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FORESTRY

**Second Cycle Degree (MSc) in
FOOD AND HEALTH**

An investigation of Swiss' and Vietnamese's
consumers: a cultural comparison of the drivers that
may promote vegetable consumption

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TABLE OF CONTENTS

ABSTRACT

1. CHAPTER 1: THE IMPACT OF FOOD CHOICES ON SUSTAINABLE HEALTHY DIETS

- 1.1. SUSTAINABLE HEALTHY EATING GOALS
- 1.2. ADVANTAGES DERIVED BY INCREASING VEGETABLES CONSUMPTION
- 1.3. DISADVANTAGES DERIVED BY INCREASING MEAT CONSUMPTION

2. CHAPTER 2: EXPLORING DRIVERS THAT AFFECT SWISS' AND VIETNAMESE'S ATTITUDE TOWARDS VEGETABLE CONSUMPTION

- 2.1. FOOD SAFETY: RISK PERCEPTION OF VEGETABLES
- 2.2. SELF-EFFICACY, PERCEIVED BENEFITS AND PERCEIVED BARRIERS
- 2.3. PERCEIVED VULNERABILITY FROM INADEQUATE VEGETABLE INTAKE
- 2.4. "REACTANCE THEORY" AND ANIMAL WELFARE CONCERNS

3. CHAPTER 3: FOOD CULTURE, ENVIRONMENT AND HEALTH IN DIET SHIFT: SWISS AND VIETNAMESE CONSUMERS

- 3.1. DIFFERENT CULTURE, SOCIAL TRADITIONS AND RELIGION
- 3.2. DEMOGRAPHIC AND SOCIO-ECONOMIC DISPARITIES

4. CHAPTER 4: THE RESEARCH PROJECT

- 4.1. SUMMARY OF THE MAIN RESEARCH PLAN
- 4.2. CHANGES IN VEGETABLES CONSUMPTION: THE INVESTIGATION THROUGH THE INTENTION TO INCREASE VEGETABLES CONSUMPTION
 - 4.2.1. MATERIALS AND METHODS
 - 4.2.1.1. DATA COLLECTION AND PARTICIPANTS
 - 4.2.1.2. QUESTIONNAIRE
 - 4.2.2. DATA ANALYSIS
 - 4.2.3. RESULTS

5. CHAPTER 5: DISCUSSION AND RESEARCH LIMITATIONS

5.1. DISCUSSION OF THE RESULTS HIGHLIGHTING SIMILARITIES AND DIFFERENCES
AMONG THE COUNTRIES

5.2. RESEARCH LIMITATIONS AND FUTURE DIRECTIONS

6. CONCLUSION

7. SOURCES

ABSTRACT

This study aimed to identify and compare predictors of the intention to increase vegetable consumption in Switzerland and Vietnam. This specific investigation is focused on the multifaceted phenomenon of food-related consumer behaviour through the Sustainable Healthy Diets. Multiple regression analyses were utilised to explore the factors impacting the intention to increase vegetable consumption in both regions. The findings suggest that both countries' participants intended to increase their vegetable intake due to perceived vulnerability resulting from insufficient vegetable intake and their self-efficacy regarding eating more vegetables. However, heterogeneity was also found between the countries studied. While the Swiss participants' intention to eat more vegetables was affected by hindering familial influence, the Vietnamese participants' interest in animal welfare positively influenced their willingness to increase their vegetable intake. Furthermore, the respondents' employment status played a role in both countries, with the intention to consume more vegetables being stronger for employees. The response cost of increasing vegetable consumption and gender (where females expressed greater interest) demonstrated significance within the Vietnamese sample. Based on the evidence that Vietnam and Switzerland differ in culture and the level of economic development, different hypothesis has been provided to explain results. The findings of this study contribute to the current literature by enlarging the research on consumer behavior in sustainable food consumption. This is crucial to inform the development of strategic responses to unsustainable dietary choices in Switzerland and Vietnam advising public authorities and stakeholders in the food system.

RIASSUNTO

Questo studio mira ad identificare e confrontare i fattori significativi legati all'intenzione di aumentare il consumo di verdure in Svizzera e in Vietnam. Questa indagine specifica è incentrata sul fenomeno del comportamento dei consumatori legato all'alimentazione attraverso le diete sane e sostenibili. Sono state utilizzate analisi di regressione multipla per esplorare i fattori che incidono sull'intenzione di aumentare il consumo di verdure in entrambi i Paesi. I risultati suggeriscono che i partecipanti di entrambi i Paesi intendono aumentare l'assunzione di verdure a causa della vulnerabilità percepita derivante da un'assunzione insufficiente di verdure e della loro autoefficacia nel mangiare più verdure. Tuttavia, è stata riscontrata anche un'eterogeneità tra i Paesi studiati. Mentre l'intenzione dei partecipanti svizzeri di mangiare più verdure è stata influenzata dall'ostacolo dell'influenza familiare, l'interesse dei partecipanti vietnamiti per il benessere degli animali ha influenzato positivamente la loro volontà di aumentare l'assunzione di verdure. Inoltre, lo status lavorativo degli intervistati ha giocato un ruolo in entrambi i Paesi, l'intenzione di consumare più verdure è correlata positivamente con l'essere lavoratore. Il "costo" per l'aumento del consumo di verdure e il genere (dove le donne hanno espresso maggiore interesse) hanno dimostrato di essere significativi nel campione vietnamita. Sulla base dell'evidenza che Vietnam e Svizzera differiscono per cultura e livello di sviluppo economico, sono state formulate diverse ipotesi per spiegare i risultati. I risultati di questo studio contribuiscono alla letteratura attuale, ampliando la ricerca sul comportamento dei consumatori nel consumo di alimenti sostenibili. Ciò è fondamentale per informare lo sviluppo di risposte strategiche alle scelte alimentari non sostenibili in Svizzera e in Vietnam, indirizzando le autorità pubbliche e gli stakeholder del sistema alimentare.

CHAPTER 1

THE IMPACT OF FOOD CHOICES ON SUSTAINABLE HEALTHY DIETS

1.3. SUSTAINABLE HEALTHY EATING GOALS

The definition of a healthy dietary pattern continues to evolve to reflect the changing understanding of the roles of various foods, essential nutrients and other food components in health and disease. A significant and expanding body of evidence suggests that consuming certain types of nutrients, particular food groups, or general dietary patterns positively influence health, promoting the prevention of common non-communicable diseases (NCDs). Others, such as the Dietary Approaches to Stop Hypertension (DASH) and the Mediterranean Intervention for Delaying Neurodegeneration (MIND) diets, aim to lower the risk of illness and include similar nutrition guidelines. In comparison to a conventional Western diet, these healthier options are abundant in plant-based foods, such as fresh fruits and vegetables, whole grains, legumes, seeds, and nuts. On the other hand, they contain fewer animal products, especially fatty and processed meats (Cena, 2020).

There is considerable evidence to support the importance of healthy eating for human health, and growing evidence to support the existence of direct relationships between diet and for instance, susceptibility to stress, mental health and mental functioning across the lifespan (Adan et al., 2019). As recently reported in the ongoing Global Burden of Disease study, one in five deaths worldwide, mainly from cardiovascular disease and cancer, can be attributed to an unhealthy diet (The Global Burden of Disease Diet Collaborators, 2019). This is why preventing diet-related non-communicable diseases has become a key global objective of health policies, aimed at establishing healthy environments and empowering people to make healthy food choices (Visioli, et al. 2021). Worldwide, 11 million lives and 255 million years of healthy life are lost every year due to dietary risk factors. The influential were low intakes of whole grains, vegetables, fruits and high intakes of sodium (Baur et al., 2022).

Sustainable healthy diets incorporate dietary patterns that sustain all aspects of an individual's health and wellness. They exert minimal pressure on the environment and have a low environmental impact. Additionally, they should be accessible, affordable, safe, and equitable whilst still being culturally agreeable.

The aim of sustainable healthy diets is to achieve optimal growth and development of all individuals, as well as support their functioning and physical, mental, and social well-being at all life stages for present and future generations. Additionally, these diets should contribute to preventing all forms of malnutrition, reduce the risk of diet-related non-communicable diseases, and support the preservation of biodiversity and planetary health. To avoid unintended consequences, sustainable healthy diets must combine all dimensions of sustainability (Food and Agriculture Organization, 2019).

Plant-based diets have gained popularity for reducing the diet's environmental footprint, promoting human health, and improving animal welfare. Although the percentage of vegetarians and vegans is lower compared to omnivores, their numbers have significantly increased in recent years. Consumers require sustainable, appetizing, secure, nourishing, accessible, and reasonably priced products. Additionally, considering the preservation of the planet is crucial as it encompasses both plants and animals, along with humans (Alcorta et al., 2021).

Among the key pillars of the European Green Deal are the Farm-to-Fork strategy, which seeks to foster a more sustainable food environment through the development of a fair, healthy, and environmentally friendly food system (Purnhagen et al. 2021; The European Commission 2020). This transition would be arduous to accomplish without modifying individuals' diets, given the present dual burden of malnutrition/nutrition (with escalating rates of overweight and obesity) and undernutrition, which still afflicts millions of people, causing stunted growth, along with approximately 20% of food waste (Visioli, et al. 2021).

Food consumption places significant pressure on the environment. Healthy diets offer a solution for reducing environmental impact and advancing public health. Connecting food and nutrition to sustainability adds a new dimension that reflects shifts in consumer values and lifestyles.

Food policy, dietary advice and consumer behaviour research need to move beyond the traditional focus on healthy diets to address broader issues of social, environmental and economic sustainability as the environmental impact of food and drink is increasingly recognised. At present, dietary guidelines around the world remain primarily health-focused, but a growing number of nutrition and public health experts argue that future guidelines should integrate both environmental and nutritional considerations (Żakowska-Biemans et al., 2019).

1.2. ADVANTAGES DERIVED BY INCREASING VEGETABLES CONSUMPTION

An unhealthy lifestyle, particularly poor diet, is a leading risk factor for the development of these diseases. Fruits and vegetables (F/V) typically have low energy density and are abundant sources of vitamins, minerals, dietary fibre as well as valuable substances like plant sterols, flavonoids, and other antioxidants. Consuming a diverse range of F/V is thought to be integral in maintaining a well-rounded and healthy diet. Low intake of fruits and vegetables is acknowledged to significantly contribute to nutrient deficiencies and escalated risk of non-communicable diseases including cardiovascular disease and cancer. Therefore, fruits and vegetables play a vital role in promoting a healthy dietary regime. The consumption of 400 g/day of fruits and vegetables to maintain good health has been an international priority supported by national and global health institutions for a considerable time (Yip, et al. 2019, Kartiko Sari, 2020).

Vegetarian and vegan diets can exhibit substantial diversity, arising from the abundant selection of foods as well as the numerous motivators that lead individuals to follow such diets. There are many reasons why people choose a vegetarian diet, such as compassion for animals, a desire to preserve the environment, to reduce the risk of chronic diseases, or to treat such diseases. A well-planned vegetarian diet, consisting of vegetables, fruits, whole grains, pulses, nuts, and seeds, can offer an adequate nutritional intake. Nutrition and dietetics experts have a crucial role to play in educating vegetarians about specific sources of nutrients and foods that may be useful in the management of certain chronic diseases (Melina et al., 2016). Although the exact mechanism by which vegetables reduce the risk of disease is complex and largely unknown, several components of whole foods are likely to contribute to the overall health benefits. Finally, an increase in vegetable consumption could improve health due to the significant presence of phytochemicals, which are a crucial source of dietary antioxidants (Ramya et al., 2019, Jideani et al., 2021).

Stanaway et al., (2022) discovered evidence linking higher vegetable consumption to lower risk of IHD, ischemic stroke, hemorrhagic stroke, and esophageal cancer. Increased vegetable consumption is a key element in a sustainable diet that promotes planetary health on a population scale (Stanaway et al., 2022).

Brondani et al., findings (2019) suggested that a diet consisting of high amounts of fruits and vegetables is linked to a decreased likelihood of bone fractures. Based on a systematic review of observational studies (Glabska et al., 2020), it appears that there is a positive correlation between the consumption of fruit and vegetable products and mental health in groups of adolescents. Particularly beneficial for overall mental health in adolescents were green vegetables, yellow vegetables, and fresh fruit. Gariballa et al., (2023) demonstrated that greater consumption of fruits and vegetables decreases inflammatory responses and oxidative damage, regardless of changes in body weight, in a population with the highest rates of obesity and related diabetes in the world. Moreover, increased consumption of fruits and vegetables may have a minor yet positive impact on glycaemic control. Given the difficulties obese people have in losing weight and regaining it easily, combined with the accessibility of healthy food options, these findings have potentially enormous public health implications in reducing the negative health effects of obesity in our community and around the world.

