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Article

Societal acceptance and environmental impact of sustainable diets: A comparative study of vegetarian, vegan, and flexitarian diets with similar transportation distances

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Abstract: The study examines the acceptance and sustainability of vegetarian, vegan, and flexitarian diets, focusing on the health and environmental benefits of reducing animal-derived proteins. Our objective was to investigate the level of acceptance of these dietary trends across different age groups and health statuses and understand how sustainability awareness and health consciousness impact dietary decisions. We used a mixed-method approach to achieve this, conducting eight in-depth interviews and a survey with 329 participants from various demographic backgrounds. Our qualitative analysis revealed that individual and family health consciousness, along with sustainability considerations, play a significant role in dietary choices, particularly among younger generations who are more open to sustainable eating. Quantitative results show that access to information and educational resources strongly influences dietary decisions, further supporting the spread of environmentally conscious eating habits. The practical significance of our research lies in highlighting the importance of educational campaigns and public health policies that can foster broader societal acceptance of sustainable diets. Educational institutions and community organizations can help facilitate the transfer of knowledge necessary for adopting such diets. Our findings emphasize the role of targeted communication strategies in increasing awareness of the benefits of plant-based diets. Furthermore, these insights underline the potential of policy interventions to make sustainable food choices more accessible and appealing to a wider population. Future research could focus on exploring economic incentives and examining long-term health and environmental outcomes associated with these diets.

Keywords: sustainability; plant-based diet; mitigation of climate change; social acceptance; environmentally conscious eating

1. Introduction

The reduction of meat consumption can be examined from various perspectives, including sustainability, social acceptance, and individual insight. The issue of global climate change and the maintenance of ecological balance are particularly important in today's society, where an environmentally conscious lifestyle is increasingly emphasized. The benefits of a plant-based diet in this context are not only significant for the environment but also for our health. Sustainable nutrition, when ecological positives are accompanied by economic and social impacts, can lead to a healthier future (Purvis et al., 2019). Food safety and sustainability are key issues in the modern food industry. Research in Hungarian dairy plants highlights the importance of measuring and reducing food losses. Minimizing losses not only brings economic

benefits but also contributes to a sustainable food supply. Effective loss management can reduce environmental pressures and ensure a high level of food safety, which is essential to safeguard consumer health and natural resources (Tóth et al., 2021).

We have compiled the factors for improvement in these three areas (**Table 1**). The aim of our publication was to link consumers' ages and their beliefs about meat consumption. We also examined the relationship between family and individual healthy eating habits. The study's evaluations are only valid under the condition of identical food transportation distances.

Table 1. Social, economic, and ecological factors.

Pillars	**Factors**
Social	The acceptance of vegetarian, vegan, and flexitarian diets is socially variable. People belong to different groups, which affects acceptance.
	Individual and family health consciousness influences dietary decisions and acceptance.
	The social environment often influences Individuals' decisions, including messages and norms conveyed by friends, family, and media.
Economic	Economic factors such as price, availability, and product quality are essential for supporting sustainable diets and convincing consumers.
	Changes in dietary preferences and consumer habits can lead to market changes, such as the emergence of new products and services.
	The availability of healthy and sustainable foods often depends on the economic situation, which can influence people's decisions.
Environmental	Reducing the consumption of animal-derived proteins can have a significant impact on emissions and the mitigation of climate change.
	Vegetarian, vegan, and flexitarian diets promote a more sustainable lifestyle and draw attention to the environmental impacts associated with dietary decisions.
	Consuming plant-based foods instead of animal products requires less water and energy production, contributing to the conservation of natural resources.

