

# The future of apitourism in Iran based on critical uncertainty approach and DEMATEL/COPRAS techniques

Mohammad Reza Fathi, Mohsen Torabi and Somayeh Razi Moheb Saraj

## Abstract

**Purpose** – Apitourism is a form of tourism that deals with the culture and traditions of rural communities and can be considered one of the most sustainable methods of development and tourism. Accordingly, this study aims to identify the key factors and plausible scenarios of Iranian apitourism in the future.

**Design/methodology/approach** – This study is applied research. For this purpose, first, by examining the theoretical foundations and interviewing experts, the key factors affecting the future of Iranian apitourism were identified. Then, using a binomial test, these factors were screened. Both critical uncertainty and DEMATEL techniques were used to select the final drivers.

**Findings** – Two drivers of “apitourism information system and promotional activities” and “organizing ecological infrastructure” were selected for scenario planning using critical uncertainty and DEMATEL techniques. According to these two drivers, four golden beehive, expectancy, anonymous bee and black beehive scenarios were developed. Each scenario represents a situation for apitourism in the future. According to the criteria of trend compliance, fact-based plausibility and compliance with current data, the “Black Beehive” scenario was selected as the most likely scenario. The “Golden Beehive” scenario shows the best case in terms of apitourism information system and implementation of promotional activities and organizing and providing ecological infrastructure. The “Black Beehive” scenario, on the other hand, describes an isolated and vulnerable system.

**Originality/value** – Developing plausible Iranian apitourism scenarios helps key stakeholders and actors develop flexible plans for various situations.

**Keywords** Futures studies, Apitourism, Critical uncertainty approach, DEMATEL, COPRAS

**Paper type** Research paper

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## 1. Introduction

Recognizing that tourism is an industry in which the environment is the primary source of attraction, considering sustainable environmental development is one of the main goals of tourism, and the realization of sustainable tourism is a global necessity (Goodwin, 2011). As a result of technological developments, increasing tourism demand has led to the emergence of various types of tourism, including eco-tourism, agritourism, cultural tourism, etc. Health tourism is another type of tourism that has emerged recently and is a trip done to improve or maintain health by visiting eco-tourism destinations and therapeutic resorts (Suna, 2018). Apitourism, also known as bee tourism, is an excellent example of a health tourism collection. The term “apitourism” comes from the Latin name of the bee, “*Apis mellifera*,” and it is a form of tourism associated with the traditional beekeeping profession and its products in terms of ecology, food and therapeutics (Beigi, 2018). Apitourism has emerged as a new concept in travel and has developed as an essential component of the green economy (Arih and Korošec, 2015).

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On the other hand, in tourism, especially tourism development planning, addressing the future and planning is an indispensable part of the development process. Tourism, and incredibly sustainable tourism, should be seen as part of the economy, and at the same time, as a tool against cultural and economic challenges. As country rich in tourism resources, Iran can become an active tourism industry because of its culture, civilization and climatic characteristics, which face unemployment and limited tourism development (Naeimi Majd and Naeimi Majd, 2019). Iran's apiculture (beekeeping) industry is among the top ten honey production and honey production farms. According to the Ministry of Agriculture's statistics, apiaries are 6,693,937 hives, producing 77,393,000 tons of honey (Beigi, 2018). Given the appropriate size of bee farms in the country, tourism planning seems necessary to take advantage of this neglected opportunity. Accordingly, this study seeks to identify the key factors and plausible scenarios of Iranian apitourism in the future. Developing plausible Iranian apitourism scenarios helps key stakeholders and actors to come up with flexible plans for a variety of situations.

## 2. Research theoretical foundations

Futures studies topics include possible, plausible and desirable types of transformation from present to future. In a more profound sense, futures research is the science and art of discovering the future and shaping the desired world of tomorrow (Azgoli and Pourjabari, 2016). Futures research is seeing everything before it happens. Scenario planning is an essential tool for foresight and futures studies. Peter Schwartz defines a scenario as a tool to regulate an individual's perception of possible future environments in which decisions will be made (Schwartz, 1996). In Iran, the history of foresight and scenario planning goes back to the country's five-year plans. The Development Vision Document on the horizon of 1404, which marked the next two decades, is the first document of Iran's strategic and foresightful thinking. Because of its geographical location, ancient heritage, climatic and vegetation diversity, and food diversity, Iran is a strategic region for attracting tourists worldwide; nevertheless, not much attention has been paid to tourism.

Apitourism, also known as bee tourism, is an excellent example of a health tourism collection. Slovenia is the leader of the apitourism market (Šivic, 2013), where apitourism became one of the branches of tourism that is very attractive both for domestic and foreign tourists. In the past five years, the dynamic development of apitourism was recorded in Poland, Germany, the Czech Republic, Lithuania, Ukraine (Oleynik and Iaromenko, 2012) and Spain (Shiffler, 2014). Apitourism activities include visiting apiaries, open-air museums and bee museums. In these sites, tourists have the opportunity to visit beekeeping work, the way of making honey, its properties (including the taste of different types of honey) and understanding other bee products (i.e. pollen, wax, beebread and royal jelly), observing the bee colony life and recognizing the ecological correlation between humans and bees (Woś and Bień, 2013; Arih and Korošec, 2015). An example of an apitourism service is shown in Plate 1.

As a result of technological developments, increasing tourism demand has led to the emergence of various types of tourism, including apitourism, food tourism, health tourism, eco-tourism, agritourism, cultural tourism, etc. (Suna, 2018).

