items for AT, 4 items for SN, 6 Items for PBC, 16 items for SC, 3 items for EK and 4 items for IT, totaling 37 items). As there were 37 measurement items, a minimum of 185 respondents is required. Since there are 218 responses that were considered for the final analysis, a minimum number of respondents is also fulfilled regarding this standard.

3.4 Data analysis

Before analyzing the data, appearing inaccuracies were modified to arrive at clean data. For consistency, the word ‘years’ in answers regarding age was deleted. For education a new group occurred: ‘Diploma’. Furthermore, ‘State examination’ was considered to be equivalent to ‘Post-graduate’ and a degree of the University of applied sciences was categorized as ‘Graduate’. Additional groups for occupation identified are ‘Pupil’ and ‘Housewife/househusband’. Prospective teachers were included in ‘Employed full-time’. In case answers included enumerations, the educational qualification or occupation mentioned first was chosen. Two respondents were either a civil servant in part-time or a retired civil servant and thus, were included in the categories ‘Employed part-time’ and ‘Retired’, respectively.

Tools for analyzing the model

The obtained data is analyzed in a two-stage process using the software programs Statistical Package for the Social Sciences (SPSS) 27.0.1.0, as well as SPSS Analysis of Moment Structures (AMOS) 27. In the first step, a confirmatory factor analysis (CFA) is carried out to test the validity and reliability of the constructs included in the measurement model. Since our study has a relatively large sample size (N=218), we did not include a normality test. When the

sample consists of hundreds of observations, the distribution of the data can be ignored. The second step is the examination of the relationships between the constructs in the structural model using structural equation modeling (SEM). The measurement model is also referred to as the *outer model*, where the predictive relationship between the observed items and the latent variables are examined. The structural model consists of the paths between the latent variables and is also called the *inner model* (Hair et al., 2011). These procedures are following the basic approach to perform a SEM analysis.

Then the data was loaded into SPSS and AMOS. The reason why AMOS is chosen to be the appropriate tool for analyzing and evaluating the model is because with this package it is possible to draw our model and then allocate the data to our model. Moreover, it generates the results including an overview of model fit statistics and parameter estimates. The survey items' scores are used as input to the analysis in the form of a covariance matrix of measured variables. The SEM indicates relationships between observed and unobserved variables using path diagrams. Observed variables are measured by the scores which are obtained from the survey. Latent variable or unobserved variables can be measured indirectly by the correlations among observed variables. Most social concepts or behaviors are complicated and multifaceted. Consequently, using single measures will not adequately cover the full conceptual picture. Latent variables have the advantages to be constructed with multiple indicators. It also can reduce random error in the measured construct. The latent variables in this model include attitude (AT), subjective norms (SN), perceived behavioral control (PBC), sustainability concern (SC), environmental knowledge (EK) and intention (IT). In our model AT, SN, PBC and IT are dependent variables (endogenous) which are explained by other constructs and are measured with error (Hair et al., 2011). SC and EK are independent variables (exogenous) which are measured without error terms. The analysis of the structural model in this paper is performed using covariance-based structural equation modeling based on a maximum-likelihood estimation method.

There are two different types of measurement models in SEM: The reflective and the formative measurement model. A reflective measurement model is presented when arrows from the estimated variables are pointing out to indicators, while a formative measurement model uses arrows from indicators toward variables. The conditions of the reflective measurement model are that the indicators are highly correlated and interchangeable.

3.5 Ethical considerations

The main method of this study is a quantitative method that applies an online questionnaire, which is supported by a qualitative method in the form of the preliminary focus group interviews. Due to the nature of online data collection from the questionnaire and the interaction between researchers and participants, ethical considerations were included within the procedure. The identified ethical principles that have been considered in this research include: Informed consent, individual permission for audio recording, the participant's right to check and modify the transcript from audio recording, voluntary participation, the participant's right to withdraw, the preservation of anonymity, the confidentiality of personal information, data protection, clear demonstration of appropriate research methodology, and full reporting of research methods (Vanclay et al., 2013).

For the focus group, after the clarification of the purpose, methods, procedures of this research, 8 people have been included with voluntary participation. The personal permission for audio recording has been provided by them. They also had the right to check and modify the transcript to ensure its correctness and to prevent that unwilling information are displayed. The names of participants from the focus group have been modified to ensure the preservation of anonymity and the confidentiality of personal information.

For the online survey, more ethical issues need to be addressed. With the development of technology, online surveys have become one of the most common types for conducting research and it translates in the increasing prevalence of this methodology in academic research. This type of data collection method can challenge the traditional ethics principles in research, such as privacy, anonymity, confidentiality and consent by inputting new issues on data security, information storage and sampling. The ethical concerns of the development of technologies in data capture are brought into focus when considering a vulnerable group of consumers (Connelly, 2014). For example, some groups of people such as senior people who do not have enough knowledge of the online operation and people who do not have access to the internet may not be included in the research. Thus, less educated people, people with limited financial resources and individuals of other ethical groups are frequently excluded from the form of online questionnaire (Bhutta, 2012). However, in the year 2021 access issues become less and less of a problem. According to statistics, 88% of the German population have the access to the Internet (Koptyug, 2021).

Generally, participants should be informed of the content of the research and the informed consents usually include the title, target, explanation of the research and the procedures to be followed (Munhall, 1988). On the first page of the questionnaire, the title is displayed as

'Sustainable Consumption of Food' to provide basic and intuitive information for participants. Next, the target of this research has been clarified with the sentence *"the aim is to identify the attitudes and motivation of consumers concerning the purchase of sustainable food products"*. Participants can obtain an understanding of what this research requires from them. Meanwhile, the information on voluntariness, anonymity and data protection have been stated. All participants should be volunteers. It should also include a statement that all the participants have the opportunity to ask questions (Field & Morse, 1985), therefore, the email addresses of the survey's owner were provided. Secured anonymity has been indicated as *"data evaluation is anonymized and aggregated"* in the instruction. It should also be a part of the consent what the researchers intend to do with the findings (Connelly, 2014). It was stated clearly that the survey serves as one part of the master's thesis with the aim to gain scientific knowledge.

3.6 Critical reflection on methodology

This section critically reflects the limitation of the chosen quantitative method. An often-described limitation of convenience sampling is that the samples are prone to be biased (Farrokhi & Mahmoudi-Hamidabad, 2012). This bias can be caused by respondents giving answers, of which they think that they are desirable by society and thus, do not reflect their actual thoughts which distorts findings (May, 2011). Another cause of bias is the self-selection of respondents because people's interest regarding the researched topic is affecting their willingness to respond to it. Therefore, it is likely that people who are already interested in sustainability in general or regarding sustainable food consumption in particular tend to answer the questionnaire more than people who are less interested in the topic (Farrokhi & Mahmoudi-Hamidabad, 2012; May, 2011). This may result in distorted findings since very interested and less interested respondents are not equally represented in the sample. Furthermore, handing out the surveys by convenience results in a large share of responses coming from people we know or people around us. This can be seen in the age distribution, where the majority of respondents belong to the age group of 16-30 years and 46-60 years. Moreover, even though surveys are explanatory to a certain degree, their design aims to test hypotheses which are formulated based on theory. Therefore, the reasons behind responses cannot be interpreted, also due to the lack of possibility of the researcher to ask following up questions (May, 2011). Nonetheless, considering the circumstances of being students and having restricted resources, the chosen method is regarded to be appropriate to investigate the research topic.

4 Results

This chapter describes the findings of the analysis. In the descriptive part, the profile of the respondents, including gender, age, education, occupation and income, are depicted. Next the internal reliability of the constructs, and the convergent and discriminant validity of the measurement model are examined, as well as the model fit. Based on that, the relationships between constructs are analyzed using structural equation modeling and according to the results, the hypotheses are either supported or rejected.

4.1 Sample characteristics

The second section of the questionnaire consisted of items regarding demographics and participants were asked about their gender, age, education, employment status and income before tax.

Table 9: Socio-demographic characteristics of the sample (N = 218)

Variable	Categories	Frequencies	Percentage
Gender	Female	125	57.3
	Male	93	42.7
Age	16 – 30 years	125	57.3
	31 – 45 years	26	11.9
	46 – 60 years	56	25.7
	Above 60 years	11	5.0
Education	Secondary school	10	4.6
	Highschool	43	19.7
	Completed vocational training	33	15.1
	Master craftsman	4	1.8
	Graduate	80	36.7
	Post-graduate	29	13.3
	Diploma	13	6.0
	Doctorate	6	2.8
Employment Status	Pupil	3	1.4
	Student	87	39.9
	Employed part-time	25	11.5
	Employed full-time	69	31.6
	Self-employed	16	7.3
	Job seeking	2	0.9
	Housewife/-husband	1	0.5
	Retired	9	4.1
Monthly income (before tax)	Less than € 800	57	26.1
	€ 800 - € 2000	66	30.3
	€ 2001 - € 3000	29	13.3
	€ 3001 - € 4000	24	11.0
	€ 4001 - € 5000	17	7.8
	More than € 5000	13	6.0
	I don’t want to answer	12	5.5

The frequency analysis provides an overview of participants’ socio-demographic profiles. The complete outcomes can be found above in **Table 9**. The sample consisted of 218 respondents,

ranging in age from 16 to 77 years, of which 57.3% (n = 127) are female and 42.7% (n = 93) are male. Referring to the gender distribution, the sample is slightly departed from the population data by gender in Germany. In terms of the highest education qualification, 36.7% of the respondents are Graduates (n = 80), 19.7% have obtained a Highschool qualification (n = 43), 15.1% have completed vocational training (n = 33), 13.3% are Post-graduates (n = 29), and the rest are distributed among Secondary school, Master craftsman, Diploma and Doctorate with 4.6% (n = 10), 1.8% (n = 4), 6% (n = 13), 2.8% (n = 6), respectively. The majority of the respondents are students (39.9%) and full-time employed (31.6%). People with less than 800€ monthly income before tax account for 26.1% (n = 50), while respondents with 800€ to 2000€ occupy 30.3% (n = 66). In comparison with the average gross monthly salary in Germany of 3994€, our sample has a lower income than the average which can be explained by the share of students in the sample.

4.2 Evaluation of the measurement model

The measurement model is evaluated by calculating Cronbach's α to check the scales' reliability and by calculating the average variance extracted and composite reliability to assess the convergent and discriminant validity as subsets of construct validity. In the next step, the model fit of the measurement model is analyzed.

4.2.1 Scale reliability and validity

The latent variables are measured with the help of multi-item scales. There are a total of 6 estimated variables, thereof attitude (AT), subjective norms (SN) and intention (IT) are each measured by 4 indicators, perceived behavioral control (PBC) consists of 6 indicators, sustainability concern (SC) has 16 indicators and environmental knowledge (EK) is measured by 3 indicators. To receive a coherent mean, answers of statements that have a negative formulation (AT3, SN3, PBC2, PBC5 and IT2) were reversed. This reversal of formulation is achieved using SPSS. Meanwhile, the descriptive values (mean and standard deviation) of all used scales and items are also calculated by using SPSS and the results are displayed in **Table 17** in Appendix 2.

In order to examine the internal consistency of the scales, Cronbach's α was computed using SPSS. The analysis of internal reliability within a multi-item scale gives information about whether the indicators relate to the same thing or not and if they relate to each other (Bryman, 2012). The values of the *corrected item-to-total correlation* detected two items (SN3 and PBC5) that showed low correlation between items within a construct by having values close to zero (Tavakol & Dennick, 2011). This means that these two items may indicate something else and

should be excluded from the construct. Deleting SN3 and PBC5 resulted in an improved Cronbach's α from 0.639 to 0.766 for SN and from 0.584 to 0.641 for PBC. As displayed in **Table 10**, the Cronbach's α of each construct, except PBC, achieves 'very good' (> 0.8) or 'adequate' (> 0.7) as a consequence of excluding these items. This meets the requirements of being greater than 0.7 (Kline, 2016, p. 92).

