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# Scenario Planning for Food Tourism in Iran's Rural Areas: Ranking Strategies Using Picture Fuzzy AHP and COPRAS

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## Abstract

Iran is a uniquely compelling case due to its ancient and diverse culinary heritage, coupled with a strategic national mandate to significantly boost tourism, making the development of this high-impact sector a crucial policy imperative. The present study adopts a scenario planning approach to first identify the key factors influencing food tourism in rural areas of Iran, then explores plausible future scenarios for rural tourism development, and finally ranks strategic alternatives for enhancing food tourism in these regions. Methodologically, the research combines a goal-oriented, descriptive-analytical approach with future study techniques. Data for the initial phase were collected through a literature review, field studies (surveys, interviews), and expert surveys, and subsequently analyzed using MICMAC and ScenarioWizard software tools. Strategic alternatives were then evaluated using Picture Fuzzy Sets (PFSs) and the COPRAS method based on six critical factors. The findings reveal that six primary factors—promotional activities, pricing, food quality, infrastructure, government support, and investment—play pivotal roles in advancing food tourism in rural Iran. Based on these six primary factors, the study constructs three future scenarios: optimistic, stagnant, and crisis-driven scenarios. In the third phase of the analysis, employing Picture Fuzzy COPRAS and Picture Fuzzy Analytic Hierarchy Process (PF-AHP), the results indicate that "food festivals and promotional campaigns" carry the greatest weight and are deemed the most influential in attracting tourists, whereas "investment" ranks the lowest. Following normalization and application of weights, COPRAS analysis identifies "improving the quality of tourism infrastructure" as the most effective strategy, receiving the highest score (464.0620). A sensitivity analysis further confirms that the overall ranking of the strategies remains stable despite changes in the criteria weights, with only minor shifts observed among mid-ranked alternatives. These results offer policymakers a practical decision-making tool to allocate limited resources efficiently and focus on high-impact strategies that support the sustainable development of food tourism in Iran's rural areas.

**Keywords:** rural tourism; food tourism; food tourism development; scenario planning; factors of food tourism

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## 1. Introduction

Rural communities today face numerous economic, social, and environmental challenges, especially in developing countries. Among these challenges are issues such as poverty [1], low-income levels [2], the reduced need for labor due to the use of machinery in agriculture [3], migration [4], population aging [5], and environmental problems such as climate change [6], floods, droughts, forest fires [7], environmental degradation [8], and limited natural resources [9].

Despite these difficulties, rural areas are still essential for the region and the country. For instance, 80% of the food in Asia and sub-Saharan Africa is produced by small-scale farmers, most of whom live in rural communities [10]. Food tourism, with a sustainable approach, not only utilizes natural heritage but also preserves it [11]. In addition to directly contributing to gross domestic product (GDP), it plays a crucial role in strengthening and developing peace, welfare, and national and international relations [12] in achieving sustainable development goals [13]. The valuable benefits of rural tourism in various dimensions of sustainable development have led governments to pursue its development actively [14]. Considering that in 1950, there were about 25 million international tourists, and in the mid-2010s (2010–2020), this figure increased to over one billion; optimistically, it is predicted that this figure will increase to 4.2 billion by 2050 [15].

Among the various forms of rural tourism, food tourism is one of the most essential strategies for local and regional development. It is considered a strategic response to solving rural development issues and problems [16,17], and it is an essential pillar for both tourism and local development [18].

Food tourism is a key factor connecting farmers, producers, distributors, retailers, and consumers, and it can bring numerous benefits to stakeholders and communities participating in the tourism process [15]. Food tourism covers multiple stakeholders with different motivations and roles; thus, it can be referred to as an entrepreneurial food network [17]. Nonetheless, alongside accommodation, transportation, travel, shopping, and entertainment, food is one of the six primary components of the tourism system [19]. Studies indicate that during travel, tourists typically spend between one-third [20] and 40 percent of their budget on food and beverages [21]. An astonishing aspect of food tourism is that it is a 24/7 global activity, available 365 days a year [22]. Additionally, among every ten visitors to a tourist destination, eight are influenced by food attractions [23]. Scenario planning, by offering a holistic and future-oriented perspective, makes it possible to account for the interplay and uncertainty of these factors in the future. Rather than focusing on a single outcome, this methodology allows for the modeling of multiple plausible pathways (such as the desired, static, and crisis scenarios). This approach helps policymakers design robust and flexible strategies for each potential future. Furthermore, it helps them allocate limited resources in a way that is resilient against sudden shifts in policy or economic conditions, simultaneously supporting local capacities to effectively cope with uncertainty.

In recent years, one of the most significant challenges facing rural areas in Iran has been employment and rural–urban migration. Food tourism can positively impact the cultural fabric of rural communities by promoting and showcasing local and traditional cuisine, thus preserving cultural heritage and customs. By connecting food to specific rituals and celebrations, food tourism can help sustain and strengthen these cultural events [24,25].

Some of the most important studies related to food tourism covering various topics include the social factors influencing participation in food tourism, the impact of word-of-mouth advertising on food tourism [26], the influence of festival food quality characteristics on experience, satisfaction level, and intent to revisit [27], the trend and development of food tourism [28], investigating factors affecting repeat visits by food tourists [29], the link between agriculture and food tourism [30], understanding the behavioral intentions of food

tourists [31], the future success of food festivals [32], growth strategies in food tourism [33], the impact of food value video clips in promoting food tourism [34], and policy analysis in food tourism [35].

Iran's geographical position, situated at the crossroads of trade routes connecting the East and the West, has led Iranian cuisine to be influenced by various cultures, such as the Mediterranean, Mesopotamian, Russian, Arabic, European, and others, providing diverse and delicious foods for tourists [36]. Among Asian countries, Iran has one of the most unique food traditions. Historical documents indicate that Iranian cuisine dates back four thousand years and includes approximately 2200 types of dishes, 109 beverages, and various sweets and breads [35]. Some famous Iranian dishes that attract tourists and hold significant value include Fesenjan (walnut and pomegranate stew), Bademjan (eggplant and tomato stew), Baghali Polo (rice with dill and fava beans), Zereshk Polo (barberry rice), Ghormeh Sabzi (herb stew), Ash Reshteh (noodle soup), Tahdig (crispy rice), and Kebab (lamb, chicken, lamb liver, ground meat) [29].

Adapting to the geographical conditions prevailing in Iran, its rural areas exhibit a wide range of diversity in terms of climatic, cultural, religious, ethnic, and socioeconomic conditions, which has led to the production of various traditional foods and beverages in rural areas [37]. In recent years, Iranian policymakers and planners have endeavored to introduce Iran as a new food tourism destination and use it as a tool for rural development [38]. For this reason, the 20-year vision of the Islamic Republic of Iran emphasizes attracting 20 million foreign tourists by 2027 and increasing Iran's share of global tourism revenue to 2% by 2026, aiming to earn nearly $25 billion from tourism in 2026 [39]. However, despite the implementation of policies such as the global recognition of Iranian foods and branding certain cities as creative food cities, food tourism in Iran has not fully realized its potential due factors such as a lack of coordination among executive and supervisory bodies in the government sector, non-prioritization of food tourism development in planning, restrictive laws in the field of food tourism, excessive government oversight of food tourism operations, and weak cooperation among all influential factors in shaping food tourism [35]. Consequently, food tourism in rural areas of Iran is not at an acceptable level, and it has failed to establish an acceptable position [37]. Even though rural areas of Iran face various challenges. Food tourism development can serve as a new opportunity for the optimal and sustainable use of environmental resources that are highly susceptible to destruction [40], ultimately ensuring that the main dimensions of sustainable rural development (economic, social, and ecological sustainability) are addressed [20].

Various aspects of food tourism have been investigated from different perspectives in several studies. However, some unanswered questions remain about food tourism. This study examines the broad and important aspects that influence food tourism using a future-focused methodology. Then, it lists the major forces behind food tourism and, drawing from the opinions of experts, projects possible futures.

Given the topics addressed, the main objective of this research is scenario planning for developing food tourism in rural areas of Iran. Achieving this goal will provide a helpful background and scientific foundation for policymakers, planners, and all stakeholders in rural development, so that by utilizing it, they can leverage the multiple economic, social, cultural, environmental, political, and other benefits of food tourism development toward achieving sustainable rural development. Furthermore, the results of this research will provide policymakers and planners with an essential scientific document to use in achieving the goals of the 20-year vision of the Islamic Republic of Iran. Studies indicate that there is limited research on scenario planning for food tourism development in rural areas. Despite the significant potential for food tourism development and the current inadequate status of food tourism in rural areas of Iran, this research gap is important.

Therefore, this study, in addition to its administrative and organizational applications, can serve as a basis for researchers in the field of food tourism.

In line with the primary objective of this research, which is to develop strategies for developing food tourism in Iran's rural areas through scenario planning, this study endeavors to answer the following core questions:

What are the key factors and primary drivers influencing the development of food tourism in Iran's rural areas? Considering the interaction and interplay between the identified key factors, what are the plausible future scenarios for developing food tourism in these regions? Based on these projected future scenarios, what is the priority ranking of development strategies for rural food tourism in Iran, and which specific strategy is deemed the most effective for advancing this industry?

## 2. Literature Review

In the late twentieth century, food was considered a significant asset and vital element in enhancing the attractiveness of tourism destinations [41]. Generally, food tourism has a relatively new history, and the early twenty-first century can be considered its starting point. The increasing interest in food tourism has led to multiple definitions of "food tourism." These definitions aim to distinguish individuals whose primary purpose is eating, familiarizing themselves with food and beverage preparation, and being motivated by food-related factors during the travel process [28]. Various terms have been used to describe the relationship and combination of food and tourism, such as food tourism [42], foodie tourism, taste tourism [28], slow food tourism [23,43], delicious tourism, and indigenous tourism. However, specific terms are more prevalent in different regions owing to the various modifications related to food tourism. For example, food tourism is used more frequently in North American publications, Europe, and Australia and New Zealand [44]. Some researchers believe that these modifications are largely similar and are sometimes used interchangeably. However, food tourism is one of the most widely used concepts among the aforementioned terms [45]. In fact, due to the complex, evolving nature and overlap of food tourism with other forms, providing a definition of food tourism limits and weakens it [28].

Nevertheless, the inclination to experience a specific type of food or product in a particular region is a simple definition of food tourism [20]. The World Food Travel Association defines food tourism as follows: "The pursuit and enjoyment of unique and memorable food and beverage experiences, both near and far" [22]. Additionally, tourist activities that involve tasting the foods of a place or engaging in food-related activities represent a more flexible definition of food tourism [34].

To alleviate the growing challenges of rural communities in social, economic, and environmental dimensions [46], such as geographical isolation, weak economic conditions, limited infrastructure development, low education and social welfare [47], poverty [48], declining economic activity, population aging, migration of highly educated youth and decreased quality of life [49], various strategies have been employed [50]. Among these, tourism development is one of the most essential strategies for rural development [51–53]. The development of the tourism industry over the past 70 years has significantly impacted the development of many rural areas [54]. Rural tourism has been considered a poverty alleviation industry [55], an alternative tool for achieving economic and social revitalization, and an engine for economic development, helping to improve the quality of life for rural residents [56].