Among the factors influencing dietary decisions, perhaps the most important is the lower emission of greenhouse gases. The meat industry, particularly livestock production, significantly contributes to the emission of greenhouse gases such as methane and nitrogen oxides into the atmosphere. These gases play a critical role in the progression of climate change. Research, such as that by Keller and Bocsková (2020) and Balsa-Budai and Szakály (2023), supports the notion that plant-based diets can significantly reduce the emission of these harmful gases, thereby contributing to climate change mitigation. The production of meat not only contributes to the emission of gases but also involves significant water and energy consumption. Animals require feed and drinking water, which entails intensive resource use. According to Horn (2018), breeding animals is a time-consuming process that requires substantial human and financial resources. In contrast, plant-based diets demand fewer resources, reducing the ecological footprint. Minimizing food loss during production is also vital for sustainability. In the dairy industry, around 0.9%–1% of daily milk intake is lost due to processing inefficiencies, but improving automation and supply chains can help reduce these losses (Tóth et al., 2021).

The meat industry plays a significant role not only in greenhouse gas emissions but also in land use. Producing one kilogram of meat requires several hectares of land

for feed production, whereas plant-based foods require significantly less land (Godfray et al., 2018). This makes plant-based diets more sustainable in terms of land use.

Intensive agriculture and deforestation, often driven by the meat industry, threaten biodiversity. The spread of plant-based diets can reduce the extent of deforestation, contributing to the preservation of ecosystems and species (Tilman and Clark, 2014). In addition to environmental impacts, plant-based diets offer health benefits, such as reducing the risk of cardiovascular diseases (Willett et al., 2019). While this is not a directly environmental argument, sustainability considerations are often linked to promoting a healthier lifestyle. Animal farming typically requires significantly more water than plant farming. Producing one kilogram of beef, for example, requires approximately 15,000 liters of water, while grains or vegetables require only a fraction of this amount (Hoekstra and Chapagain, 2007). Thus, plant-based diets help conserve water resources. Plant-based food production is more easily integrated into the principles of a circular economy. Food waste and by-products can be more easily reused as animal feed or biogas, reducing waste and increasing energy efficiency (Fiala, 2019).

Local production and reduced transportation emissions

Promoting plant-based diets can encourage local food production, reducing emissions generated during food transportation. Locally grown plant-based foods require less logistical and energy resources (Weber and Matthews, 2008).

Preserving biodiversity is also a critical issue. Livestock farming often involves deforestation and intensive use of arable land, which endangers the habitats of wild animals and plants. Plant-based diets generally require less land, thus reducing the need for deforestation and promoting the conservation of natural habitats. Bíróné Asbóth (2019) points out that lower land requirements pose less threat to biodiversity and create an opportunity to curb deforestation. Recent studies also highlight the link between environmental sustainability and broader societal changes such as financial security and corruption (Kálmán et al., 2024b; Kálmán et al., 2024c), indicating that moving towards more sustainable practices could potentially improve not only ecological conditions but also social and economic stability. Plant-based diets require less land for food production, contributing to sustainability. The reduction in land designated for livestock farming can aid in the preservation of natural habitats and the fight against deforestation. In this context, the work of Bíróné Asbóth (2019) and Vetőné Mózner (2014) highlights that a plant-based diet offers a more sustainable approach to food production. Further research in Hungary emphasizes the importance of sustainable choices in dietary habits as part of larger societal shifts towards financial security and reduced environmental degradation (Németh et al., 2024). Overall, prioritizing plant-based diets and reducing meat consumption plays a crucial role in protecting our health and contributes to mitigating global climate change, employing a more efficient use of resources, and preserving biodiversity and natural habitats. Therefore, it is important that we consider and support dietary changes at both societal and individual levels. The support covers the proper teaching of knowledge in accordance with the new educational paradigm and the transforming teacher-student relationship (Kálmán, 2022).

The social acceptance of vegetarian, vegan, and flexitarian diets is not solely a personal choice but is also influenced by societal factors. Educational level, age, and religious beliefs (Miassi et al., 2022) all play a role. Health misconceptions and social stigma, which can be addressed through education and awareness campaigns, also significantly shape dietary decisions (Shah and Thanki Joshi, 2024). For those who choose these diets, awareness, motivations, and supportive social circles are vital (De Groeve et al., 2022). Economic reasons can also motivate consumers; the high cost of meat leads many to switch to a flexitarian diet (Aschemann-Witzel and Janssen, 2022). The influence of economic factors is particularly strong in the event of a crisis (Kálmán et al., 2021). This highlights the potential for societal change and the importance of creating an environment that supports and encourages these dietary choices.