Table 10: Scale reliability and convergent validity
Source: Own illustration based on Paul et al. (2016, p. 128)

Construct	Item	Corrected item-to total correlation	Cronbach's α	Factor loadings	Average variance extracted (AVE)	Composite reliability (CR)
Attitude (AT)	AT1	0.785	0.838	0.860	0.594	0.870
	AT2	0.643		0.738		
	AT3	0.574		0.639		
	AT4	0.719		0.827		
Subjective norms (SN)	SN1	0.597	0.766	0.807	0.541	0.747
	SN2	0.631		0.738		
	SN3	0.049*		-		
	SN4	0.447		0.610		
Perceived behavioral control (PBC)	PBC1	0.466	0.641	0.695	0.277	0.595
	PBC2	0.359		0.477		
	PBC3	0.319		0.444		
	PBC4	0.360		0.502		
	PBC5	0.070*		-		
	PBC6	0.392		0.476		
Sustainability concern (SC)	SC1	0.380	0.848	0.275	0.314	0.865
	SC2	0.419		0.401		
	SC3	0.427		0.439		
	SC4	0.313		0.178		
	SC5	0.263		0.167		
	SC6	0.485		0.449		
	SC7	0.517		0.586		
	SC8	0.648		0.832		
	SC9	0.695		0.885		
	SC10	0.496		0.644		
	SC11	0.381		0.373		
	SC12	0.321		0.292		
	SC13	0.573		0.514		
	SC14	0.711		0.819		
	SC15	0.600		0.704		
	SC16	0.591		0.664		
Environmental knowledge (EK)	EK1	0.586	0.718	0.734	0.469	0.782
	EK2	0.554		0.709		
	EK3	0.481		0.604		
Intention (IT)	IT1	0.716	0.777	0.824	0.595	0.835
	IT2	0.300		0.321		
	IT3	0.712		0.803		
	IT4	0.633		0.689		

*Deleted due to item-to-total correlation close to zero (Tavakol & Dennick, 2011)

The reason why Cronbach's α for PBC is below the threshold even after deleting one item with low item-to-total correlation might be that the statements in the questionnaire are asking about more heterogeneous aspects of perceived behavioral control (PBC), whereas item-to-total correlations and Cronbach's α are meant to measure internal reliability of homogenous constructs (Tavakol & Dennick, 2011). However, Berthoud (2000, p. 169) considers a value of above 0.6 to be 'good'. For this reason, a Cronbach's α of 0.641 for PBC is accepted. From the analysis of the internal reliability of the scales can be concluded that the items that construct the scale are consistent in what is intended to be measured and that the scores between the indicators relate to each other.

Construct validity is testing if a variable is actually measuring the particular construct that it is supposed to measure. In the next step the convergent validity of the construct was measured with the help of factor loadings values > 0.5, average variance extracted (AVE) values > 0.5 and composite reliability (CR) values > 0.6 (Bagozzi & Yi, 1988) to test whether the constructs that are expected to measure the same construct are related. As **Table 10** shows, acceptable values of CR were achieved by all constructs. Since PBC's value of 0.595 comes very close to 0.6, it is considered to be achieved. Issues concerning the convergent validity were found for the constructs PBC, SC and EK with AVE values of 0.277, 0.314 and 0.469 respectively, not meeting the required threshold of 0.5. For EK it is not feasible to exclude more items to improve convergent validity, whereas excluding items with factor loadings < 0.5 for PBC would result in just two remaining items with an AVE of 0.366, not reaching the threshold either. Similar to PBC, SC is a more heterogenous than homogenous construct resulting in a wide range of factor loadings between 0.167 and 0.885 and thus, a low AVE. Deleting items with a factor loading < 0.5 would result in removing 8 items from the scale, conflicting with the aim of this scale to include various aspects of each sustainability dimension. However, if AVE < 0.5, Fornell and Larcker (1981) argue that the convergent validity of the construct is considered to be adequate when CR > 0.6. As mentioned before, this requirement is met. Moreover, the internal reliability and discriminant validity of all three constructs was found to be satisfying, so the scales were kept for further analysis (Schmidt, 2019).

Compared to convergent validity, discriminant validity shows that constructs that are not expected to have a relationship, indeed, do not have one. To achieve discriminant validity, the square root value of each construct's AVE needs to exceed the correlations between the other constructs (Fornell & Larcker, 1981). As **Table 11** shows, this is given for every construct and thus, indicates discriminant validity.

Table 11: Correlation between the constructs (discriminant validity)
Source: Own illustration based on Paul et al. (2016, p. 128)

Construct	AT	SN	PBC	SC	EK	IT
Attitude (AT)	**0.734**					
Subjective Norms (SN)	0.525**	**0.737**				
Perceived Behavioral Control (PBC)	0.179**	0.201**	**0.518**			
Sustainability Concern (SC)	0.481**	0.288**	0.012	**0.551**		
Environmental Knowledge (EK)	0.234**	0.130	0.244**	0.048	**0.685**	
Intention (IT)	0.696**	0.501**	0.192**	0.498**	0.245**	**0.711**

Note: Diagonal values represent the square root of AVE for each construct.
**p < .01

The reliability and validity tests showed that all constructs are reliable and valid, with some convergent validity issues occurring for PBC, SC and EK due to a low AVE. That means that the items within the construct are explaining more errors than the variance in the construct and the findings need to be interpreted with caution. However, AVE is only one part of convergent validity, and the CR values of each construct are found to be acceptable, 'weighting' out the low values of AVE, resulting in an adequate convergent validity. Moreover, the discriminant validity is given. Based on that, the requirements for the construct validity are fulfilled and the constructs in fact measure what they are supposed to measure.

4.2.2 Model fit

Traditionally, chi-square ($\chi 2$) is used to test a model for goodness of fit. The approach is to evaluate whether a model differs significantly from the model that fits exactly to the data (Kline, 2016). The degrees of freedom (*df*) and the Chi-square per degree of freedom ratio ($\chi 2/df$) are the index for confirming model identification, and when df > 0, it means that the model is overidentified and that there are more equations than unknown parameters. The level of $\chi 2$/df ratio should be lower than 5 (Bagozzi & Yi, 1988). If $p < 0.05$, the null hypothesis of an exact-fitting model can be rejected. As **Table 12** depicts, all of the three models have a $\chi 2$/df ratio < 5 and $p < 0.05$. Therefore, the null hypothesis of an exact-fitting model can be rejected.

Table 12: Assessment of goodness-of-fit

Model	$\chi 2$	*df*	$\chi 2/df$	*p*
Model Fit	1581.741	622	2.543	0.000
Model Fit deleting SN3 & PBC5	1437.472	533	2.697	0.000
Model Fit with MI deleting SN3 & PBC5	934.081	539	1.733	0.000

Note: MI = Modification indices

The Tucker-Lewis Index (TLI), comparative fit index (CFI), and incremental fit index (IFI) are all incremental or comparative fit indices. The purpose of these indices is to compare the fit of

our model against that of a null model (Byrne, 2016). The values of all these indicators range between 0 and 1. Earlier research indicates that TLI > 0.90 demonstrates an acceptable fit (Bentler & Bonett, 1980). Kline (2016) recommended that CFI ≥ 0.90 can be treated as indicative for a reasonably good fit of the model and CFI ≥ 0.95 may be considered a 'super fit' model. Kline (2015) recommended that CFI ≥ 0.90 can be treated as indicative for a reasonably good fit of the model and CFI ≥ 0.95 may be considered a 'super fit' model. A root means square error approximation (RMSEA) value of < 0.05 suggests a 'close fit', and if < 0.08 it indicates a reasonable model fit (Browne et al., 1993). However, these measurement standards are largely based on previous experience instead of real statistical theory (Marsh et al., 2004).

According to **Table 13**, all the Goodness-of-Fitness (GOF) of the original model showed some deviance from the acceptable limit (TLI = 0.638; CFI = 0.705; IFI = 0.709; RMSEA = 0.084). The two items SN3 and PBC5 were deleted in an earlier step to improve the scale reliability. Their exclusion also improved the model fit and the fit-statistics slightly (TLI = 0.700; CFI = 0.721; IFI = 0.725; RMSEA = 0.086), which means that the model fits better to the set of observations. However, the values still deviate from the required values. Therefore, modification indices (MI) were applied, a method that contributed to a large decrease in the chi-square value. The logic of MI is to correlate the residuals of two sets of variables to incorporate these sets of shared variances in the model. Generally, researchers are allowed to modify the model, but it is important to understand the reasons behind the adjustments. Factor loadings determine the measurement model and thereby influence the model fit. Within attitude, subjective norms, environmental knowledge, intention, similar questions were asked to measure the variable. However, in sustainability concerns and perceived behavioral control, various aspects of sustainability are included which results in low factor loadings. The error terms can be correlated between corresponding observed items when the items are used to measure the same variable. By conducting MI, the GOF result (TLI = 0.862; CFI = 0.876; IFI = 0.878; RMSEA = 0.058) indicates a reasonable model fit since RMSEA <0.08 and TLI, CFI and IFI are very close to a reasonably good fit.

Table 13: Model goodness-of-fit

Model	TLI	CFI	IFI	RMSEA
Model Fit	0.683	0.705	0.709	0.084
Model Fit deleting SN3 & PBC5	0.700	0.721	0.725	0.086
Model Fit with MI deleting SN3 & PBC5	0.862	0.876	0.878	0.058

Note: MI = Modification indices

AMOS reports that the minimum was achieved with no errors, which means it is safe to proceed with the next step, the model fit output. Firstly, model identification is tested. In practice, successfully fitted model are just-identified or overidentified and researchers want to use overidentified models because they permit people to test statistical hypothesis (Loehlin & Beaujean, 2016). The freedom of degree of our model is larger than 0 which indicates that it is an overidentified model. It shows that more than one set of parameter estimates is possible, and that it is possible to explore which set of parameter provide the best fit to the data. Secondly, the chi-square test of absolute model is sensitive to sample size, the overall fit of a model can also be assessed by various descriptive fit statistics. The result shows that the model is approaching a reasonably good fit.

4.3 Evaluation of the structural model and hypotheses testing

Structural equation modeling (SEM) with maximum likelihood estimation was used to test the hypothesized relationships between the variables in the model.