Among the various attractions in rural settlements, food has been identified as a significant driving force for tourism development [31,57], playing a crucial role in tourist satisfaction and destination marketing [58]. Local food, which showcases national, regional,

and personal identities, plays a key role in improving the image of a destination [29]. Within various environmental, social, cultural, and economic discourses, it has been argued that local food, with its authenticity and freshness being among its most important characteristics [44], leads to reduced distances traveled for food consumption and greenhouse gas emissions, improved food safety and quality (resulting in greater health benefits), increased social capital, and bolstering of the local economy. Politically, supporting small and local food producers increases their resilience against corporations [59].

Overall, food tourism in rural areas, as a small-scale business [45], business development [20], maintaining the authenticity of destinations, developing environmentally friendly infrastructure, strengthening the local economy, enhancing the sustainability of tourism [60], providing job opportunities and local economic development, have positive effects on other sectors of activity in rural communities, overcoming seasonal outmigration [61].

Given the extensive effects of food tourism on tourist destinations and their sustainable development [20], identifying the factors influencing food tourism is essential for the optimal management of tourist destinations and the sustainable utilization of their benefits [62,63]. Studies indicate that there has been increased attention to research related to food tourism in recent years [20,64], and a wide range of factors can influence the development of food tourism [29].

An examination of scholarly texts related to food tourism indicates that researchers have identified other factors as drivers of food tourism, as follows: respect for dietary laws among tourists, especially among Muslim tourists [65]; innovation in tourist destinations [44]; attention to the authenticity of tourist destinations [41]; valuing local people [42]; stakeholder participation [45]; food innovation; provision of quantitative and qualitative information about food; food tourism managers; food festivals; word-of-mouth advertising; provision of travel information; employee training in ensuring food safety; legislation; health protocols; and the spread of global pandemics [18].

Existing research on food tourism primarily focuses on the current state of development and the factors influencing its growth or decline. However, few studies have identified the key factors of food tourism. Moreover, given the diverse geographical and cultural contexts, the key factors of food tourism vary across regions. In addition, while some studies have proposed solutions, few have explored future scenarios.

Consequently, a two-fold gap exists in the literature on food tourism. First, there is a need for more research to identify the key factors of food tourism in different regions. Second, there is a dearth of studies that have developed scenarios for the future of food tourism.

By understanding the key factors and developing future scenarios, researchers and policymakers can better inform decision-making and develop effective strategies to promote food tourism. Such research can contribute to the sustainable development of rural areas and the preservation of cultural heritage.

## 3. Materials and Methods

### *3.1. Study Area*

According to the latest estimates from the Statistical Center of Iran, Iran has 31 provinces and a population of 84,055,000 people. Out of this population, 63,867,000 people (equivalent to 76% of the total population) reside in urban areas, and 20,179,000 people (equivalent to 24% of the total population) live in rural areas. The rural population of Iran resides in 622,284 rural settlements [66]. Iran, due to its rich historical background, culture, and diverse tourist attractions, is one of the Middle East's tourism destinations, hosting numerous tourists worldwide every year [67]. Rural areas of Iran also have significant potential for food tourism,

offering various attractions such as nutritious traditional foods [39], fresh, healthy, natural, and authentic foods [67], and the use of medicinal herbs in food and beverages [38].

Considering the importance of food tourism in the development process in Iran (at least theoretically), it has been mentioned as a suitable approach for employment generation and entrepreneurship and a key factor for Iran's future development [67,68]. For this reason, the Cultural Heritage, Handicrafts, and Tourism Organization of Iran has identified 464 villages as high-potential rural tourism destinations, and it is predicted that their number will increase to over 1000 villages [39].

### *3.2. Methodology*

This descriptive-analytical study is structured in three main parts. The first part focuses on identifying the key driving forces that influence the development of food tourism in Iran's rural areas. Building on these identified drivers, the second part explores possible future scenarios for the growth of rural food tourism. Finally, the third part is dedicated to prioritizing strategic alternatives to guide future development efforts in this sector:

#### 3.2.1. First Part

To identify the key factors influencing the development of food tourism in rural areas of Iran, a comprehensive literature review was conducted to identify general factors influencing food tourism development. Subsequently, these factors were presented to 30 experts in tourism development to identify the specific factors relevant to food tourism development in Iran (a group of 5 employees from tourism organizations, 18 graduate and doctoral students, and 7 professors specializing in rural and tourism planning). These individuals were selected using the snowball sampling method based on their research background in rural tourism in Iran. From the initial set of factors, 52 primary and context-specific variables were identified and extracted.

Subsequently, by distributing questionnaires and surveys among these 30 expert professionals and using cross-impact analysis with the Micmac software (version 0.4), the key factors influencing food tourism development in rural areas of Iran were identified. This software provides a cross-impact analysis, which is a method used to evaluate the interdependence between various factors or events, particularly in complex systems [69,70]. In this context, it is important to understand how different variables influencing food tourism development might affect each other. By analyzing these relationships, this method provides insights into the potential outcomes or scenarios that could arise based on different combinations of factors. The main concept involves assessing the likelihood and impact of each factor in relation to others, often using expert opinions or statistical models. The results of the cross-impact analysis typically include a matrix or map showing the strength and direction of these interactions, which can help identify key factors, potential synergies, or conflicts between variables. This approach is valuable for scenario planning and decision-making because it highlights how changes in one area can influence others, enabling more informed strategies to be developed [68,71,72].

#### 3.2.2. Second Part

Following the identification of the key factors, a third-stage questionnaire was distributed among the same 30 experts, and with the use of ScenarioWizard 4 software [73,74], the possible and desirable future scenarios for the development of food tourism in rural areas of Iran were presented.

#### 3.2.3. Third Part

The third part of the analysis is the application of an integrated multi-criteria decision-making (MCDM) approach to evaluate and prioritize alternatives across six criteria (corre-

sponding to the most relevant factors identified in the first part) using Picture Fuzzy Sets (PFS) and the COPRAS method [75,76]. The methodological framework includes two main stages: (1) determining the weights of the criteria via the Picture Fuzzy Analytic Hierarchy Process (PF-AHP) and (2) ranking the alternatives through the Picture Fuzzy COPRAS technique.

The ten strategic alternatives evaluated in the multi-criteria decision-making section were meticulously defined and developed based on the outcomes of the scenario planning phase and the subsequent application of the Delphi technique. Specifically, the three future scenarios—optimistic, stagnant, and crisis-driven—developed in the initial part of the study provided the essential context for identifying realistic and impactful courses of action. A panel of expert stakeholders in Iran's rural food tourism sector was engaged through several rounds of the Delphi process to generate, refine, and validate a set of viable strategies. This systematic approach ensured that each strategy, from organizing seasonal food festivals to improving infrastructure and branding local foods, was not only relevant to the study's focus but also grounded in expert consensus regarding its practicality and potential effectiveness within the context of the projected future scenarios. This systematic and expert-driven approach underpins the realism of the alternatives considered in the PF-AHP and COPRAS analyses.

#### 3.2.4. Criteria Weighting via PF-AHP

To capture the uncertainty and hesitation in expert judgments, we use the Picture Fuzzy Analytic Hierarchy Process (PF-AHP). A pairwise comparison matrix was constructed based on evaluations by domain experts using picture fuzzy numbers ($\mu$, $\nu$, $\pi$), where $\mu$ denotes the degree of membership, $\nu$ the degree of non-membership, and $\pi$ the degree of hesitation, ensuring that $\mu + \nu + \pi \leq 1$. The consistency of the matrix was verified, and the criteria weights were derived accordingly.

#### 3.2.5. Evaluation of Alternatives via Picture Fuzzy COPRAS

Ten alternatives were evaluated against the six criteria using expert assessments encoded in picture fuzzy numbers. The picture fuzzy decision matrix was then converted to crisp values using a suitable score function or defuzzification technique, making the data compatible with the COPRAS method. In the COPRAS framework, the normalized and weighted decision matrices were computed. For each alternative, the sum of the beneficial criteria values ($S^+$) and the sum of the non-beneficial criteria values ($S^-$) were calculated to determine the relative significance index ($K_i$). This index was used to rank the alternatives from best to worst. In this paper, for defuzzification fuzzy methods, the score function proposed for converting PNFs to a crisp number, the $S(\alpha) = \mu - \nu + \pi/2$, where $\mu$, $\nu$, and $\pi$ represent the membership, non-membership, and hesitation degrees, respectively, is used. This method can effectively balance the membership, non-membership, and hesitation components of PFNs and shows a robust transformation to crisp values, making it more suitable and adapted to the COPRAS method [77].

#### 3.2.6. Sensitivity Analysis

To assess the robustness of the ranking results, a sensitivity analysis was conducted by systematically varying the weights of each criterion. The goal was to identify how changes in the weight of each criterion influence the final ranking of alternatives.

Decision-making concerning rural tourism strategies is frequently characterized by a high degree of uncertainty and indeterminacy. In such contexts, expert opinions often extend beyond simple agreement or disagreement, incorporating a neutral zone reflecting hesitation and non-commitment. While standard fuzzy logic is limited to modeling only the Degree of Membership and the Degree of Non-Membership, the Picture Fuzzy Sets (PFS) approach introduces a third dimension—the Degree of Neutrality—thereby enabling

a more precise and comprehensive model of the actual structure of human knowledge and preferences. This unique capacity of PFS to simultaneously model agreement (acceptance), disagreement (rejection), and neutrality (hesitation) allows for a richer representation of data gathered from expert surveys, which are commonly utilized in scenario planning studies. This is particularly crucial when evaluating factors such as government support and investment, where perspectives on their potential success are often ambiguous. Consequently, adopting the PFS framework significantly enhances the accuracy and reliability of the strategic ranking results derived from the PF-AHP and Picture Fuzzy COPRAS methodologies. Given the reliance on expert judgments within the multi-criteria decision-making tools and foresight techniques employed (such as MICMAC, ScenarioWizard, and COPRAS), ensuring the consistency and reliability of the input data was paramount. During the Picture Fuzzy Analytic Hierarchy Process (PF-AHP) phase, the consistency of these judgments was verified using the method's standard internal Consistency Index, with only matrices falling within the acceptable threshold being retained. However, a more rigorous qualitative approach was adopted to guarantee validity in the other expert-based assessment stages, including the MICMAC analysis and the provision of COPRAS weighting inputs. Before the data were formally processed, the results of the individual expert evaluations were thoroughly discussed and scrutinized in Consensus Meetings. Within these sessions, any significant discrepancies in comparisons or scoring across different experts were pinpointed and renegotiated to achieve a Group Consensus. This process ensured that the final data fed into the models reflected a stable and logically consistent perspective, rather than merely a mechanical averaging of conflicting judgments. This meticulous qualitative procedure ultimately guaranteed the validity of the evaluations throughout all phases of pairwise comparisons and multi-criteria assessment, extending beyond the technical requirements of the PF-AHP.