Naeimi Majd and Naeimi Majd (2019) in their research aimed to investigate the concepts of futures studies and resilient economy and its role in sustainable tourism. The results showed that a resilient economy positively and directly affected tourism futures studies and sustainable tourism. Jandaghi *et al.* (2019) identified tourism scenarios in Turkey based on the futures study approach. Two critical factors of government policy in the tourism field and country currency value were selected using the cross-impact analysis technique to write plausible scenarios. Based on these two uncertainties, four scenarios of luxury tourism, cheap tourism, tourism deterioration and unplanned tourism were identified. Ahmadi Kahnali *et al.* (2020) aimed at developing a tourism scenario based on heuristic logic approach and key stakeholders and actors' opinions for Hormozgan Province in southern Iran. These scenarios could be helpful and efficient for managers, decision-makers and



stakeholders in tourism. [Rhisiart et al. \(2015\)](#) in their article outlined how scenario activities change the competencies of the individuals and organizational systems to recognize the nature and function of the future for what they perceive and what they perform. Cognition is the purview of the individual rather than the organization. [Fathi et al. \(2021\)](#) investigated futures study of the textile industry in Iran using the MICMAC (Matriced' Impacts Croise's Multiplication Applique'e a UN Classement or Cross-Impact Matrix Multiplication Applied to Classification) and soft operational research methods. Based on the results, four scenarios were presented. These scenarios included Elysium, Hades, Tatarus and Sisyphus.

[Fountain \(2021\)](#) concluded that trends are apparent in the food and tourism sectors before the COVID-19 pandemic that has intensified during a lockdown and is likely to influence the resetting of tourism on a more resilient and regenerative pathway. Three potential food and drink tourism trends are identified: Getting back to basics, valuing local and locals, and food for well-being. [Fathi et al. \(2019\)](#) identified the factors influencing the future of spiritual tourism. It was revealed that facilitate versus rigor and culture policy were selected among the 11 final influential factors. In the next step, four scenarios are presented in this study. These scenarios included limited liberalism, liberal world, negligence and authoritarian spirituality.

It is necessary to exploit the key driving factors influencing apitourism to identify its plausible scenarios. In this research study, a review of the related literature has been used to recognize the key driving factors. Later in the study, some of the conducted studies about this subject will be addressed.

[Zarabi et al. \(2020\)](#) argue that the main problem in constructing a research-production-tourism complex is the lack of research, training and the gap between production and supply. Land grabbing and mining to supply road and building materials have destroyed bee habitats and reduced their population and agricultural production. [Beigi \(2018\)](#) investigated apiary's position in tourism development. In this research, the concept of apitourism was presented as a creative form to spend leisure time, show its functions and identify the target groups of these tours. In another study, [Mahdavi and Taj \(2017\)](#) sought to investigate the effects of beekeeping on the economic

development of villages in Neka city. Friedman's analysis of variance (ANOVA) test showed a significant difference between different variables. The highest-ranking was related to beekeeping as the main occupation. The results of the *t*-test showed that beekeeping development affected rural development in terms of economy, community health and politics. Suna (2018) evaluated the potential of Turkey's apitourism using Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis. According to the findings, the strengths of Turkey's apitourism include having the third most crucial bee repository in the world, one of the 12 essential gene centers in the world for plants and the use of apitherapy methods as part of traditional and complementary medicine in accommodation centers approved by the Ministry of Health. Some of the weaknesses of Turkey's apitourism include lack of advertising and marketing and deficiency of information and awareness. Wos (2014) believed that apitourism deals with the culture and traditions of rural communities and can be considered one of the most sustainable methods of development and tourism. This type of tourism is associated with apiculture as a traditional profession and bee products from ecological, food and medical aspects. Nailul Insani *et al.* (2020) aimed to determine the carrying capacity of the environment and analyze the development of apitourism as a tourist attraction. The result showed that identified activities include outbound, historical tours, playgrounds and graduation ceremonies.

By reviewing previous research on apitourism, it can be said that apitourism research has been conducted as a sectional study, and extensive research has not been conducted to identify all the factors affecting apitourism, particularly Iranian apitourism.

### 3. Research methodology

The present study is applied research in terms of orientation, and it is a methodologically hybrid research. In this study, quantitative methods such as critical uncertainty, decision making trial and evaluation laboratory (DEMATEL) and complex proportional assessment (COPRAS) will investigate the problem. Similarly, since these methods are quantitative and belong to the same paradigm, a hybrid methodology is used. The study aims to develop plausible scenarios for the future of Iranian apitourism. Therefore, first, by reviewing the research literature and tourism experts' surveys, the factors affecting the future shaping of Iranian apitourism were identified. The experts in this study were those who have been working in the field of tourism for more than five years and were interviewed to extract and confirm the factors influencing the future of apitourism. Then, these drivers were screened using a binomial test to select critical factors. After removing insignificant factors using critical uncertainty and DEMATEL techniques, the final drivers were selected to develop plausible scenarios. DEMATEL and COPRAS are described as follows.

#### 3.1 Decision making trial and evaluation laboratory

The foundation of the DEMATEL method is graph theory. It allows decision-makers to analyze as well as solve visible problems. In doing so, decision-makers can separate multiple measurement criteria into a cause-and-effect group to realize causal relationships much more easily. In addition, directed graphs, called digraphs, are much more helpful than directionless graphs since they depict the directed relationships among subsystems. In other words, a digraph represents a communication network or a domination relationship among entities and their groupings (Huang *et al.*, 2007). The steps in DEMATEL are as follows (Liou *et al.*, 2007):

*Step 1:* Calculate the initial average matrix by scores. Sampled experts are asked to point the direct effect based on their perception that each element *i* exerts on each other element *j*, as presented by  $a_{ij}$ , by utilizing a scale ranging from 0 to 4. No influence is represented by 0, while a very high influence is represented by 4. Based on groups of direct matrices from samples of experts, we can generate an average matrix *A* in which each element is the mean of the corresponding elements in the experts' direct matrices.

