

# Plant-Based Meat Alternatives: Navigating Consumer Preferences, Health Implications, and Environmental Impact

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Existing food systems pose threats to both human well-being and the environment. Research indicates that a shift towards reduced meat consumption and increased reliance on plant-based foods would align with goals related to climate change mitigation and public health enhancement (Bryant *et al.*, 2019). To facilitate this transition, it is crucial to gain a deeper understanding of the factors influencing individuals' choices of plant-based foods. A robust industry centered around plant-based foods has emerged to cater to consumer preferences and encourage the adoption of plant-based diets. Traditional plant-based diets are characterized by their low energy density, rich nutrient content, and minimal saturated fat, which are believed to offer various health advantages. However, the contemporary fast-paced way of life has fueled a rising demand for plant-based convenience foods that simulate the taste and texture of meat, often through intensive processing. While processing can enhance safety, taste, and nutritional enrichment, it is noteworthy that extensive processing, particularly ultra-processing, has been linked to adverse health effects.

Certain calculations indicate that the production of food is currently accountable for about one-third of human-caused greenhouse gas emissions. Additionally, meat and dairy products necessitate

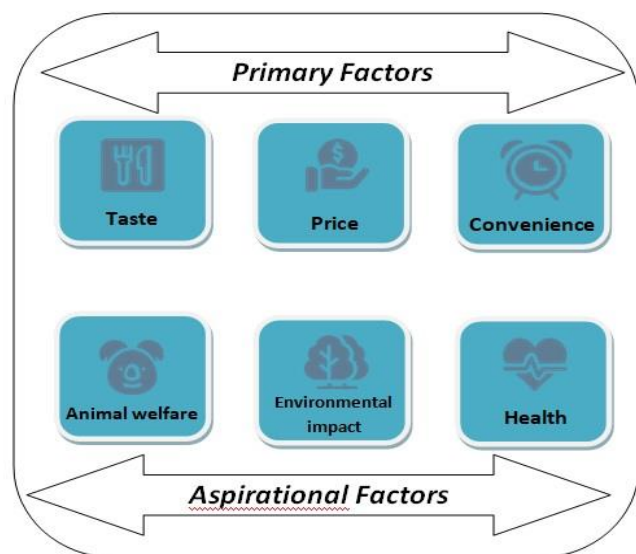
greater land and water usage compared to plant-based foods, potentially contributing to the advancement of deforestation and the decline of biodiversity. Despite being historically perceived as a vital dietary element, supplying essential nutrients like vitamin B12, iron, and calcium, excessive consumption of meat, especially processed varieties, has been linked to specific harmful health outcomes. Current levels of consumption of animal-based protein are at an unsustainable level. In the year 2021, global meat consumption was estimated to reach 328 million metric tonnes, with a projected increase of roughly 70% by the year 2050. The excessive intake of red and processed meat has been linked to an elevated risk of non-communicable ailments such as type 2 diabetes, colorectal cancer, and a decrease in life expectancy (Richi *et al.*, 2015). In fact, the World Health Organization (WHO) categorizes red meat as a Group 2A carcinogen (a probable cause of cancer) and processed meats as a Group 1 carcinogen (a confirmed cause of cancer) (Bouvard *et al.*, 2015).

Innovative plant-based meat substitutes, crafted to mimic the cooking techniques, sensory attributes, and nutritional characteristics of their animal-based counterparts, could present a promising route to assist in achieving the necessary dietary change (Choudhury *et al.*, 2020). This progressive

move towards less meat consumption and greater involvement with plant-derived foods has reportedly led to a flourishing industry centered around plant-based foods. However, expediting this transformation necessitates an enhanced comprehension of the factors that shape decisions related to the selection of plant-based foods.

### Consumer factors impacting the choice of plant-based foods

An individual's food-related actions can be influenced by a variety of intricately interrelated circumstances. General and plant-based food preferences have been observed to be mostly influenced by taste, price, and convenience. These are considered the primary factors. Demand for plant-based foods has increased, more closely matched with aspirational factors due to growing awareness of animal welfare, environmental sustainability, and personal wellness (Figure 1).



**Figure 1: Key factors influencing consumer choice of plant-based foods**

#### A) Primary factors

##### a) Taste

Novel PBMA resembles the sensory characteristics of meat, setting them apart from early generation PBMA like soy and tofu. According to Bryant (2022), PBMA that successfully mimicked the flavour and texture of processed meat have the best chance of displacing products that are based on meat. Numerous studies have stressed the importance of establishing desirable sensory qualities, such as taste, texture, look, and fragrance, in order to win over and retain customers. However, it is extremely difficult to duplicate desired meat qualities. In meat-based analogues, for instance, the higher lipid content adds flavour and texture that aren't present in PBMA, making them less juicy.

Legumes as a substitute protein source may also have a detrimental effect on the flavour. Consequently, taste can be seen as both a barrier and a facilitator. Adoption of PBMA may also be hindered by the influence of hedonic features of pleasure induced in response to perceived sensory characteristics. Consumer linkages between meat and "delicious" as opposed to "disgust" for PBMA were reported by Michel et al (2021). Customer perceptions may provide insightful information, but as they are self-reported, they cannot be directly compared to customer acceptability. High levels of food neophobia and high meat attachment have been identified as major obstacles to the adoption of PBMA. It's interesting to note that vegetarians and vegans are more likely to accept replacements that don't taste like meat, whereas omnivore/flexitarian subgroups prefer items that do.