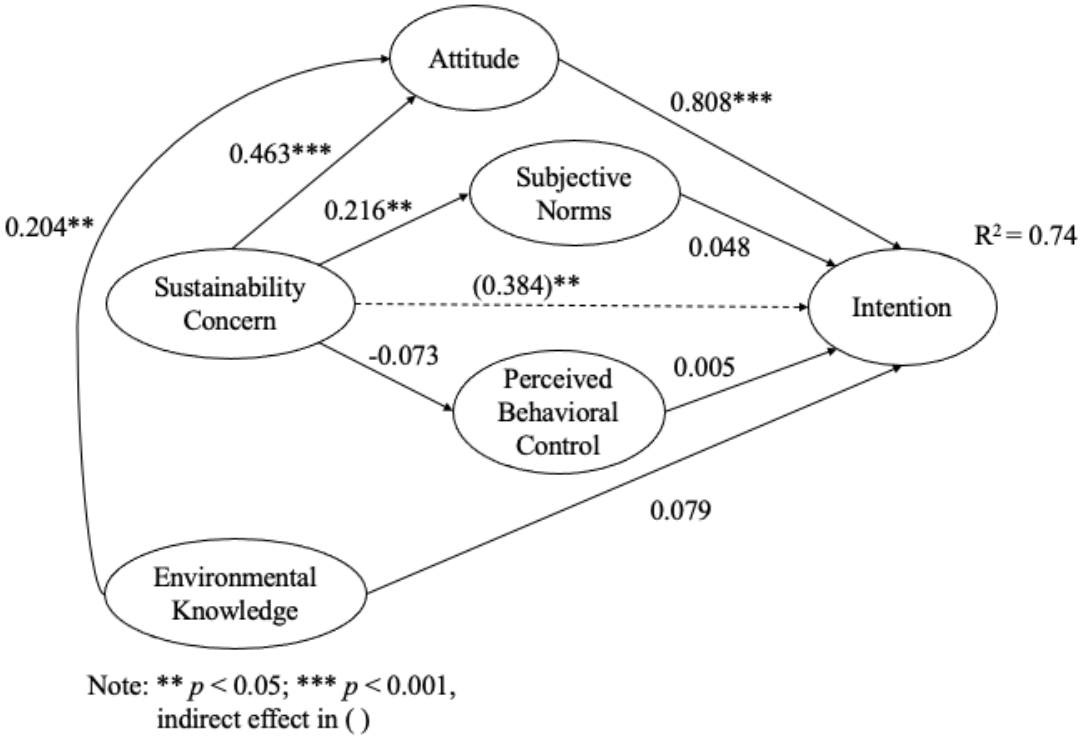


Figure 2: SEM with path estimates (β – coefficient)

As presented in **Figure 2**, significant positive relationships have been found between attitude and intention (β = 0.808; $p < 0.001$), sustainability concern and attitude (β = 0.463; $p < 0.001$), sustainability concern and subjective norms (β = 0.216; $p < 0.05$) and between environmental knowledge and attitude (β = 0.204; $p < 0.05$), supporting the hypotheses H1, H4a, H4b and H5a. However, according to the SEM analysis an insignificant positive relationship exists between subjective norms and intention, perceived behavioral control and intention, as well as

environmental knowledge and intention. Moreover, the negative relationship between sustainability concern and perceived behavioral control is insignificant. Consequently, the hypotheses H2, H3, H4c, H5b are rejected due to the lack of significance ($p > 0.05$). Although a direct relationship between environmental knowledge and intention was not found, AMOS revealed a significant indirect relationship ($\beta = 0.165$; $p = 0.006$), where environmental knowledge (EK) is mediated through attitude (AT). For a detailed overview of the results of the SEM, see **Figure 4** (in Appendix 3). Since the indirect effect of sustainability concern (SC) on intention (IT) is not displayed in the SEM, it is calculated as the sum of all indirect paths from SC to IT ($\beta = 0.384$), matching the result displayed in the table of indirect effect in AMOS. In the next step, bootstrap in AMOS is used to test the indirect relationship between SC and IT for statistical significance. The same was done for the indirect influence of EK on IT earlier. The *p*-value for the indirect effect of SC on IT is 0.016 and thus, significant. Therefore, the hypothesis H4d is supported. Despite four rejected hypotheses, the proposed model explains 74% of the variance of the construct intention to purchase sustainable food products. This suggests a moderate to substantial explanatory power of the intention to purchase sustainable food products in the model. AMOS produced direct, indirect and total effects between variables as displayed in **Table 14**. Moreover, an overview of supported and not supported hypotheses is given.

Table 14: SEM parameter estimates

Hypothesis: path	Direct effect	Indirect effect	Total effect	*β* - coefficient	*p*-value	Result
H1: AT → IT	0.808	-	0.808	0.808	0.001***	Supported
H2: SN → IT	0.048	-	0.048	0.048	0.587	Not supported
H3: PBC → IT	0.005	-	0.005	0.005	0.927	Not supported
H4a: SC → AT	0.463	-	0.463	0.463	0.001***	Supported
H4b: SC → SN	0.216	-	0.216	0.216	0.021**	Supported
H4c: SC → PBC	- 0.073	-	- 0.073	- 0.073	0.411	Not supported
H4d: SC - -> IT	-	0.384	0.384	-	0.016**	Supported
H5a: EK → AT	0.204	-	0.204	0.204	0.003**	Supported
H5b: EK → IT	0.079	0.165	0.244	0.079	0.214	Not supported

Note: ** $p < 0.05$; *** $p < 0.001$

5 Discussion

In this chapter, the research questions are answered, the results and the hypotheses of the study are discussed and compared to previous research. Afterwards, the studies' contributions to the SDGs and the field of sustainable consumption, as well as the limitations of this study are presented. In addition, possibilities and recommendations for further research are provided.

5.1 Discussion of the hypotheses

Research question 1: '*How does sustainability concern influence attitude, subjective norms and perceived behavioral control of purchasing sustainable food products?'*

The variable sustainability concern

According to the literature available to us, there is no specified construct of sustainability concern used in research to examine sustainable food consumption. We argue that it is crucial to include all three dimensions of sustainability when researching sustainable food consumption. Consequently, we concretized the construct sustainability concern to take a holistic approach on sustainability, not only including environmental concern as done by many other studies, but also social and economic sustainability. The mean (M) of sustainability concern is 4.20 with a standard deviation (SD) of 0.53, indicating that in general, respondents are concerned about sustainability. As a reminder: The variable sustainability concern is measured on a 5-point Likert scale from 1='Not important at all' to 5='Very important'. The result indicates that economic and social sustainability is under-researched in the literature because respondents expressed even a slightly higher concern for issues of sustainability that belong to the social and economic dimension than for environmental issues. This is represented by the mean M = 4.39 for social aspects, M = 4.37 for economic and M = 3.97 for environmental aspects, meaning that all three dimensions are at least considered to be *'4=Important'* by the respondents. There are only three aspects that on average are rated below 4 which are the seasonality of a product (SC2: M = 3.88), reducing meat consumption (SC4: M = 3.78) and reducing the consumption of dairy products (SC5: M = 2.88), all belonging to the environmental concern explaining the lower result. The aspects the respondents are most concerned about are reducing food waste (SC7: M = 4.62), ensuring animals' welfare during the production (SC13: M = 4.57) and respected human rights along the whole value chain (SC15: M = 4.51). For a detailed overview of the descriptive values (mean and standard deviation) of each aspect of sustainability concern, see **Table 15**.

Table 15: Concerns about sustainability issues in the food sector

Item	Statement	M	SD
	Sustainability concern	**4.20**	**0.53**
	Environment	**3.97**	**0.59**
SC1	Organic farming practices are used in the production (organic products).	4.21	0.89
SC2	It is a seasonal product.	3.88	1.00
SC3	It is a local product.	4.18	0.86
SC4	Reducing the consumption of meat products.	3.78	1.32
SC5	Reducing the consumption of dairy products.	2.88	1.33
SC6	Food products are not packaged or packaged in an environmentally friendly way.	4.21	0.92
SC7	Food waste is reduced.	4.62	0.72
	Economy	**4.37**	**0.68**
SC8	The farmers receive a fair payment for their product.	4.45	0.82
SC9	Workers are paid fair wages.	4.43	0.87
SC10	The local economy is supported.	4.33	0.95
SC11	Sustainable food products are affordable (reasonable price).	4.26	0.82
	Society	**4.39**	**0.66**
SC12	The food has high nutritional value and is good for health.	4.49	0.77
SC13	The animals' welfare in food production is ensured.	4.57	0.80
SC14	The employees have good working conditions.	4.37	0.83
SC15	Human rights are respected along the entire food value chain.	4.51	0.80
SC16	Gender equality is guaranteed.	4.00	1.30

How important the following aspects of sustainability in connection with food are to you?
1='Not important at all' and 5='Very important'.

Hypothesis 4a: Sustainability concern → Attitude

The result shows that there is a significant positive relationship between sustainability concern and attitude ($\beta = 0.463$), confirming hypothesis 4a which suggests that sustainability concern has a positive effect on consumers' attitude toward sustainable food. This outcome is in agreement with, Chumpitaz and Keslemont (1997), Grunert et al. (1993), Shin et al. (2017) and Viaene (1997) who find that consumers' concern about the environment, which is one of the dimensions in sustainability concern, is a determinant of forming a positive attitude toward purchasing sustainable food products. Further research confirms our result but uses a slightly different term to describe the construct. For example, Irianto (2015) reveals that environmental consciousness, which resembles the concept of environmental concern, affects the attitude to purchase sustainable food significantly and positively. However, many studies focus only on environmental concern rather than including social and economic concern as well. Annunziata et al. (2019), Schleenbecker and Hamm (2013) and Zander and Hamm (2010) suggest that the impact of sustainable farming should not only be focused on the environment, but also needs to be emphasized from the social and economic dimension, such as animal welfare and human rights. The reason behind is that many perspectives are included in sustainability, and it is difficult to test the impact of all these perspectives toward sustainable consumption at once.

The solution of this problem in this study is firstly, to conduct a focus group to include a variety of aspects of sustainability concern in the questionnaire. Secondly, people are asked to name their top three aspects that are the most important to them during purchasing. Eventually, the result shows that in total 36 different perspectives in sustainability were mentioned by the respondents (see **Figure 3**) which are discussed later on. This procedure provided an overview of the perspectives that are important for consumers when buying sustainable food products.

Hypothesis 4b: Sustainability concern → Subjective norms

The structural equation model reveals a positive and significant relationship between sustainability concern and subjective norms ($\beta = 0.216$). Thus, we accept hypothesis 4b. This result suggests that the higher the concern for sustainability, the more people feel socially pressured to purchase sustainable food products. Similarly, Paul et al. (2016) discover a positive relationship between environmental concern and subjective norms. Since no literature is available that includes a construct of sustainability concern, the following explanations are based on our assumptions. We assume that people with a higher concern for sustainability issues form the wish to conduct a more sustainable behavior in food consumption which raises their awareness about the behavior of people around them. Followingly, people are more prone to be influenced by others who already perform the desired behavior of consciously buying food and opting for the sustainable alternative of products. Moreover, people gather often around like-minded people that share similar values and tend to compare themselves to them, which might increase the felt pressure of behaving in a certain way. The social pressure might be higher, when the behavior of others is perceived to be more sustainable than the own behavior. People can also be influenced by friends and family who discovered a new sustainable product and recommend it to them.

Hypothesis 4c: Sustainability concern → Perceived behavioral control

The hypothesis 4c implies a positive influence of sustainability concern on perceived behavioral control. This is not supported by our findings which indicate an insignificant negative relationship ($\beta = -0.073$). Therefore, hypothesis 4c is rejected. Comparing this result to Paul et al. (2016), where sustainability concern has a significant positive influence on perceived behavioral control, our findings are not consistent. Paul et al. (2016) argue that the perception of green products not being available is altered because consumers with higher environmental concern are searching for sustainable option and have a higher knowledge about alternatives that are available to them. On the contrary, based on our result we assume that if consumers try to take all the different aspects of sustainability into consideration, for example buying organic, local and packaging-free food products to name three, they get overwhelmed easily. This is

because many products fulfill just one or two of these aspects but very few unite all aspects of sustainability that consumers are aware or care about. Moreover, especially information about the social and economic aspects of sustainability and also many environmental aspects are not displayed on the packaging which makes it hard for consumers to judge if, for example, human rights are respected during the supply chain, employees have good working conditions or farmers receive a fair payment. Meanwhile, there are also various aspects measured in PBC including availability, price and labeling of sustainable food products which create difficulties to obtain a concrete outcome of which aspect in particular affects the relationship between sustainability concern and perceived behavioral control. For conceptual reasons, we used the definition mentioned by Vermeir and Verbeke (2006) that sustainable products contribute to one or a combination of the dimensions of sustainability but not to all of them. However, in practice consumers' awareness is rising that for example buying organic food is just one drop on the hot stone considering the variety of sustainability challenges the world encounters and meeting only one aspect may not be perceived as being thoroughly sustainable.