There is growing evidence that regular consumption of fruit and vegetables, especially non-starchy varieties, provides health benefits beyond meeting nutrient requirements. Fruit and vegetables have been recommended for years because of their high nutritional density, fibre and low energy density. In addition to essential nutrients, fruits and vegetables are known to contain a wide range of dietary bioactive compounds that provide significant health benefits beyond basic nutrition. Cruciferous vegetables, dark green leafy vegetables, citrus fruits and dark berries are associated with better outcomes in biomarkers, surrogate endpoints and chronic conditions (Taylor et al., 2020).

1.3. DISADVANTAGES DERIVED BY INCREASING MEAT CONSUMPTION

Eating meat may not be sustainable, according to Willett et al. (2019), who highlight that a plant-based diet can better support the growing population, reduce environmental pressures, and promote healthier habits.

Livestock production has the greatest impact on these factors, as livestock require a larger share of cultivated land due to its position higher up the food chain. Typically, enhanced knowledge, either on its own or with other approaches, has demonstrated a capacity to diminish the behaviour of consuming meat or the inclination/determination to do so. The evocation of emotions via animal images and the introduction of environmental modifications have proven to be efficacious (Jamie et al., 2020).

In studies on meat consumption reduction, there is often a particular focus on beef (Jansson & Säll 2018; Bonnet et al. 2018; Roosen et al. 2022). This is because it has a more significant negative impact compared to alternative sources of protein. From a broader perspective of sustainability, it is worth paying attention to the impact that dietary choices can have on health. According to Springmann et al. (2017), decreasing meat consumption can provide health benefits by reducing fat and carbohydrate intake. Additionally, they suggest that red meat is particularly harmful for health, linked to conditions such as coronary heart disease. Diseases such as stroke, type 2 diabetes mellitus, obesity, and cancer may be linked to higher meat consumption. Moberg et al., (2021) suggest that decreasing meat consumption may also lower intake of vitamin B12, protein and calcium. However, it appears that as living standards rise, meat is being overconsumed. This unsustainable practice is the focus of numerous investigations into the consumption patterns typical of western societies.

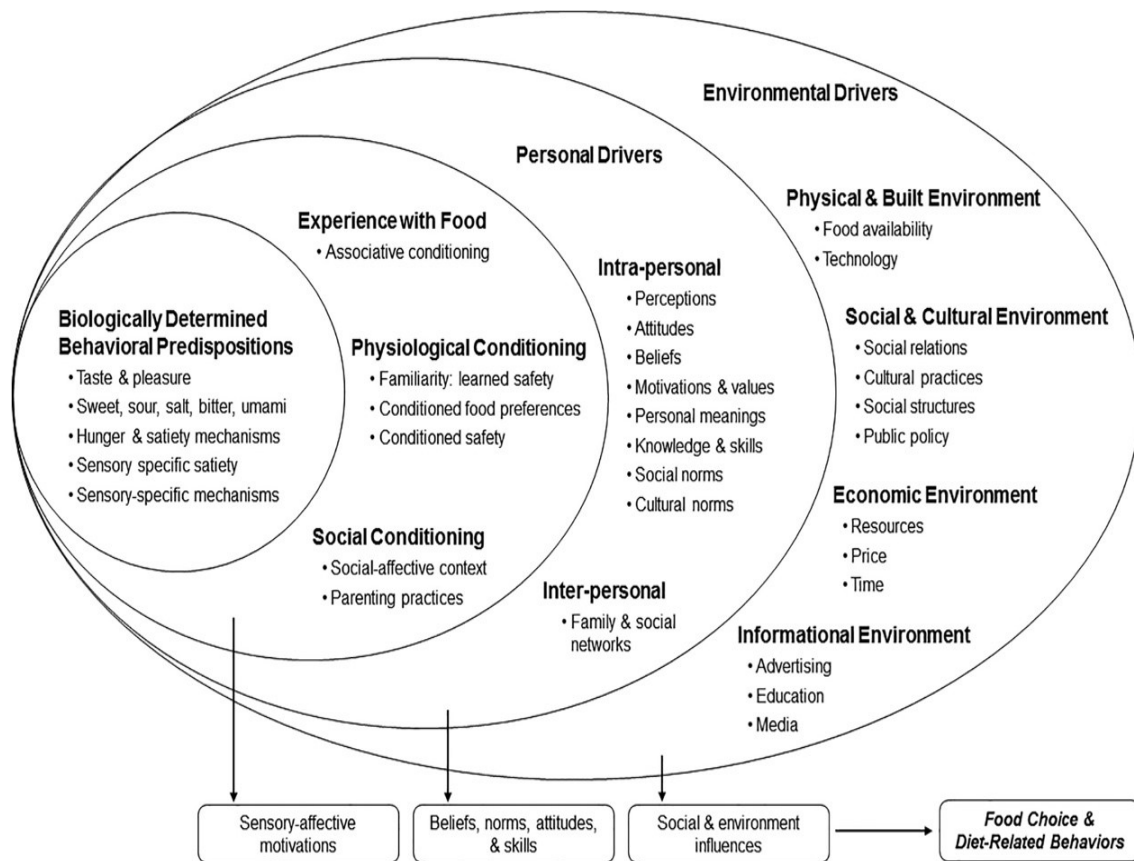
Animal welfare is another sustainability factor that varies significantly between different animal species and countries. The development of effective interventions to reduce excessive meat consumption could have widespread societal benefits for human health, animal welfare and the environment (Hagmann et al., 2019). Animal welfare appeals may have a unique potential for translating common ethical concerns about farm animal suffering into actual behavior change, and for exploiting powerful psychological tools like cognitive dissonance and the link between physical and moral disgust (Mathur et al., 2019).

Little is known about what people eat when they reduce the amount of meat they eat, without going completely vegetarian. Replacements may vary depending on reasons for reducing meat intake (Radnitz et al., 2015), cultural norms and different definitions of "meat". A study conducted in 2017, using the US National Health and Nutrition Examination Survey (NHANES), analysed the quality of the diet of individuals who reported that they did not consume any food animals on two separate days (Conrad et al., 2017). Half of this group, called "non-meat eaters", identified themselves as vegetarians. While non-meat eaters had higher Healthy Eating Index scores overall than meat eaters, there was significant variation in diet quality among non-meat eaters. In addition, compared to other groups, better diet quality was reported by non-meat eaters who were older, female or had a higher income. Likewise, Malek et al., 's study, published in 2019, suggested that the decline in beef, lamb and pork consumption in Australia was primarily due to financial constraints rather than a conscious decision to reduce consumption, suggesting that the decline was not a manifestation of an intentional anti-consumption behaviour. Conversely, the decrease in chicken meat consumption was motivated by a broader range of reasons, with less frequent concerns over pricing, and is therefore more consistent with anti-consumption behaviour. In addition, it is probable that most individuals who adopt vegetarianism or completely avoid meat do so due to anti-consumption beliefs, with ethical considerations being the driving factor behind almost two-thirds of meat avoidance decisions. Therefore, interventions aimed at promoting a transition towards more sustainable protein sources should consider framing strategies based on easily perceived and familiar food choice factors (Malek et al., 2019). Another study reveals varying dietary patterns between meat and alternative meat products as well as different levels of consumer inclination towards adopting a plant-based diet (Götze et al., 2021). More precisely, the analysis indicates that while attitudes towards meat and alternatives vary, certain aspects such as the consumption of ethically sourced and natural foods, as well as domestically grown products, are important to all consumer groups. These factors could be better exploited in food marketing.

CHAPTER 2

EXPLORING DRIVERS THAT AFFECT SWISS' AND VIETNAMESE'S ATTITUDE TOWARDS VEGETABLE CONSUMPTION

Individual food choices are essential due to their significant impact on our health and the environment, which are influenced by multiple factors related to food, individual differences, and society. Moreover, the interaction among these determinants contributes to the final food choices through direct or indirect mechanisms. Understanding the factors that influence our food choices is crucial for implementing feasible interventions and policy recommendations, which will improve food choices and successfully transform food systems (Chen et al., 2020). In line with the objective set by the European Commission in transforming food systems, Chen et al., (2020) confirm that citizens as consumers and their choices should be at the core of addressing human and planetary health problems. Food choices are determined by complex processes influenced by biological, psychological, economic, social, cultural, physical and political factors. The factors that affect food choice can be illustrated by a multilevel socio-ecological framework with concentric circles (see Figure 1). The decisions individuals make about what to eat and their dietary habits are influenced by both the social and physical environment in which they interact (Monterrosa et al., 2020).



(Figure 1) Social and environmental influences at multiple levels on food choice and diet-related behaviors.

In order to encourage consumers to opt for healthier and more sustainable diets, it is essential to establish a comprehensive policy package that takes into account behaviour, economics, and the food environment (Monterrosa et al., 2020).

2.1. FOOD SAFETY: RISK PERCEPTION OF VEGETABLES

Recognising the critical contribution of food security to the achievement of various Sustainable Development Goals and the strengthening of relevant areas of the WHO Thirteenth General Programme of Work 2019-2023, food safety is a prevalent issue in public health (Seventy-third World Health Assembly, 2020 and Omari et al. 2018).

The World Health Organization (WHO) released its initial global estimation of foodborne diseases in 2015. The report revealed that more than 600 million cases of foodborne illness occur annually, resulting in 420,000 deaths worldwide. Children under five years old face a disproportionately high risk of such diseases, particularly in developing countries. The World Bank study (Jaffee et al., 2020), urges national governments to increase investment in their food safety infrastructure, to reduce the burden of foodborne illnesses and improve public health. The establishment of standards, guidelines, and recommendations by the Codex Alimentarius Commission, along with their adoption by Member States, is crucial to support in developing science-based food safety norms, guidelines and standards from countries at all stages of development, particularly those from developing countries (FAO/WHO; 2019). Additionally, acknowledging the link between food safety and human, animal, plant, and environmental health is important to safeguard human life and health as well as food safety. According to this, One Health strategy's focus on food safety, which manages risks throughout the complete food and feed cycle (Garcia et al., 2020).

The crucial role of vegetables in promoting good health and wellbeing and a worldwide enhancement of their consumption is linked with the growing demand for safe and high quality of food. For instance, through consumer surveys and group discussions, it was determined that food safety remains a major concern for a significant majority of food shoppers in Hanoi (Ha et al., 2019). Consumers are concerned about various food hazards, particularly chemical hazards perceived as being invisible, with long-term effects and serious health consequences. Consequently, they view several common food categories as carrying a high risk of chemical contamination. This implies connections between risk perception of hazards, common food, and concern about food safety. The concern regarding food safety could be lowered by reducing the risk perception of common foods and the risk perception of hazards, especially chemical hazards (Ha et al., 2019).

In 2023 Deb et al. examined consumer concerns about food safety risks along Bangladesh's major vegetable value chain. Factors such as education, income, married status, sources of information and the presence of children at home had a significant impact on consumers' concerns about food safety risks.

Nardi et al. (2020) presented practical implications for businesses and policymakers. To build trust with consumers, companies should offer precise information to both the press and consumers and should assist consumers in developing a more profound comprehension of food and the potential risks, as well as what to do in the event of food contamination. Policymakers should establish and support government institutions that routinely inform consumers and act as a pillar for disseminating consumer knowledge. These institutions should display a proactive approach to monitoring in order to detect potential food safety problems and inform consumers before food contamination becomes widespread. Government institutions should aim to disseminate information about healthy food, given that consumers exhibit greater sensitivity towards this category of food.

