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Popular vegetarian diets in China: a sustainable dietary option for the globe?

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Vegetarian practices have historically been ingrained in Chinese society. However, it is uncertain to what extent these practices correspond to the global concept of a sustainable diet. In this study, we aimed to identify popular vegetarian dietary patterns in China based on the most-viewed online recipes and evaluate their associated food preferences and sustainability characteristics. The results indicated the following: (1) Chinese and Western vegetarian diets differ greatly in their food preferences for starchy staples, fruits, and dairy products. Popular Chinese vegetarian diets are characterized by high grain consumption and low intake of salt and added sugars. (2) Popular Chinese vegetarian diets are rich in vitamin E (32.37–37.36 mg/d), phosphorus (1172.80–1267.20 mg/d), copper (2.21–2.56 mg/d), and manganese (5.89–6.96 mg/d), yet deficient in vitamin A (421.03–565.65 µg RE/d), calcium (438.91–693.36 mg/d), and selenium (28.06–36.90 mg/d). Additionally, there is a risk of inadequate riboflavin intake within a vegan dietary pattern. (3) Compared with Chinese omnivorous diets and Western vegetarian diets, at the 2,000 kcal/d level, popular Chinese vegetarian diets have a lower environmental footprint in terms of land use (3.44–5.95 m²), greenhouse gas emissions (1.76–2.74 kgCO₂eq), and freshwater withdrawals (510.87–678.34 L). Our findings serve as a valuable reference for promoting healthy dietary choices worldwide and advancing sustainable development goals related to food security and environmental conservation.

KEYWORDS

China, sustainable diet, vegetarian, nutrition, environmental impact, recipe

1 Introduction

The pursuit of sustainable diets has gained widespread acceptance (Aidoo et al., 2023; Xiang et al., 2023). Sustainable diets are characterized by a low environmental impact, the promotion of food and nutritional security, and healthy living for present and future generations (FAO, 2010). Vegetarian diets are generally regarded as eco-friendly (Bunge et al., 2024; Rabès et al., 2020; van Dooren et al., 2014). Choosing plant-based foods can minimize the high-intensity land use and greenhouse gas emissions (GHGE) associated with the consumption of animal products (Takacs et al., 2022). Additionally, vegetarian diets are rich in fiber, polyunsaturated fatty acids, folate, vitamin C, vitamin E, and magnesium (Neufingerl and Eilander, 2021; Craig, 2009). Vegetarians and vegans have a reduced risk of certain health conditions, including ischemic heart disease, type 2 diabetes, hypertension, certain types of cancer, and obesity (Melina et al., 2016). Hence, scientific and governmental institutions across many nations endorse vegetarian dietary patterns as examples of sustainable diets,

accompanied by the issuance of corresponding position statements and guidelines (Chinese Nutrition Society, 2022; Agnoli et al., 2017; Richter et al., 2016; Melina et al., 2016; Nakamoto et al., 2009). Vegetarianism has also experienced a surge in popularity in recent years and is increasingly regarded as a critical component in the transition toward sustainable societies (Zeng et al., 2024).

However, controversy remains regarding vegetarian diets. First, not all vegetarian diets are equally healthy. Protein, vitamin B12, vitamin D, iron, zinc, iodine, calcium, and selenium contents may be much lower in certain vegetarian diets than in omnivorous ones (Chinese Nutrition Society, 2022; Neufingerl and Eilander, 2021; Leite et al., 2020). Vegetarian dishes rich in refined flours, hydrogenated oils, high-fructose corn syrup, sucrose, artificial sweeteners, salt, and preservatives have been shown to increase the morbidity and mortality rates (Wang et al., 2023; Rosi et al., 2017). Second, highly processed and refined plant-based foods may have a relatively high environmental impact (Wang et al., 2023). Even a diet composed of healthy plant-based foods might be characterized by high water consumption (Meier and Christen, 2013; Fresán and Sabaté, 2019). From a promotional perspective, the advantages of vegetarian diets in terms of environmental sustainability, human health, and animal welfare are still not widely recognized by many consumers. The limited visibility and diversity of vegetarian foods, along with the scarcity of vegetarian menu options, result in the general public having few opportunities to encounter and familiarize themselves with vegetarian diets (Allenden et al., 2022; Kwasny et al., 2022). Perceptions of a bland taste and a lack of skills in shopping for, preparing, and cooking meatless dishes hinder the adoption of vegetarian dining at home (Kwasny et al., 2022; Mullee et al., 2017).