2. Materials and methods

We conducted quantitative research in several northwestern Hungarian towns and the capital city. Data collection took place from 1 September to 30 November 2023. Our respondents were over 20 years old. After cleaning and filtering the responses, we worked with a sample of 329 individuals. Following data entry and import in SPSS, we examined correlations for Likert scale responses, conducted paired *t*-tests, and performed cross-tabulation analysis for non-scale but ordinal variables. Our findings were supported by three in-depth interviews. We inquired how crucial sustainability is in dietary choices. This section of the publication offers valuable perspectives. When formulating our hypotheses, we primarily relied on subjective observations, exploring the relationships between family, age, sustainability, and diets containing moderate amounts of animal protein.

H1: For our respondents, forming and supporting sustainable eating habits among family members is more important than focusing on their own sustainable eating. H1/1: The formation and support of sustainable eating habits among family members are closely linked to the respondents' own sustainable eating behaviors. The more emphasis an individual places on the sustainability of family eating habits, the more inclined they are to opt for more sustainable food choices themselves.

H2: Middle-aged adults have a particularly positive attitude towards sustainable diets, such as vegan and vegetarian diets, which reduce greenhouse gas emissions and the use of natural resources. H2/1: Positive attitudes towards a strict vegan diet and its sustainability benefits vary by age group, providing the opportunity to tailor communication and educational strategies to popularize sustainable diets across different age groups.

We have summarized the demographic distribution of respondents in **Table 2**.

Table 2. Demographic distribution of the sample.

Demographic characteristics			**Place of residence**		
Gender				fő (n)	%
	fő (n)	%	Village	55	16.7
Male	60	18.2	Small town*	45	13.7
Female	268	81.5	Large city**	153	46.5
No response	1	0.3	Capital	72	21.9
Total	329	100.0	No response	4	1.2
Age			Total	329	100.0
	fő (n)	%	Education		
20–29 years	67	20.4		fő (n)	%
30–39 év years	141	42.9	8 years of primary education	2	0.6
40–49 év years	63	19.1	vocational qualification	14	4.3
50–59 év years	29	8.8	bachelor's degree	102	31.0
60 years or above	29	8.8	master's degree	209	63.5
No response	0	0.0	No response	2	0.6
Total	329	100.0	Total	329	100.0

Note: * less than 20,000 people, ** at least 20,000 people.

3. Results and discussion

Table 3 provides a summary of the current and past adherence to the dietary habits under study.

Table 3. Dietary practices in the sample.

Diets	**Flexitarian**		**Vegan**		**Vegetarian**	
Opinions	Frequency	%	Frequency	%	Frequency	%
Have Not Followed, and Do Not Wish To	237	72.0	248	75.4	214	65.0
Have Not Followed, but Would Like To	66	20.1	30	9.1	42	12.8
Followed for a Short Time	5	1.5	30	9.1	36	10.9
Followed Multiple Times for a Short Period	10	3.0	13	4.0	11	3.3
Followed for an Extended Period	6	1.8	1	0.3	16	4.9
Currently Following	5	1.5	7	2.1	10	3.0
Total	329	100.0	329	100.0	329	100.0

Note: * less than 20,000 people, ** at least 20,000 people.

The third table shows how many of our respondents currently follow, have followed, or plan to follow the dietary guidelines of the given diets. Most participants have not followed any of these diets and do not intend to, with approximately 72%, 75.4%, and 65% in the three groups, respectively. The vegan diet received the highest level of rejection. In the "have not followed, but would like to" category, interest was lower: 20.1% for the flexitarian, 9.1% for the vegan, and 12.8% for the vegetarian diet. There is notable interest in the flexitarian lifestyle, though it remains to be seen

whether these plans will be realized in the near future. The "followed multiple times for a short period" and "followed for an extended period" groups represent low proportions across all three diets, and the "currently following" category is also small. However, it is highest for the vegetarian diet at approximately 3%.

