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Differences in Asian Consumers' Willingness to Purchase Plant-Based Meat and Alternative Protein Products

Zhishu Zhang[1, *]

[1]College of horticulture, South China Agriculture University, Guangzhou,510262, China
*Corresponding author: 13422363014@163.com

Abstract:

The rapid population growth and excessive consumption of traditional meat resources have led to environmental degradation. Replacing meat consumption with alternative protein products can effectively reduce traditional meat consumption. Some developed countries, such as Singapore and the United Kingdom, have conducted research in this area for many years and achieved some results, with alternative protein products already commercialized. However, active participation from consumers in other countries is still needed. Moreover, alternative protein products cannot be accepted by many consumers in a short period of time. This paper summarizes findings from indicator surveys conducted among consumers in representative countries. It identifies variations in consumption willingness toward alternative protein products among Asian populations and analyzes underlying reasons. Furthermore, it explores technical and ethical challenges that must be addressed before promoting alternative protein products, aiming to provide clear guidance for enterprises regarding the consumption prospects of such products. As environmentally conscious and green consumption concepts gain traction, we believe these obstacles will be expected to be effectively resolved through technological innovation.

Keywords: Artificial meat; Consumption; Alternative protein.

1. Introduction

From 1961 to the present, global meat consumption has increased nearly fourfold. A growing population has expanded livestock farming, with approximately 80 billion animals slaughtered annually to produce 340 million tons of meat for human consumption. In 2022, pork accounted for 34% of global meat consumption, while poultry and beef represented 40% and 22%, respectively. Global pork consumption surged 77% from 63.5 million metric tons in 1990 to 113 million metric tons in 2022, poultry and beef

consumption grew 287% and 49% respectively over the same period. China's total domestic supply of poultry, pork, beef and mutton reached 75.5 million metric tons, whereas the United States—once the world's largest meat consumer—produced only 50.1 million metric tons domestically [1].

Today, global warming is receiving increasing attention worldwide. Human activities are currently raising global temperatures at a rate of 0.2°C per decade. A significant 23% of greenhouse gases originate from land use practices like agriculture, where excessive development of land and fields is leading to the loss of natural habitats and biodiversity. As a major contributing factor, livestock farming accounts for 12%-18% of greenhouse gas emissions [2]. Simultaneously, most environmental pollutants dissolved in animal fats—such as polychlorinated dibenzo-p-dioxins/polychlorinated biphenyls (PCBs), polybrominated diphenyl ethers (PBDEs), and polychlorinated naphthylenes (PCNs)pose hidden risks for numerous cardiovascular diseases and cancers when consumed red meat. In 2015, the International Agency for Research on Cancer classified red meat as a probable human carcinogen (Group 2A) and processed meat as a human carcinogen (Group 1). Overall, human dietary patterns regarding red meat require urgent adjustment, both for the sake of the planet and for human health [1].

Therefore, numerous efforts have been made to reduce traditional meat consumption or increase the production of alternative meat products. Among these, alternative protein products have attracted significant interest from many countries, though in some nations they may still be in the commercial development phase [3]. Alternative protein products can be produced from plants or microorganisms. They primarily include two types: plant-based protein products and microbial protein products. Plant-based protein products extract protein from plants and combine it with other plant components to mimic the texture and flavor of meat as closely as possible [4]. Microbial protein, also known as single-cell protein (SCP), involves cultivating and harvesting microbial cells to meet human food demands [3]. Over the past few decades, multiple technological advancements have significantly accelerated the development of plant protein reconstruction methods.

With Asia's diverse ethnic groups, varied culinary traditions, and large population, red meat consumption remains high. The development status of emerging alternative protein products varies significantly across different countries. By analyzing representative regions, insights can be gained for the future global promotion of alternative protein products.

2. The Current Status of Alternative Proteins in Asian Countries

2.1 China

China's large population and massive meat consumption market are facing the pressure of ecological environment and resource constraints. Understanding China's current consumption landscape can provide valuable reference for developing countries experiencing rapid economic growth. Chinese consumers show limited enthusiasm for alternative protein products, with most respondents expressing "uncertainty" or "willingness to try" regarding these products. This may be influenced by the concept of "the middle way" in Chinese philosophy. Additionally, many consumers lack a clear understanding of alternative protein products, failing to accurately discern differences between various alternative protein types. Consequently, they express concerns about food additives and production processes. Furthermore, the perceived unnaturalness of alternative protein products fosters insecurity and resistance, with some consumers viewing this as an obstacle difficult to overcome. At the same time, respondents expressed relative optimism about the environmental and resource pressures associated with traditional meat consumption, preferring to view alternative protein products merely as occasional novelty items. In summary, Chinese respondents have not yet developed sufficient trust in these products. Due to traditional dietary habits and perceptions, widespread acceptance of a full range of alternative protein products is unlikely in the near term.