Promoting Chinese vegetarian diets might contribute to addressing these global challenges. Driven by Buddhist tenets, Taoist philosophy, ancestor worship, a lifestyle of small-scale farming, and the principles of traditional medicine, vegetarian diets have historically been ingrained in Chinese society (Chinese Nutrition Society, 2022; Zeng et al., 2024). For instance, Chinese Buddhism prohibits the consumption of animal source foods, with the exception of dairy products. More than 40 million Chinese Buddhists adhere to vegan or lacto-vegetarian diets, and an additional 200 million are influenced by vegetarianism, adopting similar dietary habits to varying extents (Tseng, 2020). Guided by the principle of “medicine–food homology” in Traditional Chinese Medicine, healthy vegetarian foods are meticulously selected to create daily menus for the public (Chen et al., 2024). The concept of vegetarianism has long been part of Chinese culinary culture, giving rise to diverse vegetarian dishes (Wang, 2016). Despite the shift to vegetarian ingredients, many vegetarian recipes preserve the cooking techniques and flavors that are reminiscent of traditional meat-based family dishes (Chinese Nutrition Society, 2022). As a result, Chinese vegetarian diets have become highly favored by people in China and are expected to have great potential for global promotion (Zeng et al., 2024). However, existing research has yet to provide a quantitative description of the health benefits and environmental effects of typical Chinese vegetarian diets. Consumers cannot determine whether their dietary patterns align with the principles of a sustainable diet. The absence of such information could hinder the widespread adoption of Chinese vegetarian dietary practices.

Therefore, in this study, we aimed to address the research gap regarding the sustainable attributes of Chinese vegetarian diets. The

remainder of this paper is organized as follows. First, we presented an analytical framework for identifying popular vegetarian diets and assessing their sustainability characteristics. Second, we applied this framework to analyze the food consumption, nutrient contents, and environmental impacts associated with popular Chinese vegetarian diets, highlighting their strengths and weaknesses in terms of sustainability. Third, we examined the results from the perspective of recipes and discussed strategies for promoting Chinese vegetarian diets. Finally, the main conclusions of the study were summarized. The findings of this study offer valuable insights into the development of healthy dietary systems globally and the advancement of sustainable development goals related to food security and environmental conservation.

2 Materials and methods

A database of popular Chinese vegetarian dishes was constructed based on the most widely viewed online vegetarian recipes. It was used to determine the prevalence of dietary patterns among vegetarians in China. Food consumption, nutrient contents, GHGE, land use, and water withdrawals related to these vegetarian diets were estimated using authoritative nutrient and environmental footprint databases. The sustainability characteristics of popular Chinese vegetarian diets were determined based on comparison with reference diets using the corresponding indicators (Figure 1).

2.1 Identification and standardization of popular vegetarian diets

In this study, we focused on the two most common types of vegetarian diets in China: vegan and lacto-ovo-vegetarian (Chinese Nutrition Society, 2022). A vegan diet excludes all types of animal-sourced foods (Richter et al., 2016), whereas a lacto-ovo-vegetarian diet allows dairy products, eggs, and honey in addition to the foods permitted in a vegan diet (Melina et al., 2016). The primary differences among Chinese dietary patterns were reflected in the variety of dishes (Rong et al., 2019). We compiled a collection of Chinese vegetarian dish recipes from the Douguo website,¹ which is a leading interactive culinary community network used by Chinese people, with hundreds of millions of users and a recipe database exceeding 5 million entries. We extracted recipe data from vegetarian ingredient categories on this website on November 30, 2024. We filtered out vegetarian recipes with fewer than one million views, which are often regional dishes or contain unusual ingredients, resulting in a collection of 922 popular recipes. To ensure accurate analysis of sustainable characteristics, 131 dishes with unspecified ingredient weights were excluded. To quantify ingredient amounts described using utensils such as spoons or cup measures, we referred to conversion standards from the Chinese dietary guidelines (Chinese Nutrition Society, 2022). When recipes had duplicate names, we retained only the version with the most views. Finally, 233 vegetarian recipes, of which 165 were vegan recipes, were identified.