## 4. Results

Table 1 presents the initial factors influencing the development of food tourism in Iran's rural areas. These elements were subsequently used as the preliminary set for identifying the key factors impacting food tourism within these regions.

**Table 1.** Factors Influencing Food Tourism.

| Encoding | Factors | References | Encoding | Factors | References |
|---|---|---|---|---|---|
| **A1** | Understanding the motivations and needs of tourists | [78] | A27 | Coordination of laws and policies | [64] |
| **A2** | Reduction in tax rates | [78] | A28 | Attention to tourists' food interests. | [58] |
| **A3** | The decoration of food, its color, and presentation | [79,80] | A29 | Satisfaction and contentment about repeat visit intention | [60] |
| **A4** | Increasing competition among companies involved in food production | [78] | A30 | Internet and Web (information and communication technology) in the tourism sector | [81] |
| **A5** | Creating campaigns and organizing festivals, events, meetings, conferences, and trade shows. | [17,27,79] | A31 | Advertising, particularly word of mouth and social media advertising | [18,26] |
| **A6** | The authenticity of food | [30,79] | A32 | The quality, shape, and color of food containers | [82] |
| **A7** | Prices (for food, drinks, courses, etc.) | [29,78,79] | A33 | Personnel (attire and interaction manner, ensuring safety by them) | [58,79] |
| **A8** | Quality of food | [58,79] | A34 | Marketing | [33,43] |

**Table 1.** *Cont.*

| Encoding | Factors | References | Encoding | Factors | References |
|---|---|---|---|---|---|
| **A9** | Designing the ambient decoration of the destination (considering ethnicities, furniture, artworks, environmental embellishments, lighting quality, and entertainment such as music and shows) | [58,79] | A35 | Accurate assessment of assets' capacity | [83] |
| **A10** | Industrial reconstruction | [84] | A36 | Continuous and comprehensive evaluation of food tourism destinations | [83] |
| **A11** | Proximity and accessibility to accommodation | [84] | A37 | Investment. | [85] |
| **A12** | Quality of infrastructure | [43,84] | A38 | Collaboration and stakeholder participation | [32,45,83] |
| **A13** | Local lifestyle | [84] | A39 | Enhanced interaction between tourists and local communities. | [17] |
| **A14** | National food vacation calendar | [85] | A40 | Adding a dreamy aspect to festivals | [32] |
| **A15** | High capacity for agricultural and animal husbandry | [19,85] | A41 | Elevating the level of motivation for well-being and exclusivity in local communities | [32] |
| **A16** | Formation of tourism companies | [85] | A42 | The fluid identity of the festival and its food. | [32] |
| **A17** | Government support and assistance | [43] | A43 | Travel information provision | [18] |
| **A18** | Diversity of food | [30] | A44 | Development and promotion of street food | [62] |
| **A19** | Respect for tourists' dietary regime laws in tourist destinations | [65] | A45 | Food safety | [62] |
| **A20** | Traditional restaurants | [85] | A46 | Attention should be paid to the authenticity of tourism destinations. | [41] |
| **A21** | Quality perceived by tourists | [19] | A47 | Establishment of food museums | [85] |
| **A22** | Improving communication between tourists and the host community | [85] | A48 | Quantitative and qualitative information about food | [18] |
| **A23** | Awareness (local and general) of tourists' preferences and food tourism | [69] | A49 | Food tourism managers | [18] |
| **A24** | Values (health value, emotional value, experience and consumption value of local food, perceived value for repeat visit intention, valuing local people) | [60,70] | A50 | Innovation and creativity in food and destination | [18,84] |
| **A25** | Cooking motivation | [30] | A51 | Observation of health protocols | [18] |
| **A26** | Adaptation and coordination of tourism products | [33] | A52 | Human risks such as the COVID-19 pandemic | [18] |

### *4.1. Identification of the Key Factors of Food Tourism in Rural Areas of Iran*

After identifying the initial factors influencing food tourism based on publications and expert opinions, a rigorous selection process led to the final set of 52 key factors. These factors were then presented to a panel of 30 experts to evaluate their mutual impacts and interdependencies. Given the number of factors, the resulting Matrix of Direct Influences (MDI) is structured as a 52 × 52 matrix, capturing a comprehensive network of relationships. The degree of influence among the factors is quantified on a scale from 0 to 3, where 0 indicates no relationship, while values of 1, 2, and 3 represent increasing levels of impact. Specifically, a score of 1 indicates minimal influence, 2 denotes a moderate effect, and 3 indicates a strong influence between factors.

A detailed analysis of the matrix characteristics reveals that out of 2704 possible interactions (52 × 52), a total of 2345 non-zero relationships exist, resulting in a high fill rate of 86.72%. This percentage underscores the extensive interconnectivity among the selected factors, demonstrating the complex and interwoven nature of food tourism dynamics.

Breaking down these interactions, 896 relationships (38.2%) exhibited low influence (score of 1), 874 interactions (37.3%) showed moderate influence (score of 2), and 575 interactions (24.5%) displayed strong influence (score of 3). In addition, 359 elements remained zero, indicating a lack of direct impact between certain factors. These findings highlight the intricate dependencies within the system and highlight the need for a holistic approach when analyzing the drivers of food tourism development (Table 2).

**Table 2.** Primary features of the collected data and cross-effects (Matrix of Direct Influences) using the MICMAC software.

| MDI Characteristics | |
|---|---|
| Matrix size | 52 |
| Number of iterations | 2 |
| Number of zeros | 359 |
| Number of ones | 896 |
| Number of twos | 874 |
| Number of threes | 575 |
| Total | 2345 |
| Fill rate | 86.72 |

The stability of the data, achieved through two rounds of statistical rotation, was 100%, indicating a high validity of the questionnaires and their responses.

As is evident, the level of influence of the factors on each other is 99%, and the level of influence of the factors on each other is 96% (Table 3).

**Table 3.** Stability (Matrix of Direct Influences).

| Iteration | Influence | Dependence |
|---|---|---|
| 1 | 99% | 96% |
| 2 | 100% | 100% |

Factors Determining or Influencing the Development of Food Tourism in Rural Areas of Iran

Figure 1 illustrates the dispersion status of the factors influencing food tourism development in rural areas of Iran, indicating system stability, as most variables conform to an "L" distribution. In the Micmac software, the dispersion of the variables in the diagram defines the system stability. In stable systems, variable dispersion typically forms an "L" shape, where some variables exhibit high influence while others show high dependence [86]. Variables in stable systems generally fall into three categories: highly influential variables (key factors), independent variables, and system output variables (outcome variables). Each variable's position is clearly defined, and its role is presented explicitly. Conversely, unstable systems present a more complex pattern in which variables scatter around the diagonal axis of the scatter plot, often indicating an intermittent state of influence and dependence, making the assessment and identification of key factors challenging.

However, solutions have been proposed for such systems to guide the selection and identification of key factors [86]. Factors influencing the development of food tourism in rural areas of Iran generally have both direct and indirect impacts, which can be categorized into five groups based on their impact type: determinant or influential variables, bidirectional variables (risk variables and target variables), influenced variables, independent variables, and regulatory variables.




**Figure 1.** Factors influencing food tourism development in rural areas of Iran.

Figure 1 depicts the most influential factors affecting food tourism development in rural areas of Iran. These factors are more impactful and less susceptible to external influences. They are positioned in the northwest quadrant of the diagram. Of the 52 influential factors in food tourism, six factors fall into this category. These factors include creating campaigns and organizing festivals, events, meetings, conferences, and trade shows (A5); prices (for food, drinks, courses, etc.) (A7); the quality of food (A8); the quality of infrastructure (A12); government support and assistance (A17); and investment (A37).

The findings from the identification of key factors influencing the development of food tourism in rural areas of Iran were presented to experts and subsequently validated through follow-up interviews. The findings were thus validated through expert consensus, further strengthening their validity.

### *4.2. Scenario Development for Food Tourism in Rural Areas of Iran*

After identifying the key factors influencing food tourism development in rural areas of Iran, scenario development for food tourism in these regions was explored. Each key factor of food development leads to three different futures (desired scenario, continuation of current trends, and crisis scenario), which form the basis of the scenarios in this study (Table 4).

**Table 4.** Key factors and possible scenarios for future food tourism development in rural areas of Iran.

| Key Factor ID | Key Factors for Food Tourism Development | Possible Scenarios for Each Factor | States or Levels of the Main Factor | Degree of Desirability | Status |
|---|---|---|---|---|---|
| A | Creating campaigns and organizing festivals, events, meetings, conferences, and trade shows | A1 | Expanding the number of festivals | Desirable | Green |
| | | A2 | Continuation of the current trend | Average | Yellow |
| | | A3 | Reduction in the number of festivals | Undesirable | Red |
| B | Prices (for food, drinks, courses, etc.) | B1 | Reduction in prices | Desirable | Green |
| | | B2 | Continuation of the current trend | Average | Yellow |
| | | B3 | Increase in prices | Undesirable | Red |

**Table 4.** *Cont.*

| Key Factor ID | Key Factors for Food Tourism Development | Possible Scenarios for Each Factor | States or Levels of the Main Factor | Degree of Desirability | Status |
|---|---|---|---|---|---|
| C | Quality of food | C1 | Improvement in food quality | Desirable | Green |
| | | C2 | Continuation of the current trend | Average | Yellow |
| | | C3 | Reduction in food quality | Undesirable | Red |
| D | Quality of infrastructure | D1 | Improvement in the quality of infrastructure | Desirable | Green |
| | | D2 | Continuation of the current trend | Average | Yellow |
| | | D3 | Reduction in the quality of infrastructure | Undesirable | Red |
| E | Government support and assistance | E1 | Increase in government support for food tourism | Desirable | Green |
| | | E2 | Continuation of the current trend | Average | Yellow |
| | | E3 | Reduction in government support for food tourism | Undesirable | Red |
| F | Investment | F1 | Increase in investments in the development of food tourism | Desirable | Green |
| | | F2 | Continuation of the current trend | Average | Yellow |
| | | F3 | Reduction in investments in developing food tourism | Undesirable | Red |
| Total | | 18 | | ---- | ---- |

#### 4.2.1. Scenario Analysis of Food Tourism Development in Rural Areas of Iran

The six key factors influencing food tourism development in rural areas of Iran, each in three possible states, were combined to create 18 potential scenarios for the future of food tourism development in these areas. These scenarios were presented to experts to assess the impact of each of the 18 possible states on each other. This assessment was expressed on a scale ranging from −3 to +3. For example, if state A1 of key factor A occurs in the future, what impact will it have on the occurrence or non-occurrence of state B1 of key factor B? The findings of these assessments indicate several strong to weak scenarios, as shown in Table 5. Strong scenarios are those that are more likely to occur in the future, while weak scenarios are those that are less likely to occur.

The findings indicate 196 scenarios with weak probability (from the possible scenarios) in Table 6, which makes it impossible to deal with such a volume of scenarios. What seems logical is that between the limited number of strong (probable) scenarios and weak (possible) scenarios are the scenarios with consistency values $\geq -1$, which is an extension

of the range of strong scenarios by one unit toward weak scenarios [86]. Accordingly, 10 scenarios with maximum consistency were calculated for planning and policymaking for food tourism development in rural areas of Iran, which includes the 4 strong scenarios as well, as shown in Figure 2.