We conducted a paired t-test to determine whether individuals consider the health of their family's diet to be more important than their own eating habits. The fourth table demonstrates that, for the majority of respondents, the health of family members is more important than their own health.

Based on the results of **Table 4**, our first hypothesis was clearly confirmed, which suggests that individuals regard the healthy eating of family members as more important, while they are more tolerant of their own eating habits. H2/1 hypothesized a correlation between the two opinions, and this indeed exists, $p < 0.001$. **Table 5** illustrates our cross-tabulation analysis. We explore the relationships between age and diet type. The fifth table presents the percentage of respondents by age group who attribute positive health effects to the examined diets. The total percentages do not add up to 100% because the table reflects the proportion of the entire sample who attribute positive effects to diets.

Our second hypothesis posited that the middle-aged group is most confident in the positive effects of the three special diets on health and well-being. Furthermore, our sub-hypothesis suggested that there might be some variation in the popularity of the vegan diet among different age groups. Both our main and sub-hypotheses were confirmed, as we found the vegetarian and flexitarian diets to be popular among those aged 30−39, while those who favor veganism tended to be in the 40−49 age group (**Table 5**).

Table 4. Personal and family members' nutrition.

Questions	Pairwise difference			*t*	df	Significance
	Average difference	St. deviation	St. error			
The importance of healthy nutrition for oneself and family members	−0.225	1.733	0.096	−2.354	328	0.019

Table 5. Age and special diets.

Diets	Age						All together
	Perceived effect	20−29 years	30−39 years	40−49 years	50−59 years	60 years and over	
Vegan	Improves well-being and health status	17.9%	22.0%	36.5%	6.9%	24.1%	22.8%
Vegetarian		22.4%	28.4%	22.2%	24.1%	13.8%	24.3%
Flexitarian		23.9%	31.9%	23.8%	24.1%	13.8%	26.4%

In-depth interviews

Our first interviewee is a devoted, single mother who raises two young children with high standards and great attention to detail. As a successful professional in a stable financial situation, she is able to shape her family life consciously and environmentally responsibly. She is committed to sustainability and environmentally conscious living, which she strives to impart to her children in their daily lives. When choosing her diet, she prioritized environmental sustainability. She consciously tries

to minimize the consumption of animal-derived products and is aware of the significant environmental impact of livestock farming. She is concerned about the future of our planet and the preservation of resources and wants to ensure a healthy, sustainable environment for her children and, hopefully, for her grandchildren as well. She has chosen a flexitarian diet as it allows her to significantly reduce meat consumption without eliminating it from her diet completely. This approach fits well with her family life, too. Her children consume meat, as she believes that a balanced and varied diet is essential for their development. When her children eat meat, she consumes the leftovers, thus avoiding unnecessary food waste. She does not buy meat for herself, further reducing her ecological footprint. This decision is important not only for the positive impacts on environmental sustainability but also because it provides an opportunity to set a practical example for her children about commitment to sustainability. It is important to her that her children are also aware that every decision we make, which includes our dietary habits, has environmental consequences, and it is vital to make conscious choices.