It is crucial to provide consumers with the information about the 'sustainability performance' of products and the companies who stand behind it, so they are enabled to make an informed and conscious decision. This can happen in form of standardized labels issued by an independent third-party to ensure the trustworthiness, and sustainability reports which disclose production practices of companies (Staniškis, 2012). Moreover, the information must be readily available and sustainable products need to be easy to identify. This is because consumers often do not have the time to look for the environmental performance of products when grocery shopping (Liobikienė et al., 2016). This is confirmed by respondent 168 who states that it should not take too much effort in the daily routine to search for the sustainable alternative to a product because a person *"realistically cannot manage to keep up [the effort] permanently"* and mentioned that it is often *"difficult to tell the difference"* between products. Similarly, respondent 174 argues that *"convenience often gets in the way of us consuming food in a sustainable way."* Besides informing consumers, infrastructures and policies need to be established to ensure the availability and accessibility of a large selection of sustainable options *"to make the sustainable choice the easy choice"* (Reisch et al., 2013, p. 17) and thus, foster sustainable consumption (Staniškis, 2012).

One interesting finding within our constructed variable perceived behavioral control is that the answers of four items, including the simplicity to distinguish sustainable alternatives from conventional products, confusing labelling, trustworthiness of labels and availability of sustainable alternatives, are on average approaching the neutral position. Furthermore, they

have a high standard deviation ranging between 0.99 and 1.20, showing that respondents both agree and disagree to the statements. Surprisingly, besides the neutral position regarding the first four items of perceived behavior control, respondents agree (M = 4.05) to the last statement *'In general, I think I can buy sustainable food products as I wish'* (see **Table 16**). This means, even though some agree and other disagree to the statements that measure the perceived behavioral control, respondents are overall thinking that they are capable of purchasing sustainable products if they intend to. Moreover, PBC5 which was excluded from the structural equation model (SEM) due to a low item-to-total correlation value shows the tendency that the price of sustainable products is perceived as expensive. However, the qualitative analysis of the top 3 priorities when buying food reveals that a certain price premium for these products is accepted by consumers, as long as the price/performance ratio is perceived to be adequate.

Table 16: Perceived behavioral control when buying sustainable food products

Item	Statements	M	SD
	Perceived behavioral control	**3.07**	**0.60**
PBC1	It is easy to distinguish sustainable food products from conventional products.	2.90	1.07
PBC2	Labels on sustainable food products (do not) confuse me.	2.95	1.20
PBC3	Food with sustainable labelling is trustworthy.	3.20	0.99
PBC4	Sustainable food products are always available for buying.	2.87	1.07
PBC5	Sustainable food products are (not) expensive for me.*	2.45*	1.07*
PBC6	In general, I think I can buy sustainable food products as I wish.	4.05	0.88

Please rate the following statements
1='I do not agree at all' and 5='I completely agree'
Note: *excluded from the SEM

Research question 2: '*What indirect effect does sustainability concern have on the intention to buy sustainable food products?'*

Hypothesis 4d: Sustainability concern → Intention

Hypothesis 4d states that sustainability concern has a positive indirect effect on intention. A positive relationship between sustainability concern and attitude, subjective norms and perceived behavioral control is assumed. Meanwhile, these three variables all have a hypothesized positive relationship towards intention. Thus, sustainability concern should have an indirect positive effect on intention. Even though we only found a significant positive relationship between sustainability concern and attitude, sustainability concern and subjective norms, and attitude and intention, our findings support the hypothesis of an indirect influence of sustainability concerns on intention ($\beta = 0.384$), while the SEM shows that 0.374 of it is mediated through attitude. Previous research, such as Kottala and Singh (2015) and Padilla Bravo et al. (2013) find that sustainability concerns, including environmental and social concerns, played an important role in determining the intention of purchasing sustainable food

products among consumers. In other words, people with higher sustainability concern are more likely to consume sustainable food products (Annunziata et al., 2019; Rana & Paul, 2017). Therefore, this result indicates that sustainability concern can be used by policy makers, marketers or industry practitioners as an important factor to address when developing strategies to achieve a more sustainable consumption pattern. However, this higher intention cannot be directly translated to behavior because even if people have greater concerns about the environment, they still can be inactive, not purchasing sustainable food products (Straughan & Roberts, 1999). The reason behind this relates to the previous chapter **2.2 Differentiation and relationship between attitude, intention and behavior** where the attitude-behavior gap has been discussed.

Research question 3: '*What role play attitude, subjective norms, perceived behavioral control and environmental knowledge for consumers' intention to purchase sustainable food products?'*

Hypothesis 5a: Environmental knowledge → Attitude

Our result shows that environmental knowledge positively affects attitude ($\beta = 0.204$) in a significant way. We thus accept hypothesis 5a. This finding is consistent with previous research from Shin et al. (2017) whose findings reveal that consumers who have more knowledge about environmental issues have a more positive attitude toward sustainable food products. This result can be explained by Hines et al. (1987) who argue environmental knowledge to be the most important predictor of conducting environmental action. In our study, a general question about the level of knowledge of environmental problems and the impact of food products were asked regarding sustainable food products. To test the knowledge of people, not only knowledge about environmental issues is important, but also the knowledge about sustainable food products is fundamental. People who have a low level of knowledge about environmental problems may not always be able to distinguish which product is the best choice to solve the environmental issues that are related to food consumption. Therefore, the knowledge of distinguishing sustainable food products from conventional food products was also tested. The result indicates that people who have a higher level of environmental knowledge in general tend to have a more positive attitude toward sustainable food products. Consequently, it is of great importance to educate people about sustainability issues and what impacts their consumption has on the environment. Raising people's knowledge level and thus, their awareness can be done through campaigns, workshops and by including subjects about impacts of consumption on the environment, about sustainability and climate change already in school. In turn, educated children can influence their parents to change their behavior. Respondent 147, whose parents

are involved in agriculture, commented that a large share of the population does not know what effort is behind agriculture and that it is not appreciated. Similar respondent 38 puts it like this: *"Consumers should learn again where food comes from (apple doesn't grow in supermarket but on a tree). This issue needs to be addressed in kindergarten"*, advocating that education about how our food is grown needs to start in the kindergarten.

Hypothesis 5b: Environmental knowledge → Intention

No significant relationship between environmental knowledge and intention is discovered (β = 0.079). This result is in agreement with some of the earlier research, such as Zhao et al. (2014) who state that the knowledge of environmental issues and green consumption does not have a direct effect on purchasing behavior. However, other research have a contrary outcome, for example, Laroche et al. (2001) discover that people who are more knowledgeable about the environmental problems intend to buy only eco-friendly products. Their finding suggests that environmental knowledge has a positive effect on purchasing intention. Since environmental knowledge had a positive effect on attitude and attitude affects intention positively, it can be assumed that there is an indirect effect of environmental knowledge on intention. This is confirmed by the table produced by AMOS which shows the indirect effects between variables. It reveals a significant indirect relationship between environmental knowledge and intention (β = 0.165), mediated by attitude. Many studies have implied that ecological knowledge is an important variable to motivate people to study more about their behavioral indicators including intention (Chan & Lau, 2000; Straughan & Roberts, 1999). Kanchanapibul et al. (2014) also demonstrate that young consumers with a higher level of knowledge about environmental problems have a stronger intention to be involved in sustainable purchasing. Nevertheless, with a low β-coefficient, its influence on intention to purchase sustainable products is less important than other variables (Haron et al., 2005). The reason why our findings do not reveal a direct relationship and thus, differ from other research may be explained by the approach of constructing the questions in the questionnaire. Both Zhao et al. (2014) and Kanchanapibul et al. (2014) apply questions with theoretical knowledge about ecological issues in the survey. However, in this study people can rate their environmental knowledge level by themselves which means that the result is more subjective and not measured objectively. People who are more knowledgeable may tend to be more reserved to select a high score for rating their knowledge level. This may explain why there is no significant direct relationship between the level of environmental knowledge and purchasing intention identified in the structural model.

Hypothesis 1: Attitude → Intention

Our findings show that attitude has the greatest positive influence (β = 0.808) on consumers' intention to purchase sustainable food products among the tested determinants. We can therefore accept hypothesis 1. This result is consistent with findings of many other studies in which attitude is significantly predicting intention, such as Kumar (2012), Gracia Royo and de-Magistris (2007), and Chen (2009). A positive attitude as the most significant determinant of the intention to purchase sustainable food products in Germany indicates that holding a strong attitude is a fundamental precondition to support the intention. Since attitude itself can be affected by many other factors, it is also important to explore the influencing factors to understand attitude better. Some research study the relationship of attitude and other variables such as health and environment (Gracia Royo & de-Magistris, 2007). In this study, to understand the main predictors of attitude, the relationships of the variables sustainability concern and environmental knowledge toward attitude have been tested. The results demonstrate that attitude is influenced by both constructs. Therefore, education about sustainability issues is crucial. This is because education can raise the level of knowledge and might also influence the concern about sustainability issues, leading to a better attitude and thus, to a higher intention to purchase sustainable food products. Understanding the importance of consumers' attitude shaping a more positive intention can help policy makers and marketers to develop more effective strategies that enhance the consumption of sustainable food.

Hypothesis 2: Subjective norms → Intention

In terms of subjective norms, contrasting results exist in research. In our study, hypothesis 2 suggests that subjective norms have a positive effect on the intention to purchase sustainable food products. The result however shows only a low positive and insignificant relationship between subjective norms and intention (β = 0.048). Thus, hypothesis 2 is rejected. This outcome is consistent with Kumar (2012), and Tarkiainen and Sundqvist (2005) where subjective norms are a non-significant predictor of the intention of food purchasing. However, it contrasts with Qi and Ploeger (2019), Irianto (2015), and Liobikienė et al. (2016) who find that subjective norms significantly influence the consumers' intention toward food product purchasing. According to Tarkiainen and Sundqvist (2005) subjective norms have shown poor explanatory power regarding intention and instead they argue that subjective norms are influencing intention indirectly using attitude as a mediator.

The reasons behind the difference of the outcomes of subjective norms may be also due to culture differences and social context. For instance, Qi and Ploeger (2019) conduct the research in China where group conformity and face consciousness play an important role in the society.

When people are under pressure of expectations toward their behaviors from family or friends and attempt to avoid failures and mistakes, the values of the group and society may influence their intention more than their attitude. However, people in Germany focus more on self-identity and individual self-esteem. They emphasize their own attitude instead of collectivistic characteristics during decision-making and behaviors of consumption. Consumers in Germany may not consider opinions of people around them when purchasing sustainable food products. This can be one explanation why consumers' intention to buy sustainable food products is not determined by social pressure and the positive and negative opinion toward sustainable food of family and friends around them. Another reason might be the current social context. The Coronavirus (SARS-CoV-2) which emerged in December 2019 and spread immediately all over the world, may also contribute to the result. With the constantly increasing cases, German government has imposed a string of restrictions on meeting people in public in 2020, such as home office and meeting of maximum 5 people of 2 households or at some point only allowing one person to meet with another household. With these regulations, which last until now (May 2021), the opportunities to meet other people decreased sharply which means that the influence from people around may also be reduced due to less contact and interaction.

Other studies found that subjective norms are influencing the intention to buy organic food indirectly, using attitude as the mediating variable (Al-Swidi et al., 2014; Irianto, 2015; Tarkiainen & Sundqvist, 2005). This means that the positive or negative opinion about a certain behavior is affecting other people's attitude and then their intention to perform the behavior. Moreover, Ajzen (1991) acknowledges that attitude and subjective norms are affecting each other. The correlation matrix displayed in **Table 11** confirms a high positive correlation between attitude and subjective norms (0.525) which is significant. Even though our results do not support the assumption that subjective norms are predicting the intention to buy sustainable food products, subjective norms might still have an important role influencing intention indirectly by affecting people's attitude.