**Table 5.** Summary of Strong to Weak Scenarios for Food Tourism Development in Rural Areas of Iran.

| Scenario Status | Number of Scenarios |
|---|---|
| Weak (possible) scenarios | 196 |
| Scenarios with maximum consistency (consistency value $\geq -1$) | 10 |
| Strong or probable scenarios (consistency value 0) | 4 |

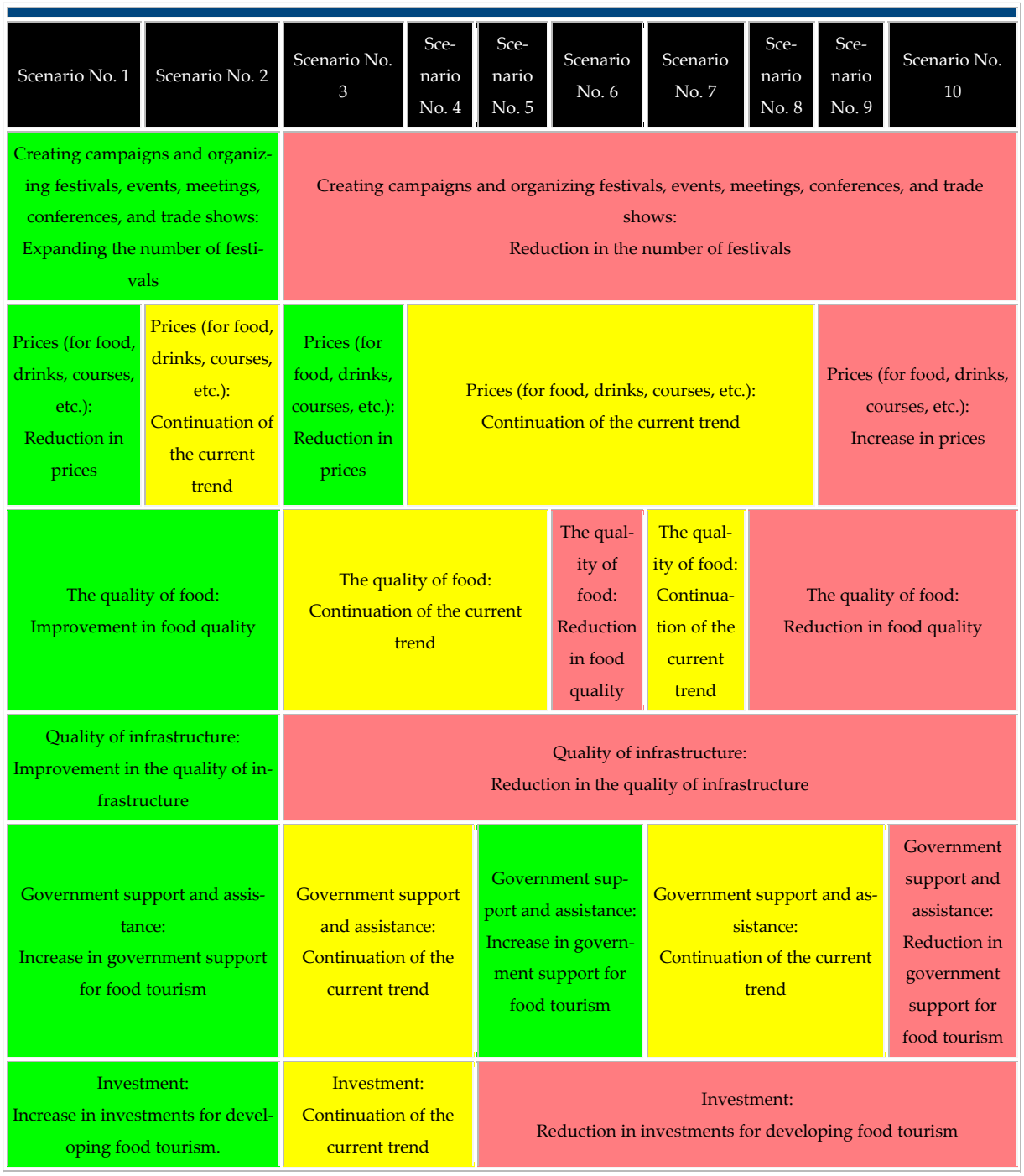


**Figure 2.** Scenarios for Food Tourism Development in Rural Areas in Iran.

**Table 6.** Scenarios of group 1 from the total set of plausible scenarios for developing food tourism in rural areas of Iran.

| Group | Scenario Number | Consistency Value | Icons. Descriptor. | Total Impact Score | Characteristics |
|---|---|---|---|---|---|
| 1 | Scenario 1 | 0 | 0 | 55 | All factors except one in this group will be in their most desirable state. These factors include creating campaigns and organizing festivals, events, meetings, conferences, and trade shows with an expanded number of festivals; improving the quality of food and infrastructure; increasing government support for food tourism; and higher investments for its development. The only exception is the pricing factor, which continues its current trend in Scenario 2, reflecting ongoing conditions. |
| | Scenario 2 | 0 | 0 | 49 | |

4.2.2. Selected Scenarios for Food Tourism Development in Rural Areas of Iran

In general, the 10 scenarios obtained can be classified into four groups based on their characteristics as follows. These groups represent the general framework of the prevailing conditions for food tourism development:

Group 1: Scenarios for Food Tourism Development in Rural Areas of Iran under Very Favorable Conditions.

This group includes two scenarios representing the most favorable conditions for food tourism development in rural areas in Iran. As shown in Figure 2, all states of the factors are in the best possible state. The characteristics of this scenario are provided in Table 6.

Group 2: Scenarios of food tourism development in rural areas of Iran with static trends, current conditions, relative improvement in some factors, and crisis conditions in others. This group includes six scenarios. In this group, some factors will be in desirable conditions, some will continue their current trends, and some will experience crisis conditions. Table 7 presents the results.

**Table 7.** Scenarios of the second group from the total scenarios of food tourism development in rural areas of Iran.

| Group | Scenario Number | Consistency Value | Icons. Descript. | Total Impact Score | Characteristics |
|---|---|---|---|---|---|
| 2 | Scenario 3 | −1 | 3 | 4 | In this group, two factors—creating campaigns and organizing festivals, events, meetings, conferences and trade shows and the quality of infrastructure—are collectively in critical conditions across all six scenarios. Scenario three involves a reduction in the factor relating to prices, while in scenarios five and six, the government support and assistance factor is favorable. Other factors remain in either the current state continuation or critical conditions across all scenarios. |
| | Scenario 4 | −1 | 3 | 2 | |
| | Scenario 5 | −1 | 2 | 10 | |
| | Scenario 6 | −1 | 2 | 14 | |
| | Scenario 7 | −1 | 1 | 9 | |
| | Scenario 8 | 0 | 0 | 15 | |

Group 3: Critical Scenarios for Food Tourism Development in Rural Areas in Iran

Two scenarios (9 and 10) were identified in this group. As depicted in Figure 2, scenarios within this group are in a state of complete crisis, showing no signs of efforts to enhance or maintain the current situation (except for government support and assistance: continuation of the current trend). All factors constitute a severe and comprehensive crisis. The key characteristics of these scenarios are presented in Table 8.

**Table 8.** Scenarios of the third group from credible scenarios of food tourism development in rural areas of Iran.

| Group | Scenario Number | Consistency Value | Icons. Descript. | Total Impact Score | Characteristics |
|---|---|---|---|---|---|
| 3 | Scenario 9 | −1 | 1 | 15 | In this group, Scenarios 9 and 10 are positioned in a state of complete crisis, as illustrated in Figure 2. These scenarios depict a full-scale crisis in which there is no evidence of efforts to improve or even maintain the current situation, except for government support and assistance, which continues along its current trajectory. The critical features of these scenarios, detailed in Table 8, encompass a severe reduction or deterioration in all key factors: a decrease in the number of festivals, an increase in prices, a decline in food quality, a degradation of infrastructure quality, reduced government support for food tourism, and diminished investments in the development of food tourism. |
| | Scenario 10 | 0 | 0 | 20 | |

### *4.3. Multicriteria Analysis of the 10 Alternative Scenarios*

#### 4.3.1. Picture Fuzzy Pairwise Comparison Matrix (PF-AHP Input)

Table 9 presents the evaluation of 10 strategic alternatives (scenarios) for developing food tourism in Iran's rural areas, based on six key criteria: Campaigns and Festivals, Prices, Food Quality, Infrastructure Quality, Government Support, and Investment. Each strategy is assessed using Picture Fuzzy Numbers (PFNs), represented as triplets, reflecting expert judgments under uncertainty. The strategies include initiatives such as organizing seasonal food festivals, improving infrastructure, and branding local foods, all of which align with the study's focus on planning and ranking strategies for developing rural food tourism. The ten strategic alternatives evaluated in the multi-criteria decision-making section were meticulously defined and developed based on the outcomes of the scenario planning phase and the subsequent application of the Delphi technique. Specifically, the three future scenarios—optimistic, stagnant, and crisis-driven—developed in the initial part of the study provided the essential context for identifying realistic and impactful courses of action. A panel of expert stakeholders in Iran's rural food tourism sector was engaged through several rounds of the Delphi process to generate, refine, and validate a set of viable strategies. This process ensured that each strategy, from organizing seasonal food festivals to improving infrastructure and branding local foods, was not only relevant to the study's focus but also grounded in expert consensus regarding its practicality and potential effectiveness within the context of the projected future scenarios. This systematic and expert-driven approach underpins the realism of the alternatives considered in the PF-AHP and COPRAS analyses.