#### b) Price

Consumer engagement is hampered by the PBMA's allegedly expensive cost (Michel, Hartmann, & Siegrist, 2021). A number of cross-sectional studies

have found that PBMA engagement in the present and the future is significantly influenced by affordability. Survey results may be impacted by sociodemographic variables and respondents' annual income, with cost being identified as a key product attribute among low income groups and those with lower educational outcomes, while engagement with PBMA is reportedly higher among those with higher socioeconomic status (Hoek et al., 2011).. Consumer segmentation may also have an impact on the response: although vegetarians were reportedly more hesitant, meat consumers identified the cost of Quorn as a drawback. While further research into the association between dietary habits and sociodemographic traits is necessary, it is evident that innovative PBMA's pricing is a critical factor in determining whether or not they will be adopted by a variety of consumer sectors.

### **c) Convenience**

Convenience and its alleged impact on self-efficacy may also limit consumption of plant-based diets. Elzerman, van Boekel, and Luning (2013) investigated consumer experiences and contextual factors related to meat substitutes. According to the study, people believed that preparing a desirable dinner using PBMA's would take substantially longer than preparing a similar meal using meat. Since flexitarians and meat eaters are more frequently found in households with children and prioritise time convenience more than meat avoiders, demographic factors may be significant confounders. It is possible to hasten the adoption of plant-based dietary patterns by creating and promoting widely accessible PBMA's that are quick to prepare and contextually suitable meat alternatives.

## **B) Aspirational factors**

While the three main determinants of food choice – taste, price, and convenience – are substantial, animal welfare, environmental impact, and health also play a considerable role.

### **a) Animal welfare**

Animal welfare has consistently served as a motivator for meat avoidance, even while questions about disparities in global meat production standards and problems with the transportation of live animals continue to have an impact on the progressive decline in meat consumption. Neff et al (2018). discovered that, in contrast to other factors like cost and health, just 12% of respondents in the USA mentioned reduced meat intake as a result of concerns about animal welfare. Varying outcomes could stem from consumer subgroup disparities, with rural individuals less impacted than urban counterparts, influenced by animal husbandry experiences or limited access to large supermarkets. Additionally, vegetarians and vegans have a tendency to value animal welfare more highly.

### **b) Environmental impact**

36% of respondents to a recent food standards agency study indicated they would be open to trying plant-based proteins for sustainability-related reasons as opposed to health (39%) and safety (44%). This reinforces the findings that omnivores and semi-vegetarians' adoption of a plant-based diet is more influenced by their own health than by environmental sustainability. Therefore, when it comes to consuming less meat and more plant-based diets, personal health benefits could prevail over altruistic considerations. Age and sex are noted to influence both the level of awareness and importance of the environmental

impact of meat consumption, with these effects appearing to be greatest among younger adults, Millennials, and females as compared to older adults and males. Demographic characteristics of study respondents predict consumer behaviour.

### c) Health

Excessive intake of red and processed meat has been linked to negative health effects, including a higher risk of type 2 diabetes, colorectal cancer, and a shorter life span. Because of this, consumers have changed their eating habits to consume fewer foods derived from animals and more plant-based meals as a result of increased consumer awareness of potential health benefits. Consuming plant-based foods is thought to have health benefits due to their predicted nutritional profile (low energy density, low saturated fat content, rich micronutrient profile), as well as the likely physiological effects of diet adoption (altered cardio-metabolic risk and decreased risk of obesity).

### Health benefits for novel plant-based meat substitutes

Regarding the health benefits of innovative PBMA and their ability to match the nutritional profile of meat-equivalents, the published scientific information is unclear. In their investigation of Australian supermarkets, Curtain and Grafenauer (2019) reported that the majority of PBMA had a healthier nutritious profile than meat-based analogues. For instance, PBMA had much higher levels of dietary fibre and significantly lower levels of calorie density, total fat, and saturated fat. However, just 4% of PBMA products were designated as "low in sodium," indicating that the sodium level of these items was unusually high (Alessandrini *et al.*, 2021). In fact, meat sausages contained considerably more salt than PBMA, whereas plant-based mince had a 6-fold

higher sodium load than the meat-based equivalent. According to several researches, PBMA often contain less saturated fat, more dietary fibre, and much more sodium than their meat-based counterpart. Non-haem iron, which is mostly found in plant-based foods and has a significantly lower bioavailability than haem iron, which is the main form of iron found in foods originating from animals, is another reason why PBMA fortification is necessary.

### Conclusion

Food producers are now acknowledging the need for thorough studies that take into account a variety of factors, such as level of processing and nutritional composition, in order to create products with healthier nutrient profiles. Understanding how prolonged processing affects health impacts may serve to support the implementation of novel techniques intended to maintain linked health benefits. Additionally, expanding our understanding of the nutritional benefits of PBMA will help us spot ways to improve their health profile and encourage consumers to make wise food decisions.

Finally, a better knowledge of the variables affecting target consumer subgroups' involvement with PBMA could aid in the manufacture of appealing, healthier plant-based foods. Such an evidence-based approach to food production has the potential to improve both human and planetary health in the future.

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