¹ <https://www.douguo.com/>

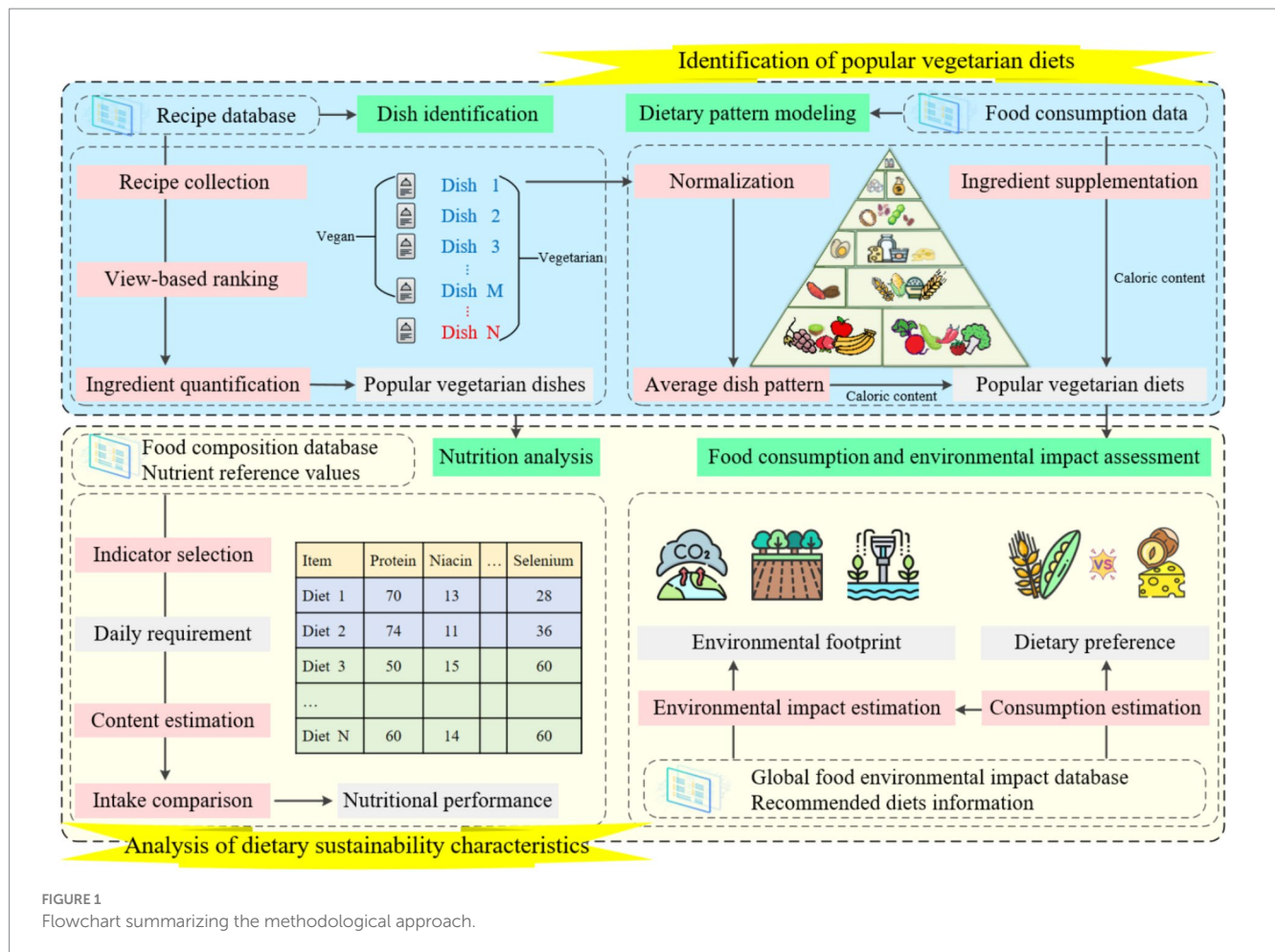


FIGURE 1

Flowchart summarizing the methodological approach.

Following the method of Angelsen et al. (2023), we normalized each recipe to a 100 g serving size, and created an average pattern for popular Chinese vegetarian dishes. Staple foods, dairy products, and fruits are typically not the main ingredients in Chinese dishes. We investigated the caloric contributions of staple foods, dairy products, and fruits in a 2,000 kcal/d vegan or lacto-ovo-vegetarian diet based on research findings on Chinese dietary characteristics (Chinese Nutrition Society, 2022). In accordance with the calorie content data (energy density) from the China Food Composition Tables (Yang, 2019), we then determined the weight of each food category. This enabled us to establish an average pattern for popular Chinese vegetarian diets. The weight of ingredients in dishes and diets can be calculated using the following formulas (Equations 1–3):

$$U_{ij} = S W_{ij} / \sum_{j=1}^m W_{ij} \quad (1)$$

$$D_j = \sum_{i=1}^n U_{ij} / n \quad (2)$$

$$V_j = E D_j / k + R_j / h_j \quad (3)$$

where U_{ij} is the weight of ingredient j in normalized recipe i , S is the serving size, W_{ij} is the weight of ingredient j in online recipe i , m is the total number of ingredient categories, D_j is the weight of ingredient j in the average pattern for dishes, n is the total number of recipes, V_j is the weight of ingredient j in a diet, E is the reference energy intake for dishes within a dietary pattern, k is the energy content of the average pattern for dishes, R_j is the energy intake from ingredient j in staple foods, dairy products, or fruits, and h_j is the energy density of ingredient j .