Step 2: Calculate the initial influence matrix. After normalizing the average matrix A, the initial influence matrix D,  $[d_{ij}]_{n \times n}$  is calculated so that all principal diagonal elements equal zero. In accordance with D, the initial effect that an element exerts and/or acquires from each other element is given. The map depicts a contextual relationship among the elements within a complex system; each matrix entry can be seen as its strength of influence. This is depicted in Figure 1 an arrow from d to g represents the fact that d affects g with an influence score of 1. As a result, we can easily translate the relationship between the causes and effects of various measurement criteria into a comprehensible structural model of the system based on influence degree using DEMATEL.

Step 3: Develop the full direct/indirect influence matrix. The indirect effects of problems decreases as the powers of D increase, e.g. to  $D^2, D^3, \dots, D^\infty$ , which guarantees convergent solutions to the matrix inversion. From Figure 1, we see that the effect of c on d is greater than that of c on g. Therefore, we can generate an infinite series of both direct and indirect effects. Let the (i, j) element of matrix A be presented by  $a_{ij}$ , then the direct/indirect matrix can be acquired by following equations (1) through (4)

$$D = s \cdot A, \quad s > 0 \quad (1)$$

or

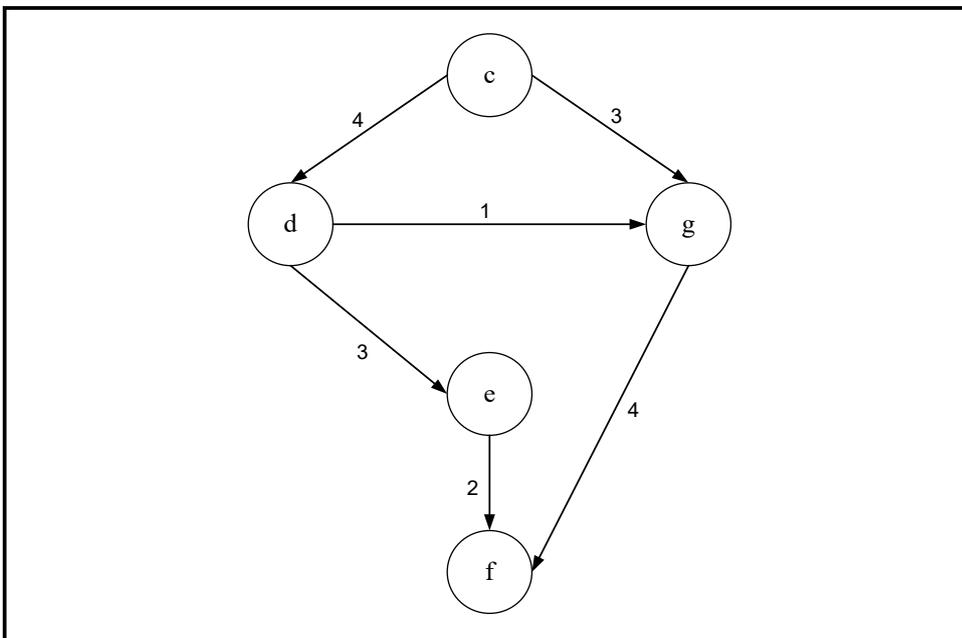
$$[d_{ij}]_{n \times n} = s[a_{ij}]_{n \times n}, \quad s > 0, \quad i, j \in \{1, 2, \dots, n\} \quad (2)$$

$$s = \text{Min} \left[ \frac{1}{\max \sum_{1 \leq j \leq n} |a_{ij}|}, \frac{1}{\max \sum_{1 \leq i \leq n} |a_{ij}|} \right] \quad (3)$$

and

$$\lim_{m \rightarrow \infty} D^m = [0]_{n \times n} \quad \text{where } D = [d_{ij}]_{n \times n}, \quad 0 \leq d_{ij} < 1 \quad (4)$$

**Figure 1** An influential map



The total-influence matrix  $T$  can be acquired by utilizing [equation \(5\)](#). Here,  $I$  is the identity matrix:

$$T = D + D^2 + \dots + D^m = D(I - D)^{-1} \quad \text{when } m \rightarrow \infty \quad (5)$$

If the sum of rows and the sum of columns is represented as vector  $r$  and  $c$ , respectively, in the total influence matrix  $T$ , then:

$$T = [t_{ij}], \quad i, j = 1, 2, \dots, n, \quad (6)$$

$$r = [r_i]_{n \times 1} = \left( \sum_{j=1}^n t_{ij} \right)_{n \times 1} \quad (7)$$

$$c = [c_j]'_{1 \times n} = \left( \sum_{i=1}^n t_{ij} \right)_{1 \times n} \quad (8)$$

where the superscript apostrophe denotes transposition.