2.2 SELF-EFFICACY, PERCEIVED BENEFITS AND BARRIERS

A first step in designing nutrition or health promotion programmes is to understand individuals' intention, action and maintenance of fruit and vegetable intake. The aim of Wong Chee Yen et al. (2014) study was to identify the stages of change to increase fruit and vegetable intake and their relationship with fruit and vegetable consumption, self-efficacy, perceived benefits and perceived barriers. Fruit and vegetable consumption was evaluated by means of the 24-hour dietary recall during two face-to-face interviews held on non-consecutive days, one weekday and one weekend day. The study participants (348 public university staff in University Putra Malaysia) were asked to report the specific types of foods and beverages they had consumed, as well as their brands, preparation methods, recipes for any composite dishes, and the amounts consumed. Self-efficacy was an important factor in motivating people to adopt and maintain a diet that is high in fruit and vegetables. The study research has demonstrated that self-efficacy has a similar trend of increasing patterns across different stages, mirroring the perceived benefits observed. Respondents' efforts to increase their fruit and vegetable consumption appeared to be delayed by perceived barriers such as safety, satiation and storage of fruit and vegetables, and preferences for other foods. In conclusion, an understanding of individuals' fruit and vegetable intake for the design of nutrition education programmes can potentially be realized through insights into the relationships between stages of change and related psychosocial factors. (Wong Chee Yen et al. 2014).

People face numerous obstacles when attempting to adopt a healthful diet. The study carried out by de Mestral et al., (2020) examined whether there is an association between barriers to healthy eating and compliance with the Swiss dietary guidelines.

The results showed that a lower adherence to vegetables and fruit intake guidelines was associated with barriers such as daily habits and taste, whereas higher adherence was linked to price and limited options in restaurants and supermarkets. Several self-reported obstacles to healthy eating are hindering adherence to the dietary guidelines in the adult Swiss population (de Mestral et al., 2020). In Hanoi, De Filippo et al., (2021) revealed that the consumption of fruits and vegetables was facilitated by knowledge of their nutritional value as well as by family preferences and habits. However, obstacles to consumption included low perceived efficacy and, for example, limited production of fruits and vegetables at home. Empirical research and recommendations revealed by Tran, et al. (2019) indicated that health benefits, environmental consciousness, and conforming to social norms supported the intention to purchase organic food by Vietnamese consumers nationwide. Despite the presence of a strong inclination to buy organic food in Vietnam, it was not converted into actual purchasing behaviour. The primary obstacles for the inconsistency were the high cost and limited accessibility of organic goods, or the trouble of purchasing them in the marketplace.

2.3 PERCEIVED VULNERABILITY FROM INADEQUATE VEGETABLE INTAKE

The Health Belief Model (HBM) was initially developed in the early 1950s by social scientists in the US Public Health Service to understand people's failure to adopt disease prevention strategies. The Health Belief Model (HBM) proposes that an individual's perception of the threat of disease or disorder, combined with a belief in the efficacy of the recommended health behaviour or intervention, predicts the likelihood that the individual will adopt the behaviour (Guo et al., 2019).

Achieving better health is a key motivator for those who choose to become vegetarian. Hopwood et al. (2020), found that health was the predominant factor for non-vegetarians contemplating adherence to a vegetarian diet.

By informing themselves about the nutritional merits of a vegetarian diet, more people may be motivated by the need or desire to improve their health. Consequently, a vegetarian diet can be both the cause and the consequence of positive physical outcomes. Individuals who want to improve their health may be inclined to adopt a vegetarian diet, and once they have done so, the physical benefits may act as a further motivation to maintain their new diet (Hargreaves et al., 2021).

Epidemiological, toxicological, and nutritional studies suggest that there is a link between consuming fruits and vegetables and a lower incidence of chronic diseases, including coronary heart disease, cancer, diabetes, and Alzheimer's disease. The protective roles including antioxidant and other bioactivities, sustainable approaches for quality determination, and processing techniques to modify the initial nutrition and antioxidant levels of fruits, vegetables and additives have been explored (del Río-Celestino et al., 2020). The medical advantages of vegetables in cancer prevention are based on the antioxidants contained in vegetables (phenolic acids, flavonoids, α -tocopherol, β -carotene, lutein and ascorbic acid), which can prevent cardiovascular and cerebrovascular diseases. Most vegetables comprise a significant quantity of organic compounds that assist in fortifying (Khan et al., 2022). Unhealthy eating habits are prevalent among adolescents in Vietnam, where the food environment during transition is progressively supplying high-energy low-nutrient foods. Achieving favourable behaviour modifications requires feasible and acceptable approaches that promote locally available, accessible and preferred foods (Gie et al., 2023). Adolescent nutrition holds significant importance in low- and middle-income countries (LMICs), such as Vietnam, undergoing nutritional transition. In these countries, a large number of young people are facing the double burden of micronutrient deficiencies and increasing overweight and obesity and the food environment in transition increasingly offers energy-dense foods that are low in micronutrients.

2.4 "REACTANCE THEORY" AND ANIMAL WELFARE CONCERNS

According to Brehm's theory (1966), individuals have a certain amount of freedom regarding their behaviour. When this freedom is restricted or threatened, individuals are motivated to regain it. This is psychological reactance.

This theory of psychological freedom is examined regarding its broad applicability to consumer behaviour. Promotional influence, manipulative advertisements, product unavailability, and government regulations are all identified as potential threats to freedom. The psychological reactance theory emphasises the importance of understanding how consumers react to manipulative tactics, describing the consumer's response to reductions in freedom (Clee et al., 1980).

According to Chen et al., (2020), food environments are external factors that significantly impact food choices. These factors are beyond the food itself, encompassing a range of contextual aspects that influence the decision to choose one food option over another.

The food choice is influenced by both the social and physical environment (availability, accessibility, and convenience of products). The social environment includes intrapersonal factors, social norms of family, peers, media and ethical concerns. Within the social context, the family and domestic food environment have a significant impact on food consumption. It has been suggested that both the context of shared meals and the social norms and attitudes of group members influence the types and amounts of food consumed by individuals, whether they eat together or not. However, this effect diminishes for meals (e.g. breakfast and lunch) and for certain food selections (e.g. healthy food or snacks) (Chen et al.,2020). In fact, individuals were more unlikely to consume a healthy diet when reminded that members outside of their group adhered to a healthy eating standard. This phenomenon occurs because individuals tend to avoid association with out-group members, including for instance household members, potentially leading to reactance (Cruwys et al., 2015).

Adhering to a vegetarian diet extends beyond dietary choices. Vegetarianism can be viewed as a social identity, reflecting the attitudes, motivations, and emotions of those who opt for it. The key reasons for adopting a vegetarian diet are associated with ethical and health considerations. The primary motivation being animal welfare, followed by concerns over the substantial environmental impacts resulting from the production and consumption of animal-derived foods. For the past thirty years, meat consumption per capita and per year has been gradually declining in Switzerland. Health, wellness, animal welfare and environmental concerns are key factors behind this decrease. Animal welfare was cited as a major factor in opposition to meat consumption by green Vietnamese consumers. This issue was widely debated not only from a religious perspective (Buddhism), but also regarding specific practices considered cruel (Markoni et al., 2023).

Hopwood et al (2020) found that environmental and animal welfare concerns were two main drivers for vegetarianism. A strong advocate of vegetarianism, Vietnam is a country with deep roots in Buddhism (abstaining from killing animals and eating meat to promote human compassion and generosity). In Vietnam, plant-based foods (such as soy and wheat) are among the most consumed foods by vegetarian Buddhists who wish to avoid animal consumption for religious reasons. Previous research suggests that these motivations, particularly ethical and health-related, are the main factors driving decisions to adopt healthier diets, given intentions to consume more vegetables (Nguyen et al., 2020).

With all the concerns about the sustainability of our current diets, it is important to gain a good understanding of the sustainability motives that drive consumers' food choices. A comprehensive and validated scale to measure sustainability motivations across the full range of food choice motivations could contribute to this understanding. The aim of Verain's et al. (2021) paper was to develop the Sustainable Food Choice Questionnaire (SUS-FCQ) which covers the whole concept of sustainability. In this analysis the reliability of the variable animal welfare was evaluated, suggesting for future research the animal welfare scale in a study on vegetables consumption.

CHAPTER 3

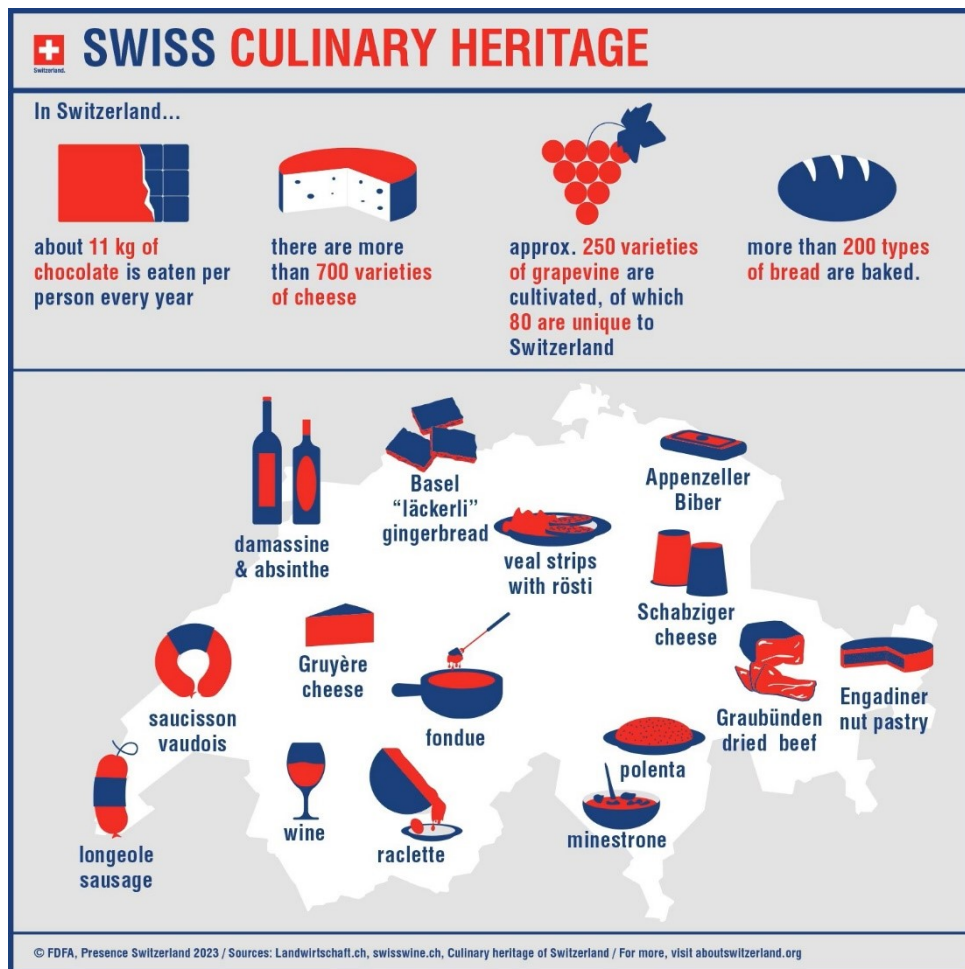
FOOD CULTURE, ENVIRONMENT AND HEALTH IN DIET SHIFT: SWISS AND VIETNAMESE CONSUMERS

3.1 CULTURE, SOCIAL TRADITIONS AND RELIGION

Culture is what makes everyone different from who they are and where they were born. It involves all aspects of people's lives and the way they communicate and interact with other people. Food plays a crucial role in people's lives, not just as a way of surviving. Culture distinguishes individuals based on their origins and circumstances. The diversity of cuisines and ingredients across cultures creates a fusion with their distinct cultural identities. There is a profound association between food and culture, which includes religion and tradition. Culture is the set of values, knowledge, language, rituals, customs, lifestyles, attitudes, beliefs, folklore, rules and practices that identify a particular group of people at a particular time (Sibal, 2018).

For cross-cultural studies, such preliminary studies should be developed for each of the participating countries/cultures to identify common motivations and those more specific to this or that country/culture (Cunha et al., 2018).

The diversity and rich culinary heritage of Swiss cuisine (see Figure 2) can be traced back to its various local traditions. Each region has created its own unique specialities, some of which have even achieved national status. In addition, the country has hundreds of cheeses, meat products, breads and chocolates. It is so popular that some Swiss-made foods can be found in almost every Swiss household. In Switzerland, there is always a wide variety of food available. However, numerous individuals tend to follow an unbalanced diet in which they excessively consume salt, sugar, and fatty foods. This type of diet promotes diseases such as diabetes, obesity, and cardiovascular disorders. These ailments cause not only human suffering but also account for approximately 80% of Switzerland's healthcare costs, underscoring the importance of a balanced diet in promoting good health (Federal Department of Foreign Affairs, 2023).



