

Track 5: Civil society, culture and social movements

Diffusion of Vegetarian and Vegan Diets as Social Innovations: Motive Dynamics and Impacts on Environmental- and Animal-Conscious Behaviour

Ursula Ploll, Heidrun Petritz, Tobias Stern

University of Graz, Institute of Systems Sciences, Innovation and Sustainability Research, Graz, Austria

Extended Abstract

Background. Vegetarian and vegan dietary practices have recently moved from being marginal activities to occupying a more mainstream position. The number of vegetarians and vegans in Austria and other Western countries increases steadily. Yet, plant-based diets have frequently been investigated in the medical context, with regard to the motive structure and potential environmental effects. In particular, the reasons why individuals become a vegetarian or vegan previously received a lot of attention by many researchers; however, the extent to which outwards-oriented motives also influence other behavioural contexts remains relatively unexplored. Henceforth, this research analyses (1) how this trend can be described as a social innovation, (2) how motive structures may have changed over the last decades, (3) the degree to which motives and other factors influence behaviour, and (4) to what degree vegetarians and vegans act in other contexts in an environmental- and animal-conscious manner.

Method. A self-administered survey was conducted among omnivores, conscientious omnivores, vegetarians and vegans in Austria. A mixed-mode sampling strategy resulted in 520 completed surveys being collected, and with each dietary group being represented within the selected sample. The results are based on statements of 134 self-defined vegans, 90 vegetarians, 151 conscientious omnivores and 145 omnivores. The research design is based on an extended version of the theory of planned behaviour (TPB). The assessment in terms of a social innovation is mainly based on the application of a diffusion curve and the classification between early and late adopters.

Results. The correlation analysis of the TPB shows that there are significant relations between motives, subjective norms, attitudes, behavioural intentions and the behaviour in question. Each of these concepts is measured with regard to animal-welfare and environmental protection. Group comparison of the measured behaviour based on dietary identifications showed that vegans and vegetarians engage in a more environmental- and animal-conscious manner than other groups did. With regard to environmental motives, when analysing the year of dietary adaptation by means of general diffusion patterns a significant increase can be observed in later adopters. In contrast, food scandals seem to foster animal-welfare and dis-taste as adaptation motives. Adaptation motives appear to be changing over time and their base is seemingly getting broader. The vegan movement is still in an early

adopter (increasing growth) stage; whereas, the vegetarian movement could be approaching a turning point in the near future.

Conclusions. The results suggest that within the framework of the TPB, the motives play an important role in influencing the behaviour of vegetarians and vegans. Particularly animal welfare and environmentalism are stated as main reasons for a vegetarian or vegan dietary change. Because of the associated contributions to animal and climate protection, it is possible to respond to socially relevant challenges. In conjunction with the emergence of social movements, vegetarianism and veganism can be linked with the development of social innovations. The high share of vegetarians and vegans within the socio-environment of individuals with similar dietary habits provides a corresponding indication. When considering all dietary groups, the results indicate that the differentiation in behaviour is impacted by dietary patterns: the stricter the diet, the stronger the behavioural commitment related to animal-wellbeing and environmental protection. However, further research on beneficial factors for the diffusion of vegetarianism and veganism as social innovation is necessary.

Ursula Ploll and **Heidrun Petritz** started research on vegetarianism and veganism for their graduate theses. Ursula Ploll plans on pursuing a doctoral degree in a related field. Her research interests include human environmental interactions, values and determinants of behaviour.

Tobias Stern is professor of Energy and Resource Innovation at the Institute of System Science, Innovation and Sustainability Research, University of Graz. His research focus is on bioeconomy, biomass consumption and bio-based innovations.

Table of Contents

1. Introduction	4
2. Definitions and Concepts	5
2.1. Vegetarian and Vegan Dietary Categories	5
2.3. Motives and Behaviour of Vegetarians and Vegans	5
2.3. Social Innovation	6
3. Material and Methods.....	7
3.1. Participants and procedure	7
3.2. Survey Structure and Measures.....	9
3.2.1. Dietary Practices and Identities	9
3.2.2. Motives	9
3.2.3. Theory of Planned Behaviour	10
3.2.4. Behavioural Commitment.....	10
4. Results	11
4.1. Dietary Practices and Motives	11
4.2. Development and Diffusion	13
4.2.1. The Vegetarians' Development	13
4.2.2. The Vegans' Development	14
4.2.3. Overall Development.....	15
4.3. Behavioural patterns	17
4.3.1. Animal-related Results	17
4.3.2. Environment-related Results	18
5. Discussion	20
6. Conclusion.....	20
References	22

1. Introduction

Nutrition and dietary practices are a basic human need and hence play an important role in many global processes. Because of the prevalent role that food plays in everyday life, several consumer-based strategies have arisen, which address the way food has been produced. Vegetarianism and veganism are an example of such consumer-based strategies. Within the field of transition research, Markard et al. (2012) pointed out the importance of agency and consumer-related research. As a consumer at the end of the value chain, vegetarians and vegans aim towards a greater transition of the food system. Studies indicate that vegetarianism and veganism are more and more popular, as numbers of its participants seem to be increasing (Phillips, 2005; Ruby et al., 2013; Stiles, 1998). The projected growing numbers related to vegetarians and especially vegans (Elmadfa & Leitzmann, 2015; Kerschke-Risch, 2015; Strecker, 2016; Vinnari, 2008) indicates a trend towards plant-based diets in Western countries (Englert & Tölke, 2016).

Many studies related to vegetarianism and veganism focus on motives for a change in dietary behaviour (Beardsworth & Keil, 1992; Fox & Ward, 2008a; Haverstock & Forgays, 2012; Rozin et al., 1997). Because of the impact a vegetarian or vegan diet can create, the reasons why individuals decide to change their diet are also just as diverse. While animal welfare is reported as being a prominent motive (Fox & Ward, 2008a; Spencer et al., 2007), other motives play a role as well. Health as a reason is a common and long-since examined motivational driver (Donovan & Gibson, 1996; Glick-Bauer & Yeh, 2014; Huang et al., 1999; Ingenbleek & McCully, 2012). Additionally, research on the environmental effects of vegetarian and vegan diets come more and more to the fore (Baroni et al., 2007; Hallström et al., 2015; Marlow et al., 2009).

The question whether these different motives are enacted and expressed by vegetarians and vegans - aside from their food practices - remains relatively unexplored. This is especially relevant in order to describe the vegetarian and vegan identity and the impact this has on other behavioural contexts. Vegetarian and vegan diets are a new solution to social and environmental problems, which is one key criteria for social innovations. The projection of social innovation indicators onto vegetarianism and veganism allows the interpretation of vegetarianism and veganism as a social innovation. However, plant-based diets have not yet been considered as social innovations in scientific literature.

Research Questions

Henceforth, this research analyses (1) how this trend can be described as a social innovation, (2) how motive structures may have changed over the last decades, (3) the degree to which motives and other factors influence behaviour, and (4) to what degree vegetarians and vegans act in other contexts in an environmental- and animal-conscious manner.

This research contributes, on the one hand, in the demarcation of the development of vegetarianism and veganism so far. On the other hand, further implications of behavioural patterns are described. In this way, the past and present state of plant-based diets are analysed and described.

2. Definitions and Concepts

2.1. Vegetarian and Vegan Dietary Categories

Generally speaking, food and food practices are enacted by the individual based on their own judgement. Hence, dietary choices are a private and individual activity. Although these implementations vary from person to person, umbrella classifications have been defined. Beardsworth and Keil first coined the vegetarian scale; where the dietary forms are arranged along a scale from least to most strict (1992, p. 263). In *Figure 1*, these dietary types are depicted along the vegetarian scale, including the classifications which were used during this research.