Hypothesis 3: Perceived behavioral control → Intention

Hypothesis 3 states that perceived behavioral control positively influences intention. The findings suggest no relationship between perceived behavioral control and intention ($\beta = 0.005$). Consequently, hypothesis 3 is not supported. This result is consistent with Lehmann and Sheffi (2020, p. 80) who explain that consumers should feel capable to buy the sustainable alternative *"given the abundancy and availability of purchasing options in modern supermarkets"*. Also Tarkiainen and Sundqvist (2005) argue that availability is not perceived as a constraint by consumers, and a price-premium is almost non-existent for organic products in Finland and

therefore, perceived behavioral control has no effect on intention. However, respondent 166 commented that *"[i]f available I always buy sustainable"*, leaving the impression that the availability of sustainable options at some point is still an issue in Germany. Contradicting to our result, other studies have found a positive relationship between perceived behavioral control and intention (Paul et al., 2016; Schmidt, 2019), suggesting that marketers should communicate the availability of green products in order to improve consumers' perceived control over their behavior and show that it is convenient to shop sustainable alternatives of a product (Vermeir & Verbeke, 2008). Since our model has not identified a relationship between perceived behavioral control and intention, we argue that perceived behavioral control might not influence intention directly but instead might affect the performed behavior in the supermarket, where the actual availability and labels on sustainability products can constrain the purchase of sustainable food products.

Extreme answers for negatively formulated statements

Besides the relationship between variables, it is interesting that many items (SN3, PBC5 and IT2) that are statements with a negative formulation resulted in a more 'extreme' answer which is visible in a much higher or lower mean in comparison to the other statements within a construct. For example, the mean value of SN3 = *'People's negative opinions toward sustainable products makes me want to buy less sustainable food products.'* on a reversed scale is 4.54, whereas the means of the other three statements range from 3.20 to 3.54. Similarly, the mean of PBC5 = *'Sustainable food products are expensive for me.'* on a reversed scale is 2.45 and the mean of the other five statements range from 2.95 to 4.05 (see **Table 17** in the appendix). Also, these two items (SN3 and PBC5) needed to be excluded from the further analysis due to a low item-to-total correlations to improve the scale reliability. This means that people are prone to give a more extreme answer (in each direction) when they are disagreeing. Taking this into consideration, it is arguable that statement with negative formulation should be avoided in order to improve item-to-total correlation and thus, scale reliability or to improve factor loadings and thus, the average variance extracted (AVE). However, negative formulated statements serve the purpose of verifying respondents' attention in order to avoid that they are checking boxes without reading the statements or questions carefully.

Priorities when buying food

To explore what German consumers care most about when purchasing food, at the end of the sixth section in the questionnaire, the respondents were asked to name their top 3 priorities in this regard. Out of 218 answers, 95 respondents mentioned regionality as one of their priorities when shopping groceries, 64 mentioned that the products' packaging is important, including

little or no (plastic) packaging, environmentally friendly packaging, recyclable or reusable packaging. 55 mentioned animal welfare and 47 mentioned that they prefer food products that were cultivated using organic farming practices. However, these figures need to be interpreted with caution because we asked to name the top 3 priorities and people might care about other factors as well but were constrained to name just three. For an overview, see **Figure 3.**

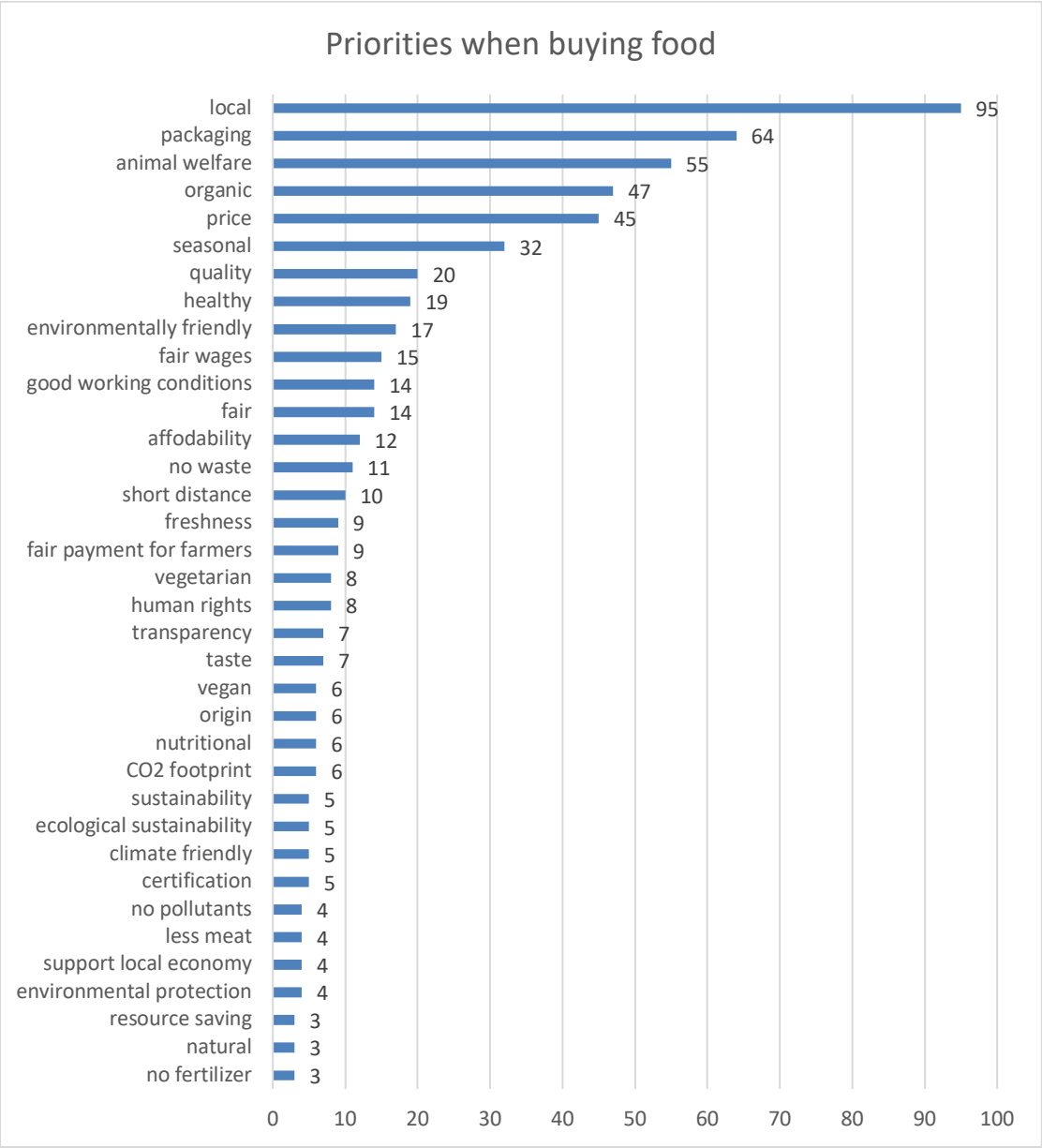


Figure 3: Respondents' priorities when buying food

In order to enhance sustainable food consumption, it should be easily assessable where a product comes from, so consumers can choose the product that is local to them. Moreover, an examination of what consumers classify as local is needed because people often have a different understanding of regionality and could mean the direct environment, state borders or country borders. Corresponding labeling could help to meet consumers' preferences and farmers could increase their sales by differentiating their products (Aprile et al., 2016). Speaking from our

own experience, it is currently very hard for consumers to buy food products packaging-free (or at least in a card box instead of plastic packaging) in a regular supermarket because bulk stores are often only available in bigger cities. Which is confirmed by one respondent of the focus group who said that reducing packaging waste is the most difficult part in food consumption and for groceries except fruits and vegetables not possible *"if you don't have access to a 'loose-goods store' near you."* (Mark) Even if committed consumers try to bring their own containers and cloth bags to bakeries, to the butcher or to the cheese counter, it is likely that employees reject to use the brought containers due to unclear hygiene regulations. This situation worsened because of the pandemic. To improve the package-free grocery shopping and reduce plastic waste, clear regulations that support packaging free systems, such as bulk stores and bulk sections within supermarkets, are fundamental and need to be imposed by the government. Even though reducing food waste was only mentioned by 11 respondents, in the variable sustainability concern it was the aspect that respondents were concerned most about. In the comments one person showed a positive attitude toward products that are imperfect. Thus, rethinking the standard of perfect produce in supermarkets can help to reduce the wasted food in the supply chain.

As mentioned in the introduction, in 2016, Germany was the biggest market for organic food products and this demand is confirmed by around 22% of the respondents paying attention to whether a product is organic or not. Consequently, to meet the demand of local and organic food, the effort by the government needs to be increased to help transition conventional farmers to farmers using organic farming practices. Subsidies can be an incentive that support farmers in the cost-intensive transition toward a more sustainable agriculture because in the beginning farmers have higher costs but still need to sell their products to the conventional price because they are not certified yet. Moreover, 32 participants stated that seasonality is an important aspect for them. This goes hand in hand with the regionality of the food products which was already discussed as the most stated priority of the respondents. With increasing the share of organic farming in Germany, the environmental aspects of local, organic and seasonal cultivation can be combined, and local economies are supported.

The price of the products is another important aspect named by 45 people. Some mentioned that the price/performance ratio is important to them and that a higher price for sustainable food products is acceptable to a certain degree. This is in line with the findings of Irianto (2015) who find that most of the consumers who participated in his survey are tolerating a premium price for organic food. This is contradicting research that identified the higher price as a barrier to purchasing organic products (Fotopoulos & Krystallis, 2002). For this we also gathered

evidence in the questionnaire. Even though one member of the focus group mentioned that price is not important to him (King), respondent 118 wrote in the comments that often her *"stinginess gets in the way"* and respondent 147 criticized the prevailing attitude of *"Geiz ist geil" (stinginess is cool)* in the society and questioned how it is possible that meat and vegetables in discounters can be so cheap. Another member of the focus group stated that the price of products that are more sustainable is usually higher and that *"it is a decision of how much I am willing to invest for the sustainable aspect."* (Mark) This indicates that the higher price can be a barrier for some people to purchase sustainable food products. Moreover, 20 people reported to prioritize the quality of the food which is perceived to be higher for local food (Aprile et al., 2016) and organic products (Irianto, 2015) compared to conventional products. The perceived higher quality by consumers may also explain the willingness to pay a price premium.

5.2 The studies' contribution to the SDGs

Our study provides both the public sector and individuals with a deeper insight of sustainable food consumption and our findings have valuable implications for policy makers, marketers and individuals on how to contribute better to the following Sustainable Development Goals:

1. SDG12 – *Responsible Consumption and Production*. The focus of the study lies on sustainable food consumption, exploring variables that influence consumers' intention to buy sustainable food products. The findings show that the participants have a favorable attitude toward sustainable food products which significantly determines their intention. Moreover, practical implications of the result, such as clear labeling and displaying sustainability information on products, and infrastructures to ensure availability and accessibility, can support the sustainable consumption of food.

2. SDG2 – *No Hunger*. Part of this SDG is to ensure sustainable agriculture. The findings suggest that one fifth of the respondents prefer organically cultivated products. Thus, the demand for organic products exists and the transition toward farms that manage their land ecologically needs to be supported by the government. Moreover, the variable sustainability concern revealed that it is important to consumers that food waste is reduced along the food chain and fruits and vegetables should not be thrown away because they do not fit the standard. Thus, the standard used by supermarkets to reject farmers' high quality, but imperfect food needs to be re-examined.

3. SDG4 – *Quality Education*. Our findings reveal that attitude is influenced by environmental knowledge and sustainability concern which means that efforts to educate people about the impacts of their consumption patterns on the environment and climate change need to be increased. This is in line with target 4.7 that all should *"acquire the knowledge and skills*

needed to promote sustainable development, including […] education for sustainable development and sustainable lifestyles" (United Nations, n.d.-c, par. 7); Meanwhile, the attention of the broader public about sustainable food products should be raised by emphasizing the values provided by sustainable alternatives. This can help to convey educational messages to encourage consumers to adopt a more positive attitude toward sustainable food products and thus, supports the goals 4 and 12.