If  $r_i$  represents the sum of the  $i$ th row of matrix  $T$ , then  $r_i$  presents the sum of both direct and indirect effects of factor  $i$  on all other criteria. In addition, if  $c_j$  represents the sum of the  $j$ th column of matrix  $T$ , then  $c_j$  presents the sum of both direct and indirect affects that all other factors have on  $j$ . Moreover, note that  $j = i(r_i + c_i)$  demonstrates the degree to which factor  $i$  affects or is affected by  $j$ . Note that if  $(r_i - c_i)$  is positive, then factor  $i$  affects other factors, and if it is negative, then factor  $i$  is affected by others ([Liou et al., 2007](#); [Tzeng et al., 2007](#)). Step 4: Set the threshold value and generate the impact relations map (IRM). Last, we must develop a threshold value. This value is generated by taking into account the sampled experts' opinions in order to filter minor effects presented in matrix  $T$  elements. This is needed to isolate the relation structure of the most relevant factors. In accordance with the matrix  $T$ , each factor  $t_{ij}$  provides information about how factor  $i$  affects  $j$ . To decrease the complexity of the IRM, the decision-maker determines a threshold value for the influence degree of each factor. If the influence level of an element in matrix  $T$  is higher than the threshold value, which we denote as  $p$ , then this element is included in the final IRM ([Liou et al., 2007](#)).

### 3.2 COPRAS

The COPRAS (COmplex PROportional ASsessment) method ([Zavadskas and Kaklauskas, 1996](#)) assumes direct and proportional dependence of the significance and utility degree of the investigated versions in a system of criteria adequately describing the alternatives and of values and weights of the criteria ([Kaklauskas et al., 2010](#)). This method is widely applied when a decision-maker has to select the optimal alternative among a pool of alternatives by considering a set of evaluation criteria. The procedure of the COPRAS method includes the following steps:

*Step 1.* Construct the decision matrix.

*Step 2.* Normalize the decision matrix ( $f_{ij}$ ). The normalization of the decision-making is calculated by dividing each entry by the largest entry in each column to eliminate anomalies with different measurement units so that all the criteria are dimensionless.

*Step 3.* Calculate the weighted normalized decision matrix ( $\hat{x}_{ij}$ ). The weighted normalized values are calculated by multiplying the weight of evaluation indicators ( $w_j$ ) with normalized decision matrices:

$$\hat{x}_{ij} = f_{ij} * w_j \quad (9)$$

*Step 4.* Sums  $P_i$  of attributes values which larger values are more preferable (optimization direction is maximization) calculation for each alternative (line of the decision-making matrix):

$$P_i = \sum_{j=1}^k \hat{x}_{ij} \quad (10)$$

Step 5. Sums  $R_i$  of attributes values which smaller values are more preferable (optimization direction is minimization) calculation for each alternative (line of the decision-making matrix):

$$R_i = \sum_{j=k+1}^m \hat{x}_{ij} \quad (11)$$

In [equation \(11\)](#) (m-k) is the number of attributes that must to be minimized.

Step 6. Determine the minimal value of  $R_i$ :

$$R_{\min} = \min_i^{R_i}, i = 1, 2, \dots, n \quad (12)$$

Step 7. Calculate the relative weight of each alternative  $Q_i$ :

$$Q_i = P_i + \frac{R_{\min} \sum_{i=1}^n R_i}{R_i \sum_{i=1}^n \frac{R_{\min}}{R_i}} \quad (13)$$

[Equation \(13\)](#) can to be written as follows:

$$Q_i = P_i + \frac{\sum_{i=1}^n R_i}{R_i \sum_{i=1}^n \frac{1}{R_i}} \quad (14)$$

Step 8. Determine the optimality criterion K:

$$K = \max_i^{Q_i}, i = 1, 2, \dots, n \quad (15)$$

Step 9. Assign the priority of the alternatives. The greater weight (relative weight of alternative)  $Q_i$ , the higher is the priority (rank) of the alternatives. In the case of  $Q_{\max}$ , the satisfaction degree is the highest.

$$N_i = \frac{Q_i}{Q_{\max}} 100\%, \quad (16)$$

Step 10. Calculate the utility degree of each alternative:

where  $Q_i$  and  $Q_{\max}$  are the weight of projects obtained from [equation \(15\)](#).

### 3.3 Extraction of final drivers

In this section, the drivers influencing the future shaping of Iranian apitourism were identified by reviewing the research literature and surveys with experts. Screening methods such as binomial tests were used to select the final uncertainties. Initially, using this test, factors with lower than average scores were eliminated. In the next step, using critical uncertainty and DEMATEL methods, the factors that obtained the necessary scores were considered the final uncertainties for scenario development. For final selection, the key factors must have obtained the necessary scores in three indicators of expertise, importance and consensus from critical uncertainty's perspective and the net effect index from the DEMATEL technique's perspective. Finally, the outcome of these two methods will determine the final uncertainties. Due to the high frequency of drivers, the Likert scale questionnaire was used to reduce the number of drivers. A questionnaire consisting of 37 items of factors affecting the future of Iranian apitourism was designed. Eighteen experts completed the questionnaire. Then, the appropriate statistical test was used. Based on the results, some drivers were removed. The Wilcoxon test was used to determine outputs' reliability. The final factors are listed in [Table 1](#).