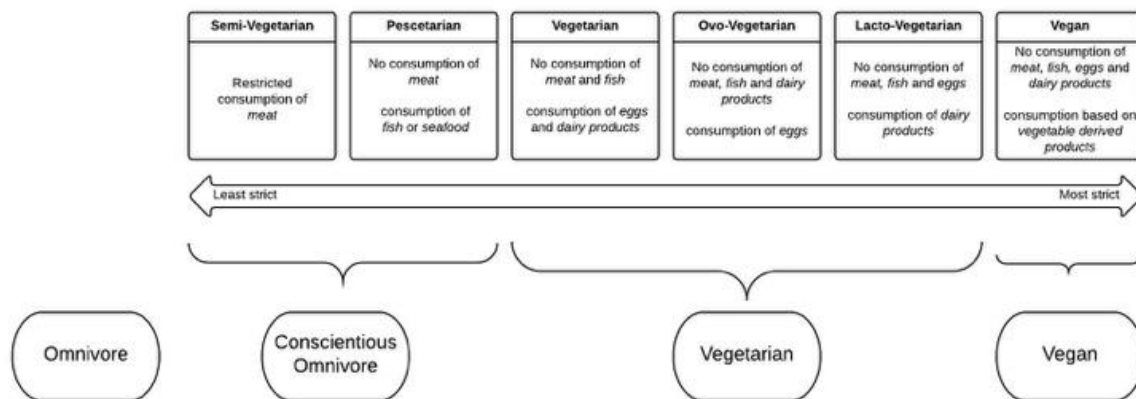


Figure 1: Vegetarian Scale including Clustering of Dietary Groups (adopted from Beardsworth and Keil, 1992).

According to definition, the omnivore follows no particular dietary restrictions, and thus also consumes meat or other animal products accordingly. The so-called "conscientious omnivore" is defined by a restricted consumption of meat (Greene-Finestone et al., 2008; Rothgerber, 2014). Because both the omnivore and the conscientious omnivore consume meat, these dietary classifications were not originally part of the vegetarian scale. The "vegetarian" category was used in a broad sense within this research; it included both the ovo and lacto-vegetarian, which means the main characteristic is the exclusion of meat, fish and seafood. The vegan dietary group is defined by a complete exclusion of animal-derived products in their consumption.

2.3. Motives and Behaviour of Vegetarians and Vegans

Generally speaking, there is a high variety of motives which trigger a dietary change among vegetarians and vegans. Nonetheless, previous research established and delineated a few key reasons among vegetarians and vegans (Fox & Ward, 2008b; Peattie, 2010; Rozin et al., 1997; Ruby et al., 2013). Two main distinctions can be made between health and ethical considerations. These binary groups capture the difference between intrinsic and extrinsic driven motivations. The health-driven motive centres on the individual themselves, whereas ethical-driven motives focus on external conditions such as animal wellbeing or environmental conditions.

The three main motives which were employed in this research are: health motives, animal-related reasons and environmental considerations. See *Table 1* for an overview.

Classification	Key Aspects	Related Behavioural Activities
Health	Personal health is the main reason	Activities that support personal wellbeing and health
Animals	Animal welfare, cruelty, death	Avoidance of activities or consumption of products that harm animals directly or indirectly
Environment	Environmental impact during production and usage	Engagement in pro-environmental activities

Table 1: Classification system of motives.

Because several motives can influence and trigger a dietary change, a pairwise comparison of the different motives was included in the questionnaire. This method was taken from the analytical hierarchy process (AHP). The process was coined by Thomas L. Saaty as a mean to break down complex problems into several smaller elements (Mateo, 2012). These individual elements were then used for pair-wise comparison and thus created relative measurement (Saaty, 1996). In the present research, only the pairwise comparison was extracted from the AHP in order to calculate the strengths of the different motives.

So far, little research exists on the connection between dietary choices and lifestyle or behavioural decisions. The results of Fox and Ward's article suggests that a philosophy is underpinning certain dietary choices, which then connects to lifestyle choices (2008a). In order to evaluate related behavioural patterns, the theory of planned behaviour (TPB) was integrated into the research model. The TPB has attained academic acceptance as a conceptual model for measuring and describing behaviour. It was first introduced by Icek Ajzen (Ajzen, 1991), however, the first model was the theory of reasoned action which models consumer intentions and behaviours (Sheppard et al., 1988). The aim of the TPB is to describe human behaviour while referring to consciousness (Ajzen, 2011). Studies which applied the TPB found several limitations and varying degrees of predictive power. Henceforth, several researchers added further concepts to the model in order to increase the precision of the theoretical framework (Aertsens et al., 2009; Berndsen and Pligt, 2004; Connor and Armitage, 1998; Fleskens and Jorritsma, 2010; Karali et al., 2013; Peattie, 2010; Povey et al., 2001; Vermeir and Verbeke, 2006). Also, within this research design, the strength of the relevant motives was included in the TPB.

2.3. Social Innovation

The application of social innovation indicators onto plant-based diets allows for the interpretation of vegetarianism and veganism as social innovation. Vegetarianism and veganism satisfy the following criteria for social innovations as defined by Phills Jr. et al. (2008):

- *novel solution to a social problem*: plant-based diets are a new approach in its contribution to less environmental destruction and mitigate climate change; vegetarianism and veganism also make a contribution to the social challenge of animal protection/welfare;

- *more sustainable and the value created* accrues primarily to society: the avoidance of animal-derived products results in lower GHG emissions or the prevention of malnutrition;
- can be a *social movement*: several academics labels vegetarianism and veganism as a social movement.

So far within scientific literature, plant-based diets have not yet been considered as social innovations.

Hence, the objective of this paper is to shed light on vegetarianism and veganism by evaluating the motive structure with relation to other behavioural spheres. The application of a social innovation perspective will allow for a comparison of the development of vegetarianism and veganism. The aim is to investigating whether behavioural patterns between different dietary categories can be observed; as well as, investigating whether an assignment of vegetarianism and veganism to the concept of social innovation is possible and meaningful by considering the time dimension and driving factors.

3. Material and Methods

A self-administered survey was conducted among omnivores, conscientious omnivores, vegetarians and vegans in Austria. The online-survey was performed between June 15th and August 06th 2016. Through a mixed-mode sampling strategy 520 completed surveys could be collected.

3.1. Participants and Procedure

The data used in this study is based on Ploll (2017) and Petritz (2017). First, a pre-test was conducted at two different fairs themed around vegan and vegetarian products and lifestyle in Graz. Because of the relevant theme of the fair, the target audience overlapped with the targeted sample characteristics. A total of twenty surveys could be used for the pre-test, other contacts could be collected for a later distribution of the survey. Participants and researchers were both present during the execution of the pre-test, in that way participants had the possibility to ask questions or clarify uncertainties. This provided immediate verbal and informal survey feedback.

The main data collection was implemented through LimeSurvey. With this online software, the survey could be forwarded and accessed through an URL. This internet-based survey had its advantages and disadvantages, for example, only a certain group is easy to reach online (Nosek et al., 2002). Altogether, various sampling strategies were used to reach as many vegetarians and vegans as possible, see *Table 2* for an overview.

Sample	Means of approach	Characteristics	Return
Facebook groups: Österreich Vegan; [[Vegan @ Graz]]	Social media post of online survey in Facebook groups once a week during collection period.	Closed Facebook groups, access only with a Facebook account. Groups that deal solely with vegan topics in Austria, respectively Graz. Österreich Vegan: 5484 members*; [[Vegan @ Graz]]: 1577 members*.	n = 111 (20.00%)

Restaurants: Café Erde; Cofeba; Die Erbse International; Ginko; Go Nutz Vegan Coffeeshop; Mangolds; Parks; Postgarage Cafe; Tischlein deck dich	Hard-copy distribution in vegetarian and vegan restaurants. After contact, cooperation could only be accomplished with Café Erde, Tischlein deck dich and Mangolds.	Customers at vegan or vegetarian restaurants located in Graz (VGT, 2016). Copies of the surveys were placed in prominent places in the restaurants.	n = 46 (8.30%)
Veggie Planet: Verein Gegen Tierfabriken (VGT); Team Vegan	Snow-ball sampling at fairs, contacts to relevant groups established through contact person.	VGT: members of activist group for animal welfare, number of members or means of survey provision unknown. Team Vegan: vegan sports team in Graz, number of members or other characteristics unknown.	<u>VGT e-mail:</u> n = 38 (6.80%)
Veggienale: Visitors	Presence of researcher during the fair; however, participants during the event were used for the pre-test. Collected e-mail addresses were used for the actual survey.	Fair held in Graz on the 4 th and 5 th of June (Veggienale, 2015). Fair catered to people interested in a vegan lifestyle and consumption.	<u>Fairs:</u> n = 14 (2.50%)
University Email System	Online access through the university communication system.	Email contact with registered students at the University of Graz. Number of reached students is unknown.	n = 313 (56.30%)
High school	Contacts established with teacher of a high school.	Age of prospective participants: 14-18 years old. Participation through input of teachers.	n = 24 (4.30%)
Other means	Private distribution and other means.	If possible, participants were encouraged to distribute the survey among friends, family or other interested persons.	n = 10 (1.80%)

* as in June 2016

Table 2: Sampling strategies and return rates.