(Figure 2) Swiss culinary heritage

Traditional Vietnamese cuisine is considered nutritious due to its emphasis on rice, vegetables and fish in meals (see figure 3). Cooking techniques commonly used include steaming or stir-frying. Green leafy vegetables are widely consumed in contemporary Vietnamese cuisine and are typically incorporated into every meal from breakfast through dinner. The nutritional properties and taste of these vegetables are highly valued by the Vietnamese. The presence of green leafy vegetables is one of the factors contributing to the health benefits of Vietnamese cuisine, which is recognised as one of the healthiest ethnic cuisines in the world. Vietnamese cuisine is categorized into three distinct regions, namely the North, the Centre and the South, influenced by the country's geography. Each area offers a wide variety of unique local specialities. Nevertheless, the cuisine of each region is characterised by two elements: rice and a rather specific fish sauce (Tu et al., 2001).



(Figure 3) Vietnam traditional cuisine

The Vietnamese's sensory preferences concerning the appearance, smell, texture and taste are unique and well-defined within the South-East Asian region. Frequently, their cuisine consists of fresh vegetables, herbs, rice and noodles, fish and meat, with only insignificant amounts of dairy, oil or processed animal products. To create a sensory balanced meal according to Vietnamese standards, contrasts or 'yin and yang' are necessary. Essentially, there are undisclosed cultural characteristics that differentiate the sensory experiences of Vietnamese consumers. Sharing food to enhance social connections, mark occasions, and express emotions is a crucial aspect of Vietnamese culinary traditions. Current worries over highly processed and high-energy foods incorporate ethical and environmental considerations regarding health risks and harmful chemical residues (Trinh et al, 2023).

Most societies have food customs and 'taboos' influenced by religion, beliefs, traditions, cultures, and social norms, which can positively or negatively impact food consumption and the Food Security and Nutrition. For instance, some religions dictate appropriate food choices and preparation methods. Food preparation, including practices appropriate and inappropriate for human consumption during particular times of the year or during ceremonies (FAO, 1997).

Most Vietnamese Buddhists abstain from consuming meat, and it is essential to include and verify these religious motivations. In Asian societies, the 'religion' dimension is frequently

incorporated into the measurement of consumption motivations and is often regarded as one of the most significant factors (Trinh et al., 2023).

3.2. DEMOGRAPHIC AND SOCIO-ECONOMIC DISPARITIES

The significance of personal socio-demographic traits in elucidating the variability in motivation was verified in examining how gender and age play a moderator role (Roger, 1975).

Ronda-Pérez et al., (2020) analysed a representative sample of the Spanish working population. Low fruit and vegetable consumption has been linked to various factors, including gender, age and health behaviour. Available literature reports that men consume lower amounts of these dietary components than women, indicating gender disparities in health awareness and the significance of maintaining a healthy diet. Age is also a socio-demographic factor showing a statistically significant correlation with fruit and vegetable consumption. Consumption increases with age. These findings are consistent with prior research suggesting that young people are more prone to unhealthy behaviours such as skipping meals, consuming heavily processed foods and giving less priority to healthy habits.

Vietnam's impressive economic growth over the past three decades has raised the country from being one of the poorest nations to a lower-middle-income country, illustrating a perfect instance of nutritional transition. Following the *doi moi* reforms of the 1990s, a reduction in the consumption of starchy foods and an increase in the intake of meat, fish, and dairy products contributed to decreasing, even though not eradicating, the frequency of undernourishment. The rate of childhood underweights declined from 31.9% in 2001 to 17.5% in 2010, and the prevalence of growth retardation decreased from 43.3% in 2000 to 29.3% in 2010. Meanwhile, data from Vietnam has revealed patterns of unhealthy food consumption, including high intake of ultra-processed foods (including instant noodles) and sugary soft drinks. However, national-level statistics obscure variations among subgroups. Notably, significant disparities exist between rural and urban regions. For instance, city-residents typically allocate less of their expenses to rice and allocate a larger proportion to animal-based commodities (Nguyen et al., 2021). There is a lack of available statistics on the number of vegetarians and vegans in Vietnam, but it is believed that the percentage of vegetarians is minimal. Nevertheless, there has been an increase in the number of Vietnamese individuals following a meat-free diet, and a

lot of Buddhist Vietnamese consume meat-free meals several days a month (Markoni et al., 2023).

The process of urbanisation and the consequent shift in lifestyles and dietary habits has been identified as a primary factor contributing to the nutrition transition. In addition to enhanced availability of both fresh and processed foods, shifting preferences have been the primary factor driving urban population changes. This phenomenon is due to a complex interplay of factors such as growing incomes, greater connections between people from diverse countries, and the expanding influence of advertising and media marketing. Other factors related to urbanization include the rise of individuals working outside of the home and limited space for food preparation. This leads to a higher dependence on convenience and street foods and greater food marketing exposure. Vietnam has a strong and internationally recognised food culture, with traditional foods based on a long history of integration with other cuisines and generally considered diverse and healthy, whether eaten inside or outside the home. Nonetheless, changing times have led to a growing demand for convenience and fast foods, which some individuals prefer for their convenience qualities. Meat consumption in Vietnam has experienced a rapid increase, driven in part by positive social connotations of meat as a symbol of development and progress, as well as the prevalence of eating out and the intensification of meat in traditional meals (Harris et al., 2020). In addition, women represent a very active workforce in Vietnam. However, cultural expectations dictate that women are responsible for food preparation, inevitably resulting in time constraints for young peri-urban families who are increasingly residing autonomously. (Trinh et al., 2023).

The 2030 Agenda for Sustainable Development is a key guiding framework for Switzerland. Cantons, cities and municipalities, as well as the business sector, scientific community and NGOs play a significant role in implementing sustainable development in the country. Many cantons have their own sustainability strategies and coordination mechanisms. The agricultural sector of Switzerland accounts for about 55% of the country's food needs, employs about 150,000 people and utilises about 25% of the country's total land area. The remaining food necessities are covered by imports (Federal Department of Foreign Affairs, 2018).

In Switzerland, meat consumption per capita and per year has been gradually declining over the past three decades. The reasons accounting for this trend primarily concern health, welfare, animal welfare and the environment.

For instance, while men are more prone to being committed carnivores, women are more inclined to prioritise their health and opt for meat substitutes instead of meat. While meat consumption remains a prevalent aspect of Swiss society, an increasing number of individuals are adopting vegan or vegetarian diets, as indicated by a study conducted by MACH. The MACH Consumer Study is the most extensive and exhaustive consumer media study presently available in Switzerland, furnishing invaluable insights into consumer behavior. In 2021, 4.1% of individuals residing in Switzerland and Liechtenstein were vegetarians, 0.6% were vegans (with a higher proportion of women, younger people and those with a university education following a meat-free diet), and 24% were flexitarians (who actively reduce their meat intake). Although meat is regarded as a symbol of status in both nations, decades ago vegetarianism was more prevalent in Vietnam, for both religious and economic justifications. Currently, meat consumption levels are similarly high in both countries. In Switzerland, there is a growing range of meat substitutes on the market that has not yet made its impact in Vietnam. Due to the previously listed differences and cultural distinctions, consumption habits in the two countries vary greatly. In Vietnam, health is prioritised while sustainability takes precedence in Switzerland. (Markoni et al., 2023).

CHAPTER 4

THE RESEARCH PROJECT

4.1. SUMMARY OF THE MAIN RESEARCH PLAN

During the last half-century, the worldwide dietary pattern of food consumption has considerably shifted towards unhealthy diets high in animal protein but lacking fiber. This change in eating habits places a significant strain not only on public health but also on the environment. Imbalanced dietary habits are among the primary causes of obesity, which is evident from the number of overweight or obese adults worldwide, which is nearly 2.1 billion (Willett et al., 2019). At present, our diet lacks balance and requires modification. Choices are among the leading causes of climate change, biodiversity loss, and degradation of natural resources. Unbalanced diets that prioritize meat consumption are associated with substantial greenhouse gas emissions and thus present a significant environmental risk compared to plant-based diets (Willett et al., 2019).

To achieve a sustainable food system, it is crucial to make behavioural changes in food consumption. One potential solution is to reduce meat intake and opt for plant-based foods, such as vegetables, which can improve both health and environmental outcomes (Hartmann and Siegrist, 2017). Another possible approach is to consider consuming insect-based food. To improve food security and eliminate the environmental impacts induced by our food system, it is essential to reduce household food waste. Comprehending this challenge and answering it assigns a comprehensive understanding of the barriers and motivations linked with transforming consumer behaviour regarding sustainable food consumption.

Vietnam and Switzerland represent contrasts in both cultural and economic development. Vietnam represents an emerging economy with a collectivist culture, while Switzerland is a typical developed country with a dominant individualistic paradigm. These differences may result in attitudinal disparities. Vegetable consumption is also insufficient in both countries. In 2021 the vegetables consumption in Switzerland corresponded to 104 kg per head (Federal Statistical Office, 2020) and a national representative survey discovered that the average Vietnamese person consumes 0.87 fruit servings and 2.29 vegetable servings daily.

Furthermore, approximately 80% of individuals aged 25-64 have a lower fruit and vegetable intake than the WHO's recommended five servings a day (Van Bui et al., 2016).

The available evidence indicates that current food choices in both countries can have negative health and environmental consequences. Sustainable food consumption is defined as the handling and consumption of foods that are both healthy and environmentally friendly. It involves various practices, including shopping, cooking, storage, consumption, and disposal. In order to develop strategic responses to unsustainable food choices in Switzerland and Vietnam, research on consumer behaviour related to sustainable food consumption is essential.

The main research project was funded by the Swiss National Science Foundation (SNSF) within the framework of the Vietnamese Swiss Joint Research Program. And, it was funded by the Vietnam National Foundation for Science and Technology Development (NAFOSTED). I was enrolled as international student at the School of Agricultural, Forest and Food Sciences HAFL, Bern University of Applied Sciences BFH (Switzerland), for six months, doing my Master Thesis's research project on consumer behaviour in food.

Three specific practices are the focus of the main project: firstly, consuming more vegetables and less meat, secondly, accepting insects as a food source and, thirdly, minimizing food waste. These three specific actions reflect ecological behaviours in food choice and handling, which have become increasingly critical global issues. Thus, the proposed project aims to provide evidence-based recommendations for promoting positive behavioral changes in food consumption that improve health and the environment in Vietnam and Switzerland. To achieve this goal, the research project proposed four specific studies: investigate sustainability-oriented consumer perception and behaviour regarding sustainable food consumption practices, establish trends and changes in vegetable and meat consumption, analyse insect-based food product acceptance and examine consumer behaviour towards food waste reduction.

4.2. CHANGES IN VEGETABLES CONSUMPTION: THE INVESTIGATION THROUGH THE INTENTION TO INCREASE VEGETABLES CONSUMPTION

The study of the changes in vegetables (and meat consumption) aims to analyse changes in vegetable over time. It was relating to the changes that have been observed in the past: analysing (based on secondary household data) whether these changes are indicative of sustainable practices. Differently, prospective changes that facilitate a transition to sustainable practices are the focus of the second sub-objective: the investigation through the intention to increase vegetables consumption. This analysis was based on a consumer survey in both countries, designed to capture not only the demographic but also the main social and psychological factors that influence sustainable food choices.

The aim of this study was to analyse the intention to increase vegetable consumption by investigating the attitudes of Swiss and Vietnamese consumers towards vegetable consumption. Additionally, this study aimed to identify the motivators and barriers associated with increased vegetable consumption, and to examine the role of culture (individualistic and collectivistic) in influencing consumption patterns. It also investigated the differences in norms and values that contribute to the heterogeneous nature of vegetable consumption and explored potential policy measures to promote increased vegetable consumption.

4.2.1. MATERIALS AND METHODS

4.2.1.1. DATA COLLECTION AND PARTICIPANTS

A nation-wide postal survey was conducted in Switzerland and a stratified random survey in Vietnam. In Switzerland, the aim was to expand on two previous surveys, one focusing on the entire population and the other on students. The results obtained from the latest survey will be analysed in comparison to the previous ones. Stratification has been implemented for Vietnam and a nation-wide sampling for Switzerland to select 900 survey respondents in each country. In Vietnam, the survey has been carried out in Hanoi, Hochiminh, and Da Nang (n=300 per city). The aim was to achieve an equal distribution of male and female respondents, as well as urban and rural consumers, covering a range of age groups in both countries.