**Table 1** Final factors screened

Row	Factors	Reference
1	Apitourism information system and promotional activities (unknown concept of apitourism)	Suna (2018), Insani <i>et al.</i> (2020), Arih and Korošec (2015)
2	Organizing and providing ecological infrastructure	Beigi (2018)
3	Planning and policy-making	Interview
4	Quality of apiaries' tourist attractions	Interview
5	Education and promotion of healthy lifestyle	Wos (2014)
6	Providing services required by tourists and accommodation facilities	Suna (2018), Insani <i>et al.</i> (2020)
7	Investment	Interview
8	Policy-maker's pro-ecological attitude	Wos (2014), Hegarty and Przezborska (2005), Arih and Korošec (2015)
9	Area location	Insani <i>et al.</i> (2020)
10	Seasonality of tourism demand	Interview
11	Cooperation and coordination between institutions and organizations involved	Wos (2014), Arih and Korošec (2015)
12	Economic benefits	Interview
13	Government proposal to support apitourism practices	Insani <i>et al.</i> (2020), Wos (2014)
14	Pricing	Suna (2018)
15	Holding festivals	Brščić <i>et al.</i> (2013)
16	Tourists' demand	Interview
17	Area security	Insani <i>et al.</i> (2020)
18	Variety of bee products	Hegarty and Przezborska (2005)
19	Green economy	Arih and Korošec (2015)
20	Adherence to the traditions	Arih and Korošec (2015)
21	Marketing	Shiffler (2014)

Then, the collected data will be expressed as documented information. The results of data analysis are presented in separate tables, including indicators of expertise, importance and consensus. Data were collected in two steps using the Delphi technique.

(1) Determining critical uncertainties by expertise indicator

This indicator shows the extent to which experts specialize in a proposition or item. It is calculated as follows:

$$\text{Expertise Index} = \frac{\text{Number of responses to option A} \times 100 + \text{Number of responses to option B} \times 50 + \text{Number of responses to option C} \times 25 + \text{Number of responses to option D} \times 0}{\text{Total number of responses}}$$

The closer the value of the expertise index is to zero, the more it indicates that the experts have little expertise in the subject matter. The closer the value of the index is to 100, it indicates that the experts have high levels of specialized knowledge on the subject. Table 2 shows the drivers that experts are more knowledgeable about them. According to the results, it is observed that the expertise index is above 50 for all propositions. Therefore, it can be stated that experts' level of knowledge in the field in question is moderate to high.

(2) Determining critical uncertainties by importance indicator

This indicator shows the importance that experts attach to each of the uncertainties in influencing the future of Iranian apitourism. Table 3 calculates the importance of each of the apitourism drivers. This index is calculated as follows:

$$\text{Importance Index} = \frac{\text{Number of responses to High} \text{ option} \times 100 + \text{Number of responses to Medium} \text{ option} \times 50 + \text{Number of responses to Low} \text{ option} \times 25 + \text{Number of replies to None} \text{ option} \times 0}{\text{Total number of responses}}$$

According to the results, "apitourism information system and promotional activities (unknown concept of apitourism)," "planning and policy-making," "economic benefits," "quality of apiaries'

**Table 2** Expertise coefficient of critical factors

<i>Expertise index (Stage 2)</i>	<i>Expertise index (Stage 1)</i>	<i>Factors affecting apitourism</i>
86.08	88.79	Apitourism information system and promotional activities (unknown concept of Apitourism)
85.66	79.41	Organizing and providing ecological infrastructure
84	81.91	Planning and policy-making
79	83.16	Quality of apiaries' tourist attractions
83.16	79.08	Awareness and education
79.41	83.16	Providing services required by tourists and accommodation facilities
70.83	85.66	Investment
82.33	76.08	Policy-maker's pro-ecological attitude
82.50	88.33	Area location
80.41	80.00	Seasonality of tourism demand
79	87.33	Cooperation and coordination between institutions and organizations involved
85.66	81.5	Economic benefits
85.25	83.16	Government proposal to support Apitourism practices
74	85.66	Pricing
87.75	70.83	Holding festivals
76.08	85.66	Tourists' demand

**Table 3** The importance level of critical factors

<i>Importance index (Stage 2)</i>	<i>Importance index (Stage 1)</i>	<i>Factors affecting apitourism</i>
83.49	79.73	Apitourism information system and promotional activities (unknown concept of apitourism)
78.41	79.41	Organizing and providing ecological infrastructure
80.45	81.23	Planning and policy-making
78.31	79.58	Quality of apiaries' tourist attractions
73.08	75.39	Awareness and education
60.41	61.16	Providing services required by tourists and accommodation facilities
79.66	77.96	Investment
77.08	78.41	Policy-maker's pro-ecological attitude
64.50	62.33	Area location
68.41	69.00	Seasonality of tourism demand
64	62.33	Cooperation and coordination between institutions and organizations involved
79.45	80.50	Economic benefits
72.78	73.16	Government proposal to support apitourism practices
75.00	79.66	Pricing
73.75	70.83	Holding festivals
67.08	66.66	Tourists' demand

tourist attractions," "investment" and "organizing and providing ecological infrastructure" are the most critical factors.

### (3) Determining critical uncertainties by consensus indicator

The consensus index indicates the extent to which experts agree on the subject matter. The closer the consensus index is to zero, the more likely there is disagreement about the subject matter. There is no consensus on either of the two states, so the variable is uncertain. Table 4 shows the consensus drivers. This index is calculated as follows:

**Table 4** Consensus index of critical factors

Consensus index (Stage 2)	Consensus index (Stage 1)	Factors affecting apitourism
0.08	0.10	Apitourism information system and promotional activities (unknown concept of apitourism)
-0.14	-0.13	Organizing and providing ecological infrastructure
-0.10	-0.12	Planning and policy-making
-0.11	-0.11	Quality of apiaries' tourist attractions
-0.32	-0.28	Awareness and education
-0.45	-0.44	Providing services required by tourists and accommodation facilities
-0.22	-0.21	Investment
-0.21	0.24	Policy-maker's pro-ecological attitude
-0.43	-0.48	Area location
0.34	-0.37	Seasonality of tourism demand
-0.45	-0.47	Cooperation and coordination between institutions and organizations involved
0.13	-0.17	Economic benefits
-0.29	-0.32	Government proposal to support apitourism practices
-0.25	-0.27	Pricing
-0.30	-0.36	Holding festivals
-0.34	-0.33	Tourists' demand

$$\text{Consensus index} = \frac{\text{Number of responses to option A} * 2 + \text{Number of responses to option B} * 1 + \text{Number of responses to option C} * (-2) + \text{Number of responses to option D} * (-1) + \text{Number of responses to option E} * 0}{\text{Total number of responses}}$$

According to the results, the key factors of “apitourism information system and promotional activities (unknown concept of apitourism),” “planning and policy-making,” “organizing and providing ecological infrastructure,” “quality of apiaries’ tourist attractions” and “economic benefits” have a little consensus and are suitable for developing the future scenarios of Iranian apitourism.

Based on the results obtained from the previous steps (Table 5), the effective drivers are “apitourism information system and promotional activities (unknown concept of apitourism),” “planning and policy-making,” “organizing and providing ecological infrastructure,” “quality of apiaries’ tourist attractions” and “economic benefits.” All five key factors have an absolute consensus coefficient below 0.20.

Then, using the DEMATEL technique, pairwise comparisons are made between the five effective drivers, and the results are shown based on the influence and dependence. DEMATEL is an effective way to analyze the cause-and-effect relationships between components of a system. By analyzing the total relation between criteria through DEMATEL, a better understanding of structural relationships and the ideal solution to complex problems can be achieved. DEMATEL is a soft approach to extracting relationships between criteria. The more influential a criterion is, the better it is selected as a basis for scenario planning. The DEMATEL method was first introduced at the Geneva Research Center. This method was used to solve complex problems such as famine, energy, environmental protection, etc. This method is one of the multi-criteria decision-making (MCDM) tools based on graph theory to program and solve problems. It may draw a network map of several criteria in the cause/effect group to better understand the causal relationships. The final output of the DEMATEL process is presenting an image on which the respondents organize their activities and determine the direction of relationships between criteria. The DEMATEL uses surveys to extract the strength of direct and indirect causal relationships from multiple experts (Du and Zhou, 2019). There are four steps to perform the DEMATEL technique:

- (1) *Formation of a direct-relation matrix (Z)*: When using several experts’ views, the simple average of the views is taken into account, and a direct relation matrix Z is formed.

**Table 5** Key factors derived from critical uncertainty

Total uncertainty (Sample 2)	Total uncertainty (Sample 1)	Key factors
1	1	Apitourism information system and promotional activities (unknown concept of apitourism)
2	3	Planning and policy-making
5	4	Organizing and providing ecological infrastructure
3	2	Quality of apiaries' tourist attractions
4	5	Economic benefits

$$z = \frac{x^1 + x^2 + x^3 + \dots + x^p}{p}$$

where  $p$  is the number of experts, and  $x^1, x^2, x^p$  are the pairwise comparison matrices of expert 1, expert 2, and expert  $p$ , respectively.

(2) Normalize the direct relation matrix

$$N = k * M$$

For calculating  $k$ , the sum of all rows and columns is first calculated, and then the inverse of the most significant number of rows and columns of  $k$  is formed.

(3) Calculate the total relation matrix

$$T = N * I - N^{-1}$$

(4) Create a causal diagram

In this step, using the sum of row elements (D) and the sum of column elements (R) for each criterion, the degree of influence and dependence of each criterion was obtained. The horizontal vector (D + R) shows the influence and dependence of that criterion in the system. In other words, the higher the D + R value of a component, the more it interacts with other system components. The vertical vector (D-R) also shows the influence of each criterion. In general, if D-R is positive, it is considered a causal variable, and if D-R is negative, it is considered an effect variable.

The three indicators of influence, dependence and interaction are obtained from the total impact matrix. The more interaction the driver or key factor has, the better that factor is for scenario planning because of that factor's more significant influence and dependence. Table 6 shows the indicators for these five drivers that are the result of implementing the DEMATEL method (Table 7).

Based on the results of both critical uncertainty and DEMATEL techniques, two drivers of "apitourism information system and promotional activities (unknown concept of apitourism)" and

**Table 6** The influence and final ranking of each key factor

Final rank	Interaction	Dependence	Influence	Key factors
1	5.115	2.771	2.813	Apitourism information system and promotional activities (unknown concept of apitourism)
2	4.286	2.465	1.285	Organizing and providing ecological infrastructure
3	4.197	1.655	2.157	Planning and policy-making
5	1.822	1.047	1.149	Quality of apiaries' tourist attractions
4	2.934	1.353	0.672	Economic benefits

“organizing and providing ecological infrastructure” should be used for scenario planning. The four future scenarios of Iranian apitourism based on these two drivers are shown in [Figure 2](#).

#### 4. Developing plausible scenarios for Iranian apitourism

According to the two main factors, the scenarios facing Iranian apitourism include *golden beehive*, *expectancy*, *anonymous bee* and *black beehive*.