The complete sample consisted of 556 participants, with a high proportion of female participants (n = 443, 79.70%) and a comparatively low number of male participants (n = 113, 20.30%). With regards to their age, the majority of the participants was in their mid to late 20s (mean = 28.45 years old, mode = 24.00 years), 50.00% were between 22 and 31 years old. Given the sampling method, the average age structure can be explained by the university e-mail distribution system, as 56.30% of the participants (n = 313, mean = 26.55 years old) were reached through this sampling strategy. This bias also becomes apparent in the educational level, 0.90% (n = 5) completed only compulsory schooling, 12 subjects (2.20%)

finished vocational training, 40.60% (n = 226) finished secondary or high school, and finally, 313 participants (56.30%) completed tertiary education. Employment status was mainly distributed between students (54.90%) and employees (33.10%). The majority of participants were either single (n = 236, 42.20%) or in a relationship (n = 246, 44.20%), a small portion was married (n = 55, 9.90%) and the rest stated some other status (widowed, divorced or other). 61.60% (n = 331) of the participants indicated Graz as their place of residence, 9.7% (n = 52) Vienna, 24.80% (n = 133) had their home in other cities or places with less than 50,000 inhabitants and 1.10% (n = 6) did not reside in Austria.

These sample characteristics (female, young and educated) are, although biased, in line with typical socio-demographics of a person more likely to adopt a vegetarian or vegan diet (Ruby, 2012). Nonetheless, a representative sample was not a goal of this research, hence, a representative sample was not targeted.

3.2. Survey Structure and Measures

The survey was implemented with the software LimeSurvey. Before its publication, the critique and comments from the pre-test were integrated.

Altogether, the survey consisted of several sections questioning various aspects of the participants' daily life. One section questioned the amount of persons in the participants' household, family and close friends. From these social groups, the number of vegetarians and vegans were queried.

3.2.1. Dietary Practices and Identities

Previous research illustrated that there is a discrepancy between an individuals' self-identification among the dietary groups and their actual food consumption (Rothgerber, 2014). Therefore, first the participants' rate of consumption with regard to the following animal-derived products was questioned: meat, fish or seafood¹, milk or milk products, eggs or products with eggs. Based on these indications, the average, self-reported dietary consumption was calculated. Only afterwards did the participants indicate their dietary group: (1) Semi-Vegetarian, (2) Vegetarian, (3) Vegan, (4) Nothing like that, (5) Nothing like that, but reduced consumption of meat and/or animal products, (6) Other. Furthermore, participants were asked to indicate the time period that they have been following this diet so far.

3.2.2. Motives

Previous research shows that motives of vegans and vegetarians are not fix and stable (Ruby et al., 2013), but that they also change over time (Stiles, 1998). In order to capture this fluidity, a pair-wise comparison of all four motives where the participants were asked to rate on a nine-point scale which motive influenced them more was implemented (with one motive at the beginning of the scale, and the other one at the end of the scale). The comparison matrix was then created on the basis of the resulting scores (Saaty, 1996). Further calculations, the multiplied matrix and eigenvalues allowed for the assessment and the indication of the strengths of the motive.

¹Only referred to "fish" out of practical reasons

3.2.3. Theory of Planned Behaviour

The TPB is consists of four main concepts: subjective norms, attitude, perceived behavioural control and behavioural intentions. Each one of these concepts was operationalised to fit the respective behavioural categories (see Francis et al., 2004).

Subjective Norm

The calculation of the subjective norm (SN) was based the three reference groups (g): family, friends and household members. First, the participant needed to indicate whether he/she valued the opinion of these groups (assessment of the group's opinion = wo). Answers were entered on a five-point scale: very unimportant, unimportant, neutral, important, very important. The second item was queried for each social group; participants had to rate to which degree the social group would think that they should engage in the following behavioural activities (i.e. the normative belief (nb) that the group (g) thinks that the subject should engage in behaviour j): “take care of the environment”, “take care of animals” (j = 1 - 2). Possible responses ranged from “completely disagree” to “completely agree” on a five-point scale, with the additional option of “do not know”. This thus made it possible to calculate the perception of subjective norms (SN) as follows:

$$SN_j = \sum_{g=1}^{g=3} wo_g \times nb_{gj} \quad (\text{adopted from Conner and Norman, 2005})$$

Attitude

The attitude describes the participants' opinion of the selected activities. Respondents had to rate the activities (j) on four dichotomised features (i). These were split again on a five-point scale with the following items at either end: “(for me) pleasant” to “(for me) unpleasant”; “not very important” to “very important”; “very bad” to “very good”; and “harmful” to “beneficial”. Each combination of descriptors represents a different attitudinal measure (Honkanen et al., 2006).

$$A_j = \sum_{i=1}^{i=4} a_{ij}$$

Perceived Behavioural Control

Perceived behavioural control is made up of two key factors (Francis et al., 2004): the degree of external control which the person is able to exercise the behaviour in question (controllability = c), and the degree to which the person believes in his or her own capacities to perform said behaviour (self-efficacy = se). The variable controllability was measured on a range between “complete control” and “little control”, and self-efficacy was measured on a scale ranging from “very easy” and “very hard”. The final aggregated variable describing perceived behavioural control of behaviour j was computed as follows:

$$PBC_j = se_j \times c_j$$

3.2.4. Behavioural Commitment

The measurement of behavioural commitment was based on the frequency that participants engaged in certain activities with regards to animal well-being and environmental protection.

Also, the subsequent evaluation is based on the frequency. Depending on the behaviour in question a more or less frequent engagement is interpreted as a pro or contra position with respect to the behavioural category. For example, frequent usage of air planes was interpreted as an environmentally harmful activity. A complete overview of the measured environment-related behaviour can be found in *Table 3*.

Resources	Groceries consumption	Clothes consumption	Transportation
Recycling	Organic	Organic	On Foot
Waste reduction	Regional	Regional	Bicycle
Energy consumption	Certification	Certification	Motorbike
		Second-Hand	Public transportation
			Train
			Long distance Bus
			Car
			Car sharing
			Plane

Table 3: Behaviour categories and items of environment-related behaviour measures.

In ***Error! Reference source not found.*** an overview of the measured activities with regard to animal-related behaviour can be found. Hobbies were not rated on a frequency scale, but instead on a five-point scale about the participants' agreement with each activity.

Animal performances	Agreement with hobbies	Cosmetics	Animal products	Meat consumption
Zoo visits	Hunting		Leather	Organic meat
Circus visits	Keeping pets	Content	Coats	Regional meat
Show visits	Horse riding	Animal testing	Honey	Direct sales
	Fishing		Gelatine	Butcher
			Fur	Groceries store
			Down feather	

Table 4: Behaviour categories and items of animal related behaviour measures.

4. Results

4.1. Dietary Practices and Motives

The results are based on the answers of 134 self-defined vegans, 90 vegetarians, 151 conscientious omnivores and 145 omnivores. The higher number of vegans than vegetarians is surprising, since a vegetarian diet is the less strict diet and hence the more popular one. Nonetheless, the conscientious omnivores remain the biggest group, followed by the omnivores.