**Table 9.** Picture Fuzzy Pairwise Comparison Matrix (PF-AHP Input).

| Strategies | Campaigns and Festivals | Prices | Food Quality | Infrastructure Quality | Government Support | Investment |
|---|---|---|---|---|---|---|
| Organizing seasonal food festivals | (6, 7, 9) | (3, 5, 7) | (4, 6, 8) | (2, 4, 6) | (3, 5, 7) | (2, 4, 6) |
| Improving tourism infrastructure quality | (4, 6, 8) | (3, 5, 7) | (3, 5, 7) | (7, 9, 10) | (4, 6, 8) | (5, 7, 9) |
| Specialized training in local cooking | (2, 4, 6) | (3, 5, 7) | (6, 8, 10) | (2, 4, 6) | (3, 5, 7) | (3, 5, 7) |
| Extensive advertising on social media | (5, 7, 9) | (3, 5, 7) | (4, 6, 8) | (2, 4, 6) | (3, 5, 7) | (2, 4, 6) |
| Attracting domestic and foreign investment | (3, 5, 7) | (4, 6, 8) | (3, 5, 7) | (4, 6, 8) | (3, 5, 7) | (7, 9, 10) |
| Creating food tourism routes | (5, 7, 9) | (3, 5, 7) | (4, 6, 8) | (4, 6, 8) | (3, 5, 7) | (4, 6, 8) |
| Targeted and sustainable government support | (4, 6, 8) | (3, 5, 7) | (4, 6, 8) | (3, 5, 7) | (8, 9, 10) | (5, 7, 9) |
| Control and stability of service pricing | (3, 5, 7) | (7, 9, 10) | (3, 5, 7) | (3, 5, 7) | (4, 6, 8) | (4, 6, 8) |
| Branding of local foods | (4, 6, 8) | (3, 5, 7) | (6, 8, 10) | (3, 5, 7) | (4, 6, 8) | (3, 5, 7) |
| Cooperation with active local communities | (4, 6, 8) | (3, 5, 7) | (5, 7, 9) | (3, 5, 7) | (4, 6, 8) | (3, 5, 7) |

To determine the relative importance of the six criteria, we applied the Picture Fuzzy Analytic Hierarchy Process (PF-AHP). Table 10 shows the matrix that encodes the pairwise comparisons of the criteria using PFNs, where each triplet ($\mu$, $\nu$, $\pi$) denotes the degree of support, opposition, and hesitancy toward the dominance of one criterion over another. For example, the first row indicates that "Campaigns and Festivals" is strongly preferred over others, with a membership value of 1.00, which is relatively high when compared to others. This step is critical in aligning the evaluation process with the research objective, which is to prioritize development strategies through a future-oriented and uncertainty-aware methodology. By combining PF-AHP and PF-COPRAS, the study ensures both structured judgment aggregation and robust prioritization under uncertain conditions, contributing to more effective and evidence-based planning in the context of rural food tourism.

**Table 10.** Matrix for the COPRAS input.

| | Campaigns and Festivals | Prices | Food Quality | Infrastructure Quality | Government Support | Investment |
|---|---|---|---|---|---|---|
| Campaigns and Festivals | (1.00, 0.00, 0.00) | (0.60, 0.30, 0.10) | (0.70, 0.20, 0.05) | (0.50, 0.40, 0.10) | (0.40, 0.50, 0.10) | (0.60, 0.30, 0.10) |
| Prices | (0.10, 0.30, 0.60) | (1.00, 0.00, 0.00) | (0.50, 0.40, 0.10) | (0.70, 0.20, 0.05) | (0.80, 0.10, 0.05) | (0.60, 0.30, 0.10) |
| Food Quality | (0.05, 0.20, 0.70) | (0.10, 0.40, 0.50) | (1.00, 0.00, 0.00) | (0.60, 0.30, 0.10) | (0.50, 0.40, 0.10) | (0.70, 0.20, 0.05) |
| Infrastructure Quality | (0.10, 0.40, 0.50) | (0.05, 0.20, 0.70) | (0.10, 0.30, 0.60) | (1.00, 0.00, 0.00) | (0.70, 0.20, 0.05) | (0.50, 0.40, 0.10) |
| Government Support | (0.10, 0.50, 0.40) | (0.05, 0.10, 0.80) | (0.10, 0.40, 0.50) | (0.05, 0.20, 0.70) | (1.00, 0.00, 0.00) | (0.60, 0.30, 0.10) |
| Investment | (0.10, 0.30, 0.60) | (0.10, 0.30, 0.60) | (0.05, 0.20, 0.70) | (0.10, 0.40, 0.50) | (0.10, 0.30, 0.60) | (1.00, 0.00, 0.00) |

As illustrated in the chart (see Figure 3), "Campaigns & Festivals" received the highest weight (0.2567), indicating that promotional activities and seasonal food events are considered the most influential factor in promoting food tourism in rural Iran. "Prices" follows with a weight of 0.2213, highlighting the importance of affordability and cost management in attracting tourists to rural areas. The remaining criteria received comparatively lower weights, with "Food Quality" at 0.1704 and "Infrastructure Quality" at 0.1418, reflecting the significance of both culinary excellence and physical facilities in enhancing the tourist experience. "Government Support" (0.1106) and "Investment" (0.0992), although important, were deemed less critical by experts within the short- to mid-term planning horizon. These weights serve as essential inputs for the Picture Fuzzy COPRAS method in the next step of the analysis, where the strategic alternatives are ranked based on how well they address these prioritized criteria. The results underscore a clear emphasis on soft infrastructure and promotional strategies, suggesting that visibility, engagement, and affordability are key factors for the development of rural food tourism in Iran.

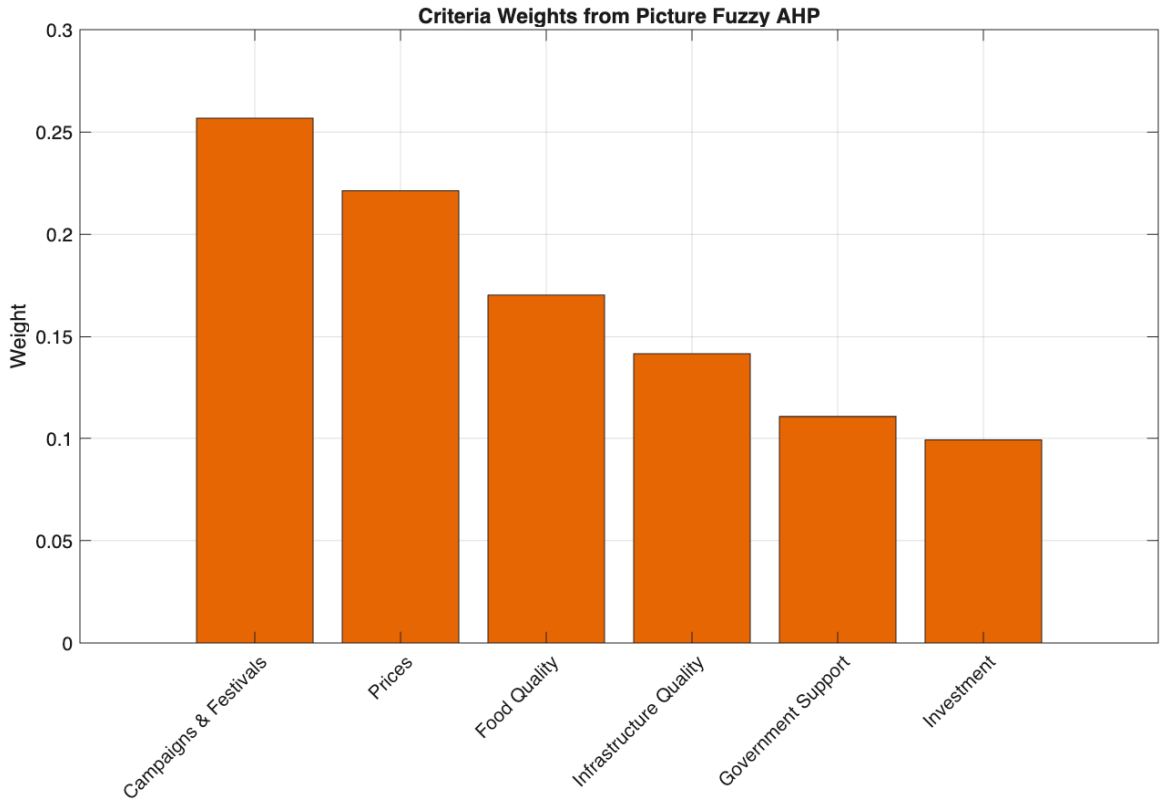


**Figure 3.** Criteria weights from the picture fuzzy AHP.

#### 4.3.2. Converted Decision Matrix (Picture Fuzzy Numbers)

Table 11 presents the Picture Fuzzy evaluation of 10 strategic alternatives in the context of planning and ranking strategies for developing food tourism in Iran's rural areas. Each row corresponds to a specific strategy, and each column represents one of the six criteria: Campaigns & Festivals, Prices, Food Quality, Infrastructure Quality, Government Support, and Investment. The values in the matrix are expressed as Picture Fuzzy Numbers ($\mu$, $\nu$, $\pi$), where $\mu$ (membership) indicates the degree of agreement that the alternative satisfies the criterion, $\nu$ (non-membership) reflects the degree of disagreement, and $\pi$ (hesitancy) represents uncertainty or lack of clarity in the expert's judgment. This representation allows for a more realistic and flexible assessment of strategic alternatives under ambiguity, making it well-suited for future-oriented planning. Using this approach, the model integrates subjective expert input with mathematical rigor, ensuring that both the complexity of rural tourism development and the uncertainty inherent in long-term decision-making are adequately addressed.

**Table 11.** Converted Decision Matrix (Picture Fuzzy Numbers).

| Strategies | Campaigns and Festivals | Prices | Food Quality | Infrastructure Quality | Government Support | Investment |
|---|---|---|---|---|---|---|
| Organizing seasonal food festivals | (0.60, 0.30, 0.10) | (0.30, 0.40, 0.30) | (0.40, 0.40, 0.20) | (0.20, 0.40, 0.40) | (0.30, 0.40, 0.30) | (0.20, 0.40, 0.40) |
| Improving tourism infrastructure quality | (0.40, 0.40, 0.20) | (0.30, 0.40, 0.30) | (0.30, 0.40, 0.30) | (0.70, 0.30, 0.00) | (0.40, 0.40, 0.20) | (0.50, 0.40, 0.10) |
| Specialized training in local cooking | (0.20, 0.40, 0.40) | (0.30, 0.40, 0.30) | (0.60, 0.40, 0.00) | (0.20, 0.40, 0.40) | (0.30, 0.40, 0.30) | (0.30, 0.40, 0.30) |
| Extensive advertising on social media | (0.50, 0.40, 0.10) | (0.30, 0.40, 0.30) | (0.40, 0.40, 0.20) | (0.20, 0.40, 0.40) | (0.30, 0.40, 0.30) | (0.20, 0.40, 0.40) |
| Attracting domestic and foreign investment | (0.30, 0.40, 0.30) | (0.40, 0.40, 0.20) | (0.30, 0.40, 0.30) | (0.40, 0.40, 0.20) | (0.30, 0.40, 0.30) | (0.70, 0.30, 0.00) |
| Creating food tourism routes | (0.50, 0.40, 0.10) | (0.30, 0.40, 0.30) | (0.40, 0.40, 0.20) | (0.40, 0.40, 0.20) | (0.30, 0.40, 0.30) | (0.40, 0.40, 0.20) |
| Targeted and sustainable government support | (0.40, 0.40, 0.20) | (0.30, 0.40, 0.30) | (0.40, 0.40, 0.20) | (0.30, 0.40, 0.30) | (0.80, 0.20, 0.00) | (0.50, 0.40, 0.10) |
| Control and stability of service pricing | (0.30, 0.40, 0.30) | (0.70, 0.30, 0.00) | (0.30, 0.40, 0.30) | (0.30, 0.40, 0.30) | (0.40, 0.40, 0.20) | (0.40, 0.40, 0.20) |
| Branding of local foods | (0.40, 0.40, 0.20) | (0.30, 0.40, 0.30) | (0.60, 0.40, 0.00) | (0.30, 0.40, 0.30) | (0.40, 0.40, 0.20) | (0.30, 0.40, 0.30) |
| Cooperation with active local communities | (0.40, 0.40, 0.20) | (0.30, 0.40, 0.30) | (0.50, 0.40, 0.10) | (0.30, 0.40, 0.30) | (0.40, 0.40, 0.20) | (0.30, 0.40, 0.30) |

#### 4.3.3. Normalized Decision Matrix (Crisp Values for COPRAS Calculation)

The normalized decision matrix (Table 12) presents the crisp values of the 10 alternatives across the six criteria for COPRAS calculations.