2.2 Food consumption and environmental impact assessment of different diets

In this study, the foods in the diet were categorized into 11 groups: grains, tubers, vegetables, fruits, meat and poultry, eggs, aquatic products, dairy, legumes and nuts, oils, and added sugars. Salt was also monitored as a separate item. The consumption amounts of these 12 items in the popular Chinese vegan diet (PCVD) and popular Chinese lacto-ovo-vegetarian diet (PCLOD) were quantified based on dietary ingredients. These estimated consumption values were compared with those of recommended dietary patterns, including the recommended Chinese diet (RCD), recommended Chinese vegan diet (RCVD), recommended Chinese lacto-ovo-vegetarian diet (RCLOD) (Chinese Nutrition Society, 2022), recommended

American diet (RAD), recommended American lacto-ovo-vegetarian diet (RALOD) (USDA and HHS, 2020), recommended Japanese lacto-ovo-vegetarian diet (RJLOD) (Nakamoto et al., 2009), and the EAT–Lancet Commission healthy sustainable reference diet (HSRD) (Willett et al., 2019). Using the global food environmental impact database provided by Poore and Nemecek (2018), we estimated the land use, GHGE, and freshwater withdrawals associated with the PCVD, PCLOD, and recommended diets. As the recommended diets do not specify the composition of food subgroups, the results are presented as ranges. A comparison of these environmental impact values among different diets indicated whether popular Chinese vegetarian diets are more sustainable.

2.3 Nutritional analysis of popular vegetarian diets

The nutrient contents of the PCVD and PCLOD were determined by mapping their ingredients to the China Food Composition Tables (Yang, 2019), which is a database that provides nutritional information for over 4,700 food items. Given the completeness of the statistical data within the database and the specifications for essential nutrients from the Dietary Reference Intakes for China (DRIs) (Chinese Nutrition Society, 2023), we selected 17 nutrition indicators: protein, dietary fiber, vitamin A, vitamin E, thiamine, riboflavin, vitamin C, niacin, calcium, phosphorus, potassium, magnesium, iron, zinc, selenium, copper, and manganese. The reference daily nutrient intakes for adults, as specified in the DRIs (Chinese Nutrition Society, 2023), Daily Nutritional Goals for Americans (DNGs) (USDA and HHS, 2020), Dietary Reference Values for Nutrients (DRVs) (European Food Safety Authority, 2017), and Codex Nutrient Reference Values (CNRVs) (Lewis, 2019), were used as evaluation criteria. By comparing the nutrient contents of the PCVD and PCLOD with these reference values, we identified the strengths and weaknesses of popular Chinese vegetarian diets in terms of nutrient provision to determine whether they are healthy.

3 Results

3.1 Food consumption in popular Chinese vegetarian diets

Table 1 displays the food consumption patterns of popular Chinese vegetarian diets compared with those of the reference diets, all with an energy intake of 2,000 kcal/d. In comparison to healthy Western diets such as the RAD and HSRD, a healthy Chinese diet such as the RCD places a greater emphasis on the consumption of grains and vegetables among plant-based foods. It also highlights the intake of eggs and aquatic products among animal-based foods while maintaining stricter control over the consumption of oils, salt, and added sugars compared to Western diets. Recommended Chinese vegetarian diets such as the RCVD and RCLOD preserve these characteristics and require a higher intake of grains and legumes as substitutes for meat, poultry, and aquatic products. This aligns with the vegetarian practices prevalent in many East Asian countries or regions, and is more evident in RJLOD (Nakamoto et al., 2009). The estimation results showed that under popular Chinese vegetarian diet patterns, the consumption of most food groups meet the recommendations of the RCVD or RCLOD. However, the tuber intake (27–35 g/d) is low, falling short of the recommended levels. The intake of legumes (102 g/d) in the PCVD and the intake of vegetables (300 g/d) in the PCLOD meet only the minimum recommendations. Consequently, there is a need to increase the intake of these foods in popular Chinese vegetarian diets. The PCLOD features a lower consumption of oils (24 g/d) and added sugars (6 g/d) than the PCVD, aligning more closely with the “less oil, less sugar” principle outlined in the Chinese dietary guidelines (Chinese Nutrition Society, 2022). The salt intake in popular Chinese vegetarian diets (3 g/d) is only 40–50% of the upper limits recommended in China and the USA, reflecting a preference for subtle flavors in these diets. The results also indicated that there are clear differences between popular Chinese vegetarian diets and American-style vegetarian diets, such as the RALOD, particularly in the consumption of starchy staples, fruits, and

TABLE 1 Food consumption gap between dietary patterns.

Product	Reference value (g/d)							Estimated value (g/d)	
	RCD	RCVD	RCLOD	RAD	RALOD	RJLOD	HSRD	PCVD	PCLOD
Grains	215	200–350	185–310	170	184	395	186	294	273
Tubers	75	50–125	50–125	169	169	73	40	35	27
Vegetables	450	300–500	300–500	372	372	436	240	380	300
Fruits	300	200–350	200–350	473	473	205	160	277	279
Meats, Poultry	50	0	0	93	0	0	34	0	0
Eggs	50	0	40–50	25	25	70	10	0	48
Aquatic products	50	0	0	32	0	0	22	0	0
Dairy	300	0	300	710	710	252	200	0	304
Legumes, Nuts	60	100–130	65–100	46	86	124	100	102	78
Oils	25	20–30	20–30	27	27	10	42	26	24
Added sugars	25	25	25	50	50	28	25	8	6
Salt	5	5	5	6	6	5	—	3	3

The corresponding values for oils, salt, and added sugars represent the upper limits of recommended daily intake. “—” represents the absence of a reference value.

dairy products. The daily consumption gap ranges from 100 g to 200 g for grains, tubers, and fruits, and the gap for dairy products is up to 400 g/d. This divergence in dietary preferences is likely to pose a serious obstacle to the global promotion of Chinese vegetarian diets, particularly in Western societies.