Because previous research has illustrated that the self-identification does not necessarily overlap with the definition of the dietary category in question (Barr and Chapman, 2002; Robinson-O'Brien et al., 2009; Ruby, 2012; Worsley and Skrzypiec, 1998), the consumption patterns of the participants were also questioned. *Figure 2* illustrates the consumption pattern of various animal-derived products of each dietary group.

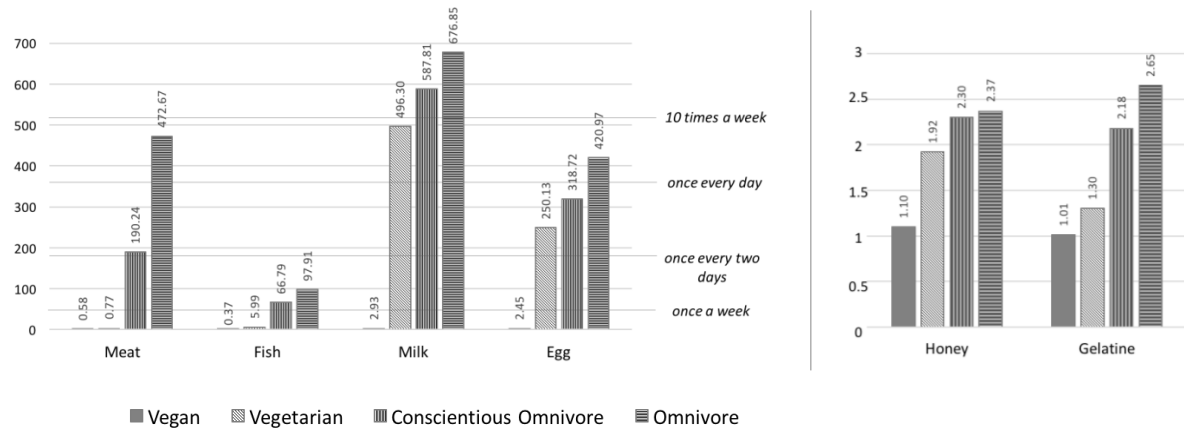


Figure 2: Average food consumption pattern per dietary identity in a year.

Among self-proclaimed vegans there are several individuals that consume meat, fish, milk and egg about once a week or even more often. The higher amount of fish consumption among vegetarians might be due to the popular form “pescetarian”. Overall, the average consumption of fish appears to be relatively low among all dietary groups. One reason could be the traditional Austrian cuisine, which is more dominated by other animal-products and meat than fish and seafood. By definition, the vegetarian’s and conscientious omnivore’s diet is not restricted with regards to milk or egg, yet both groups score lower than the omnivores and higher than the vegans. The consumption frequency of honey and gelatine shows the same pattern as the other food products, the general rule the stricter the diet the lower the consumption frequency still applies.

With regards to the motives, the AHP analysis and the corresponding calculations resulted in the following factor loadings: 43.80% animal welfare motives, 29.08% environment motives, 18.11% health motives and 9.00% taste motives. Other scholars have previously identified similar patterns (e.g. Janda and Trocchia, 2001; Beardsworth and Keil, 1992): animal-related motives are the strongest reasoned, environmental considerations are the second motivational trigger. Health and taste related motives play a smaller role. *Figure 3* illustrates the occurrences of the strongest motive of each participant split up by dietary groups.

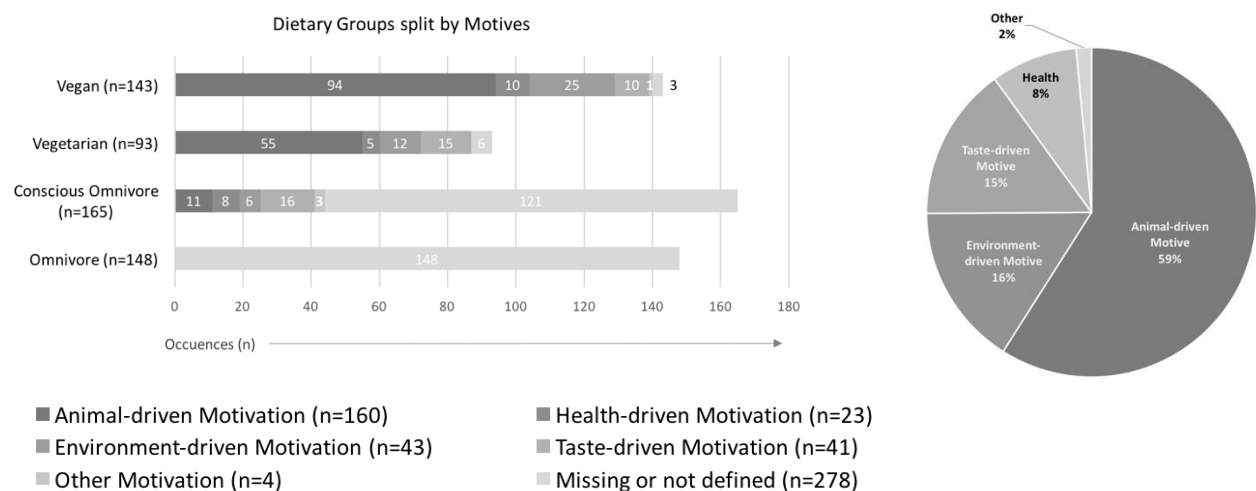


Figure 3: Motive weight distribution in percentage among the vegetarians and vegans.

4.2. Development and Diffusion

4.2.1. The Vegetarians' Development

Participants of this survey adopted their vegetarian diet between the years 1990 and 2016. An illustration in form of a diffusion curve can be found in **Error! Reference source not found.**, the curve is based on the year the participants adopted their current diet. It is apparent that the number of vegetarians is constantly increasing since 1995. In 2004 small oscillations and minor stagnations are visible, but they hardly influence the almost linear trend. Superimposing a linear regression showed that 88.5 percent ($R^2 = 0.8849$) of the variance is explainable by time. In 2010 exactly half of the vegetarian sample adopted their vegetarian diet, this year also marks the point of differentiation between early and late vegetarians.

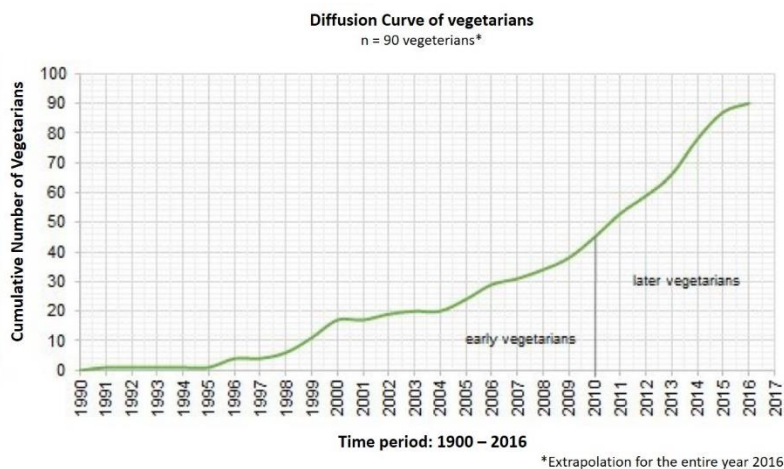


Figure 4: Diffusion curve of the adoption of a vegetarian diet within this sample.

Table 5 compares early adopters of a vegetarian diet with later adopters (split, as explained above, with regards to their duration of diet). The age of early vegetarians and later vegetarians does not differ significantly ($U = 810.5$; $p = 0.139$), this could be explained by the varying time spans since the adoption of a vegetarian diet. Additionally, no differences between the gender distributions are evident. No significant statistical deviation can be found with regard to the annual consumption of animal-derived products.

The motive structure shows the biggest difference between early and later adopters. The animal-related motive is undoubtedly the most important one for both groups, whereby the percentage distribution varies. For 22.2 percent of the early vegetarians (dis)taste played a major role for their dietary change, whereas solely 2.2 percent of the later vegetarians stated this motive as the main reason. Environment-related reasons seem to have gained considerable importance over the years, since later vegetarians indicate this certain motive much more often than early vegetarians do. Health and other motives are almost tantamount for both groups.