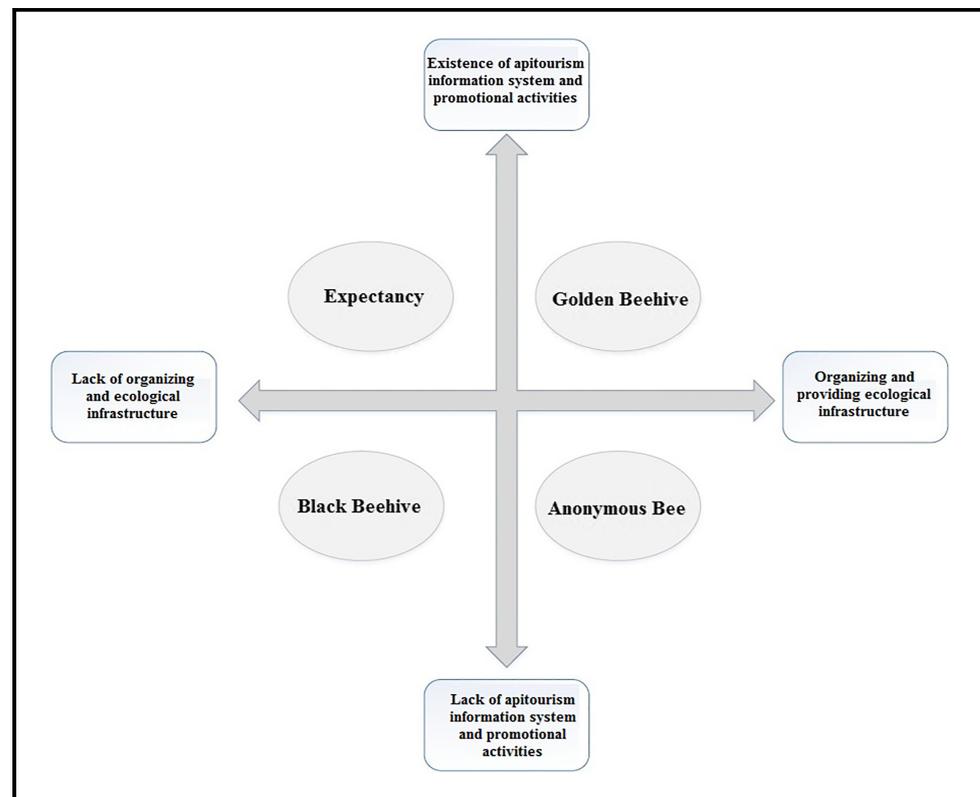
##### 4.1 Golden beehive scenario

The *golden beehive* scenario results from the coincidence of two situations, “the existence of apitourism information system and promotional activities” and “organizing and providing ecological infrastructure.” This scenario represents the best case of apitourism in the future. According to this scenario, apitourism information system and promotional activities are in good condition both quantitatively and qualitatively. The environmental infrastructure is also fully provided. These two factors have contributed to the tourism industry and provided an opportunity

**Table 7** Ranking of Iranian apitourism scenarios

Scenarios	$s_j^+$	$s_j^-$	$Q_i$	$N_j$	Rank
Black beehive	0.19	0.04	0.69	13.68	1
Expectancy	0.09	0.02	0.99	19.73	2
Anonymous bee	0.12	0.02	1.02	20.36	3
Golden beehive	0.13	0.02	1.03	20.44	4

**Figure 2** Plausible scenarios for Iranian Apitourism



for the tourism complex to develop apitourism in Iran. Planners try to seize the opportunities quickly and urgently to develop the apitourism industry further. In this scenario, the ecological infrastructure is entirely in place, and apiaries and locals start promoting apitourism while introducing their villages, culture and attractions. In other words, apitourism services allow local people to present their local culture and customs and market their products. Thus, tourists will gain a genuine, authentic and unique cultural experience that will lead to satisfaction and loyalty, a positive image, the consolidation of the regional economy and the environmental sustainability of the tourist destination. In addition to the above, according to this scenario, the authorities are trying to hold a prestigious and distinctive festival related to bee products specific to Iranian culture to promote further and register nationally and globally. The Ministry of Agriculture and the environmental protection agency devote a lot of effort and resources to this tourism branch. As a result, we are witnessing the realization and development of untapped potentials in the production and processing of hive-related products, job creation opportunities through implementing entrepreneurial ideas in the apitourism industry and rural economic development. In short, under this scenario, many rural economic activities, which have declined sharply in recent decades, and the country, which has experienced rising unemployment, and consequently the exodus of educated youth from rural communities, are being revitalized by the apitourism industry and emerging from recession and isolation.

#### **4.2 Expectancy scenario**

The *expectancy* scenario results from the coincidence of two states, “the existence of apitourism information system and promotional activities” and “lack of organizing and ecological infrastructure.” In this scenario, owing to the nonexistence of environmental infrastructure, the government, as a policymaker in various fields, is developing strategic and macro plans focusing on the tourism industry’s private sector to utilize the private sector active in the tourism industry to deal with weak infrastructure. The government provides a platform for the private sector and paves the way for its widespread presence in the tourism industry. Under these circumstances, it can be hoped that it will be easier than ever to attract many foreign tourists. Government officials are trying to provide legal protections for the significant presence of private sector investors and reduce the red tape in the tourism investment process so that investors are more willing to inject their capital into the apitourism industry. Iranian tourism officials are likely to talk to Chinese officials about their investment in Iran’s growing tourism industry. Multipurpose applications of infrastructure in tourism can help pay for infrastructure that includes the socio-economic benefits of tourism and boost tourism in the region. On the other hand, with the development of tourism and the subsequent development of infrastructure, the endogenous development of rural areas is provided.