Our next interviewee is a young woman preparing to become a veterinarian. Even before her high school graduation, she is consciously shaping her future, not only professionally but also personally and environmentally. As an ovo-lacto vegetarian, she consumes dairy products and eggs but does not eat meat. This decision stems not only from her love for animals but also from environmental concerns. She is aware that while many choose the vegetarian lifestyle out of empathy for animals, she sees it as significantly contributing to the protection of our planet. The young woman is not just a passive observer of environmental issues, but an active participant in making a change. She actively promotes selective waste collection, not only at home but also in her community. Packaging-free shopping is particularly important to her, so she frequently visits local markets and zero-waste stores where she can shop with her own containers. She avoids using plastic and consciously chooses products that place less environmental burden on the Earth. In her statement, she emphasizes that living an environmentally conscious lifestyle is not just a personal choice but also part of a broader community responsibility. “As my high school graduation approaches, I become increasingly aware that every decision I make has far-reaching consequences. As a vegetarian, I protect not only animals but also the environment. Livestock farming comes with significant environmental impacts, including the emission of greenhouse gases, resource demands, and the reduction of biodiversity. These facts motivated me to choose this path. I hope that by setting an example, I can inspire other young people to consider a more sustainable lifestyle.” Her love for animals and nature guides her in developing a sustainable and environmentally friendly lifestyle, which could serve as an exemplary model for her peers. Our third interviewee, who started a family later in life, in his fifth decade, adopted a vegan lifestyle following medical advice he received for treating an infection contracted during his service in the armed forces. Since changing his diet, his health has shown continuous improvement, which motivates him to maintain this lifestyle. However, he must be vigilant in ensuring that he consumes enough nutrients to keep his physical condition from deteriorating, as the new diet poses particular challenges. He consciously strives to reduce the negative environmental impacts with his vegan lifestyle, yet he remains deeply skeptical about the future. He feels that although his efforts help to some extent, the overwhelming

global environmental problems are insurmountable and unchangeable. This realization often causes him doubt, as he believes that individual actions have little impact on solving more significant environmental issues.

Studies related to a healthy lifestyle have demonstrated the particular positive effects of vegetarian and vegan diets. Meat eaters often smoke more, consume more alcohol, and engage in less physical activity. Vegans also enjoy additional benefits from their dietary habits. They consume a lot of whole grains, legumes, and seeds. Reducing meat consumption thus plays a prominent role in preventing chronic diseases and maintaining health (Gili et al., 2019). In addition, the balance of omega-3 and omega-6 fatty acids, commonly found in certain foods, is essential for reducing health risks and promoting well-being (Ivancsóné Horváth and Kőmíves, 2024). According to Miguel and colleagues (2023), ecological factors also motivate followers of plant-based, non-vegan diets. They are concerned about the state of the natural environment and are interested in animal welfare. Vegans are primarily driven by animal protection and ideological views. A study in Germany looked at the health status of vegans, where they generally have a relatively low body mass index, and minimal alcohol consumption and smoking have been observed among them. Detailed studies indicate the need to supplement certain vitamins and minerals, including calcium, iodine, and cobalamin (Waldmann et al., 2003). Vegetarian and vegan diets are associated with a lower risk of cardiovascular diseases, type 2 diabetes, and certain cancers. However, concentrations of omega-3 fatty acids, proteins, calcium, zinc, iron, and vitamins B12 and D may be low. While vegetarian and vegan lifestyles offer many benefits, they can also lead to nutrient deficiencies (Petti et al., 2017). It has also been observed that sustainable city tourism trends can be linked with shifts in dietary practices. Cities like Budapest and Mumbai have been analyzed for their approaches to sustainable tourism, which also reflect broader lifestyle trends such as increased vegetarian and vegan preferences due to health and environmental awareness (Kálmán et al., 2024a). These shifts reflect the global interconnectedness of urban tourism and lifestyle changes, where ecological awareness plays a significant role.

Dietary choices among men have been examined as a separate category. They adhere to special diets when personal values are complemented by social support and appropriate information availability (Banyte et al., 2022). For women, combining a vegetarian and Mediterranean diet with physical activity and sufficient sleep leads to better well-being (Kaluza et al., 2023). Individuals with learning difficulties also often opt for a meat-free diet, where compassion towards animals is vital for them (Bates, 2021). Finally, it is important to note that maintaining a vegan lifestyle requires community support and motivational tools. The guideline for teenage vegetarians is: "I see how they treat animals, and I don't like it" (Bates, 2021; Cherry, 2014). Older individuals, those in childhood, and expectant vegetarians can remain healthy if they consume supplements that influence growth indicators and increase the body's iron content (Axelsson et al., 2024; Vijayakumaran et al., 2023; Weder et al., 2020). Based on the results, it can be concluded that the spread of sustainable diets–mainly vegetarian, vegan, and flexitarian diets–has significant implications at both theoretical and practical levels. Theoretically, this research contributes to a deeper understanding of the relationship between sustainability and dietary habits, highlighting the importance of health awareness at both individual and societal levels and