Early Vegetarians		Later Vegetarians
> 6 years	Duration of dietary status	< 6 years
29	Rounded mean age	27
	Gender	
88.9 %	Female	88.9 %
11.1 %	Male	11.1 %
	Annual consumption	
0	Meat	0
6	Fish and seafood	6
532	Milk and dairy products	468
237	Eggs and egg products	234
	Motives	
57.8 %	Animal-related	62.2 %
2.2 %	Environment-related	13.3 %
8.9 %	Health	11.1 %
22.2 %	(Dis)Taste	2.2 %
8.9 %	Others	11.1 %

Table 5: Comparison of early and later vegetarians.

4.2.2. The Vegans' Development

Figure 5 illustrates the diffusion of this sample's vegans, the first vegan changed to a vegan diet in 1994. Between 1994 until 2009 not more than 30 participants adopted a vegan diet. Only in 2010 did the number of vegans start to increase considerably. Superimposing a linear regression line onto the vegan diffusion curve shows that 68.7 percent ($R^2 = 0.6872$) of the variance is explainable by the time (t^2). In the vegan sample, the year 2013 marks the point where half of the vegans adopted their current diet.

The comparison between early and later adopters of a vegan diet can be found in Table 6. The average age of early vegans with around 34 years is significantly higher than the average age of later vegans, who are unsurprisingly younger ($U = 1353.5$; $p = 0.000$). The gender distribution shows differences between the early and late vegans: there are 32.8 percent male early vegans, which is almost 15 percentage points or 10 male vegans more than the vegetarian gender distribution. Concerning the annual consumption rates, no significantly deviating results are observable, although it appears that a few early vegans consume milk

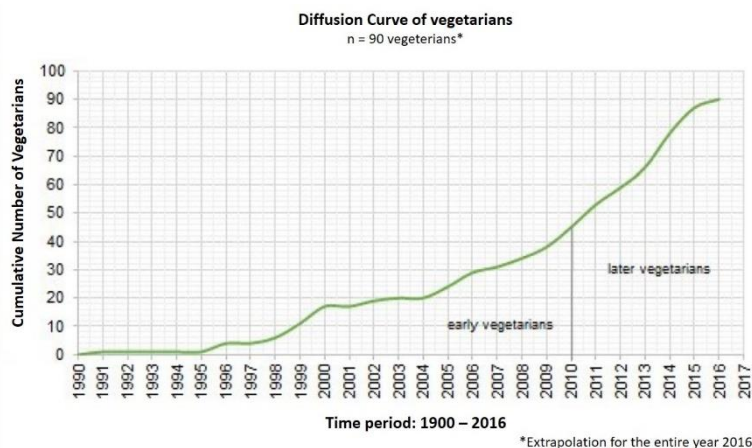


Figure 5: Diffusion curve of the adoption of a vegan diet within this sample.

and dairy products as well as eggs and egg products on rare occasions. Again, animal-related reasons are the strongest motive for both groups. However, the percentage distribution of the motive varies strongly between the two groups. For the early vegans, animal-driven motives appear to be paramount, the other motives only amount to 17.9 percent in total. For later vegans, health reasons are the second strongest motive with a share of 19.4 percent. Environment-related motives were also more frequent with the later vegans than with the early vegans, they amounted to 16.4 %. It can be seen that the other motives gained popularity with the later vegans, especially environment-related reasons and health driven considerations.

Early Vegans		Later Vegans
> 3 years	Duration of dietary status	< 3 years
34	Rounded mean age	27
	Gender	
67.2 %	Female	82.1 %
32.8 %	Male	17.9 %
	Annual consumption	
0	Meat	0
0	Fish and seafood	0
4	Milk and dairy products	0
3	Eggs and egg products	0
	Motives	
82.1 %	Animal-related	55.5 %
7.5 %	Environment-related	16.4 %
6.0 %	Health	19.4 %
1.5 %	(Dis)Taste	3.0 %
3.0 %	Others	6.0 %

Table 6: Comparison of early and later vegans.

4.2.3. Overall Development

Data growth rates for a larger population and the overall relative diffusion curve (of vegans and vegetarians together) of the sample have been created in order to check the validity of the graph. In *Figure 6* results from a representative survey across the Austrian population (APA_OTS, 2013) was used to compare the observed growth rates of this sample. It can be seen that the values of a previously conducted study in 2013 (APA_OTS, 2013) accurately fit the observed growth rate of the vegetarian and vegan sample between 2005 and 2011/2012. Although this sample grew faster than the share of vegetarians and vegans in the IFES study, this could be explained by the accuracy of the population survey (e.g. +/- 3.5% if the sample size was 800) or because of the point in time that the study was conducted (beginning or end of the year).

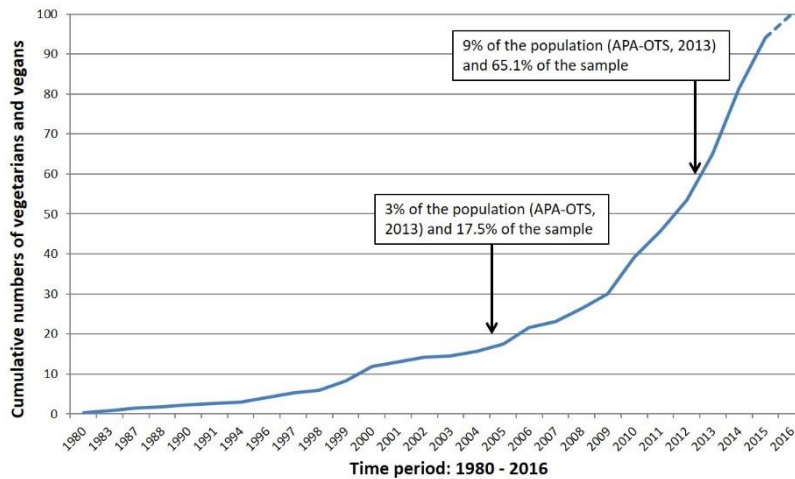


Figure 6: Diffusion curve of the adoption of a vegetarian and vegan diet within the sample compared with the results from a representative survey in Austria.

On the other hand, when looking at the absolute numbers, when the vegetarian and vegan sample changed to their current diet, several tipping points can be observed (see *Figure 7*). These tipping points are also the time periods when deviations occurred from the constant growth patterns of vegans and vegetarians, as observable in *Figure 4* and

Figure 5. These peaks in the years 2000, 2006, 2010 and 2014 could potentially coincide with food scandals which occurred in the same years.

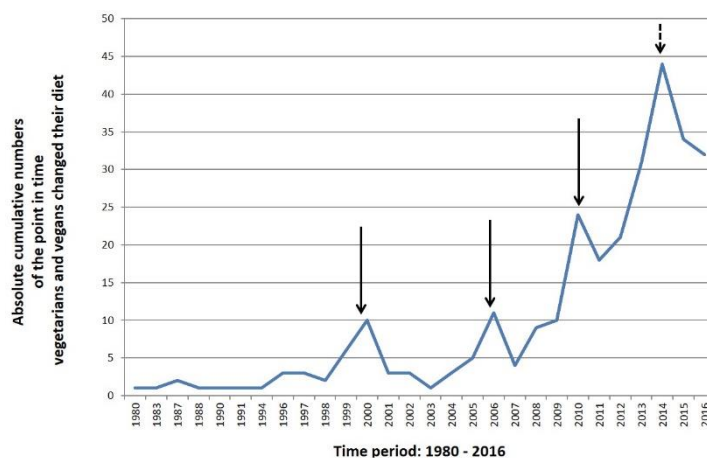


Figure 7: Absolute diffusion curve of the adoption of veganism and vegetarianism of the sample within the time range 1990-2016.

In order to test whether the observed peaks in the dietary adoption curve show an explanatory relation with the aforementioned food scandals, the motives for dietary change in peak years were compared among all respondents. As shown in *Table 7*, the Chi²-test reveals a significant difference in the motive structure, which indicates that (dis-)taste is a stronger motive in periods with food scandals compared to other years.