**Table 12.** Normalized Decision Matrix (Crisp Values for COPRAS Calculation).

| Strategies | Campaigns and Festivals | Prices | Food Quality | Infrastructure Quality | Government Support | Investment |
|---|---|---|---|---|---|---|
| Organizing seasonal food festivals | 0.1261 | 0.0917 | 0.0968 | 0.0762 | 0.0862 | 0.0696 |
| Improving tourism infrastructure quality | 0.1008 | 0.0917 | 0.0806 | 0.1619 | 0.1034 | 0.1217 |
| Specialized training in local cooking | 0.0672 | 0.0917 | 0.1290 | 0.0762 | 0.0862 | 0.0870 |
| Extensive advertising on social media | 0.1176 | 0.0917 | 0.0968 | 0.0762 | 0.0862 | 0.0696 |
| Attracting domestic and foreign investment | 0.0840 | 0.1101 | 0.0806 | 0.1143 | 0.0862 | 0.1478 |
| Creating food tourism routes | 0.1176 | 0.0917 | 0.0968 | 0.1143 | 0.0862 | 0.1043 |

**Table 12.** *Cont.*

| Strategies | Campaigns and Festivals | Prices | Food Quality | Infrastructure Quality | Government Support | Investment |
|---|---|---|---|---|---|---|
| Targeted and sustainable government support | 0.1008 | 0.0917 | 0.0968 | 0.0952 | 0.1552 | 0.1217 |
| Control and stability of service pricing | 0.0840 | 0.1560 | 0.0806 | 0.0952 | 0.1034 | 0.1043 |
| Branding of local foods | 0.1008 | 0.0917 | 0.1290 | 0.0952 | 0.1034 | 0.0870 |
| Cooperation with active local communities | 0.1008 | 0.0917 | 0.1129 | 0.0952 | 0.1034 | 0.0870 |

#### 4.3.4. Weighted Normalized Decision Matrix (Crisp Values)

Next, the weighted normalized decision matrix is calculated (Table 13), which displays the crisp values after applying the criterion weights for the COPRAS method.

**Table 13.** Weighted Normalized Decision Matrix (Crisp Values).

| Strategies | Campaigns and Festivals | Prices | Food Quality | Infrastructure Quality | Government Support | Investment |
|---|---|---|---|---|---|---|
| Organizing seasonal food festivals | 0.0324 | 0.0203 | 0.0165 | 0.0108 | 0.0095 | 0.0069 |
| Improving tourism infrastructure quality | 0.0259 | 0.0203 | 0.0137 | 0.0230 | 0.0114 | 0.0121 |
| Specialized training in local cooking | 0.0173 | 0.0203 | 0.0220 | 0.0108 | 0.0095 | 0.0086 |
| Extensive advertising on social media | 0.0302 | 0.0203 | 0.0165 | 0.0108 | 0.0095 | 0.0069 |
| Attracting domestic and foreign investment | 0.0216 | 0.0244 | 0.0137 | 0.0162 | 0.0095 | 0.0147 |
| Creating food tourism routes | 0.0302 | 0.0203 | 0.0165 | 0.0162 | 0.0095 | 0.0103 |
| Targeted and sustainable government support | 0.0259 | 0.0203 | 0.0165 | 0.0135 | 0.0172 | 0.0121 |
| Control and stability of service pricing | 0.0216 | 0.0345 | 0.0137 | 0.0135 | 0.0114 | 0.0103 |
| Branding of local foods | 0.0259 | 0.0203 | 0.0220 | 0.0135 | 0.0114 | 0.0086 |
| Cooperation with active local communities | 0.0259 | 0.0203 | 0.0192 | 0.0135 | 0.0114 | 0.0086 |

#### 4.3.5. Sums of Weighted Normalized Values (COPRAS $S^+$ and $S^-$ Scores)

Table 14 presents the summed positive ($S^+$) and negative ($S^-$) scores for the ten strategic alternatives assessed using the Picture Fuzzy COPRAS method. The $S^+$ scores reflect the weighted advantages or benefits of each strategy, with "Improving tourism infrastructure quality" (Alternative 2) achieving the highest score (0.0861), followed closely by "Targeted and sustainable government support" (Alternative 7) with 0.0851, and "Creating food tourism routes" (Alternative 6) at 0.0828. These high scores suggest that these strategies are perceived as the most beneficial in addressing the study's six key criteria. In contrast, "Specialized training in local cooking" (Alternative 3) yielded the lowest benefit score (0.0682), indicating its comparatively limited impact according to expert evaluations. On the other hand, the $S^-$ scores represent the non-benefits or drawbacks associated with each alternative. Most strategies exhibit low and relatively consistent cost scores around 0.0203, indicating limited perceived disadvantages. However, "Attracting domestic and foreign investment" (Alternative 5) shows a moderately higher cost (0.0244), and "Control and stability of service pricing" (Alternative 8) stands out with the highest cost value (0.0345), suggesting greater potential challenges or resource demands. The combination of high $S^+$ and low $S^-$ scores in Alternatives 2 and 7 marks them as the most effective and efficient strategies, whereas Alternative 8, with modest benefits and significantly higher cost, ranks lowest in overall desirability. These findings offer valuable insights for policymakers seeking to prioritize resource allocation in rural tourism development (see Table 15 and Figure 4).

**Table 14.** Sums of Weighted Normalized Values (COPRAS $S^+$ and $S^-$ Scores).

| Alternative (1–10) (Strategy) | $S^+$ Score | $S^-$ Score |
|---|---|---|
| Organizing seasonal food festivals (1) | 0.0761 | 0.0203 |
| Improving tourism infrastructure quality (2) | 0.0861 | 0.0203 |
| Specialized training in local cooking (3) | 0.0682 | 0.0203 |
| Extensive advertising on social media (4) | 0.0739 | 0.0203 |
| Attracting domestic and foreign investment (5) | 0.0757 | 0.0244 |
| Creating food tourism routes (6) | 0.0828 | 0.0203 |
| Targeted and sustainable government support (7) | 0.0851 | 0.0203 |
| Control and stability of service pricing (8) | 0.0706 | 0.0345 |
| Branding local foods (9) | 0.0814 | 0.0203 |
| Cooperation with active local communities (10) | 0.0787 | 0.0203 |

**Table 15.** Relative Importance Index (K_i).

| Alternative (Strategy) | K_i Value |
|---|---|
| Organizing seasonal food festivals (1) | 464.0520 |
| Improving tourism infrastructure quality (2) | 464.0620 |
| Specialized training in local cooking (3) | 464.0441 |
| Extensive advertising on social media (4) | 464.0498 |
| Attracting domestic and foreign investment (5) | 386.7223 |
| Creating food tourism routes (6) | 464.0587 |
| Targeted and sustainable government support (7) | 464.0610 |
| Control and stability of service pricing (8) | 272.9976 |
| Branding local foods (9) | 464.0573 |
| Cooperation with active local communities (10) | 464.0546 |

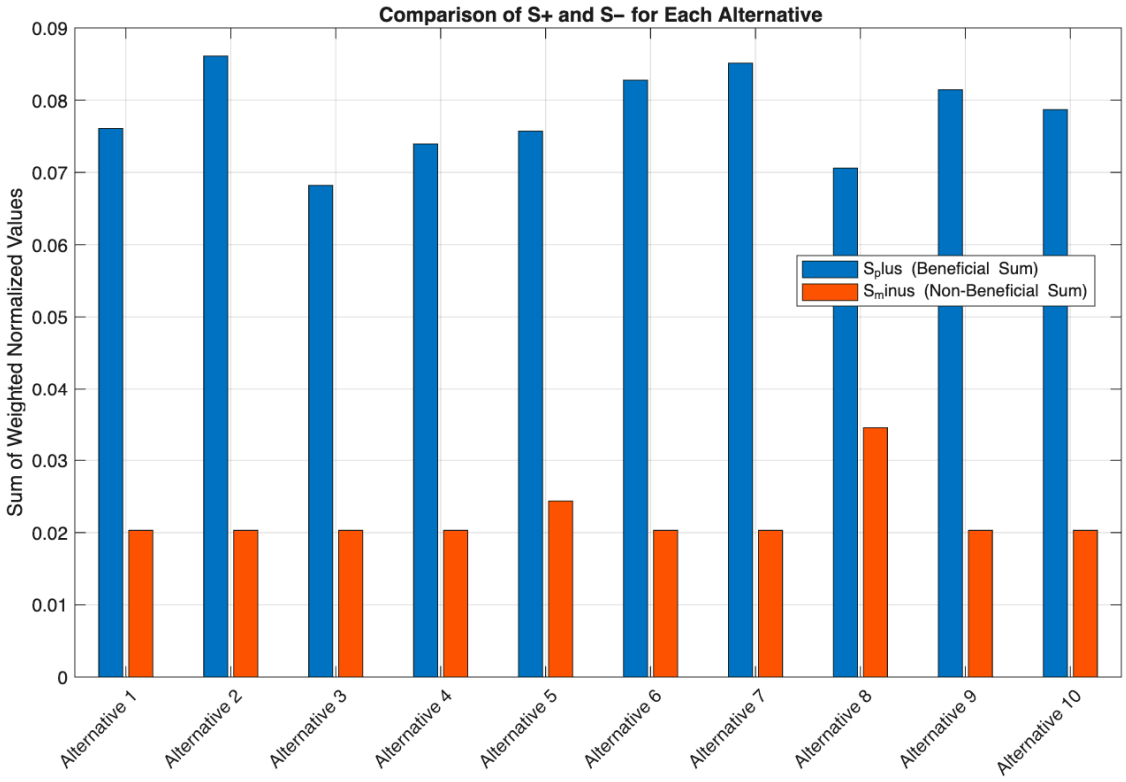


**Figure 4.** Comparison of S+ and S− for each alternative.

4.3.6. Relative Importance Index (K_i)

Table 15 presents the Relative Importance Index (K_i) values for each alternative derived from the COPRAS results.

4.3.7. Final Ranking of Alternatives (Picture Fuzzy COPRAS)

Table 16 presents the final ranking, based on the Relative Importance Index (K value) calculated through the Picture Fuzzy COPRAS method, which prioritizes ten strategic alternatives for developing food tourism in Iran's rural areas. The highest-ranking strategy is "Improving tourism infrastructure quality" with a K value of 464.0620, closely followed by "Targeted and sustainable government support" (K = 464.0610), "Creating food tourism routes" (K = 464.0587), and "Branding local foods" (K = 464.0573). These four alternatives form a tightly grouped top-performing cluster, suggesting that each provides similarly high value across the six decision-making criteria and should be prioritized in policy and investment planning. In the mid-range, strategies such as "Cooperation with active local communities", "Organizing seasonal food festivals", and "Extensive advertising on social media" show slightly lower, yet still competitive K values (between 464.05 and 464.049), indicating modest but consistent trade-offs. Further down the ranking, "Specialized training in local cooking" (K = 464.0441) also remains in the competitive range. In contrast, "Attracting domestic and foreign investment" and especially "Control and stability of service pricing" display significantly lower K values (386.7223 and 272.9976, respectively), indicating that these options face substantial drawbacks or insufficient strengths across the key criteria. Their poor performance suggests a need for major revision or complementary support before they can be considered viable strategies in the broader rural food tourism development framework.