3.2 Nutrient profile of popular Chinese vegetarian diets

Figure 2 shows the intake of 17 types of nutrients in popular Chinese vegetarian diets compared with the reference values for these nutrients according to the DRIs, DGNs, DRV, and CNRV standards. It is found that the protein, phosphorus, magnesium, iron, copper, manganese, vitamin E, and thiamine contents in popular Chinese vegetarian diets can meet the recommendations of the four standards. Notably, the levels of vitamin E (32.37–37.36 mg/d), phosphorus (1172.80–1267.20 mg/d), copper (2.21–2.56 mg/d), and manganese (5.89–6.96 mg/d) are more than 30% higher than the reference values but still within the tolerable upper intake levels. Protein and phosphorus intake is higher in the PCLOD than in the PCVD, whereas the magnesium, iron, copper, manganese, vitamin E, and thiamine levels tend to be lower. Potassium and zinc intake is nearly identical in the two popular vegetarian dietary patterns, meeting the recommended values in the DRIs and DGNs. The vitamin C intake in the PCVD (99.79 mg/d) meets the recommendations of all standards,

whereas the vitamin C intake in the PCLOD (86.01 mg/d) only reaches the recommendations of the DGNs. A fiber intake of 25.19 g/d and niacin intake of 12.67 mg/d in the PCVD meet the DRIs recommendations. However, these nutrient intakes are 16 and 12% lower, respectively, in the PCLOD, failing to reach the reference values. The riboflavin intake in the PCLOD (1.10 mg/d) meets the DGNs recommendations, whereas the intake in the PCVD (0.64 mg/d) is much lower and fails to meet the recommended levels of the four standards. Popular Chinese vegetarian diets are unlikely to meet the daily requirements for vitamin A, calcium, and selenium. The intake of vitamin A (421.03 μ g RE/d), calcium (438.91 mg/d), and selenium (28.06 mg/d) in the PCVD are only 40–60% of the recommended daily allowances.

Popular Chinese vegetarian diets are rich in dietary fiber, magnesium, vitamin C, and vitamin E, which are typical characteristics of many vegetarian dietary patterns. The high protein content of these diets is consistent with the findings of a dietary survey conducted by Yao et al. (2020). Unlike some vegetarian diets that are associated with low intake of iron and zinc (Neufingerl and Eilander, 2021), popular Chinese vegetarian diets do not have such deficiencies. However, issues related to insufficient calcium and selenium intake among Western vegetarians, as noted by Bunge et al. (2024) and Leite et al. (2020), are also likely to occur in Chinese vegetarian cuisine. Chinese vegans, in comparison to lacto-ovo-vegetarians, might also face inadequate intake of riboflavin because of their stricter dietary restrictions.