Adaptation motive	Animal-related	Environment-related	Health	(Dis-)Taste	Total
In other years	113	24	30	11	178
Years with scandals / years with peaks	46	5	5	12	68
Total	159	29	35	23	246
Chi-Square Test	Value	df	Asymptotic significance (2-sided)		
Pearson Chi ²	11.742	3	p = 0.008		

Table 7: Chi-Square test comparing motives frequency in peak years with motive frequency in other years.

4.3. Behavioural Patterns

The results of the behavioural patterns are based on an analysis using the TPB and comparisons of the different dietary groups.

4.3.1. Animal-related Results

Results from the Theory of Planned Behaviour

Figure 8 depicts the statistical results from the bivariate correlation analysis using the concepts from the theory of planned behaviour with respect to animal-related behaviour. It can be seen that there is a high amount of significant correlations. However, from these correlations only few explain a lot of variability in the other variables. Perceived behavioural control and intentions show the highest level of explained variability with 31.00%. The coefficient of determination of the subjective norms is relatively low compared to that of the other concepts, at $r_s = 0.14$. From a statistical perspective, the respective significance values, and hence also r_s , of the motives, matches that of the other concepts in explaining behaviour. It appears that the attitude variable correlates strongly with behavioural intentions, yet, the connection between attitude and behaviour is not as strong. Attitude itself can explain more variation in the intentions than of the actual behaviour.

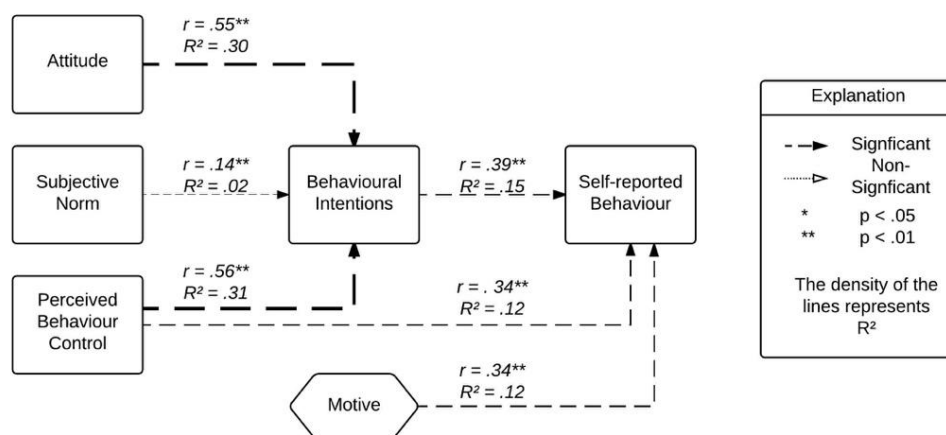


Figure 8: Results of the theory of planned behaviour with regards to animal-related behaviour.

Behavioural Commitment

The results of each measured behavioural activity can be found in *Figure 9*. The reliability of the variable describing all animal-related activities is not high, Cronbach's $\alpha = 0.64$. A reason for this value could be the relatively high variety in mean values of the other behavioural means used to aggregate the overall behaviour variable. As can be seen in the graphical illustration, the mean values as well as the variety differs greatly between the activities. The variable describing the consumption of meat was only available for participants who first indicated in the survey that they consumed meat.

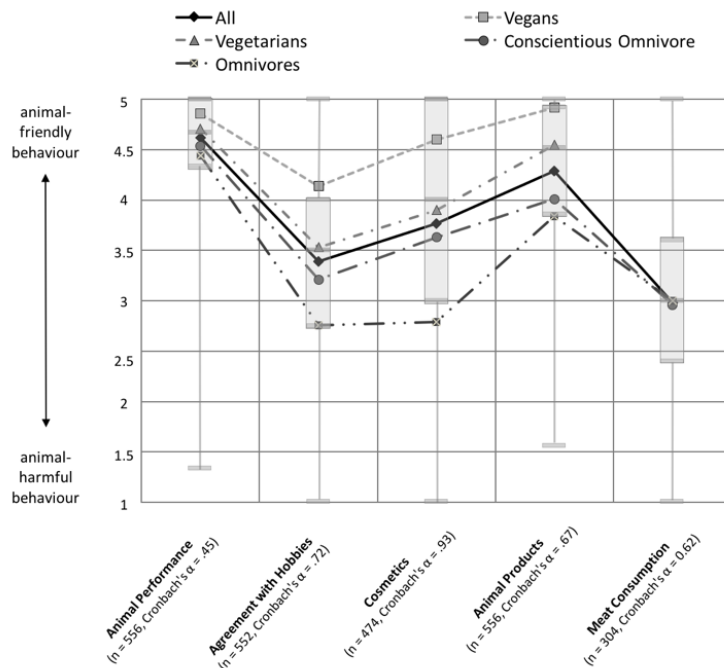


Figure 9: Self-reported behaviour of animal-related activities (n of items =5, Cronbach's $\alpha = 0.64$) in relation to dietary choices.

It can be observed that the mean value of the vegans is continually above the median, and they scored the highest mean of all groups throughout all the activities. The high skewedness of the variable describing animal performances could be explained by the small role that these play in everyday life.

Altogether, there appears to be a pattern: the stricter the diet the higher the average scores (which means the more animal-friendly the behaviour). The data is split by the mean value of all participants: plant-based diet groups scored above the sample's mean and meat-consuming groups scored below the mean.

4.3.2. Environment-related Results

Results from the Theory of Planned Behaviour

As illustrated in *Figure 10*, all concepts appear to correlate significantly with each other. However, the magnitude between these correlations differs. Again, the weakest correlation is overserved between the intentions and subjective norms, with a shared variability of 1.00%. The other measured concepts show a shared variability between 13.00% and 27.00%.

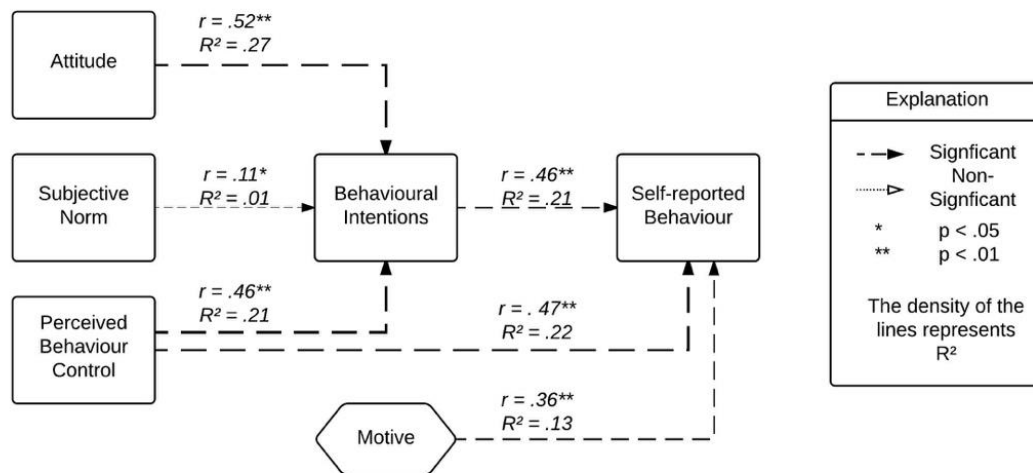


Figure 10: Results of the theory of planned behaviour with regards to environment-related behaviour.

Behavioural Commitment

Figure 11 shows that the same general pattern observed with regards to animal-related behaviour could be observed with regards to environment-related behaviour. The main difference, however, is that the divergence between the mean values is not as clear anymore. Therefore, the observed behavioural differences may not be as significant. Nonetheless, the omnivores scored consistently lower than the other groups.