2.2 Singapore

In December 2020, the Food Agency of Singapore became the world's first regulatory body to approve the sale of cell-cultured protein products [5].Singaporeans demonstrate high acceptance of alternative protein products. This is due to both the country's advanced economic development and high educational standards, which foster greater awareness of animal welfare issues, and the limited land resources in Singapore. The government actively encourages sustainable land use strategies, providing strong support for the alternative protein industry [6]. In summary, public awareness of this cultivation technology exceeds the global average, enabling people to overcome food aversion and try these products. Furthermore, Singaporeans prioritize safety and health, making them more willing to choose alternative protein products and believe in the health benefits they offer. Finally, Singapore's Muslim population constitutes a significant proportion. Their perspective on alternative protein products reflects a de-

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gree of trust in relevant regulatory bodies. In other words, Muslims are more likely to trust products bearing halal certification, leading to differing views on various types of alternative protein products among this demographic [7].

2.3 Japan

Japanese society shows the highest acceptance for plant-based protein products, then microalgae products, followed by cell-cultured protein products, with insect protein ranking last. This may explain why insect protein often evokes negative sentiments among Japanese consumers. Plant-based protein products benefit from relatively mature R&D technologies and entered the Japanese market early. Surveys also reveal that younger Japanese consumers demonstrate stronger purchasing intention for cell-cultured protein products compared to middle-aged individuals, with youth showing greater concern for animal welfare issues. Furthermore, domestic Japanese publications frequently link cell-cultured protein products to food security concerns, strengthening their influence among the public [8].

2.4 South Korea

South Korean consumers are enthusiastic about a range of derived products made from edible insect protein in alternative protein offerings. The Korea Food and Drug Administration has approved several edible insects [9]. Simultaneously, there is significant consumption of microalgae-based processed foods designed to mimic the texture of chicken. South Korea‘s Nongshim Foods is also actively researching the feasibility of edible insects. Many products like cookies and cereals now incorporate powdered nutrients derived from decomposed insects. Additionally, efforts are underway in South Korea to enhance flavorings by adding partially hydrolyzed plant proteins [10].

3. Influencing Factors

3.1 Product-Related Factors

The physical attributes and functional characteristics of a product are direct factors that affect consumer acceptance. In terms of appearance, consumers often make an initial judgment about a product‘s authenticity and appeal based on visual features such as color, texture, and shape. For example, Japanese consumers particularly value whether high-end alternative protein products feature a “snowflake pattern” resembling natural meat. This visual reality enhances their willingness to purchase [8]. In South Korea, consumers prioritize whether product forms match local dietary customs—such as whether ready-to-eat microalgae snacks or insect protein bars appear clean and appetizing. Additionally, packaging design and color significantly influence consumer perception. Studies indicate green packaging is often associated with health and environmentalism, making it more appealing to eco-conscious consumers [11]. In South Korea, many alternative protein products adopt bright, tech-inspired packaging designs to appeal to younger generations and innovation-focused consumers.

When it comes to taste, the exact replication of traditional meat‘s texture and flavor is crucial for plant-based protein products. Many consumers indicate they are more likely to repurchase if these alternatives closely imitate real meat in chewiness, juiciness, and flavor. The Korean market stands out in this regard, with local companies making effective use of fermentation techniques and seasoning processes to enhance the meaty qualities of plant-based protein products. For instance, they add mushroom extracts or seaweed ingredients to boost freshness and have even developed customized products suited for Korean-style stir-fries, grilling, and other cooking methods [10]. Convenience is equally important, in terms of both ease of preparation and accessibility. If plant-based alternatives can be as convenient to cook as traditional meat and readily available in supermarkets or restaurants, consumer’s desire to try them will significantly increase. In South Korea, plant-based products have already gained widespread distribution in convenience stores and online retail channels, increasing consumer exposure and purchasing opportunities.

Health Attributes represent another crucial dimension, covering protein content, additive usage, allergen control, and more. Consumers generally prioritize whether products are low-fat, low-cholesterol, or free from antibiotic or hormone residues. These health claims effectively enhance a product‘s market appeal [12].Korean consumers particularly value the inclusion of functional ingredients, such as adding B vitamins or omega-3 fatty acids to insect protein products to boost their nutritional value [13].

3.2 Level of Education and Cultural Background

Educational level directly influences consumers‘ awareness and acceptance of alternative protein products. Higher-educated groups typically possess greater knowledge of food technology, ingredient composition, and production processes, making them more likely to understand and trust the safety and environmental benefits of alternative proteins [12]. They tend to evaluate products from scientific and ethical perspectives rather than relying solely on intuition or traditional beliefs. And Cultural backgrounds

shape consumers‘ dietary preferences and taboos at a deeper level. For instance, in certain regions of China, insects have a historical tradition as a protein source, resulting in relatively less resistance to the promotion of insect-based protein products. Conversely, in Japan, where dietary culture emphasizes“naturalness”and “craftsmanship,”highly processed alternative protein products are often perceived as incompatible with traditional dietary aesthetics, leading to lower acceptance rates.