**Table 16.** Final Ranking of Alternatives (Picture Fuzzy COPRAS).

| Alternative (Strategy) | K Value | Rank |
|---|---|---|
| Improving tourism infrastructure quality | 464.0620 | 1 |
| Targeted and sustainable government support | 464.0610 | 2 |
| Creating food tourism routes | 464.0587 | 3 |
| Branding of local foods | 464.0573 | 4 |
| Cooperation with active local communities | 464.0546 | 5 |
| Organizing seasonal food festivals | 464.0520 | 6 |
| Extensive advertising on social media | 464.0498 | 7 |
| Specialized training in local cooking | 464.0441 | 8 |
| Attracting domestic and foreign investment | 386.7223 | 9 |
| Control and stability of service pricing | 272.9976 | 10 |

When the weight of Campaigns & Festivals varies, the top cluster (Alternatives 2, 7, 6) remains largely consistent, with only minor crossovers among mid-tier options around 0.4–0.6. Changing the Price weight has virtually no effect on rankings, indicating that all alternatives scale proportionally under this criterion. Adjusting Food Quality causes Alternatives 3 and 4 to swap positions near the midpoint but leaves the top and bottom choices unchanged. Varying Infrastructure Quality briefly flips Alternatives 1 and 4 at very low weights before the original order is quickly restored. Altering Government Support weight shifts Alternative 6 slightly above Alternative 5 between 0.2 and 0.4, but outside that band, all ranks stabilize. The investment weight only induces a brief swap between Alternatives 6 and 7 around 0.5, with the rest of the ranking fully robust. Overall, the COPRAS ranking proves highly reliable, since the leading and trailing alternatives remain

fixed under broad weight variations and only mid-rank options show transient, limited reordering (cf. Figure 5).

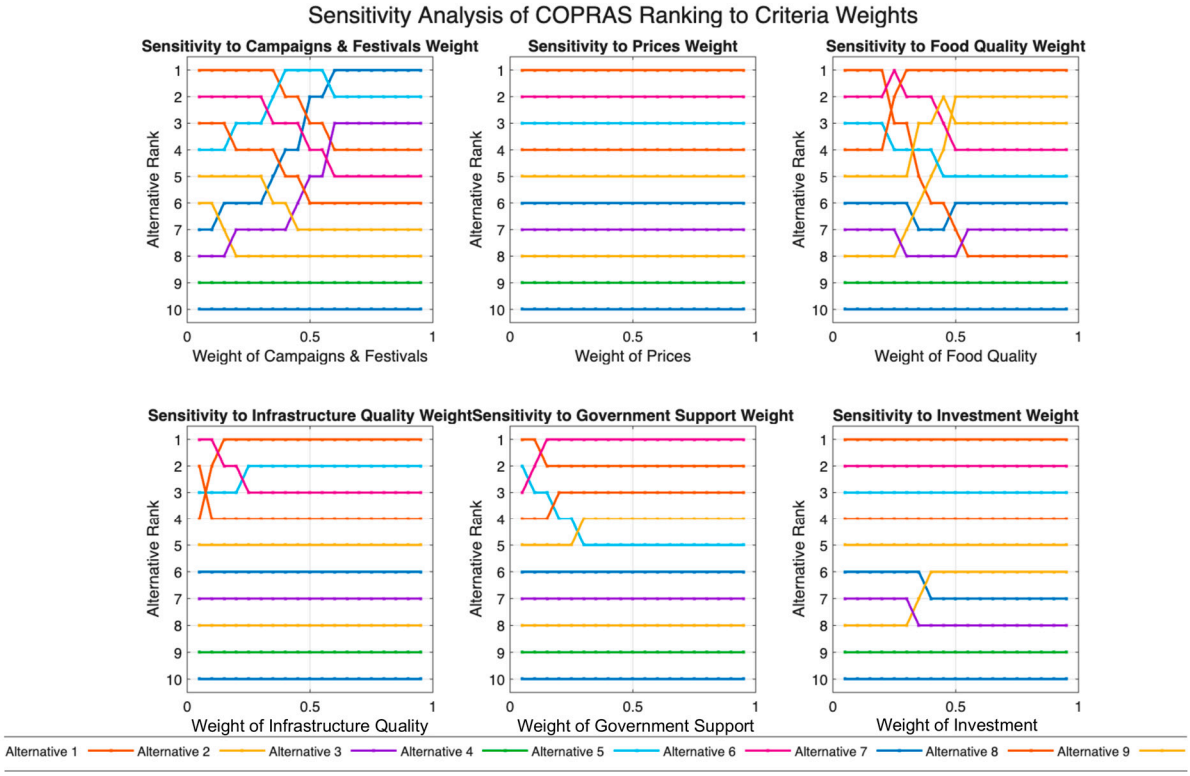


**Figure 5.** Sensitivity analysis of COPRAS ranking to criteria weights.

## 5. Discussion

It is important to clearly separate the results of AHP and COPRAS. The AHP analysis highlights the relative importance of the criteria, with promotional activities and pricing emerging as highly influential. In contrast, the COPRAS results emphasize that improving infrastructure quality is the most effective strategy under the given conditions. This difference shows that while marketing activities are highly valued, the absence of reliable infrastructure can limit long-term development. Therefore, policymakers should design strategies that integrate both soft measures, such as campaigns and affordability, and hard measures, such as infrastructure and governance.

The three future scenarios identified in this study also provide important insights for policy and planning. The optimistic scenario requires coherent government support, targeted infrastructure development, and the integration of local culinary traditions into national branding efforts. The crisis scenario, on the other hand, underlines the risks of neglecting infrastructure and underfunding promotional campaigns, leading to a decline in competitiveness. Based on the strategy rankings, policymakers are advised to prioritize infrastructure improvements and sustainable government support over pricing policies, ensuring that food tourism contributes effectively to the sustainable development of rural areas in Iran.

Economic, social, cultural, and managerial factors influence food tourism development. In this study, six key factors have been identified among the 52 primary influential factors on food tourism development in rural areas of Iran. These factors include the following:

Creating campaigns and organizing festivals, events, meetings, conferences, and trade shows: These activities play a crucial role in food tourism development by enhancing public awareness and effectively promoting food destinations. Festivals and food events

highlight the food attractions of a region, attracting both media attention and tourists, thereby increasing domestic and international tourist numbers. This increase in tourist numbers can strengthen the local economy, create job opportunities for residents, and benefit local businesses, such as restaurants and food suppliers, due to increased demand. In addition, these events contribute to cultural exchange and highlight cultural diversity in different regions. Conferences and food-related meetings can foster international relations and new collaborations between regions and countries. Furthermore, these events provide opportunities for knowledge exchange and experiences among food tourism professionals, which can lead to the establishment of standards, best practices, and innovation in the industry. Thus, food campaigns and events play a pivotal role in developing and advancing food tourism. Studies [15,27,28,65,82] have confirmed the impact of creating campaigns and organizing festivals, events, meetings, conferences, and trade shows on developing food tourism.

Prices (for food, drinks, courses, etc.): Prices play a crucial role in developing the food tourism industry. First, they affect customer satisfaction, as tourists seek memorable and satisfying experiences at reasonable prices. Increasing access to various food and beverage items at reasonable prices can increase the number of tourists and help convert them into repeat customers. Second, prices are crucial for competitiveness and attracting visitors. In a competitive market, offering services at attractive prices can provide a significant competitive advantage. Restaurants, hotels, and other service units can attract more tourists and increase income by employing appropriate pricing strategies. Moreover, reasonable prices can contribute to the development of the local industry, as these food items and services often use local products and resources, promoting the local economy and supporting local producers. Overall, food tourism prices contribute to customer satisfaction and aid in the sustainable development and competitiveness of this industry. Studies [27,28] have emphasized the impact of price on the development of food tourism.

The quality of food: Food quality is a fundamental and vital factor in the development of food tourism. Food quality encompasses not only the taste and visual appeal of food but also its cooking processes, the use of high-quality ingredients, local sourcing, and hygiene. High-quality foods usually create a unique and exceptional experience for tourists due to their unique properties, such as local ingredients and hygienic processing. They can help attract more tourists and increase the demand for local services.

Furthermore, food quality can enhance the reputation and international recognition of a tourist destination. Offering high-quality food can act as an attractive factor for foreign tourists and generate positive feedback, leading to positive promotion in international markets. Additionally, the direct impact of food quality on tourists' experiences and their satisfaction is crucial; a positive experience can help convert tourists into repeat customers and bring them back to the region. Overall, food quality plays a key role in the development and sustainability of food tourism and can contribute to increasing local income, added value, and the reputation of the destination. A previous study [27,28] highlighted the impact of food quality on the development of food tourism.

The quality of infrastructure is a crucial factor in tourism development and attracting tourists. This term clearly refers to the facilities and infrastructure, such as hotels, restaurants, roads, airports, recreational facilities, tourist information, etc., that tourists use for their accommodation and leisure. Quality infrastructure can impact tourists' experiences in several ways. First, high-quality infrastructure enhances tourists' accommodation experiences and generates positive feedback from them, which can lead to positive promotion of the tourist destination. Second, adequate infrastructure quality can increase tourists' trust in the destination and enhance their sense of security and comfort. This can contribute to

sustainable tourism development and increase the number of tourists, thereby boosting local income.

In general, improving infrastructure quality is fundamental for enhancing the tourism industry and increasing destination attractiveness. This can help with sustainable development and added value for the local economy. Studie [43] has confirmed the impact of the quality of infrastructure on food tourism development.

Government support and assistance can play an important role in tourism development. Governments can assist the tourism industry through various actions and policies, including the following:

First, financial facilities and support: Governments can help tourism businesses by providing financial facilities under favorable conditions. These facilities may include long-term repayment loans, low-interest financing, or collaboration in major investments in tourism infrastructure.

Second, governments can provide financial support for advertising and marketing tourist destinations, promoting the industry in domestic and international markets. These actions can increase the awareness and reputation of a tourist destination and ultimately help attract more tourists.

Third, infrastructure development: Governments can invest in the development and improvement of tourism infrastructure, including the construction and renovation of roads, airports, recreational and accommodation facilities, and the creation of public amenities such as parks and museums. These actions can help improve tourists' experiences and attract them to the destination.

Overall, government support and assistance can contribute to the sustainable development and growth of the tourism industry, leading to increased national income and suitable employment in tourism regions. A previous study [43] confirmed the impact of government support and assistance on the development of food tourism.