4. SDG13 – *Climate Action*. The findings show that it is important to the respondents to buy local products which reduces the transport distances of food and lowers related emissions. Marketers should clearly state where a product comes from, so the consumer can choose the product that has the shortest transport route.

5. SDG14 & 15 – *Life below Water & Life on Land*. A high priority of consumers is to buy packaging-free products which if available and to all accessible would reduce plastic waste that pollutes the ocean, rivers and the environment if not disposed properly. Thus, clear regulations that enable package-free shopping need to be introduced. Moreover, organic farming helps to sustain biodiversity by not applying synthetic pesticides and mineral fertilizer. Therefore, it must be subsidized more by the government.

5.3 Limitations

There are several limitations to the sample that need to be addressed. To begin with, convenient sampling was used to collect the data. Thus, the total population remains unknown but nevertheless the sample with 218 respondents has statistical power. Second, more females than males participated in the survey because influencing the share of men and women is not possible when distributing a questionnaire online including a possible snowball effect. There could be two reasons to explain this uneven share. The first reason is that compared to males, females are more willing to help to fill out the survey. The second reason may be that female are more interested in sustainability and take more responsibility for grocery shopping. However, a share of 57% women and 43% men is considered to be acceptable. Third, age is not normally distributed with a majority of respondents belonging in the age group between 16 and 30 years (57%) and very few respondents being between 31 and 45 years old (12%). This may be explained by the convenient sampling, where mainly friends in our age group and parents in the age group between 46 and 60 years were asked to participate, and the snowball effect was leading to other people in a similar age. Consequently, the sample is not representative for the German population and a broader demographic and random sample should be considered in further research to generalize findings for the German population. Nevertheless, it provides insights and shows trends about which variables influence consumers' intention the most.

The study intended to gain a holistic comprehension of potential environmental, social and economic aspects within sustainable food consumption. Compared to our study, other research that has a high AVE score in environmental concern, social concern or economic concern, uses more general questions such as *"I have avoided buying a product because it had potentially harmful environmental effects."*(Mohd Suki & Mohd Suki, 2015) However, the questions in our survey needed to be constructed in a different way to be consistent with the target of the study. Therefore, specific questions including all environmental, social and economic perspectives have been asked. However, this resulted in a low AVE value and it is questionable whether it can reflect the real level of sustainability concerns of respondents or not.

As mentioned earlier, our constructed variable environmental knowledge is measuring knowledge subjectively because respondents rated their knowledge by themselves. This can lead to distortions in the result compared to their actual knowledge. Therefore, it might be more appropriate to ask theoretical fact-based questions that need to be answered, so afterwards the knowledge level can be measured objectively by the researcher by applying a pre-defined scale.

5.4 Suggestions for further research

There are several additional issues, areas of research and questions that appeared during the process of conducting research, analyzing data and discussing the findings. These extra points remain open for further investigation.

Firstly, an interesting field for future research is what affects the level of environmental knowledge. Gracia Royo and de-Magistris (2007) find that knowledge can be determined by lifestyle and socio-demographic factors such as education level and income. Knowledge can encourage and increase positive environmental attitude and values, to improve consumers' environmentally responsible consumption behavior and simultaneously convince more consumers to choose sustainable alternatives (Haron et al., 2005). People with higher sustainability concern may intend to obtain more knowledge about sustainability issues. At the same time, the level of sustainability concern can also be increased when people gain more knowledge. Therefore, the variable sustainability concern which is constructed as a new variable for the extended theory of planned behavior in this study can either be a factor to explain environmental knowledge or can be a result of it. Exploring the relationship between environmental knowledge and sustainability concern is thus interesting for future research. Besides, only general questions about the level of knowledge were asked in our study. There is a need to ask more specific and fact-based questions to measure people's level of knowledge objectively, as explained in the limitations.

Secondly, one of our findings suggests a positive relationship between sustainability concern and subjective norms, however the reasoning remains unclear. Further research is necessary to explain why a higher sustainability concern leads to a higher value of subjective norms and what the implications of this result are.

Thirdly, a variable that is not part of our model but has been identified as being a significant predictor and barrier to environmental behavior are habits (Schmidt, 2019). Furthermore, the intention of consumers to purchase sustainable products is only a small part of the puzzle of sustainable consumption. Other studies show that consumers are dependent on infrastructures and access which are often inequal, representing barriers and thus, lock consumers into unsustainable consumption patterns (Jackson, 2014; Tukker et al., 2008). Therefore, studying sustainable food consumption by applying practice theory which includes routines and socio-technical structures and is neither individualistic nor holistic (Warde, 2005) can support understanding the mechanisms that hinder sustainable (food) consumption. Furthermore, our developed questionnaire focuses on consumers' intention to purchase sustainable food because the actual behavior cannot be studied quantitatively and need to be approached by observation or experiments in order to obtain reliable findings mirroring people's behavior.

Besides, it could be investigated if the creation of a standardized label to evaluate a product's sustainability performance, that show the degree of the impact on the environment, society and economy, would make it easier for the consumer to choose the more sustainable option. For example, rating a product from A to E considering all the aspects of sustainability to gain a final average score. This could avoid that consumers feel overwhelmed by the various information on the packaging of a product and could make a quick decision during purchasing easier. Further research on evaluating standardized systems of sustainable food products can be considered.

6 Conclusion

With the constantly increasing attention on sustainable consumption, this paper aimed to investigate the influencing variables on the purchase intention of consumers toward sustainable food products in Germany. Previous research shows that the current consumption patterns are unsustainable and have caused many environmental, social and economic problems such as climate change, pollution, forced labor and unfair trade. To reach more sustainable consumption patterns, people need to understand the impacts of consumption, and search for an appropriate method to improve this situation. Since food consumption accounts for nearly one third of the total household emissions from consumption in Germany, it is important to understand what influences people's intention toward sustainable food consumption. This understanding is vital to enable a transit toward a sustainable consumption of food. To improve the sustainability of the food system, it is necessary to raise the awareness about sustainability issues of food consumption since sustainable consumption cannot be viewed separately from sustainable production.

The research was led by the following three research questions: 1. "*How does sustainability concern influence attitude, subjective norms and perceived behavioral control of purchasing sustainable food products?",* 2. "*What indirect effect does sustainability concern have on the intention to buy sustainable food products?"* and 3. "*What role play attitude, subjective norms, perceived behavioral control and environmental knowledge for consumers' intention to purchase sustainable food products?"* A deductive approach was taken by translating these research questions into nine hypotheses. For data collection a quantitative method in form of an online questionnaire was chosen. Based on previous research an extended model of the theory of planned behavior was constructed and hypothesized relationships between the variables have been established. The five variables that were suggested to influence consumers' intention to purchase sustainable food products are attitude, subjective norms, perceived behavioral control, sustainability concern and environmental knowledge. Previous research on sustainable food consumption focuses on environmental aspects such as organic, local or green products. Because of this lack of a comprehensive approach toward sustainability, we constructed sustainability concern as a variable that takes a holistic approach, including 16 aspects of the environmental, social and economic dimension of sustainability. These aspects were explored by conducting a preliminary focus group. The confirmatory factor analysis found that the measurement model is reliable, valid and has a good model fit. In the results, the structural equation model revealed the following significant relationships between the variables: The greatest determinant of consumers' intention is their attitude toward sustainable

food products (β = 0.808) which in turn is influenced by sustainability concern (β = 0.463) and by environmental knowledge (β = 0.204). Moreover, sustainability concern has a positive effect on subjective norms (β = 0.216) and an indirect positive influence on intention (β = 0.384) which is mediated by attitude. This means that the hypotheses H1, H4a, H4b, H4d and H5a of this paper are supported. The result showed no significant relationship between sustainability concern and perceived behavioral control and no direct influence of subjective norms, perceived behavioral control and environmental knowledge on intention. Consequently, the remaining hypotheses H2, H3, H4c and H5b were rejected. Even though environmental knowledge was not found to be a significant determinant of intention, it has an indirect effect on intention mediated through attitude (β = 0.165). Despite four rejected hypotheses, the proposed model explains 74% of the variance of the construct intention to purchase sustainable food products. In sum, this study reached the goal of identifying variables that influence the intention of consumers to buy sustainable food products.

Since the findings are based on convenience sampling with a dominant age group of 16 to 30 years old, it is not possible to generalize the result for German consumers. Nevertheless, the findings can be understood as being directive, demonstrating useful implications for policy makers and marketers in the field of sustainable food consumption. Since attitude has the greatest influence on intention and in turn is affected by sustainability concern and environmental knowledge, educational campaigns are necessary to raise the awareness and knowledge about sustainability issues in order to foster sustainable consumption. Moreover, the answers in the questionnaire revealed that regional and organic products are important to consumers and thus, that the government should increase efforts to support the transition toward organic farming practices. Also important is a clear labeling on products, that allows consumers to assess the products' properties easily. Moreover, infrastructure needs to be established to ensure the availability and accessibility of sustainable alternatives and regulations that enable package-free shopping are needed to support the sustainable consumption of food. The variable of sustainability concern revealed that consumers are highly concerned about food waste in the food supply chain and comments show that some consumers have a positive attitude toward 'imperfect' produce. Therefore, the standard of 'perfect' fruits and vegetables in supermarkets needs to be reconsidered to reduce food waste. These are suggestions that can help policy makers and marketers to develop more effective strategies to enable consumers to choose the sustainable alternative of a product, promote sustainable food consumption and thus, both individuals and policy makers can contribute to the UN's Sustainable Development Goals.

This paper contributes to the existing literature about sustainable food consumption by summarizing previous research and providing a clearer scope of sustainable food products by constructing the variable sustainability concern which includes 16 aspects of sustainability issues from the environmental, social and economic dimension. Meanwhile, 36 perspectives of sustainability issues in total were mentioned by respondents in the questionnaire. Based on this, the paper provides a holistic view of sustainability issues that may affect sustainable food consumption. As mentioned, attitude was found to be the greatest determinant of intention in our model, being influenced by sustainability concern and environmental knowledge. This gives a deeper understanding about how intention can be positively shaped.

Since this study has taken an explorative approach, further research is needed to provide additional comprehension into some of the study's limitations and issues and questions raised. First, this study was conducted using convenient sampling which led to more female than male respondents and age is not normally distributed with a majority of participants belonging to the age group between 16 and 30 years. Therefore, a broader demographic sample should be considered in further research to gain a better understanding of consumers' intention toward sustainable food products in Germany. Second, improvement of the variables sustainability concern and environmental knowledge is needed. The questions of the variable environmental knowledge need to be reconstructed to reflect the level of respondents' knowledge more precisely, for example by asking fact-based questions to test respondents' real knowledge. Since it was the first attempt to construct a variable sustainability concern that takes a holistic approach, there is room for improving this variable. Also investigating the relationship between these two variables can provide deeper insights of how attitude is influenced. Third, the relationship between sustainability concern and subjective norms and influencing factors for environmental knowledge remain unclear. This shows possibilities for further investigation. Besides, it could be investigated if a label that provides consumers with information about the sustainability performance of a product would make it easier for the consumer to choose the more sustainable option. Finally, it is not sufficient to only study consumers' intention to understand sustainable consumption, but also definitive behavior and constraining socio-technical structures need to be studied by conducting observations or experiments to identify actual behavioral patterns.

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Appendix

Appendix 1 – Focus group answers

1. Mark, male, 24 years old, 30.01.2021

Q1: What do you think about sustainable food consumption and which aspects do you pay attention to when buying food?