Data were recorded from November to December 2022. following the procedures described by Delley et al. (2023) (under review). To collect data in the German- and French-speaking parts of Switzerland, flyers with a link to an online survey were sent to randomly selected postal codes in different Swiss cantons. Data from Vietnamese respondents were collected using a snowball approach. Participants from companies and associations situated in various urban and semi-urban areas were provided with a link to an online survey. They were then asked to share the same with their network. Moreover, the survey link was shared on social media by the researchers undertaking the present study. All participants agreed to an informed consent before stating to fill the survey. After cleaning the data, the final sample consisted of n. 643 and n. 616 for Switzerland and Vietnam.

According to the sociodemographic characteristics of the sample, some parameters has been evaluated to describe the sample. Sex, education, employment, and age. For both the Swiss and Vietnamese samples, the majority were female (58% Swiss residents and 59% Vietnamese residents). The same was for education: the tertiary level (University/University of Applied Sciences) had the higher rate (43% Swiss and 77% Vietnamese residents). Different was for the employment status. In fact, in the Swiss sample, the majority (35%) of the participants were students, homemaker, retired or unemployed, whereas in the Vietnamese sample, the majority (70%) were full-time workers. The sample was divided into age groups for Switzerland and Vietnam. The results showed that the majority (38%) of Swiss residents in the sample were in the 40-59 age group, while the Vietnamese sample consisted mainly of residents aged 20-39 (52%).

4.2.1.2 MATERIALS

To describe the intention to increase vegetable consumption, a modified version of the Motivation Protection Theory (Rogers, 1975) was used. Protection Motivation Theory considers motivation to adopt the recommended behaviour as an attitudinal state (attitude change) predicted by cognitive processes that mediate the effect of fear appeals. In this study, consumers consider increasing their consumption of vegetables intake to be health-protective actions. These actions are dependent on perceived severity, perceived vulnerability, self-efficacy and response costs.

Perceiving that personal health is in danger because of an inadequate intake of vegetables in one's diet (perceived severity) will encourage individuals to adopt the advised behavior of consuming more vegetables. Perceived vulnerability, or the belief that an imbalanced diet increases the chances of health issues, can lead to a shift in dietary choices towards less meat and more vegetables. Believing that shifting to a healthier diet is feasible (self-efficacy) enhances the likelihood of adopting this behaviour. By contrast, the awareness of costs related to a meatless diet, such as increased fatigue and the enhanced risk of anemia, which are response costs, discourages consumers from reducing meat consumption and increasing their intake of vegetables.

4.2.1.3 QUESTIONNAIRE

The questionnaire consisted of inquiries concerning animal welfare awareness, pro-environmental attitudes, preferences for local and seasonal foods, concerns about vegetable safety, costs associated with consuming more vegetables, self-efficacy to eat more vegetables, perceived vulnerability to inadequate vegetable intake, hindering family influence, and intentions to increase vegetable consumption. These variables were chosen because they are linked to healthier and more sustainable food consumption. Subsequently, based on comprehensive studies (Ha et al., 2019b; Hartmann and Siegrist, 2017; Rogers, 1975), it is assumed that they could relate to the intention to increase vegetable consumption. Additionally, socio-demographic variables such as age, education level, income, gender, and employment status were collected towards the end of the questionnaire. (see below part of the questionnaire Figure 4)

How important is it to you that the food you eat on a typical day...?

	Not importa nt at all	Not importa nt	Slightly importa nt	Moderat ely importa nt	importa nt	Very importa nt
	1	2	3	4	5	6
... Is produced without animals being in pain.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
... Is produced with respect for animal rights.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
... Is produced in an animal friendly way.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	Not importa nt at all	Not importa nt	Slightly importa nt	Moderat ely importa nt	importa nt	Very importa nt
	1	2	3	4	5	6
... Is produced in a way without disturbing the balance of nature.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
... Is prepared in an environmentally friendly way.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
... Is produced in a environmentally friendly way.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
... Is a local/regional product.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
... Is a seasonal product.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
... Comes from close by (little transport distance).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

(Figure 4) Extract of the questionnaire regarding animal welfare concerns, local and seasonal, and pro-environmental attitude

The research question *intention to increase vegetables consumption* was created from questions regarding individual's vegetables consumption: *"I am likely to eat more vegetables in the coming months"*, *"I plan to increase the amount of vegetables I eat over the next few months"* and *"I intend to increase the frequency with which I eat vegetables over the next few months"*. The variable *vegetable safety concern* was obtained from questions regarding pesticide residues in vegetables, the imported vegetables from countries with lower production standards and regarding the lack of freshness or poorly stored vegetables (bacterial contamination, mold, mycotoxin formation). Then the *response cost of eating more vegetables* was a new variable that has been created from questions evaluating the attitude towards vegetables consumption. For example, *"By significantly increasing my vegetable consumption, I may experience digestive problems"*, *"By increasing my vegetable consumption (at the expense of other food groups), my diet would be unbalanced"*, *"By increasing my vegetable consumption (at the expense of other food groups), I may get cravings."*. The variable *self-efficacy of eating more vegetables* (inspired on Yen et al. 2014) was evaluated using the following questions: *"I am confident that I would succeed in eating more vegetables every day even if it is a lot of work to wash, peel, cut and cook them"*, *"I am confident that I would succeed in eating more vegetables every day even when I am eating out "*, *"I am confident that I would succeed in eating more vegetables every day even when I don't feel like it"*.

According to del Rio-Celestin and Font, (2020) the *perceived vulnerability from insufficient vegetables intake* has been investigated. The questions concerned, for example, the perceived risk of suffering from diseases due to insufficient vegetables intake: “*I risk becoming overweight or obese in the next few years if I don’t eat more vegetables*”, “*I am at risk of developing cancer in the next few years if I don’t eat more vegetables*” and “*I risk developing cardiovascular diseases in the next few years if I don’t eat more vegetables*”. To conclude, the variable named *hindering familial influence* has been inspired from Markoni et al., (2023). Two items quired derived from the PTM (Protection Motivation Theory) vegetable: “*Other members of my household don't like vegetables, and this prevents me from eating more vegetables*” and “*The specific needs of other members of my household (e.g. children, sick people) prevent me from adopting new eating habits*”. One derived from PTM meat: “*Other members of my household like to eat meat and I find it difficult to reduce my meat consumption under these circumstances*”.

4.2.2. Data analyses

Multiple regression analysis was conducted using the backward method (Field, 2018; Lucas et al., 2021) with exclusion criteria greater than 0.05. The backward method starts with a model containing multiple variables and subsequently removes a single variable at a time to assess its relevance in relation to the overall results. The stepwise technique proves advantageous as it reduces the number of predictors, resulting in a reduction of the multicollinearity issue. It is one of the methods to resolve the overfitting. The dependent variable was the *intention to increase vegetable consumption*. Scales from 1 to 8 were implemented, (see Questionnaire and Table 1), with the mean score of each construct and socio-demographic factors such as age, education level, income, sex, and employment status being used as predictors. The collinearity diagnostic, which reflects the average of the variance inflation factor (VIF), was close to 1 (Table 2), revealed no cause for concern. The variance inflation factor is a measure of the severity of multicollinearity in a multiple linear regression model. It refers to the ratio of the variance when there is multicollinearity between explanatory variables and the variance when there is no multicollinearity. (Field, 2018, p. 325, 342). The analyses were performed using IBM SPSS Statistics, version 25.

4.2.3. Results

In the Switzerland sample, the average for the intention to increase vegetable consumption was 3.33 ± 1.17 , while in the Vietnam sample, the average score obtained for this scale was 4.58 ± 0.94 . The descriptive statistics of the independent variables utilized to predict the intention to increase vegetable consumption, excluding sociodemographic variables, are presented in Table 1.

Table 1. Descriptive statistics of the independent variables (except sociodemographic).

Independent variables (predictors)	Switzerland (n=643)		Vietnam (N=616)	
	Mean	SD	Mean	SD
Pro-environmental attitude*	5.09	0.95	5.03	0.82
Animal welfare*	5.04	1.01	4.47	1.10
Preference for local and seasonal food*	4.86	0.90	4.39	1.00
Vegetable safety concern**	4.62	1.03	5.19	0.66
Self-efficacy of eating more vegetables***	3.91	1.07	4.10	0.95
Perceived vulnerability of insufficient vegetable intake***	2.46	1.22	4.06	1.25
Response cost of eating more vegetables***	2.34	0.92	3.03	1.13
Hindering familial influence***	2.00	0.93	3.18	1.06

Note: *Scale measurement varied from 1 = not important at all to 6 = very important; **Scale measurement varied from 1= not concerned at all to 6 = extremely concerned; ***Scale measurement varied from 1 = strongly disagree to 6 = strongly agree.

The multiple regression analysis results revealed four significant predictors for Switzerland and six significant predictors for Vietnam (see Table 2). The models for Switzerland and Vietnam accounted for 39% and 38% of the variances respectively. Significant predictors toward the intention to increase vegetable consumption in Switzerland ($R^2 = 0.39$) and in Vietnam ($R^2 = 0.38$).

R^2 is the squared value of the sample correlation coefficient between the predictors (independent variables) and response (dependent variable). Generally, R^2 represents the percentage of variation in the response variable that is explained by its relationship with one or more predictor variables. Simply speaking, R^2 indicates the accuracy of the prediction. The higher the R^2 value, the greater the reduction in the total variation of the response due to the predictor variable.

Both in the two countries, the intention to increase vegetable consumption was positively influenced ($p < .001$) by the *self-efficacy of consuming more vegetables* and by the *perception of vulnerability associated with insufficient vegetable intake*. This suggests that respondents who exhibit higher levels of belief in their capacity to maintain diets with greater vegetable intake, despite facing some difficulties or barriers (e.g. preparation difficulties), are more likely to increase their intention to increase vegetable consumption. Moreover, the stronger the participants perceived the health hazards of consuming a vegetable deficient diet, the greater their intention to consume more vegetables.

Table 4. Significant predictors toward the intention to increase vegetable consumption in Switzerland ($R^2=0.39$) and in Vietnam ($R^2=0.38$).

<i>Predictors for</i>					
	<i>B</i>	<i>SE B</i>	β	<i>p</i>	VIF
<i>Switzerland</i>					
Constant	0.246	0.165		0.135	
Self-efficacy of eating more vegetables	0.511	0.036	0.467	<0.001	1.12
Perceived vulnerability of insufficient vegetable intake	0.203	0.032	0.216	<0.001	1.16
Hindering familial influence	0.231	0.040	0.187	<0.001	1.04
Employment status	0.198	0.076	0.082	0.010	1.01
<i>Vietnam</i>					
Constant	2.041	0.210		<0.001	
Perceived vulnerability of insufficient vegetable intake	0.310	0.027	0.408	<0.001	1.21
Self-efficacy of eating more vegetables	0.263	0.035	0.264	<0.001	1.17

Response cost of eating more vegetables	-0.116	0.027	-0.138	<0.001	1.02
Animal welfare	0.094	0.029	0.110	0.001	1.08
Sex	-0.142	0.062	-0.074	0.022	1.01
Employment status	0.220	0.097	0.073	0.023	1.00

Note: *B*: Unstandardized coefficient *B*; *SE B*: Coefficients Std. Error; β : Standardized Coefficients Beta; *p*: significance; VIF: variance inflation factor (to identify multicollinearity between predictors). Employment status (0: not working, 1: working); Sex (0: female; 1: male).

Employment status was significantly and positively associated with the intention to increase vegetable consumption in both samples. This implies that working participants displayed a greater inclination to consume more vegetables than non-workers (see to Tables 3 and 4). The variable *hindering familial influence* was found to be significant in the Swiss sample, denoting that Swiss residents tended to exhibit a certain level of reactance. The stronger a participant's intention to increase vegetable consumption was found to be associated with how much criticism, value for meat, or barriers to new eating habits were present in the household (Table 3). Additionally, a regression model conducted on the Vietnamese sample revealed that a significant predictor ($p < 0.001$) of intention to eat more vegetables was the *response cost of eating more vegetables*, which was negatively correlated. The importance of this variable within the model reveals that consumers who were less anxious about possible issues resulting from consuming vegetables (e.g. digestive problems) had a higher intention to eat more vegetables. *Animal welfare* was found to be a significant factor ($p = 0.001$), positively associated with the intention to increase vegetable consumption in Vietnam. This implies that the more consumers cared about ethical meat production, the stronger their intention to increase vegetable consumption.