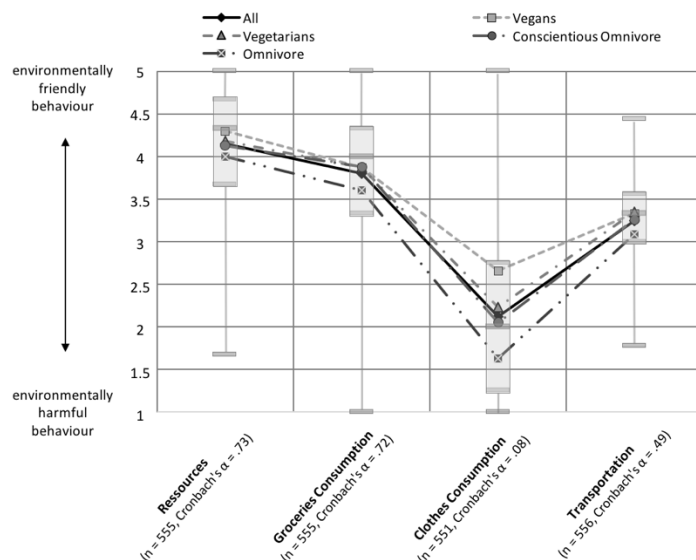


Figure 11: Self-reported behaviour of environment-related activities (n of items = 4, Cronbach's $\alpha = 0.64$) in relation to dietary choices.

Surprisingly, the data distribution with regards to the clothes consumption differs compared to the other activities. The data indicates a stronger trend towards environmentally harmful behaviour, as all mean scores are lower than the value three.

5. Discussion

Altogether, this research provided new insights and new approaches in dealing with vegetarianism and veganism.

The AHP method is a new way of measuring motive structures among vegetarians and vegans. As has already been pointed out by other scholars (i.e. Ruby et al., 2013; Stiles, 1998), motives do change over time or even increase. Also, when comparing early and late adopters of vegetarians and vegans, differences in their motive structures could be observed. In both groups, are the motives which could actively trigger a social innovation the strongest motives: both animal- and environmentally-driven motives are relatively strong in both cohorts. Surprisingly, motives that might be an indicator for social innovation processes – animal welfare, environmentalism, ethical motives – are much more prevalent for early vegans. At the same time, a slight shift towards personal motives for dietary change – health, (dis)taste, other personal reasons – is observable. Interestingly, the exact opposite is true for vegetarians. Within the group of vegetarian respondents, later vegetarians more frequently mention motives that are associated with social innovations. This observation suggests a slight tendency of vegetarian survey participants towards motives that target a contribution to animal welfare and a vital natural environment. According to the findings of Murray et al. (2010), Howaldt et al. (2015) and Schwerk (2015) the corresponding trend regarding decisive motives of vegetarians may serve as an indication for the presence of social innovation processes. Social issues and consequences concerning personal motives such as (dis)taste and health need to be considered differently. Since such motives predominantly refer to personal aspects, they contradict the nature of social innovations as defined by Phills Jr. et al. (2008).

An analysis of the development of the plant-based dietary groups indicates that both groups have gained popularity in recent times. The absolute numbers with regard to the year of adoption indicate possible connections to food scandals such as mad cow disease or the “Gammelfleischskandal” (the rotten meat scandal).

When comparing all dietary groups, several behavioural patterns were observed. Generally speaking, with regards to both animal- and environment-related behaviour, results indicate that a stricter diet also means more conscious behaviour. This reflects what other scholars have formulated before: vegetarians express their convictions also in other behaviour spheres (Fox & Ward, 2008a; Phillips, 2005). With regards to the low significance of social norms it needs to be considered that a vegetarian and vegan diet is already considered outside of the norm. As Stoll-Kleemann and Schmidt (2017) indicated, norms can create barriers to dietary change. Hence, since vegetarians and vegans already engage in a practice outside of the norm, social norms themselves play a smaller role for them.

6. Conclusion

The results suggest that within the framework of the TPB, the motives play an important role in influencing the behaviour of vegetarians and vegans. Particularly animal welfare and environmentalism are stated as main reasons for a vegetarian or vegan dietary change. The correlation analysis of the TPB shows that there are significant relations between motives, subjective norms, attitudes, behavioural intentions and the behaviour in question. Each of these concepts is measured with regard to animal-welfare and environmental protection.

Group comparison of the measured behaviour based on dietary identifications showed that vegans and vegetarians engage in a more environmental- and animal-conscious manner than other groups did. When considering all dietary groups, the results indicate that the differentiation in behaviour is impacted by dietary patterns: the stricter the diet, the stronger the behavioural commitment related to animal-wellbeing and environmental protection. However, further research on beneficial factors for the diffusion of vegetarianism and veganism as social innovation is necessary.

Because of the associated contributions to animal and climate protection, it is possible to respond to socially relevant challenges. In conjunction with the emergence of social movements, vegetarianism and veganism can be linked with the development of social innovations. With regard to environmental motives, when analysing the year of dietary adaptation by means of general diffusion patterns a significant increase can be observed in later adopters. In contrast, food scandals seem to foster animal-welfare and dis-taste as adaptation motives. It seems that (dis)taste is a particular triggered motive which does not account for social innovation perspective. The vegan movement is still in an early adopter (increasing growth) stage; whereas, the vegetarian movement could be approaching a turning point in the near future.

This research covers a wide spectrum of matters related to vegetarianism and veganism. On the one hand, internal processes of partakers were analysed, which provided insights with regards to behavioural commitment and the influence of their convictions outside of the food domain. On the other hand, the evaluation of the previous development of vegetarianism and veganism could illustrate how the dietary practice gained popularity over time. The results suggest that convictions and motives of vegetarians and vegan could qualify them to be a social innovation.

References

- 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.
- Ajzen, I. (1991). The theory of planned behavior. *Organizational behavior and human decision processes*, 50(2), 179–211.
- Ajzen I. (2011). The theory of planned behaviour: reactions and reflections. *Psychology & health*, 26(9), 1113–1127.
- APA-OTS (2013). Neueste IFES Studie bestätigt Veggie-Boom: 9% VegetarierInnen in Österreich! Retrieved April 8, 2017 from http://www.ots.at/presseaussendung/OTS_20130821_ots0142/neueste-ifes-studie-bestaetigt-veggie-boom-9-vegetarierinnen-in-oesterreich.
- Baroni, L., Cenci, L., Tettamanti, M., & Berati, M. (2007). Evaluating the environmental impact of various dietary patterns combined with different food production systems. *European Journal of Clinical Nutrition*, 61(2), 279–286.
- Barr, S. I., & Chapman, G. E. (2002). Perceptions and practices of self-defined current vegetarian, former vegetarian, and nonvegetarian women. *Journal of the American Dietetic Association*, 102(3), 354–360.
- Beardsworth, A., & Keil, T. (1992). The vegetarian option: varieties, conversions, motives and careers. *The Sociological Review*, 40(2), 253–293.
- Berndsen, M., & Pligt, J. v. d. (2004). Ambivalence towards meat. *Appetite*, 42(1), 71–78.
- Conner, M., & Norman, P. (2005). *Predicting health behaviour*. McGraw-Hill Education (UK).
- Connor, M., & Armitage, C. J. (1998). Extending the theory of planned behavior: A review and avenues for further research. *Journal of Applied Social Psychology*, 28(15), 1429–1464.
- Donovan, U. M., & Gibson, R. S. (1996). Dietary Intakes of Adolescent Females Consuming Vegetarian, Semi-Vegetarian, and Omnivorous Diets. *Journal of Adolescent Health*, 18 (4), pp. 292–300.
- Elmadfa, I., & Leitzmann, C. (2015). *Ernährung des Menschen*. Stuttgart: utb.
- Englert, H., & Tölke, A. (2016). Einführung: Vegane Ernährung - Entwicklungen und Aspekte der pflanzlichen Ernährung. In: S. Siebert (Ed.), *Vegane Ernährung* (pp. 11–25). Stuttgart: utb.
- Fleskens, L., & Jorritsma, F. (2010). A behavioral change perspective of Maroon soil fertility management in traditional shifting cultivation in Suriname. *Human ecology*, 38(2), 217–236.
- Fox, N., & Ward, K. (2008a). Health, ethics and environment: a qualitative study of vegetarian motivations. *Appetite*, 50(2), 422–429.
- Fox, N., & Ward, K. (2008b). You are what you eat? Vegetarianism, health and identity. *Social Science & Medicine*, 66(12), 2585–2595.
- Francis, J. J., Eccles, M. P., Johnston, M., Walker, A., Grimshaw, J., Foy, R., Kaner, E. F., Smith, L., & Bonetti, D. (2004). Constructing questionnaires based on the theory of planned behaviour. *A manual for health services researchers*, 2010, 2–12.
- Glick-Bauer, M., & Yeh, M.-C. (2014). The Health Advantage of a Vegan Diet: Exploring the