I think it is a very important aspect of a sustainable lifestyle, since every person has the ability to directly influence his or her food consumption through their purchase decisions. This is not necessarily the case for other parts of life such as energy and transportation. Sustainable food consumption for me encompasses the aspects food origin (geographically; **the closer to the origin, the better**), the agricultural methods used to obtain the food (conventional vs. **organic;** the less pollution and burden on land and animals, the better), the packaging (plastic vs. **paper vs. loose goods**; the less packaging and renewable packaging resources, the better) and social aspects, such has the circumstances of the people and animals involved in the food creation process (**fair pay and good working conditions**). The **seasonality** of the food is another part of sustainable food consumption however I don't really consider this aspect in my purchase decisions.

For me the decision is always between the first 4 aspects and the **cost of the food**. Since the **costs are usually higher** the more sustainable the food is on any of these 4 dimensions, it is a decision of how much I am **willing to invest** for the sustainable aspect.

Q2: How would you describe your diet and why do you choose a certain diet? – e.g., environment, health issues or animal welfare

My diet is a diet consisting of mostly **unprocessed foods** (i.e., **self-cooked** out of mostly fresh vegetables and fruits) of great variety. I eat bread with butter or margarine and marmalade in the morning and bread with cheese and sausage and vegetables/fruits in the evening. For lunch it is meat approximately twice per week and fish once per week. I eat unprocessed and fresh foods because I think it is **healthy for my body and mind** and I can ensure that **no unnecessary chemicals** are part of it. I try to use more and **more organic foods** because, next to being **sustainable for the lands and environment**, I think it is also **healthier and nutritious** for me. I am aware that eating meat causes **higher emissions of green-house gases** compared to a vegetarian diet. This is why I try to **reduce my meat consumption**. I am not willing to give up eating meat completely because I think meat, given that it is of **high quality**, is a great food with good nutritional aspects that other foods cannot provide. I buy meat from the **local butcher**

to minimize the pollution through transportation and because I can **support the local farmers.**

Reducing the amount of waste created by my food consumption is the most difficult part. For fruits and vegetables, it is mostly possible nowadays to **avoid packaging**. For most other groceries it is not possible if you don't have access to a "**loose-goods store**" near you.

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2. Carolin, female, 24 years old, 31.01.2021

Q1: What does sustainable food consumption mean for you personally?

Original answer in German	*Translation to English*
- nachhaltiger Lebensmittelkonsum bedeutet für mich:	- sustainable food consumption means for me:
- kein Essen wegzuwerfen	- **not to waste food**
- vegetarisch zu leben	- to live **vegetarian**
- regional und saisonal einzukaufen	- to shop **locally and seasonal**
- Bio- Produkte	- **organic products**
- Verzicht auf Einwegprodukte	- **no single- use products**, (*e.g., non-recyclable bottles; clarified after asking*)

Q2: To what aspects do you pay attention to when shopping for groceries?

Original answer in German	*Translation to English*
- beim Einkauf achte ich auf Regionalität und Bio-Qualität	- while shopping groceries I pay attention to **regionality and organic** quality
→ insbesondere bei Obst und Gemüse	→ especially with fruits and vegetables
- das ist mir wichtig, weil 1. Die Produkte nicht so einen weiten Reiseweg hinter sich haben (dadurch auch weniger CO2 Verbrauch) und 2. bessere Qualität, bessere Produktionsbedingungen usw.	- this is important to me because 1. the products have a **shorter way of transportation** (hence, less CO2 emissions) and 2. better **quality**, better **production conditions** etc.
- außerdem achte ich darauf, so wenig Plastik wie möglich einzukaufen	- besides that, I take care, to buy as **little plastic** as possible
→ Gemüse und Obst nur ohne Plastikverpackungen	→ fruits and vegetables only **without plastic packaging**
- überwiegend nur saisonales Obst/ Gemüse	- predominantly **seasonal** fruits and vegetables

Q3: How would you describe your diet and for which reasons do you choose this certain diet? E.g., for environmental reasons, health, animal welfare...

Original answer in German	*Translation to English*
- vegetarische Ernährung	- vegetarian diet

→ aufgrund der Massentierhaltung (ethische Gründe), Umweltgründe	→ because of livestock farming (ethical reasons), environmental reasons
- generell wenig bis keine Milchprodukte aus gesundheitlichen und ethischen Gründen	- in general, **few until no dairy products** because of health and ethical reasons
→ich meide auch aufgrund des Leistungssports Fleisch und Milchprodukte, da diese entzündungsfördernd im Körper sind; der Hauptgrund ist aber das Tierwohl	→ I also avoid meat and dairy products because of competitive sport, as these are causing inflammations in the body; but the main reason is animal welfare

3. Lisa, female, 24 years old, 31.01.2021

Q1: What does sustainable food consumption mean for you personally?

Sustainable for me means to think about which products I buy. It's not always easy (or even possible) to buy food that is from **my region**, **without mass animal husbandry** with **less packaging/organic packaging** or grew up **without antibiotics or chemicals**. I often try to look after these things, and I can proudly say that I trained myself to **buy fruit and veggies without any packaging** and just take some time and read where the food is from or under which conditions it's produced. For me it's like a journey: I always try to take a few small steps in the right direction. And I also try to influence my mom and family. Because when everybody is taking small steps, a lot of people move in the right direction.

Q2: To what aspects do you pay attention to when shopping for groceries?

Mainly the ones that are listed in question 1: Where is my food **from**? (region), Did the chicken or cow had **enough space to live**, natural conditions? (mass animal husbandry), How is the stuff **packed**? (lot of plastic, organic, reused plastic) and what **medicals, chemicals** or so did they feed the animals or plants? Another one would be to **buy seasonal** stuff. That's a really hard one for myself. I don't look after that very often (especially with fruit).

Q3: How would you describe your diet and for which reasons do you choose this certain diet? E.g. for environmental reasons, health, animal welfare...

I don't have a specific diet. I don't drink **cowmilk out of health reasons**. I switch between almond or oat milk. Otherwise, I try to eat **consciously**. That's a thing I learned from my dad. We need to **value the food** that we eat and the work that is put into producing it. I must say I eat a lot of fruit. Not always seasonal and not from my region. That's a topic I want to focus on more.

4. **Juli, female, 23 years old, 02.02.2021**

Q1: How would you describe your diet and for which reasons do you choose this certain diet?

I would describe my diet as **mostly vegetarian** and pretty healthy with the occasional chocolate bar in between.

Q2: To what aspects do you pay attention to when shopping for groceries?

I pay attention to **price** point, **regionality** (as in 'does it grow in my region?) and **how processed** it is.

Q3: What does sustainable food consumption mean for you personally?

To me it means as **little plastic** as possible, buying **regional food** and **throwing away as little as possible.**

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5. **King, male, 25 years old, 04.02.2021**
6. **Tom, male, 23 years old, 04.02.2021**

Q1: What do you think about sustainable food consumption and which aspects do you pay attention to when buying food?

K: For me very important is that every meat product and dairy product whatever basically come from animals are **biological** and yea for the reason of the **health of the animals**. But I think buying more **organic** stuff is not that beneficial for the environment. Actually, it is, but, at the same time it isn't. Carbon footprint is not that much lower you need more space and energy. But it is better for the soil an such stuff. Overall, buying organic, it is with the purpose of helping animals instead of the environment better. But for buying vegetables, I do not take care of it is organic or not. I would rather have a look on **package a lot or not**. I tried to not buy package stuff. But sometimes I also buy package stuff, for examples, the small tomatoes. So, sometimes I buy packaged sometimes I don't.

Q2: How would you describe your diet?

T: I **don't eat too much meat** because meat is less sustainable than plant. Obviously, animals need to eat plant and way more space.

K: I would like to say I'm labelled as **flexitarian**. It's basically people who are mainly vegetarian but from time to time they can also eat some meat. But I mean we are still love eating fish. You are the same right?

T: Yes. But **fish** is also a big point of sustainability. So, I tried to have a look if there is any **certification**, but even with the origins is difficult. Yea fish is also a big problem in sustainability all over the world.

K: Since what I take care is that tuna for example, it is rare on our planet nowadays. And I really love tuna because of the taste and protein and so on. But I just stop buying it because why you want to bring the rare animals to dangers even extinct. I mean, for my lunch and dinner I never buy meat. I buy a lot of **alternatives** since nowadays there are so many alternatives like **tofu, bean protein base**. There are more and more products coming. The only thing when I eat meat is that when I can buy organic meat for quick easy breakfast, a sausage or a slide of chicken. This is ok for me. Or the ingredient on pizza.

Q3: For which reasons do you choose this certain diet?

T: For me it is more from environmental protection perspective. The other point is how animals are treated. This year we saw many big meat factories on the news. So, I guess many people have also saw this, how meat is getting treated after the animals are getting killed. And also, the **people get treated** in the factory. So, I think the meat product are horrible for many aspects, environment, society and for the people. For me it is also about how we live in the future and I don't see a lot of meat product are as a way to choose.

K: Totally agree on that. If for example, the animal is killed by a hunter in the forest and live in their happy life, I don't have any problem with eating it. Our people are supposed to eat both plant and animals. But nowadays, the whole economy put basically, the chicken next to each other, on the top of each other, get rid of their nose. Still getting the infection and for pigs, they can't even turn themselves in the boxes. There are so many points that how people in these factories take the little lambs that not able to get a lot of meat from. Instead of taking normal meat procedure like getting a needle or throat cut. Some actions are so nonhuman, I don't want to support these businesses.

Q4: Any other aspects you pay attention to when doing groceries shopping?

T: I would like to buy something **healthy**, that is easy. I will buy products with good label, **bio, MSC for fishes**. For **price**, nowadays it is **not important** anymore. But if there is a **special offer**, I often take it instead of comparing other product.

K: Actually, you can see Tom take a lot of care on where the **product comes from**.
T: I firstly check it out where it is coming from to figure out which one is better. Fruit from Netherland, Sweden, or from Spain or Uganda. Sometimes a lot of electricity, water is needed. Some regions more, some regions less. Therefore, then the transport is higher or. At the moment, it is quite difficult to pick fruit product out, but for other product, I definitely buy **regional** as good as possible.
K: Actually, it is not only environmental perspective. Last time the almond I bought, the package said it comes from the area that's kind of dangerous. Because they may use labor who are not allowed to work. The **price now is really not important**, I just buy what I want.

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7. Jana, female, 25 years old, 05.02.2021

Q1: What does sustainable food consumption mean for you personally?

For me, sustainable food consumption means that environmental damage is kept at a minimum level and that later generations are not disadvantaged by higher environmental or health costs. I think that there should be **less mass production** and that **smaller farms** should get more support from the state to be able to survive on the market. These are the reasons why I support **organic farming** and try to **buy regionally from local producers**.

Q2: To what aspects do you pay attention to when shopping for groceries?

Among other things, **animal welfare** when buying eggs and meat (I always prefer free-range), how the products are **packaged** (recycled and especially recyclable packaging), and the distance to the **country of origin** (for a smaller carbon footprint). In the letter case, it seems more difficult to act rationally - do I buy regional apples in winter that have had to be cooled ever since the harvest (big carbon footprint) or should I rather buy imported fresh apples (less carbon footprint)?
In the case of unavoidable consumer goods such as coffee, I try to make sure that it is **not imported by air** but, for example, sailed to Germany. Or that the **coffee traders support the workers** on the coffee bean farms with microcredits etc. and that **they are not exploited**.

Q3: How would you describe your diet and for which reasons do you choose this certain diet? E.g. for environmental reasons, health, animal welfare...

I try to consume as **little meat as possible** and if I do, then preferably poultry (**less water consumption and methane emissions**, etc.). For health reasons, I try to **avoid dairy products**

(lactose intolerance), but this can additionally help the environment and avoid mass farming of cows.

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8. Luis, male, 22 years, 07.02.2021

Q1: What does sustainable food consumption mean to you personally?

- to eat ecologically justifiable food **without supporting inhumane working conditions**, the destruction of habitats and nature, animal suffering, the extinction of animal species or future environmental changes due to mismanagement.