Moreover, the *sex* variable significantly influenced the Vietnamese sample, with women showing a greater inclination to consume more vegetables in the future than men (Table 4).

CHAPTER 5

DISCUSSION AND RESEARCH LIMITATIONS

5.1. DISCUSSION OF THE RESULTS HIGHLIGHTING SIMILARITIES AND DIFFERENCES AMONG THE COUNTRIES

In recent years, extensive research has been carried out on the factors that influence food choices towards healthier and more sustainable products. New conceptual models have also been introduced in order to have a better understanding of the determinants of healthy and sustainable food choices (Chen et al., 2020). Personal-state factors, including psychological components such as personality (Hansen et al., 2018) and emotion (Ma et al., 2018) influence the choice of healthier and organic food. Other studies have also highlighted the significance of motivation and intention in determining final food choices (Hansen et al., 2018, Verain et al., 2015, Verain et al., 2016, Verain et al., 2017 and Provencher et al., 2016). Cognitive factors, such as belief, attitude, awareness, self-concept, and positive outcome expectations, have also been found to be important determinants of food choice (Hoek et al., 2017, Hansen et al., 2018, Aertsens et al., 2009, Kang et al., 2015, Krebs-Smith et al., 2001, Pollard et al., 2002, Glanz et al., 2005, Kumar et al., 2017). Sociocultural context and familiarity with cultural habits may impact food choices (Pollard et al., 2002), but income and economic situation remain a key factor (Krebs-Smith et al., 2001). Food prices heavily influence consumer decisions regarding healthier and more sustainable food options (Krebs-Smith et al., 2001, Pollard et al., 2002, Provencher et al., 2016).

In this study, the two regression analyses revealed similarities and differences between the countries. In both countries, there was a positive impact on the intention to consume more vegetables due to the perceived health risks from inadequate vegetable consumption. Self-efficacy was identified as a crucial driver of the intention to increase vegetable consumption in both samples, especially in the Swiss cohort. Additionally, employment status played a significant role in explaining the intent in both Switzerland and Vietnam.

The regression results displayed primary differences in relation to the influence of household members, which only affected the intention to increase vegetable consumption of participants from Switzerland. Conversely, the Vietnam regression model indicated that the intention to increase vegetable consumption was impacted by the perceived response costs of consuming more vegetables and gender, with females demonstrating higher intentions to consume more vegetables in the future. Given Vietnam's tradition, culture, and religion, the concern for animal welfare significantly influenced Vietnamese vegetable consumption.

Considering that the vegetable consumption is insufficient in both nations, the present research showed that the intention to increase vegetable consumption was stronger among Vietnamese consumers. This result is in line with Vietnamese health policy that recognises explicitly the issues of nutrition transition, including targets to reduce obesity (Harris et al., 2020).

High intake of certain fruits and vegetables, including berries, citrus fruits, and green leafy ones, could enhance self-efficacy and positive attitudes, helping to address issues such as depressive disorders (Glabska et al., 2020). The current investigation indicates that Swiss and Vietnamese people's acknowledgment of unhealthy eating habits can cause health problems and thus lead to behavioural changes in the direction of increased vegetable consumption.

Supporting Menozzi et al., (2015) which demonstrated the influence of perceived behaviour of control (a related term of self-efficacy) on vegetables consumption, the regression analysis revealed that an individual's capacity to adopt a healthier diet had a positive effect on their intention to increase their vegetable consumption.

The well-established psychological principle of reactance (Brehm, 1966; Miron and Brehm, 2006) may explain the inhibition of family influence on Swiss consumers' intention to increase vegetable consumption. The results of the study show a significant increase in the intention to consume vegetables among Swiss participants when their family members' food choices contradicted their own.

For Vietnamese consumers, the negative impact of the variable response cost when consuming more vegetables can be explained by Rogers Theory (1975). The costs associated with a meatless diet, such as increased fatigue and increased risk of anaemia, discourage consumers from reducing their meat consumption (for instance) and increasing their vegetable intake. These costs are classified as response costs.

The findings of the Vietnamese study demonstrated a direct correlation between the concern for animal welfare and the likelihood of consuming vegetables more often. Hopwood et al. (2020) identified environmental and animal rights as being among the main factors driving individuals towards adopting a vegetarian diet. In Vietnam, Buddhists who lean towards vegetarianism due to religious reasons (Nguyen et al., 2020 and Umberger et al., 2020) often consume plant-based foods made from soybean and wheat. Two primary reasons motivate these diets: ethics, such as worries about animal welfare and abusive feeding, and health and well-being. Previous research indicates that motives relating to ethics and health are key factors in guiding the choice to adopt a healthier diet, including the intention to increase vegetable consumption (Marconi et al., 2023; Nguyen et al., 2020). In parallel, according to the Swiss Federal Office for Agriculture, stricter animal welfare standards are a key incentive for Swiss consumers to reduce the amount of meat they consume (numerous campaigns have already been launched) (Richter et al., 2023).

The importance of the variable for employment status in both countries is probably related to the social setting. This setting constitutes a social space in which people interact frequently and daily. The more employees thought their colleagues were encouraging healthy habits, the higher their vegetables intake (van der Put et al., 2022 and Park et al., 2017 and Ronda-Pérez et al., 2020).

With regards to the significance of sex variable among Vietnamese participants (females demonstrated a stronger intention to increase vegetable consumption), the results of this study are consistent with previous research, which emphasized the role of health benefits awareness and affordability as important factors in promoting vegetable consumption among low-income residents in Hanoi, particularly for women (De Filippo et al., 2021). Vietnamese women tend to consume more vegetables, possibly due to their higher awareness of the importance of vegetable intake, given their primary responsibility for food shopping and preparation. For Switzerland, the trend is similar (Volken et al., 2013), but among Swiss women, there is a recognised prevalence of snack consumption and ultra-processed food intake associated with excess in body weight (Bertoni Maluf et al., 2022).

5.2. RESEARCH LIMITATIONS AND FUTURE DIRECTIONS

This study provides substantial evidence on the intention to increase vegetable consumption among Swiss and Vietnamese consumers. However, there are limitations that need to be addressed. In particular, two methods were used to conduct the survey in each country, which deserves further attention in future research. Additionally, several variables that could have influenced the outcome were not considered. For instance, the fact of being from a rural or urban area was not a relevant socio-demographic fact assessed in this study.

Practical, evidence-based solutions are essential to address the environmental and social issues facing the global food system. Meat production has a much greater impact compared to that of vegetable-based proteins. Therefore, to create a more sustainable and environmentally friendly food production and supply system, food consumption behaviour must change (Hartmann and Siegrist, 2017). According to Willett et al. (2019), transformation to healthy diets by 2050 will necessitate significant dietary changes. It will require reducing global consumption of unhealthy foods, including red meat and sugar, by more than 50%. Additionally, an increase in healthy food consumption, such as nuts, fruits, vegetables, and legumes, by over 100% is necessary. Nonetheless, the changes required vary significantly across different regions. In this case, in order to revolutionise consumption trends in both developed, such as Switzerland and developing countries such as Vietnam, research into consumer needs and cultural values around food is essential. In this context, to develop educational and behavioural programmes aimed at promoting sustainable diets at the individual and population levels, it is important to understand and analyse consumers' dietary habits and attitudes. A valuable measure in this regard is the use of social-psychological models to identify and understand the cognitive constructs that are associated with dietary behaviour (Biasini et al., 2021).

To make healthier and more sustainable food choices available, policies play a crucial role. This applies not only to policies concerning healthy food consumption, but also those related to the food supply chain, particularly in terms of food production and environmental sustainability (Chen et al., 2020).

For instance, according to the results of this study, targeting office Vietnamese and Swiss workers and changing social norms for healthy eating may be more effective than providing individualized interventions (Park et al., 2017).

In Vietnam, the National Strategy on Nutrition for the 2021-2030 period and vision for 2045 (Decision: Approving the national nutrition strategy for the 2021-2030 period with a vision toward 2045, No. 02/QĐ-TTg dated 5th January 2022, Prime Minister) omits any objectives regarding meat consumption but comprises targets for augmenting vegetable and fruit consumption. The legislation also aims to regulate the prevalence of overweight and obesity in response to detrimental food consumption patterns among Vietnamese individuals, characterised by excessive fat, salt, and sugar intake, as well as a high consumption of meat and relatively low vegetable intake.

With the increase in out-of-home consumption in Vietnam in recent decades, the introduction of vegetarian options in community catering and restaurants could significantly improve food sustainability. An effective way to influence choice architectures and encourage the selection of vegetarian options is through nudging (Parkin et al., 2022). Therefore, it is vital to design the food environment in a way that nudges individuals towards making the vegetarian option an easy choice.

Public institutions, including school canteens, could offer nutritious and tasty lunchtime meals with less or no meat, or with meat only once a week. Acquiring the necessary competencies to prepare meat alternatives or vegetarian meals, such as through training, and having the appropriate materials, such as a kitchen and specialized equipment, are essential requirements for achieving this. Vegetarian cooking classes could be included in school curricula for children and young adults (Markoni et al., 2023).

CONCLUSIONS

The study findings uncovered psychological, health, and environmental factors that affect consumers' desire to augment their vegetable intake. Among the Swiss sample, four predictors featured as significant drivers (self-efficacy of eating more vegetables, perceived vulnerability of insufficient vegetables intake, hindering familial influence and employment status) whereas six predictors demonstrated importance within the Vietnamese sample (perceived vulnerability of insufficient vegetables intake, self-efficacy of eating more vegetables, response cost of eating more vegetables, animal welfare, sex and employment status). These differences affirm the cultural heterogeneity between the two countries.

Based on the results of this study and to translate the research findings into practice, evidence-based policy have been proposed to the relevant ministries in each country, promoting sustainable and healthier dietary habits in both countries. Switzerland is in contact with the Federal Office for the Environment, the Federal Office for Agriculture, and the Federal Food Safety and Veterinary Office. Vietnam, indeed, has established connections with the Ministry of Health, Ministry of Agricultural and Rural Development, Ministry of Industry and Trade, and Ministry of Resource and Environment.

Further research should also evaluate the proposed policy measures regarding social practices and identify additional consumer groups in this context to enable customization of new interventions. Finally, there is a need for research to determine how policy interventions can offer socially equitable access to sustainable and healthy food in both rural and urban area of Vietnam and Switzerland, considering residents of different age groups. Participatory research, including workshops with individuals experience, could facilitate achieving this goal.

SOURCES

1. Adana, R. A. H., van der Beek, E. M., Buitelaare, J. K., Cryang, J. F., Hebebrandh, J., Higgs, S., Schellekens, H., Dickson, S. L. (2019). Nutritional psychiatry: Towards improving mental health by what you eat. *European Neuropsychopharmacology*, 29(12), 1321-1332. ISSN 0924-977X, <https://doi.org/10.1016/j.euroneuro.2019.10.011>.
2. Aertsens, J., Verbeke, W., Mondelaers, K., & Van Huylenbroeck, G. (2009). Personal determinants of organic food consumption: a review. *British food journal*, 111(10), 1140-1167. <https://doi.org/10.1108/00070700910992961>.
3. Alcorta, A., Porta, A., Tárrega, A., Alvarez, M. D., Vaquero, M. P. (2021). Foods for Plant-Based Diets: Challenges and Innovations. *Foods*, 10(2), 293. <https://doi.org/10.3390/foods10020293>.
4. Bárbara Franco Lucas, Jorge Alberto Vieira Costa & Thomas A. Brunner (2021) Superfoods: Drivers for Consumption, *Journal of Food Products Marketing*, 27:1, 1-9, <https://doi.org/10.1080/10454446.2020.1869133>.
5. Baur, I., Stylianou, K. S., Ernstoff, A., Hansmann, R. J., Jolliet, O., Binder, C. R. (2022). Drivers and Barriers Toward Healthy and Environmentally Sustainable Eating in Switzerland: Linking Impacts to Intentions and Practices. *Frontiers in Sustainable Food Systems*, 6, 808521. <https://doi.org/10.3389/fsufs.2022.808521>.
6. Bertoni Maluf, V. A., Bucher Della Torre, S., Jotterand Chaparro, C., Belle, F. N., Khalatbari-Soltani, S., Kruseman, M., Marques-Vidal, P., & Chatelan, A. (2022). Description of Ultra-Processed Food Intake in a Swiss Population-Based Sample of Adults Aged 18 to 75 Years. *Nutrients*, 14(21), 4486. <https://doi.org/10.3390/nu14214486>.
7. Biasini, B., Rosi, A., Giopp, F., Turgut, R., Scazzina, F., Menozzi, D. (2021). Understanding, promoting and predicting sustainable diets: A systematic review. *Trends in Food Science & Technology*, 111, 191-207. ISSN 0924-2244. <https://doi.org/10.1016/j.tifs.2021.02.062>.
8. Bonnet, C., Bouamra-Mechemache, Z., Corre, T. (2018). An Environmental Tax Towards More Sustainable Food: Empirical Evidence of the Consumption of Animal Products in France. *Ecological Economics*. Vol 147, 48–61. <https://doi.org/10.1016/j.ecolecon.2017.12.032>.
9. Brondani, J. E., Comim, V. F., Flores, L. M., Martini, L. A., Premaor, M. O., (2019). Is anti-consumption driving meat consumption changes in Australia? *British Food Journal*, 121 (1), 123-138. <https://doi.org/10.1016/j.appet.2020.104636>.