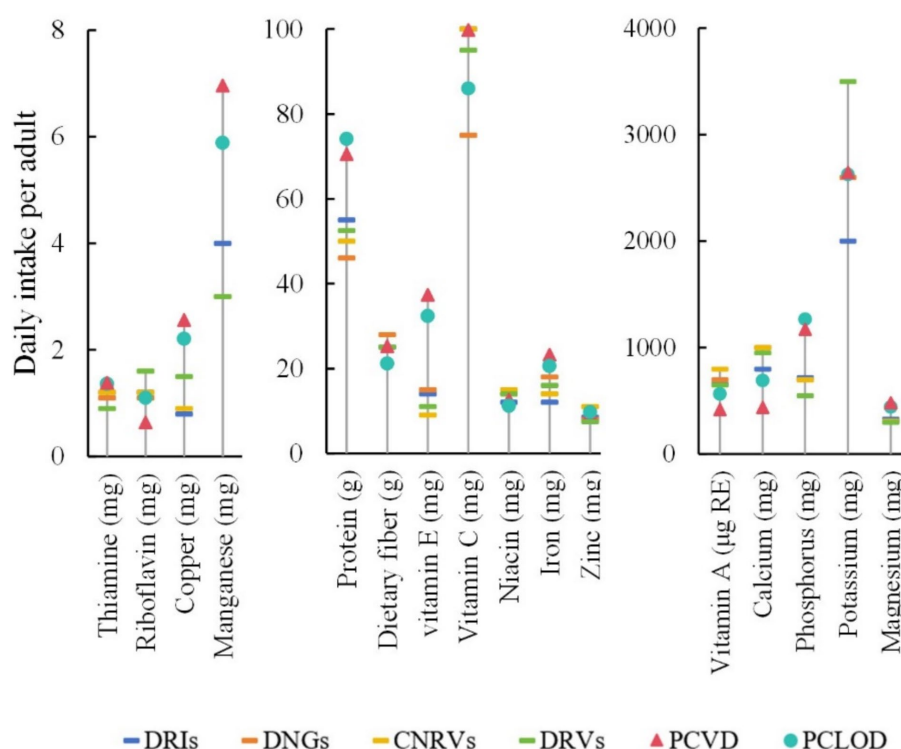


FIGURE 2

Nutritional performance of popular Chinese vegetarian diets. Given that the intake of all estimated nutrients in popular Chinese vegetarian diets remains below the tolerable upper intake levels, any intakes that exceed the reference values are considered to meet the corresponding standards' recommendations. RE, retinol equivalents.

3.3 Environmental effects of popular Chinese vegetarian diets

Figure 3 illustrates the estimated GHGE, land use, and freshwater withdrawals associated with the PCVD, PCLOD, and recommended diets. The provision of the PCVD and PCLOD, each at 2,000 kcal/d, is estimated to require 3.44 m² and 5.95 m² of land, respectively. These land use values are consistent with those for the recommended Chinese vegetarian diets (RCVD and RCLOD) and are much lower than the values related to the RCD, RAD, and RALOD. The PCVD at 2,000 kcal/d is associated with an estimated 1.76 kgCO₂eq of GHGE, while the PCLOD results in emissions of 2.74 kgCO₂eq. Similar to land use, the emission values for the PCVD and PCLOD are close to the average GHGE of the RCVD and RCLOD, respectively, and are much lower than the emissions of the RCD (3.19–9.91 kgCO₂eq), RAD (4.55–14.86 kgCO₂eq), and RALOD (3.24–5.62 kgCO₂eq). Freshwater withdrawals for the PCVD and PCLOD, at the 2,000 kcal/d level, are estimated at 510.87 L and 678.34 L, respectively. These values are 9 and 17% lower than the average withdrawals for the RCVD and RCLOD, respectively. They are close to the minimum requirements for the RCD (546.41 L) and RALOD (592.48 L), yet remain considerably higher than the minimum requirement for the RJLOD (369.99 L). Compared with the sustainable dietary pattern (HSRD) proposed by the EAT–Lancet Commission, popular Chinese vegetarian diets demonstrate evident advantages in reducing land use and GHGE. Although freshwater withdrawals for popular Chinese vegetarian diets are notably higher than the minimum required for the HSRD, they remain within the average range.

Our findings correspond to the consensus that vegetarian and vegan diets typically have low environmental footprints (Bunge et al., 2024; Takacs et al., 2022; Rabès et al., 2020). The decreased consumption of dairy products in popular Chinese vegetarian diets contributes to a higher level of sustainability than that of American-style vegetarian diets. Moreover, popular Chinese vegetarian diets do not exhibit the high water footprints found in some other vegetarian diets (Meier and Christen, 2013; Fresán and Sabaté, 2019). This is

primarily due to the Chinese preference for legumes within the “legumes and nuts” food group, as the water usage for legumes is only one-tenth of the amount required for an equivalent weight of nuts (Poore and Nemecek, 2018).

4 Discussion

Our analysis revealed that popular Chinese vegetarian diets have a low environmental impact and demonstrate advantages in providing certain nutrients. They have the potential to be broadly promoted as sustainable dietary patterns. An increasing number of people choosing these types of diets is likely to contribute toward achieving the United Nations Sustainable Development Goal of “Zero Hunger.”

To depict popular Chinese vegetarian diets, we integrated the most-viewed recipes with a range of other ingredients in line with the Chinese Dietary Guidelines (Chinese Nutrition Society, 2022). This approach provides insights into dietary trends and the diversity of food choices, but the abstracted average pattern for vegetarian diets may not fully reflect real-world dietary practices. For instance, recipes with tens of millions of views are given the same weight as those with millions of views in the calculation of the average pattern, though the former may appear more frequently in daily diets. Furthermore, the audience for online recipes is likely skewed toward younger adults, and whether they are equally popular among other age groups requires further investigation.

In terms of adoption, dishes that cater to a broad spectrum of tastes and are easy to prepare are likely to be more widely adopted across various cultural contexts than average dietary habits. For instance, vegetarian dishes such as Spicy Tofu and Spring Rolls have gained global popularity. Many people may be hesitant to adopt a vegetarian lifestyle or even a semi-vegetarian one, yet they can incorporate more meatless meals into their weekly routines or simply add a trendy vegetarian dish to their dining tables. As these transitions become more widespread, they can also lead to considerable sustainability benefits. Therefore, we endeavored to further investigate