Q2: To what aspects do you pay attention to when shopping for groceries?

- buying products that come from the **region**
- **seasonal** shopping for less waste of additional **energy and water during production** and **not** supporting the use of **chemical fertilizer and pesticides**
- **supporting local farmers** instead of buying cheap discounter-products

Q3: How would you describe your diet and for which reasons do you choose this certain diet? E.g. for environmental reasons, health, animal welfare...

My diet is a mixed one. Step by step I'm on a way to give **animal welfare** more priority in my diet, but it still is going to be a mixed one. Wherever I can, I choose regional products for environmental reasons, so the food hasn't to be shipped a hundred miles to get to me. With this decision I want to support local farmers which take care of their animals and products as good as possible with certified labels (like naturland, bioland, biokreis, ecovin, ecoland, demeter, biopark, gäa).

Appendix 2 – Questionnaire

Table 17: Scales/items used in the study

Variable/ Multi-item scale	Number of items	Code	Formulation	Answer options	Mean	Std. deviation
Attitude (AT)	4				**4.20**	**0.75**
		AT1	I have a favorable attitude toward purchasing sustainable versions of a food product.	(1) I do not agree at all - (5) I completely agree	4.37	0.84
		AT2	I like the idea of purchasing sustainable food products.		4.51	0.79
		AT3	I don't care whether a food product is sustainable or not. *(reversed scale)*		4.07	1.03
		AT4	Buying sustainable food products is important for me.		3.85	0.98
Subjective Norms (SN)	4				**3.63** / ***3.33****	**0.70** / ***0.88****
		SN1	People who are important to me think that it is a good thing when I buy sustainable food products.	(1) I do not agree at all - (5) I completely agree	3.54	1.02
		SN2	My family and friends prefer that I purchase sustainable food products.		3.26	1.03
		SN3	People's negative opinions toward sustainable products makes me want to buy less sustainable food products. *(reversed scale)*		4.54	0.83
		SN4	The people around me motivate me to purchase sustainable food products.		3.20	1.13
Perceived Behavioral Control (PBC)	6				**3.07** / ***3.19****	**0.60** / ***0.67****
		PBC 1	It is easy to distinguish sustainable food products from conventional products.	(1) I do not agree at all - (5) I completely agree	2.90	1.07
		PBC 2	Labels on sustainable food products confuse me. *(reversed scale)*		2.95	1.20
		PBC 3	Food with sustainable labelling is trustworthy.		3.20	0.99
		PBC 4	Sustainable food products are always available for buying.		2.87	1.07
		PBC 5	Sustainable food products are expensive for me. *(reversed scale)*		2.45	1.07
		PBC 6	In general, I think I can buy sustainable food products as I wish.		4.05	0.88
Sustainability Concern (SC)	16 (7, 4, 5)				**4.20**	**0.53**
			<u>Environment</u>	(1) Not important at all - (5) Very important	**3.97**	**0.59**
		SC1	Organic farming practices are used in the production (organic products).		4.21	0.89
		SC2	It is a seasonal product.		3.88	1.00

		SC3	It is a local product.		4.18	0.86
		SC4	Reducing the consumption of meat products.		3.78	1.32
		SC5	Reducing the consumption of dairy products.		2.88	1.33
		SC6	Food products are not packaged or packaged in an environmentally friendly way.		4.21	0.92
		SC7	Food waste is reduced.		4.62	0.72
			<u>Economy</u>		**4.37**	**0.68**
		SC8	The farmers receive a fair payment for their product.		4.45	0.82
		SC9	Workers are paid fair wages.		4.43	0.87
		SC10	The local economy is supported.		4.33	0.95
		SC11	Sustainable food products are affordable (reasonable price).		4.26	0.82
			<u>Society</u>		**4.39**	**0.66**
		SC12	The food has high nutritional value and is good for health.		4.49	0.77
		SC13	The animals' welfare in food production is ensured.		4.57	0.80
		SC14	The employees have good working conditions.		4.37	0.83
		SC15	Human rights are respected along the entire food value chain.		4.51	0.80
		SC16	Gender equality is guaranteed.		4.00	1.30
		------	Please list the 3 aspects of sustainability that are most important to you when shopping for food:	Open answers (see **Figure 3**)		
Environmental Knowledge (EK)	3				**3.44**	**0.69**
		EK1	Please rate your knowledge of environmental problems in general.	(1) I know very little - (5) I know a lot	3.64	0.83
		EK2	Please rate your knowledge about the environmental impacts of the food products you buy.		3.16	0.93
		EK3	Please rate your knowledge of what makes sustainable food products different from conventional food.		3.52	0.83
Intention (IT)	4				**4.05**	**0.69**
		IT1	I intend to buy (more) sustainable food products.	(1) I do not agree at all - (5) I completely agree	4.16	0.82
		IT2	I don't want to buy sustainable food products. *(reversed scale)*		4.62	0.70
		IT3	I will put more effort to choose sustainable food products when shopping.		3.80	0.99
		IT4	I am planning to spend more money on sustainable food products.		3.63	1.00

* without SN3, respectively PBC5 which are excluded from further analysis due to low item-to-total correlation

Appendix 3 – SEM

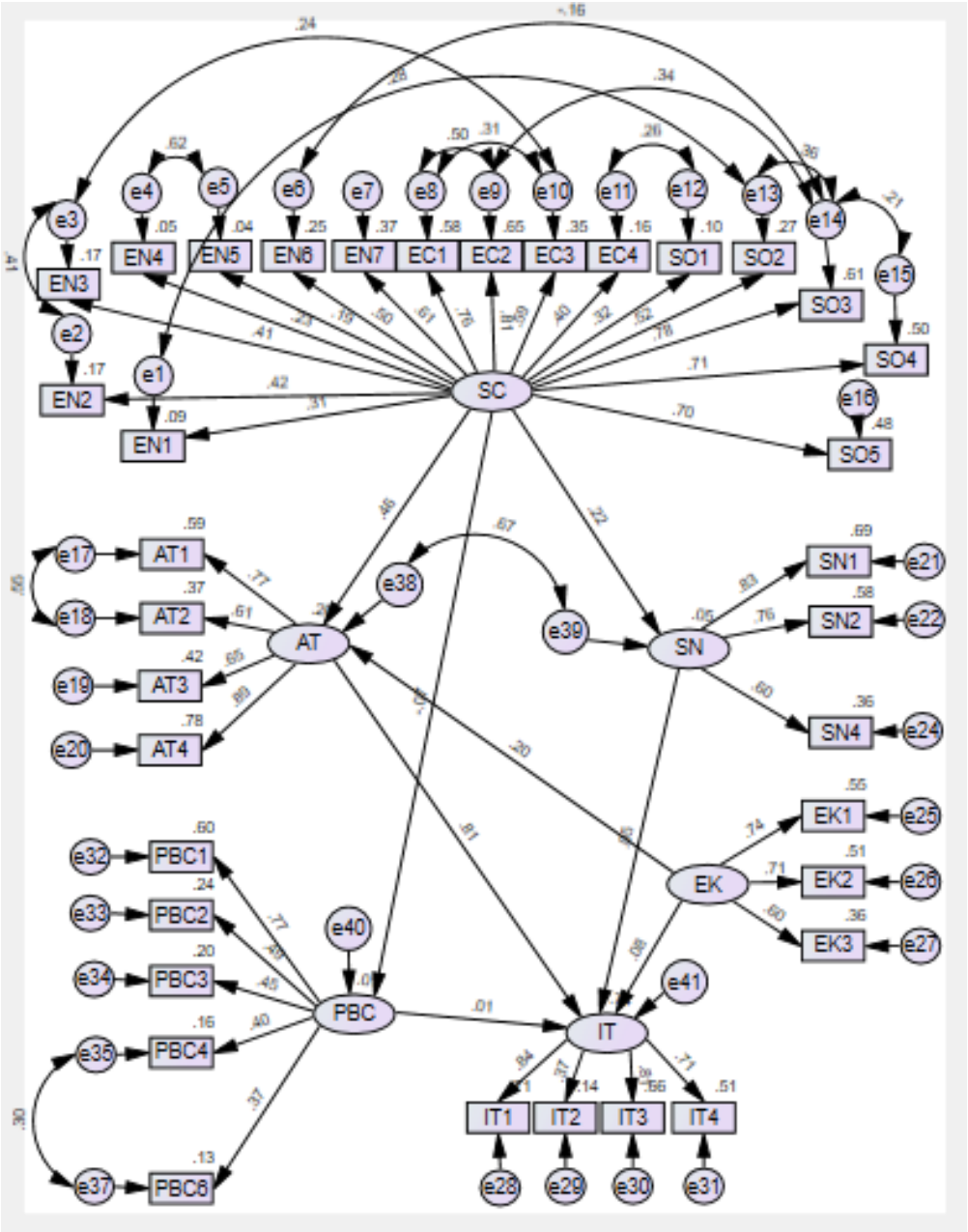

Figure 4: Results of the SEM

Appendix 4 – Translated comments of questionnaire respondents

Table 18: Questionnaire section 9 - comments

Case number	Comments
3	Our Environment should be protected, we see the effects of climate change. Consuming sustainable product is one way!
38	Consumers should learn again where food comes from (apple doesn't grow in supermarket but on a tree). This issue needs to be addressed in kindergarten.
27	Thank you for raising awareness. 😊
31	There is a trade-off between organic farming, land use and population growth. There are solutions to this that should be considered by the industry.
66	I know some people who talk about it a lot, but the "doing" is what matters.
76	I am also very much in favor of regional products because the endless and huge animal transports should finally stop because that means endless agony for the animals.
86	The felt 10000000th survey on the subject with the eternal same questions. Read once a book to it.
92	I don't care what other people think about my consumption.
94	In my opinion, the sustainability topic is currently so overused that it is more likely to cause reactance among consumers instead of being reflected in more sustainable consumption. Best regards, a long-term vegan (started before it was cool)
103	Only those who has a lot and are always full have the luxury to think about the origin of their food.
107	Great project much success!!!!!
113	Very interesting action, all the best to the students!
115	Tell me what you eat, and I'll tell you who you are.
118	Often my stinginess gets in the way.
132	There should be more permaculture.
139	The production or consumption of sustainable food is important, which must be determined primarily by us consumers. The food industry will not do this for us.
141	A very important and current topic in this time.

147	I come from the village with my own animals and garden. In addition, my parents are involved in agriculture. I was raised to consume seasonal and regional products. I think the way of handling food is different in the village than in the city. The test is very related to people who do not have so much contact with my way of life. The basic problem in our society is "stinginess is cool". Because how can it be that meat and vegetables in the large "discounters" are so cheap! The majority of the population does not know what effort is behind everything! And it is not appreciated....
148	The topic is very interesting.
166	If available, I always buy sustainable. Unfortunately, I don't really have the time to deal with the consequences. But I know how important it is for my future and the future of all others.
168	I think it always depends on which products it is concretely about, and which alternatives you actually have, without having too much effort with it in everyday life (which you then realistically cannot manage to keep up permanently). Often it is also difficult to tell the difference. I prefer to buy as regionally as possible, with as little animal suffering as possible.
171	Some questions can be interpreted in different ways. Therefore, answering them would often require a more detailed explanation. However, it is good if scientists and consumers deal with the topic. Environmental protection and sustainability in general (not only for food) are very important and will become more and more relevant in the course of time (especially with regard to industrialization, globalization and the increase of the world population and prosperity).
174	I believe that we humans are very prone to convenience. This convenience often gets in the way of us consuming food in a sustainable way.
192	Would also have liked to read before a brief description of how the two students would define sustainably produced food products and would have given us examples. Because not everyone deals with the topic.
206	Shopping for sustainable, organically grown food will definitely be easier for me when I finish my PhD and work full time, as a part time student or PhD student this is definitely harder.