10. Cena, H., Calder, P. C. (2020). Defining a Healthy Diet: Evidence for The Role of Contemporary Dietary Patterns in Health and Disease. *Nutrients*, 12(2), 334. <https://doi.org/10.3390/nu12020334>.
11. Chen, P. J., Antonelli, M. (2020). Conceptual Models of Food Choice: Influential Factors Related to Foods, Individual Differences, and Society. *Foods*, 9(12), 1898. <https://doi.org/10.3390/foods9121898>.
12. Conrad, Z., Karlsen, M., Chui, K., & Jahns, L. (2017). Diet quality on meatless days: National Health and Nutrition Examination Survey (NHANES), 2007–2012. *Public Health Nutrition*, 20(9), 1564-1573. <https://doi.org/10.1017/S136898001700026X>.
13. Cruwys, T.; Bevelander, K.E.; Hermans, R.C. (2015). Social modeling of eating: A review of when and why social influence affects food intake and choice. *Appetite*, 86, 3–18. <https://doi.org/10.1016/j.appet.2014.08.035>.
14. Cunha, L. M., Cabral, D., Moura, A. P., de Almeida, M. D. V. (2018). Application of the Food Choice Questionnaire across cultures: Systematic review of cross-cultural and single country studies. *Food Quality and Preference*, 64, 21-36, ISSN 0950-3293. <https://doi.org/10.1016/j.foodqual.2017.10.007>.
15. Deb, M., Alam, M. J., Palash, M. S., Begum, I. A. B., McKenzie, A. M. (2023). Consumer concern about food safety hazards along the vegetables value chain in Bangladesh. *Social Sciences & Humanities Open*, 7(1), 100448, ISSN 2590-2911. <https://doi.org/10.1016/j.ssaho.2023.100448>.
16. De Filippo, A., Meldrum, G., Samuel, F., Tuyet, M. T., Kennedy, G., Adeyemi, O. A., Ngothiha, P., Wertheim-Heck, S., Talsma, E. F., Shittu, O. O., Do, T. T., Huu, B. N., Lundy, M., Hernandez, R., Huong, L. T., de Brauw, A., Brouwer, I. D. (2021). Barrier analysis for adequate daily fruit and vegetable consumption among low-income residents of Hanoi, Vietnam and Ibadan, Nigeria. *Global Food Security*, 31, 100586. ISSN 2211-9124. <https://doi.org/10.1016/j.gfs.2021.100586>.
17. De Mestral, C., Khalatbari-Soltani, S., Stringhini, S., Marques-Vidal, P. (2020). Perceived barriers to healthy eating and adherence to dietary guidelines: Nationwide study. *Clinical Nutrition*, 39(8), 2580-2585. ISSN 0261-5614. <https://doi.org/10.1016/j.clnu.2019.11.025>.
18. del Río-Celestino, M., Font, R. (2020). The Health Benefits of Fruits and Vegetables. *Foods*, 9(3), 369. <https://doi.org/10.3390/foods9030369>.

19. Fasulo, L., Federal Department of Foreign Affairs FDFA (2018). Switzerland implements the 2030 Agenda for Sustainable Development. *An Insider's Guide to the UN*, 1–22.
20. Federal Department of Foreign Affairs, (2023). *Presence Switzerland*.
21. Federl Statistical Office, 2020. *Agriculture and food. Pocket statistics 2020*.
22. Flückiger, S. Weniger Fleisch—Dafür aus Tiergerechter Haltung. Available online: <https://www.fuer-mehr-tierwohl.ch/kampagne>.
23. Food and Agriculture Organization of the United Nations. 10 Tips on Proper Nutrition for Period 2013–2020. Available online: <https://www.fao.org/nutrition/education/food-dietary->.
24. Food and Agriculture Organization. *Sustainable Healthy Diets*; FAO: Rome, Italy, 2019.
25. Garcia SN, Osburn BI and Jay-Russell MT (2020) One Health for Food Safety, Food Security, and Sustainable Food Production. *Front. Sustain. Food Syst.* 4:1. doi: 10.3389/fsufs.2020.00001
26. Gariballa, S., Al-Bluwi, G. S. M., Yasin, J., (2023). Increased Fruit and Vegetable Consumption Mitigates Oxidative Damage and Associated Inflammatory Response in Obese Subjects Independent of Body Weight Change. *Nutrients*, 15(7), 1638. <https://doi.org/10.3390/nu15071638>.
27. Gie, S. M., Nguyen, P. H., Bergeron, G., Tran, L. M., Hoang, N. T., Knight, F. (2023). Locally relevant food-based recommendations could increase iron and calcium intake for adolescent girls in Vietnam. *Annals of the New York Academy of Sciences*, 1527(1), 97-106. <https://doi.org/10.1111/nyas.15036>.
28. Glabska, D., Guzek, D., Groele, B., Gutkowska, K. (2020). Fruit and vegetables intake in adolescents and mental health: A systematic review. *Roczniki Państwowego Zakładu Higieny*, 71(1). <https://doi.org/10.32394/rpzh.2019.0097>.
29. Glanz, K., Sallis, J. F., Saelens, B. E., & Frank, L. D. (2005). Healthy nutrition environments: concepts and measures. *American journal of health promotion*, 19(5), 330-333. <https://doi.org/10.4278/0890-1171-19.5.330>.
30. Götze, F., & Brunner, T. A. (2021). A Consumer Segmentation Study for Meat and Meat Alternatives in Switzerland. *Foods*, 10(6), 1273. <https://doi.org/10.3390/foods10061273>.
31. Guo, Jia., Tang, Y., Zhang, H., Lommel, L., Chen, J.I. (2019). The risk, perceived and actual, of developing type 2 diabetes mellitus for mothers of preschool children in urban China. *Plos one*, 14(9), e0222839. <https://doi.org/10.1371/journal.pone.0222839>.

32. Ha, T. M., Shakur, S., Do, K. H. P., (2019). Consumer concern about food safety in Hanoi, Vietnam. *Food Control*, 98, 238-244. <https://doi.org/10.1016/j.foodcont.2018.11.031>.
33. Haggmann, D., Siegrist, M., & Hartmann, C. (2019). Meat avoidance: Motives, alternative proteins and diet quality in a sample of Swiss consumers. *Public Health Nutrition*, 22(13), 2448-2459. <https://doi.org/10.1017/S1368980019001277>.
34. Hansen, T.; Sørensen, M.I.; Eriksen, M.-L.R.(2018). How the interplay between consumer motivations and values influences organic food identity and behavior. *Food Policy*, 74, 39–52. <https://doi.org/10.1016/j.foodpol.2017.11.003>.
35. Hargreaves, S. M., Raposo, A., Saraiva, A., Zandonadi, R. P. (2021). Vegetarian Diet: An Overview through the Perspective of Quality of Life Domains. *International Journal of Environmental Research and Public Health*, 18(8), 4067. <https://doi.org/10.3390/ijerph18084067>.
36. Harguess, M. J., Crespo, N. C., Hong, M. Y. (2020). Strategies to reduce meat consumption: A systematic literature review of experimental studies. *Appetite*, 144, 104478. <https://doi.org/10.1016/j.appet.2019.104478>.
37. Harris, J., Nguyen, P.H., Tran, L.M. et al. Nutrition transition in Vietnam: changing food supply, food prices, household expenditure, diet and nutrition outcomes. *Food Sec.* 12, 1141–1155 (2020). <https://doi.org/10.1007/s12571-020-01096-x>.
38. Hartmann, C., Siegrist, M. (2017). Consumer perception and behaviour regarding sustainable protein consumption: A systematic review. *Trends in Food Science & Technology*, 61, 11-25. ISSN 0924-2244. <https://doi.org/10.1016/j.tifs.2016.12.006>.
39. HLPE. Nutrition and Food Systems: A Report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security; FAO: Rome, Italy, 2017.
40. Hoek, A.; Pearson, D.; James, S.; Lawrence, M.; Friel, S. (2017). Healthy and environmentally sustainable food choices: Consumer responses to point-of-purchase actions. *Food Qual. Prefer*, 58, 94–106. <https://doi.org/10.1016/j.foodqual.2016.12.008>.
41. Hopwood, C.J., Bleidorn, W., Schwaba, T., Chen, S. (2020). Health, environmental, and animal rights motives for vegetarian eating. *PLoS ONE* 15(4): e0230609. <https://doi.org/10.1371/journal.pone.0230609>.
42. Jansson, T., Säll, S. (2018). Environmental consumption taxes on animal food products to mitigate greenhouse gas emissions from the European union. *Climate Change Economics*, Vol. 9, No. 4, 1850009. <https://doi.org/10.1142/S2010007818500094>.

43. Kang, J., Jun, J., & Arendt, S. W. (2015). Understanding customers' healthy food choices at casual dining restaurants: Using the Value–Attitude–Behavior model. *International Journal of Hospitality Management*, 48, 12-21. <https://doi.org/10.1016/j.ijhm.2015.04.005>.
44. Krebs-Smith, S. M., & Kantor, L. S. (2001). Choose a variety of fruits and vegetables daily: understanding the complexities. *The Journal of nutrition*, 131(2), 487S-501S. <https://doi.org/10.1093/jn/131.2.487S>.
45. Kumar, B., Manrai, A. K., & Manrai, L. A. (2017). Purchasing behaviour for environmentally sustainable products: A conceptual framework and empirical study. *Journal of Retailing and Consumer Services*, 34, 1-9. <https://doi.org/10.1016/j.jretconser.2016.09.004>.
46. Malek, L., Umberger, W., Goddard, E. (2019). Is anti-consumption driving meat consumption changes in Australia? *British Food Journal*, 121 (1), 123-138. <https://doi.org/10.1016/j.appet.2020.104636>.
47. Markoni, E., Ha, T. M., Götze, F., Häberli, I., Ngo, M. H., Huwiler, R. M., Delley, M., Nguyen, A. D., Bui, T. L., Le, N. T., Pham, B. D., & Brunner, T. A. (2023). Healthy or Environmentally Friendly? Meat Consumption Practices of Green Consumers in Vietnam and Switzerland. *Sustainability*, 15(15), 11488. <https://doi.org/10.3390/su151511488>.
48. Mathur, M. B., Robinson, T. N., Reichling, D. B., Gardner, C. D., Nadler, J., Bain, P. A., Peacock, J. (2020). Reducing meat consumption by appealing to animal welfare: protocol for a meta-analysis and theoretical review. *Syst Rev*, 9, 3. <https://doi.org/10.1186/s13643-019-1264-5>.
49. Ma, X.; Blake, C.E.; Barnes, T.L.; Bell, B.A.; Liese, A.D. (2018). What does a person's eating identity add to environmental influences on fruit and vegetable intake? *Appetite*, 120, 130–135. <https://doi.org/10.1016/j.appet.2017.08.025>.
50. Melina, V., Craig, W., Levin, S., (2016). Position of the Academy of Nutrition and Dietetics: Vegetarian Diets. *Journal of the Academy of Nutrition and Dietetics*, 116(12), 1970-80. <https://doi.org/10.1016/j.jand.2016.09.025>.
51. Menozzi, D., Sogari, G., & Mora, C. (2015). Explaining Vegetable Consumption among Young Adults: An Application of the Theory of Planned Behaviour. *Nutrients*, 7(9), 7633–7650. <https://doi.org/10.3390/nu7095357>.
52. Moberg, E., Allison, E.H., Harl, H.K., et al. (2021). Combined innovations in public policy, the private sector and culture can drive sustainability transitions in food systems. *Nat Food*, 2, 282–90. <https://doi.org/10.1038/s43016-021-00261-5>.