Investment: Investment in tourism can play a crucial role in its development and growth. Investments can be made directly or indirectly and include the following:

First, construction and improvement of infrastructure: Investment in the construction and renovation of tourism infrastructure, such as hotels, restaurants, shopping centers, recreational facilities, tourist routes, airports, and public transportation, can help improve tourists' experiences and attract them to various areas.

Second, development of tourism services: Investment in the development and improvement of tourism services such as local and international tours, sports and adventure activities, cultural and educational activities, shopping centers, and tourism-related services can enhance the diversity of tourists' experiences and increase local income.

Investments can also improve employment conditions in tourist destinations and contribute to regional economic development. These investments can stimulate local businesses and entrepreneurship, providing a conducive environment for the growth and sustainability of the tourism industry.

Overall, investment in the tourism industry can contribute to improving the value chain of this industry, increasing jobs, and enhancing local economies, acting as a significant driver for sustainable tourism development and prosperity. A previous study [14] confirmed the impact of investment on the development of food tourism.

In the second phase, based on the future prospects of these key factors, scenarios for the development of food tourism in rural areas of Iran are discussed and categorized into three groups. In the first scenario, all factors are in favorable conditions, and in Scenario 10, all factors are in crisis conditions. Two factors, 'creating campaigns and organizing festivals, events, meetings, conferences, and trade shows' and 'the quality of infrastructure'

will jointly be in all scenarios of the second and third groups, being in the most critical state possible, requiring more attention from planners and policymakers to these two factors.

The third phase of this study employed picture fuzzy multi-criteria decision-making techniques (Picture Fuzzy AHP and Picture Fuzzy COPRAS) to prioritize strategies for developing food tourism in rural areas of Iran. Initially, six key evaluation criteria—food festivals and promotional campaigns, pricing, food quality, infrastructure quality, government support, and investment—were identified through a comprehensive literature review and expert consultations. Fuzzy pairwise comparisons were then used to determine the relative weight of each criterion. Among them, "food festivals and promotional campaigns" received the highest weight (0.2567), underscoring the critical role of marketing activities and seasonal events in attracting tourists. The criterion of "pricing" (0.2213) also emerged as highly influential, highlighting the importance of affordability and cost management in the appeal of rural tourism. Other criteria, including food quality (0.1704), infrastructure quality (0.1418), government support (0.1106), and investment (0.0992), were assigned to lower relative importance.

Subsequently, the ten proposed strategies for enhancing food tourism were assessed using a fuzzy decision matrix based on the established criteria. The COPRAS analysis revealed that "improving the quality of tourism infrastructure" held the highest effectiveness score (464.0620), marking it as the most impactful strategy. This was followed by "targeted and sustainable government support," "development of food tourism routes," and "branding of local cuisines," which also ranked prominently. In contrast, the strategy of "price control and stabilization of services" received the lowest score (272.9976), reflecting both high implementation complexity and limited potential impact. The sensitivity analysis confirmed that the overall ranking of strategies remained stable under varying criterion weights, with only minor fluctuations observed among mid-tier options. These findings suggest that achieving sustainable food tourism development in rural areas requires a balanced focus on both soft infrastructures, such as marketing and branding, and hard infrastructure, including physical facility upgrades. By offering a structured, uncertainty-based decision-making framework, this study provides a practical tool for policymakers and planners to effectively guide resource allocation and strategic development efforts.

## 6. Conclusions

Tourism is one of the most crucial economic sectors in many nations. Food tourism has emerged in this domain, driven by numerous influential factors. This study aims to scrutinize the state of food tourism in rural regions of Iran using a scenario-based approach. Findings underscore the pivotal roles of six key factors in fostering the development of the food tourism sector. These factors encompass organizing campaigns and events such as festivals, meetings, conferences, and trade shows; determining prices for food, beverages, and courses; ensuring the quality of food offerings; improving infrastructure quality; governmental backing and support; and investments.

Furthermore, this study presents scenarios that categorize the future prospects of each key factor and their impact on other influential factors. In the first group of scenarios (focusing on highly favorable conditions for food tourism development), the environment is envisioned as one in which all critical factors operate optimally, facilitating development without significant setbacks. Notably, in this scenario group, all factors except one are projected to be in their most advantageous states. These include expanded event organization, reduced price levels, enhanced food quality, upgraded infrastructure, increased government support for food tourism, and boosted investments in the sector. Conversely, under Scenario 2, the price trend remains consistent with the current conditions.

In the second group of scenarios for food tourism development (scenarios characterized by a stable trend, current state, and moderate improvements in some factors alongside critical conditions in others), conditions may remain unchanged or undergo minimal changes in key factors, thereby restricting development to a lesser extent. The primary features of these scenarios include a reduction in the number of festivals and a decrease in infrastructure quality, which are common across all six scenarios under crisis conditions.

Scenario three focuses on the factor of prices (for food, drinks, courses, etc.) with a reduction in prices, while scenarios five and six highlight governmental support and assistance with an increase in support for food tourism, both maintaining favorable statuses. Meanwhile, other factors are persistent in their current state or under critical conditions across all scenarios.

In the third group of scenarios (scenarios depicting critical conditions for food tourism development), significant problems and obstacles may jeopardize or even halt food tourism development. The primary characteristic of these scenarios includes the following: All factors, except for government support and assistance, are in critical condition. In Scenario 9, they face a crisis. The critical factors in these two scenarios are the following:

- Creating campaigns and organizing festivals, events, meetings, conferences, and trade shows: reducing the number of festivals.
- Prices (for food, drinks, courses, etc.): increase in prices.
- The quality of food: a reduction in the quality of food.
- The quality of infrastructure: a reduction in the quality of infrastructure.
- Government support and assistance: reduction in government support for food tourism.
- Investment: reduction in investments for developing food tourism.

These findings can assist in better resource management, prioritization of strategies, and policy decisions to ensure the optimal development of food tourism in rural areas of Iran. The results indicate that achieving the desired scenario for food tourism development in rural Iran requires giving attention to key factors; otherwise, developmental opportunities may be lost.

The findings of this study, achieved through the integration of future studies' methodologies and picture fuzzy multi-criteria decision-making approaches (Picture Fuzzy AHP and COPRAS), provide a deeper understanding of the strategic priorities for developing food tourism in rural Iran. The identification and weighting of six key criteria revealed that "food festivals and promotional campaigns" and "pricing" are the most influential factors in attracting tourists and are especially relevant in rural settings often constrained by economic and infrastructural limitations. These insights suggest that soft elements, such as marketing efforts and service affordability, can play a pivotal role in motivating visits to rural destinations. While government support and investment are undeniably important, their lower weighted rankings may reflect the complexity and delayed impact of these factors, particularly in the short term.

In the next phase, the evaluation of 10 strategic alternatives for development using the COPRAS method indicated that enhancing the quality of tourism infrastructure has the highest potential impact. This strategy serves as a foundational measure that can amplify the effectiveness of other initiatives, such as improving food quality or regional branding. Other high-ranking strategies, including targeted government support and the creation of food tourism routes, reflect a blend of hard and soft infrastructure approaches. Sensitivity analysis confirmed the robustness of the strategy rankings against changes in criterion weights, reinforcing the reliability and practical value of the decision-making model. Overall, this research offers a systematic and uncertainty-informed framework that can serve as a scientific and actionable tool for planners, decision-makers, and policymakers in the field of rural tourism. By focusing on the most effective strategies under conditions

of resource limitation, this model supports sustainable development that aligns with the cultural and local capacities of Iran's rural areas.

While the suggested avenues for future research are valid, it is crucial to translate the specific, data-driven findings of this study into actionable policy implications for the Iranian context. The primary strategic finding, identifying "Improving tourism infrastructure quality" as the most effective strategy (COPRAS), offers a clear direction for policymakers. This is not merely an abstract priority but requires targeted resource allocation toward essential public goods in rural areas, including the upgrading of access roads, improvement of water and sanitation systems, and enhancement of digital connectivity in key rural food tourism hubs. Prioritizing infrastructure serves as a necessary foundational measure; without it, the highly weighted "food festivals and promotional campaigns" will fail to convert initial tourist interest into sustained visitor spending, ultimately limiting long-term regional development.

The necessity of this integrated approach is further illuminated by the constructed scenarios. The crisis scenario, characterized by factors such as the neglect of infrastructure and underfunding of promotion, demonstrates the high risk of inaction. Conversely, realizing the optimistic scenario hinges upon a strategic mandate that blends the hard measure of infrastructure investment with the soft measure of effective marketing and affordability. Therefore, policymakers are advised to leverage the clarity provided by the PF-AHP/COPRAS ranking: prioritize systematic, sustained government funding for basic infrastructure improvements in rural areas, and simultaneously incentivize local communities to develop high-quality, authentic food tourism products via festivals and branding. This integrated, resource-efficient approach is essential for achieving the stated goals of national tourism development and ensuring that food tourism contributes effectively to the sustainable development and economic vitality of Iran's rural communities.

*Research Limitations*

This research faces several limitations. One of the main challenges was the limited access to expert professionals in food tourism, which hindered the depth of insight gathered. Additionally, the highly specialized nature of the questionnaires designed to identify key factors and develop scenarios requires extensive training for the respondents to ensure accurate and reliable responses. Another limitation was the high cost associated with conducting future-oriented studies, which added a financial burden to the research process. Finally, the time-consuming nature of the research process, which involved multiple stages from identifying key factors to conducting data analysis, further extended the timeline of the study. In addition to the practical constraints, this study encountered several methodological limitations that merit explicit discussion. Our reliance on a sample of experts who were often drawn from similar professional backgrounds resulted in a potentially homogeneous expert sample. This homogeneity might have limited the diversity of perspectives on critical drivers and future scenarios, potentially introducing bias toward established viewpoints. Furthermore, the use of snowball sampling for recruiting experts, while practical for reaching a specialized group, inherently restricts the randomness of the sample and may skew the findings toward a network of interconnected stakeholders, thereby reinforcing common perspectives rather than capturing novel or outlying ones. Consequently, the findings regarding the strategies and their prioritization, while highly relevant to the studied context of Iranian rural food tourism, possess restricted generalizability. Policymakers and future researchers should exercise caution when extrapolating these specific rankings and weights directly to other international or even distinct regional contexts within Iran without further validation, as the results are intrinsically tied to the specific group of experts consulted.

Based on the results obtained, the following recommendations are proposed for future research:

1. Conduct studies on the impact of food tourism development on other tourism sectors.
2. Identify the competitiveness of food tourism in the provinces of Iran.
3. Assess the position of Iranian provinces in terms of food tourism development capacities using MCDM techniques.
4. Investigate the obstacles and constraints to food tourism development in rural areas of Iran.
5. Identify strategies to attract private and public sector investment in food tourism development.

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**Informed Consent Statement:** Verbal informed consent was obtained from the participants. Verbal consent was obtained rather than written because this study utilized fully anonymized secondary data from local expert professionals which were de-identified by the original data custodian. According to the institutional guidelines and the National Code of Ethics in Biomedical Research of Iran, studies using fully anonymized secondary data are generally considered exempt from formal ethical review by the local Institutional Review Board (IRB)/Ethics Committee, as they pose no direct risk to human subjects and cannot be traced back to individuals.

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