In South Korea, cultural factors exert a more diverse influence. The country has a long-standing tradition of consuming insects (such as silkworm pupae and locusts), resulting in relatively low consumer aversion to insect protein—which is even regarded as a traditional food source with high protein value [13]. Simultaneously, South Korean society is more receptive to technological innovation, with public trust in food technologies like microalgae cultivation and fermentation engineering. This fosters the adoption of microbial protein and cell-cultured protein products [9]. Religious factors also play a key role in certain regions. For instance, Muslim consumers in Singapore place more trust in alternative protein products bearing“Halal certification,”compelling companies to prioritize religious compliance to access specific markets. Similarly, in South Korea, Buddhists and the growing vegetarian population favor plant-based products, making cultural compatibility an essential consideration in product design.

3.3 Psychological Factors

The psychological dimension primarily encompasses food neophobia, sensory appeal, attitudes, and trust levels. Food neophobia refers to people‘s resistance to novel or unfamiliar foods, particularly prevalent among middle-aged and older demographics. For instance, Chinese consumers generally exhibit lower acceptance of novel foods, preferring familiar and traditional ingredients. In contrast, Singaporean consumers, having long been in a multicultural environment, demonstrate greater openness to new experiences. South Korean consumers show polarized psychological receptivity: younger generations exhibit strong curiosity and willingness to try innovative foods, while older groups remain relatively conservative. However, psychological barriers are gradually diminishing as the South Korean government and businesses actively promote the“Future Food”concept as well as the environmental and technological advantages of alternative protein products through media campaigns. Sensory appeal refers to consumers‘ expectations regarding a food‘s texture, aroma, appearance, and other attributes. If alternative products fail to meet these expectations, it can easily lead to consumer disappointment or even refusal to try them again [4]. In South Korea, to overcome this challenge, domestic companies like Nongshim and CJ CheilJedang have invested heavily in R&D to enhance the texture and flavor of plant-based and insect-based protein products. Their goal is to closely resemble the typical mouthfeel of Korean cuisine, such as chewiness, resilience, and umami depth [10]. Attitudinally, whether consumers endorse the environmental and ethical values of alternative protein products directly influences their purchasing decisions. Young Korean consumers, particularly concerned about climate change and sustainability, are more ready to support eco-friendly products. Trust, meanwhile, involves confidence in producers, government oversight, and certification systems. If consumers lack trust in food regulators or brands, products may struggle to gain market acceptance despite their merits. In Korea, approval from the Ministry of Food and Drug Safety (MFDS) and endorsements from reputable companies significantly bolster consumer confidence in alternative protein products [9].

3.4 Population Structure

Consumers of different ages, genders, and income levels exhibit distinct attitudes toward alternative protein products. Younger consumers typically prioritize sustainability, animal welfare, and personal health, making them more receptive to alternative protein options. For instance, young Japanese consumers demonstrate significantly higher acceptance of cell-cultured protein products compared to middle-aged and older adults. In South Korea, urban youth aged 20-39 form the core consumer of alternative protein products. Generally well-educated and environmentally conscious, they actively share novel food experiences on social platforms, further promoting word-of-mouth adoption. Higher-income consumers, with greater affordability for typically pricier alternative protein products, also place greater emphasis on their health and environmental attributes.Additionally, consumers in highly urbanized regions have greater exposure to new products and exhibit faster adoption rates. In aging societies like Japan, older adults tend toward conservative diet choices, which has slowed overall market adoption to some extent. While South Korea also faces an aging population, its highly concentrated urban population and developed retail systems provide favorable conditions for the rapid proliferation of alternative protein products. Gender differences are also evident: surveys indicate female consumers are often more inclined than males to choose plant-based products due to health management and ethical considerations [12].

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4. Conclusion

In terms of overall consumption, Singapore shows the highest acceptance of plant-based meat alternatives, while China, Japan, and South Korea exhibit varying attitudes toward different alternative protein products. As a multiracial, multicultural international hub, Singaporean citizens are accustomed to embracing new ideas and foreign cultures, making it the first country globally to approve the sale of cultured meat. The Chinese market holds immense potential, with its large middle class and younger generation placing significant emphasis on health, fueling strong demand for weight loss, fitness, and fat reduction. Japanese consumers, however, prioritize dietary education, with their"craftsmanship ethos"reflected in premium ingredients like wagyu beef and sashimi. Cultured meat is perceived as a "highly processed, unnatural, artificial" product that contradicts this traditional food philosophy, leading to cultural and psychological resistance. South Korea, meanwhile, embraces insect-based protein products, while microalgae protein items are already circulating across its markets.

To better promote plant-based meat and alternative protein products, the following approaches can be adopted: Emphasize environmental sustainability, health benefits, and religious compatibility, while actively collaborating with local food brands to develop specialty offerings; Highlight technological innovation, functional benefits (such as added nutrients), and allergen-free attributes as value-added features; Encourage governments and companies to adopt more flexible policies for product promotion, ensuring alignment with local cultural and religious practices.

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