- Gut Microbiota Connection. *Nutrients*, 6 (11), pp. 4822–4838.
- Greene-Finestone, L. S., Campbell, M. K., Evers, S. E., & Gutmanis, I. A. (2008). Attitudes and health behaviours of young adolescent omnivores and vegetarians: A school-based study. *Appetite*, 51(1), 104–110.
- Hallström, E., Carlsson-Kanyama, A., & Börjesson, P. (2015). Environmental Impact of Dietary Change: A Systematic Review. *Journal of Cleaner Production*, 91, pp. 1–11.
- Haverstock, K., & Forgays, D. K. (2012). To Eat or Not to Eat. A Comparison of Current and Former Animal Product Limiters. *Appetite*, 58 (3), pp. 1030–1036.
- Honkanen, P., Verplanken, B., & Olsen, S. O. (2006). Ethical values and motives driving organic food choice. *Journal of Consumer Behaviour*, 5(5), 420–430.
- Howaldt, J., Kopp, R., & Schwarz, M. (2015). Social Innovations as Drivers of Social Change - Exploring Tarde's Contribution to Social Innovation Theory Building. In: A. Nicholls, J. Simon, & M. Gabriel (Eds.), *New Frontiers in Social Innovation Research* (pp. 29–51). Basingstoke: Palgrave Macmillan.
- Huang, Y.-C., Lin, W.-J., Cheng, C.-H., & Su, K.-H. (1999). Nutrient Intakes and Iron Status of Healthy Young Vegetarians and Nonvegetarians. *Nutrition Research*, 19 (5), pp. 663–674.
- Ingenbleek, Y., & McCully, K. S. (2012). Vegetarianism produces subclinical malnutrition, hyperhomocysteinemia and atherogenesis. *Nutrition*, 28(2), 148-153.
- Janda, S., & Trocchia, P. J. (2001). Vegetarianism: Toward a greater understanding. *Psychology & Marketing*, 18(12), 1205–1240.
- Karali, E., Brunner, B., Doherty, R., Hersperger, A. M., & Rounsevell, M. D. (2013). The effect of farmer attitudes and objectives on the heterogeneity of farm attributes and management in Switzerland. *Human ecology*, 41(6), 915-926.
- Kerschke-Risch, P. (2015). Vegan Diet: Motives, Approach and Duration. *Ernaehrungs Umschau international*, 62 (6), pp. 98–103.
- Markard, J., Raven, R., & Truffer, B. (2012). Sustainability transitions: An emerging field of research and its prospects. *Research policy*, 41(6), 955-967.
- Marlow, H. J., Hayes, W. K., Soret, S., Carter, R. L., Schwab, E. R., & Sabate, J. (2009). Diet and the Environment: Does What You Eat Matter? *The American Journal of Clinical Nutrition*, 89 (5), 1699–1703.
- Mateo, J. R. S. C. (2012). The renewable energy industry and the need for a multi-criteria analysis. In *Multi Criteria Analysis in the Renewable Energy Industry* (pp. 1-5). Springer London.
- Murray, R., Caulier-Grice, J., & Mulgan, G. (2010). *The open book of social innovation* (p. 2). London: National endowment for science, technology and the art.
- Nosek, B. A., Banaji, M. R., & Greenwald, A. G. (2002). E-Research: Ethics, Security, Design, and Control in Psychological Research on the Internet. *Journal of Social Issues*, 58(1), 161–176.
- Peattie, K. (2010). Green consumption: behavior and norms. *Annual Review of Environment and Resources*, 35(1), 195.
- Petriz, H. (2017). *Vegetarianism and Veganism from a Social Innovation Perspective*. Master's thesis, University of Graz.
- Phillips, F. (2005). Vegetarian nutrition. *Nutrition Bulletin*, 30(2), 132–167.
- Phills Jr., J. A., Deiglmeier, K., & Miller, D. T. (2008). Rediscovering Social Innovation.

- Stanford Social Innovation Review, 2008, pp. 34–43.
- Ploll, U. (2017). *Motives of Austrian Vegetarians and Vegans and their Behavioural Expressions*. Master's thesis, University of Graz.
- Povey, R., Wellens, B., & Conner, M. (2001). Attitudes towards following meat, vegetarian and vegan diets: an examination of the role of ambivalence. *Appetite*, 37(1), 15–26.
- Robinson-O'Brien, R., Perry, C. L., Wall, M. M., Story, M., & Neumark-Sztainer, D. (2009). Adolescent and young adult vegetarianism: better dietary intake and weight outcomes but increased risk of disordered eating behaviors. *Journal of the American Dietetic Association*, 109(4), 648-655.
- Rothgerber, H. (2014). A comparison of attitudes toward meat and animals among strict and semi- vegetarians. *Appetite*, 72, 98–105.
- Rozin, P., Markwith, M., & Stoess, C. (1997). Moralization and becoming a vegetarian: The transformation of preferences into values and the recruitment of disgust. *Psychological Science*, 8(2), 67–73.
- Ruby, M. B. (2012). Vegetarianism. A blossoming field of study. *Appetite*, 58(1), 141-150.
- Ruby, M. B., Heine, S. J., Kamble, S., Cheng, T. K., & Waddar, M. (2013). Compassion and contamination. Cultural differences in vegetarianism. *Appetite*, 71, 340–348.
- Saaty, T. L. (1996). *The analytic network process*. Pittsburgh: *RWS Publications*.
- Schwerk, A. (2015). Strategische Einbettung von CSR in das Unternehmen. In: A. Schneider & R. Schmidpeter (Eds.), *Corporate Social Responsibility. Verantwortungsvolle Unternehmensführung in Theorie und Praxis* (2nd ed., 519-542). Berlin: Springer.
- Sheppard, B. H., Hartwick, J., & Warshaw, P. R. (1988). The theory of reasoned action: A meta-analysis of past research with recommendations for modifications and future research. *Journal of consumer research*, 15(3), 325–343.
- Spencer, E. H., Elon, L. K., & Frank, E. (2007). Personal and professional correlates of US medical students' vegetarianism. *Journal of the American Dietetic Association*, 107(1), 72-78.
- Stiles, B. (1998). Vegetarianism: Identity and experiences as factors in food selection. *Free Inquiry in Creative Sociology*, 26(2), 213–226.
- Stoll-Kleemann, S., & Schmidt, U.J. (2017). Reduzierter Fleischkonsum als Vehikel für die große Transformation: Voraussetzungen und Realisierungschancen. *GAIA-Ecological Perspectives for Science and Society*, 26(4), 364-365.
- Strecker, T. (2016). *EVU Position Paper: Definitions of "Vegan" and "Vegetarian" in Accordance with the EU Food Information Regulation*. <http://www.euroveg.eu/wp-content/uploads/2015/06/EVU-PP-Definition-FIC-May2016.pdf>. Last access: 12-03-2017.
- Vermeir, I., & Verbeke, W. (2006). Sustainable Food Consumption: Exploring the Consumer "Attitude - Behavioral Intention" Gap. *Journal of Agricultural and Environmental Ethics*, 19(2), 169–194.
- VGT (2016). Vegetarisch/Vegane Gastronomie. Retrieved April 19, 2016 from <http://vgt.at/service/vegetarismus/restaurants/index.php>.
- Vinnari, M. (2008). The Future of Meat Consumption — Expert Views from Finland. *Technological Forecasting and Social Change*, 75 (6), pp. 893–904.
- Worsley, A., & Skrzypiec, G. (1998). Teenage vegetarianism: prevalence, social and cognitive contexts. *Appetite*, 30(2), 151-170.