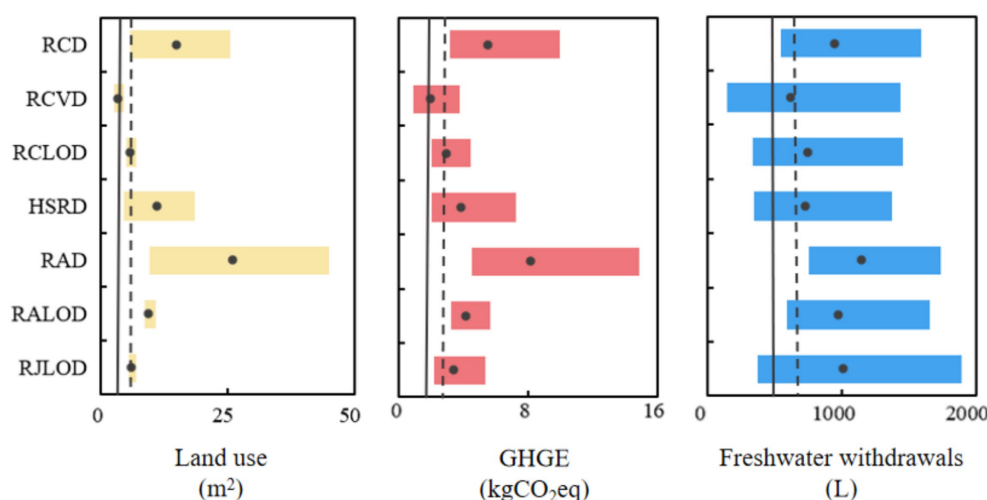


FIGURE 3

Land use, greenhouse gas emissions (GHGE), and freshwater withdrawals associated with popular Chinese vegetarian diets and recommended diets. The environmental effects of PCVD and PCLOD are shown in solid lines and dashed lines, respectively.

the health and environmental impacts of Chinese vegetarian diets from the perspective of recipes. The findings from the recipe analysis conducted by [Angelsen et al. \(2023\)](#) were used for comparison. As shown in [Table 2](#), the average carbon footprint of popular Chinese vegetarian recipes is much lower than that of Norwegian, British, and American recipes when compared at equivalent weights. The land footprint of popular Chinese vegetarian recipes is similar to that of Norwegian and American vegetarian recipes but lower than that of British vegetarian recipes. This reflects the superior eco-friendly characteristics of Chinese vegetarian dishes when compared with Western vegetarian dishes, which is consistent with our findings on the environmental effects of different diets. Popular Chinese vegetarian recipes are found to contain higher levels of iron, copper, vitamin C, and dietary fiber than typical Norwegian, British, and American recipes, but lower levels of thiamine, niacin, potassium, selenium, and protein. Compared with vegetarian recipes from Norway, the UK, and the USA, vegetarian recipes from China contain slightly less dietary fiber. However, they offer a comparative advantage in terms of higher protein and iron contents. Considering the primary sources of essential nutrients, increasing the selenium content in dishes is crucial for enhancing the nutritional profile of Chinese vegetarian diets.

Owing to the limitations of the available statistical data on food composition, we did not analyze a few nutrients, particularly those that may be deficient in vegetarian diets, such as vitamin D, vitamin B-12, and iodine ([Leite et al., 2020](#)). Therefore, in our future research, we will aim to achieve a more comprehensive nutritional analysis of recipes and dietary patterns based on the most recent updates from the China Food Composition Tables. Building upon this foundation, further research into ingredient optimization, like that conducted by [Liu and Xin \(2024\)](#), will facilitate the refinement of Chinese-style

vegetarian diets. From an international perspective, the integration of the merits of popular Chinese vegetarian diets with the vegetarian practices of other regions may contribute to the development of a new vegetarian diet paradigm that is more nutritionally balanced. This would greatly contribute to the improvement of healthy dietary systems globally. Considering the importance of nutritional guidance in promoting a healthy diet, providing a detailed explanation of eco-friendly attributes may also facilitate the widespread adoption of sustainable diets ([Buratto and Lotti, 2024](#); [Kwasny et al., 2022](#)). Hence, there is a need for an overall analysis of the environmental impacts associated with Chinese vegetarian diets, including indicators not addressed in this study, such as biodiversity loss, emissions that contribute to acidification and eutrophication, and the regional heterogeneity of these impacts. Such scholarly endeavors will play an important role in future environmental movements.

In this study, we focused on the nutritional attributes and environmental footprints of vegetarian diets. However, diets are more than a simple combination of food consumptions. They are a way of life that shapes and is shaped by local social, cultural, and economic contexts ([FAO and WHO, 2019](#)). Chinese vegetarian diets are characterized by a high intake of grains and legumes and a low intake of oil, aligning well with the dietary preferences of many East Asian regions, such as Japan and Vietnam. However, Western consumers may hold negative taste expectations toward these dietary patterns. Further investigation is needed to understand the potential for Chinese vegetarian culture to gain global popularity. In contrast to Western vegetarianism, which often leverages celebrity endorsements and ethical campaigns, the Chinese model emphasizes concrete, personalized benefits over abstract moral persuasion ([Chen et al., 2025](#)). This idea may proliferate alongside the popularity of Chinese-style vegetarian

TABLE 2 Nutritional contents and environmental impacts of recipes (per 100 g).