53. Monterrosa EC, Frongillo EA, Drewnowski A, de Pee S, Vandevijvere S. Sociocultural Influences on Food Choices and Implications for Sustainable Healthy Diets. *Food and Nutrition Bulletin*. 2020;41(2_suppl):59S-73S.
54. Nardi, V, A, M., Teixeira, R., Ladeira, W. J., Santini, F. de O. (2020). A meta-analytic review of food safety risk perception. *Food Control*, 112, 107089. ISSN 0956-7135. <https://doi.org/10.1016/j.foodcont.2020.107089>.
55. Nguyen, T., Mai, H. P. T., van den Berg, M., Thanh, T. H. T., Béné, C. (2021). Interactions between Food Environment and (Un)healthy Consumption: Evidence along a Rural-Urban Transect in Viet Nam. *Agriculture*, 11(8), 789. <https://doi.org/10.3390/agriculture11080789>.
56. Omari, R., Frempong, G. K., Arthur, W. (2018). Public perceptions and worry about food safety hazards and risks in Ghana. *Food Control*, 93, 76-82, ISSN 0956-7135, <https://doi.org/10.1016/j.foodcont.2018.05.026>.
57. Park, S., Sung, E., Choi, Y., Ryu, S., Chang, Y., Gittelsohn, J. (2017). Sociocultural Factors Influencing Eating Practices Among Office Workers in Urban South Korea. *Journal of Nutrition Education and Behavior*, 49, 6, 466-474.e1. ISSN 1499-4046. <https://doi.org/10.1016/j.jneb.2017.02.005>.
58. Parkin, B. L., & Attwood, S. (2022). Menu design approaches to promote sustainable vegetarian food choices when dining out. *Journal of Environmental Psychology*, 79, 101721.
59. Pollard, J., Kirk, S. L., & Cade, J. E. (2002). Factors affecting food choice in relation to fruit and vegetable intake: a review. *Nutrition research reviews*, 15(2), 373-387. <https://doi.org/10.1079/NRR200244>.
60. Provencher, V., Jacob, R. (2015). Impact of Perceived Healthiness of Food on Food Choices and Intake. *Curr Obes Rep* 5, 65–71. <https://doi.org/10.1007/s13679-016-0192-0>.
61. Radnitz, C., Beezhold, B., & DiMatteo, J. (2015). Investigation of lifestyle choices of individuals following a vegan diet for health and ethical reasons. *Appetite*, 90, 31–36. <https://doi.org/10.1016/j.appet.2015.02.026>
62. Ramya, V., & Patel, P. (2019). Health benefits of vegetables. *International Journal of Chemical Studies*, 7(2), 82-87.
63. Richter, S., Muller, A., Stolze, M., Schneider, I., Schader, C. (2023). Acceptance of meat reduction policies in Switzerland. *iScience*, 26, 3, 106129, ISSN 2589-0042. <https://doi.org/10.1016/j.isci.2023.106129>.

64. Rogers, R. (1975). A protection motivation theory of fear appeals and attitude change. *Journal of Psychology*, 91 (1), 93-114.
65. Roosen, J., Staudigel, M., Rahbauer, S. (2022). Demand elasticities for fresh meat and welfare effects of meat taxes in Germany. *Food Policy*. Vol 106, 102194. <https://doi.org/10.1016/j.foodpol.2021.102194>.
66. Sari, K. I., Utari, D. M., Kamoshita, S., Oktaviana, D., Sakai, S., Nishiyama, H., Yasunobu, M., Yamamoto, S. (2020). Increasing Vegetable Intake 400 G/Day to Control Body Weight and Lipid Profile in Overweight Hyperlipidemia Menopausal Women. *Journal of Public Health Research*, 9(3). <https://doi.org/10.4081/jphr.2020.1733>.
67. See Joint FAO/WHO Food Standards Programme, Codex Alimentarius Commission. Procedural manual, twenty-seventh edition. Rome: FAO/WHO; 2019:128 (<http://www.fao.org/3/ca2329en/CA2329EN.pdf>).
68. SEVENTY-THIRD WORLD HEALTH ASSEMBLY, (2020). Strengthening efforts on food safety.
69. Sibal, Vatika. (2018). Food: identity of culture and religion. 6, 10908-10915.
70. Springmann, M., Wiebe, K., Mason-D’Croz, D., Sulser, T. B., Rayner, M., Scarborough, P. (2018). Health and nutritional aspects of sustainable diet strategies and their association with environmental impacts: a global modelling analysis with country-level detail. *Lancet Planet Health*, 2: e451–61. [https://doi.org/10.1016/S2542-5196\(18\)30206-7](https://doi.org/10.1016/S2542-5196(18)30206-7).
71. Stanaway, J. D., Afshin, A., Ashbaugh, C., Bisignano, C., Brauer, M., Ferrara, G., Garcia, V., Haile, D., Hay, S. I., He, J., Iannucci, V., Lescinsky, H., Mullany, E. C., Parent, M. C., Serfes, A. L., Sorensen, R. J. D., Aravkin, A. Y., Zheng, P., Murray, C. J. L. (2022). Health effects associated with vegetable consumption: a Burden of Proof study. *Nature Medicine*, 28, 2066-2074. <https://doi.org/10.1038/s41591-022-01970-5>. The prime minister, (2012). National nutrition strategy for 2011-2020, with a vision toward 2030. Medical Publishing House.
72. Tami, S. H., Reed, D. B., Boylan, M., & Zvonkovic, A. (2012). Assessment of the Effect of Acculturation on Dietary and Physical Activity Behaviors of Arab Mothers in Lubbock, Texas. *Ethnicity & Disease*, 22(2), 192–197. <https://www.jstor.org/stable/48667645>.
73. Tran, L. H., Freytag-Leyer, B., Ploeger, A., Krikser, T. (2019). Driving and Deterrent Factors Affecting Organic Food Consumption in Vietnam. *Journal of Economics, Business and Management*, 7. doi: 10.18178/joebm.2019.7.4.596.

74. Trinh, H. T., Dao, B. T. T., Huynh, T. T. T., Nguyen, M. T. T., Nguyen, T. M., Vuong, V. T., Duong, T. T., & Haan, S. (2023). Diet Quality Index and Food Choice Motives in Vietnam: The Roles of Sensory Appeal, Mood, Convenience, and Familiarity. *Foods*, *12*(13), 2505. <https://doi.org/10.3390/foods12132505>.
75. Tu, J. (2001). Nutrition and Fasting in Vietnamese Culture. <https://ethnomed.org/resource/nutrition-and-fasting-in-vietnameseculture/>.
76. Umberger, W. J., Rupa, J. A., & Zeng, D. (2020). Understanding food westernisation and other contemporary drivers of adult, adolescent and child nutrition quality in urban Vietnam. *Public health nutrition*, *23*(14), 2571–2583. <https://doi.org/10.1017/S1368980020001354>.
77. Van Bui T, Blizzard CL, Luong KN, Le Van Truong N, Tran BQ, Otahal P, Srikanth V, Nelson MR, Au TB, Ha ST, Phung HN. Fruit and vegetable consumption in Vietnam, and the use of a ‘standard serving’ size to measure intake. *British Journal of Nutrition*. 2016 Jul;116(1):149-57.
78. van der Put, A., Ellwardt, L. (2022). Employees’ healthy eating and physical activity: the role of colleague encouragement and behaviour. *BMC Public Health* *22*, 2004. <https://doi.org/10.1186/s12889-022-14394-0>.
79. van der Put AC, Mandemakers JJ, de Wit JBF, van der Lippe T. (2021). Actions Speak Louder than Words: Workplace Social Relations and Worksite Health Promotion Use. *J Occup Environ Med*; *63*:614–21. <https://doi.org/10.1097/JOM.0000000000002196>.
80. Verain, M.C.; Dagevos, H.; Antonides, G. (2015). Sustainable food consumption. Product choice or curtailment? *Appetite*, *91*, 375–384. <https://doi.org/10.1016/j.appet.2015.04.055>.
81. Verain, M.C.D.; Onwezen, M.; Sijtsema, S.J.; Dagevos, H. (2016). The added value of sustainability motivations in understanding sustainable food choices. *Appl. Stud. Agribus. Commer*, *10*, 67–76. <https://doi.org/10.22004/ag.econ.250221>.
82. Verain, M., Sijtsema, S., Dagevos, H., & Antonides, G. (2017). Attribute Segmentation and Communication Effects on Healthy and Sustainable Consumer Diet Intentions. *Sustainability*, *9*(5), 743. <https://doi.org/10.3390/su9050743>.
83. Visioli, F., Marangoni, F., Poli, A., Ghiselli, A., Martini, D. (2022) Nutrition and health or nutrients and health? *International Journal of Food Sciences and Nutrition*, *73*:2, 141-148, <https://doi.org/10.1080/09637486.2021.1937958>.
84. Volken, T., Rüesch, P., & Guggisberg, J. (2013). Fruit and vegetable consumption among migrants in Switzerland. *Public Health Nutrition*, *16*(1), 156-163. doi:10.1017/S1368980012001292.

85. Wallace, T. C., Bailey, R. L., Blumberg, J. B., Burton-Freeman, B., Chen, C-y. O., Crowe-White, K. M., Drewnowski, A., Hooshmand, S., Johnson, E., Lewis, R., Murray, R., Shapses, S. A., Wang, D. D. (2020). Fruits, vegetables, and health: A comprehensive narrative, umbrella review of the science and recommendations for enhanced public policy to improve intake. *Critical Reviews in Food Science and Nutrition*, 60:13, 2174-2211. <https://doi.org/10.1080/10408398.2019.1632258>.
86. WHO estimates of the global burden of foodborne diseases: foodborne diseases burden epidemiology reference group 2007-2015. Geneva: World Health Organization; 2015 (https://www.who.int/foodsafety/areas_work/foodbornediseases/ferg/en/).
87. Willett, M. D. W., Rockström, J., Loken, B., Springmann, M., Lang, T., Vermeulen, S., Garnett, T., Tilman, D., DeClerck, F., Wood, A., Jonell, M., Clark, M., Gordon, L. J., , PhD Jessica Fanzo, PhD Prof Corinna Hawkes, PhD Rami Zurayk, PhD Juan A Rivera, PhD Prof Wim De Vries, PhD Lindiwe Majele Sibanda, PhD Ashkan Afshin, MD Abhishek Chaudhary, PhD Mario Herrero, PhD Rina Agustina, MD Francesco Branca, MD Anna Lartey, PhD Shenggen Fan, PhD Beatrice Crona, PhD Elizabeth Fox, PhD Victoria Bignet, MSc Max Troell, PhD Therese Lindahl, PhD Sudhvir Singh, MBChB Sarah E Cornell, PhD Prof K Srinath Reddy, DM Sunita Narain, PhD Sania Nishtar, MD Prof Christopher J L Murray, MD (2019) Food in the Anthropocene: the EAT–Lancet Commission on healthy diets from sustainable food systems. *The lancet commissions*, 303, 447-482. [https://doi.org/10.1016/S0140-6736\(18\)31788-4](https://doi.org/10.1016/S0140-6736(18)31788-4)
88. Yen, W. C., Shariff, Z. M., Kandiah, M., Taib, M. N. M. (2014). Stages of change to increase fruit and vegetable intake and its relationships with fruit and vegetable intake and related psychosocial factors. *Nutrition Research and Practice*, 8(3), 297-303. <https://doi.org/10.4162/nrp.2014.8.3.297>
89. Yip, C. S. C., Chan, W., Fielding, R. (2019). The associations of fruit and vegetable intakes with burden of diseases: a systematic review of meta-analyses. *Journal of the Academy of Nutrition and Dietetics*, 119(3): 464–481. <https://doi.org/10.1016/j.jand.2018.11.007>.
90. Żakowska-Biemans, S., Pieniak, Z., Kostyra, E., & Gutkowska, K. (2019). Searching for a Measure Integrating Sustainable and Healthy Eating Behaviors. *Nutrients*, 11(1), 95. <https://doi.org/10.3390/nu11010095>.