responsibility toward the environment. Sustainable diets, such as plant-based diets, play a crucial role in combating global climate change by reducing greenhouse gas emissions, water usage, and land use. These findings strongly support theoretical approaches suggesting environmental and social factors can jointly influence dietary habits, strengthening commitment to sustainability.

Practically, our research highlights the growing role of information and education in individuals' decisions. Younger generations, particularly, show a high receptivity to new trends, including environmentally conscious diets. In this regard, education is of great importance, as educational programs implemented in schools and other community settings can contribute to a deeper understanding of sustainability and increase societal acceptance of these diets. The economic aspects of individual decisions are also noteworthy: broader availability of plant-based products, the development of conscious consumer behavior, and market support for sustainable foods can positively impact both individual health and environmental sustainability. Furthermore, it benefits the economic sector when sustainability considerations are integrated into product development and consumer information, such as the production of alternative protein sources or low-carbon-footprint foods. This potential for economic benefits should encourage and motivate the public to support sustainable diets. An additional implication of this research is that social and economic policymakers may consider supporting sustainable diets. For instance, tax policies and pricing strategies could incentivize companies to offer more sustainable products, thereby encouraging the public to choose more environmentally conscious diets. Future research, with the potential to uncover new insights and solutions, should examine changes in the social acceptance of diets across different demographic groups and the role of individual and family health awareness in the spread of sustainable food consumption. The demand for sustainability and healthy eating could also foster the development of sustainable food chains at the community level, which, in the long term, may help reduce ecological footprints and promote a healthy lifestyle.

4. Conclusion

As evident from the discussion, the relationship between age and a diet that limits meat consumption has been examined in multiple publications and, similar to our findings, significant variations have been noted across different life stages. There has been limited research concerning health in relation to both family and personal perspectives. Thus, our observation regarding the priority of family health and its connection to individual health can be considered an original finding. Our questionnaire did not delve deeply into sustainability issues, but our theoretical framework and in-depth interviews addressed the relationship with diet. We can conclude that sustainability considerations significantly influence followers of vegetarian, vegan, and flexitarian diets. Based on the categories compiled in our table, it would be worthwhile to conduct further research examining the dietary decisions of the involved parties from social, economic, and ecological perspectives. Certain limiting factors influence our research results and may affect their generalizability and validity. First, the sample size and geographical limitations—mainly covering the northern regions of Hungary and Budapest—may restrict the ability to draw

conclusions at a national level, especially regarding groups with different socio-economic backgrounds. While the interviews conducted as part of the qualitative research contributed to a deeper understanding of the results, their number was limited and based on individual perspectives, which may not be generalizable to a broader population.

In future research, it would be advisable to expand the sample both geographically and socio-economically to gain a more comprehensive view of the acceptance of sustainable diets across various cultural and demographic groups. A detailed examination of the motivations and barriers to adopting sustainable diets, particularly in relation to individual and family health awareness, could shed light on important factors for promoting social-level support. The questionnaire assessed only a few aspects related to diets containing less animal protein. Further research is needed to determine the extent to which environmental awareness plays a significant role in these choices. However, the study could face challenges, as many respondents might embellish the importance of personal interests. Additionally, it would be helpful to investigate the impact of economic incentives and ecological considerations on the choice of sustainable diets. Social and political interventions, such as education, community campaigns, and subsidies for food prices, may play a role in encouraging the spread of environmentally friendly diets.

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