Item	China		Norway		UK		USA	
	Vegetarian	Vegan	TP	Vegetarian	TP	Vegetarian	TP	Vegetarian
Protein (E%)	16.5	15.9	23.1	13.9	20.9	12.2	25.8	15.9
Dietary fiber (g/MJ)	2.9	3.6	1.8	4.4	2.6	3.0	1.4	4.6
Thiamine (RV%)	6.1	5.7	7.0	—	9.0	—	9.0	—
Vitamin C (RV%)	10.1	12.1	8.0	—	13.0	—	6.5	—
Niacin (RV%)	6.1	7.1	13.0	—	11.0	—	15.0	—
Potassium (RV%)	5.4	5.9	8.5	—	9.0	—	8.0	—
Iron (RV%)	12.6	13.8	5.0	6.6	6.0	5.6	5.0	9.0
Selenium (RV%)	4.7	3.3	10.5	—	7.0	—	10.0	—
Copper (RV%)	11.8	13.6	8.5	—	11.0	—	7.0	—
GHGE (kgCO ₂ eq)	0.14	0.10	0.50	0.27	0.40	0.36	0.70	0.20
Land use (m ²)	0.25	0.22	0.60	0.27	0.50	0.39	0.80	0.24

E%, percentage of energy intake; GHGE, greenhouse gas emissions; RV%, percentage of recommended value in DRVs; TP, typical recipes from Norway, the UK, or the USA provided by [Angelsen et al. \(2023\)](#). “—” represents the absence of an estimated value.

practices, influencing dietary perceptions across diverse cultures, thereby lowering the barriers to the adoption of plant-based diets. Moreover, cost factors have been increasingly emphasized in recent research on the sustainability of dietary habits (Hirvonen et al., 2020; Bach et al., 2023). Generally, vegetarian diets are less expensive than omnivorous ones (Springmann et al., 2021). However, in certain regions, alternatives to meat, eggs, and dairy products, such as tofu and other soy products, may not be readily available, which can increase their prices (Kolbe, 2020; Bunge et al., 2024). Consequently, vegetarian culinary options may be more expensive in these areas. This should be considered during the international promotion of Chinese vegetarian diets. From a different perspective, the growing popularity of Chinese vegetarian diets may stimulate improvements in the supply chain of animal product substitutes. This, in turn, could address cost-related challenges because the actual production expenses of many substitutes are inherently low.

5 Conclusion

In this study, we identified popular vegetarian dietary patterns in China by analyzing the most-viewed online recipes. We evaluated the food consumption, nutrient contents, and environmental footprints associated with these dietary patterns. Following a comparison with widely recognized dietary standards, our results revealed the sustainability characteristics of popular Chinese vegetarian diets.

The main results were as follows: (1) There are notable differences in dietary preferences between Chinese and Western vegetarian diets. Popular Chinese vegetarian diets are characterized by a relatively higher consumption of grains (273–294 g/d) and a lower consumption of salt (3 g/d) and added sugars (6–8 g/d). (2) Popular Chinese vegetarian diets are rich in vitamin E (32.37–37.36 mg/d), phosphorus (1172.80–1267.20 mg/d), copper (2.21–2.56 mg/d), and manganese (5.89–6.96 mg/d); however, they are lacking in vitamin A (421.03–565.65 µg RE/d), calcium (438.91–693.36 mg/d), and selenium (28.06–36.90 mg/d). Additionally, there is a risk of inadequate riboflavin intake (0.64 mg/d) within a vegan dietary pattern. (3) Popular Chinese vegetarian diets have minimal environmental impacts in terms of land use (3.44–5.95 m²/d) and GHGE (1.76–2.74 kgCO₂e/d). A high water footprint associated with certain vegetarian dietary patterns is not observed in popular Chinese vegetarian diets.

This study further discussed the sustainable performance of popular Chinese vegetarian diets from a recipe perspective, as well as the potential challenges related to their promotion. It is proposed that the health, acceptability, affordability, and environmental conservation advantages of vegetarian practices from China and other regions should be integrated to establish a global paradigm of sustainable vegetarian diets. There were limitations in terms of the narrow range of nutrients and environmental impact indicators used in our evaluation. We plan to continue this research and overcome these

issues to better assess the sustainability attributes of diets using an improved analytical framework.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Author contributions

YZ: Conceptualization, Formal analysis, Methodology, Writing – original draft. WD: Data curation, Funding acquisition, Resources, Validation, Writing – review & editing. XX: Conceptualization, Funding acquisition, Investigation, Methodology, Project administration, Writing – review & editing. MJ: Data curation, Software, Writing – review & editing. XW: Validation, Visualization, Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Generative AI statement

The authors declare that no Gen AI was used in the creation of this manuscript.

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