Under this scenario, continuous information and promotional activities are top priorities. The Cultural Heritage Organization is the only government authority with a budget line for culturalization in various fields. This organization tries to appear more potent than before in eco-tourisms, with walking tours in the old textures through careful and informed planning and more publicity and holding purposeful festivals in bee products and related services.

#### **4.3 Anonymous bee scenario**

The *anonymous bee* scenario results from the coincidence of two situations, “the lack of apitourism information system and promotional activities” and “organizing and providing ecological infrastructure.” In this scenario, Iran needs to promote and identify tourist attractions worldwide to develop tourism. However, in addition to incorrect policies, non-standard advertising has also failed to achieve this goal. Iranian tourism advertising is inappropriate and differs from the usual advertisements of developed countries in tourism and neighboring countries. In general, under this scenario, no serious steps are taken for tourism. It faces problems in advertising, including lack of priority in the tourism industry, failure to employ tourism and advertising professionals, the inefficiency of tourism and advertising activists, failure to apply creativity, non-utilization of existing

tourism potentials in advertising, lack of modern advertising equipment, inadequate publication of existing ads for tourists from other countries, lack of budget allocation for tourism advertisements and disregard for tourism activists.

On the other hand, farmers have not been informed about this, and they are unaware of the usefulness of bees for trees and agricultural products. This causes foreign tourists to lack complete information about the potential of Iranian apitourism, so Iran is not selected as their tourist destination. Locals who could offer their products and culture if properly advertised also become frustrated and think of other lucrative jobs due to inflation, such as living in the city and engaging in industrial activities.

In this scenario, the ecological infrastructure is fully available. Iranian orchardists, who previously did not have the necessary cooperation with beekeepers to set up their hives, are now, like in European countries, willing to pay even to set up beehives next to orchards and farms. Transportation problems to relocate hives to other parts of the country have been resolved. As drivers are optimistic about the current trend in the beekeeping industry, they offer shipping prices following the bill of lading and reasonable tariffs.

#### **4.4 Black beehive scenario**

The *black beehive* scenario results from the coincidence of two states, “the lack of apitourism information system and promotional activities” and “lack of organizing and ecological infrastructure.” This scenario indicates the worst case of apitourism in the future. Unfortunately, under this scenario, appropriate measures are not taken in Iranian apitourism advertising. Also, due to poor advertising and awareness, farmers and apiarists are unaware of beekeeping, including the correct methods of managing bees under different seasons of the year, scientific methods of feeding bees, the use of some permitted foods and the production of more nutritious, fragrant or unique flavored honey, timely migration of the apiary or low migration and perpetuation of the apiary in places without sufficient nectar and pollen. Although orchardists and farmers in developed countries pay apiarists to set up their hives in their orchards and farms, most Iranian farmers and orchardists are unaware of the importance of bee pollination. They do not allow apiarists to set up their hives in their orchards and farms. Even if they allow beekeepers to do this, they will charge them money, which sometimes leads to disagreement. The catastrophe of this unawareness is that some farmers and orchardists assume that bees are harming their crops.

The lack of organizing and ecological infrastructure is another problem predicted in this scenario. Due to population growth, urban development and negligence of relevant authorities in protecting natural resources, forests and pastures are being destroyed, and Iran has become a country with relatively low water deserts and vegetation. In addition to this gradual disaster, unfortunately, the same amount of green resources that remain, especially in fields and orchards, are not being adequately utilized. All of these factors have not only reduced honey production but also endangered agricultural production. In addition, during the peak season, tourists are faced with an inadequate worn-out rail and air transportation system, a shortage of accommodation and the unfavorable condition of temporary resorts, restaurants and especially restrooms is an unpleasant experience for tourists.

#### **4.5 Selecting the most likely scenario**

In this section, the COPRAS technique was used to select the most likely scenario. COPRAS is a decision-making method used to prioritize or rank various alternatives, applying the weights of criteria. First, this method was developed to determine the priority and degree of influence of alternatives. COPRAS is used to evaluate the value of both minimum and maximum criteria, and the effect of minimum and maximum criteria on the evaluation of results is considered separately. Also, while simple, this technique is convenient and powerful, and its calculation does not require complex mathematical operations.

Therefore, a questionnaire was provided to the experts. They were asked to comment on each scenario and the three criteria of consistency with current trends, compliance with current statistics and data and fact-based plausibility. Then, the questionnaires were collected, and experts' views were aggregated using the geometric mean method. Finally, the scenarios were ranked, and the steps of this method are listed below. The steps of the COPRAS method are (Qasemi *et al.*, 2016):

- (1) Determine the weight of criteria using standard methods such as entropy, AHP, Fuller, etc.
- (2) Formation of decision matrix.
- (3) Formation of a weighted matrix; the values of alternatives are multiplied by their weight and divided by the values' sum:

$$\frac{q_i}{\sum_{j=1}^n x_{ij}} * x_{ij} = d_{ij}$$

- (4) Separation of positive and negative criteria; a positive or consistent criterion is a measure that, as its value increases, its utility also increases, but for negative criteria, by increasing the value, the utility is reduced.
- (5) After determining the positive and negative criteria, the final value of the positive and negative criteria must be calculated. The algebraic sum of positive and negative values is calculated separately. This calculation is done using the following equation:

$$\sum_{z=-} d_{ij} = s_j^-$$

$$\sum_{z=+} d_{ij} = s_j^+$$

- (6) In the final step, the following equation is used to calculate the final value of each Q.

$$S_j^+ + \frac{s_{min}^- \sum_j^n}{s_j^- \sum_j^n} = 1 \frac{S_j^- x}{\frac{s_{min}^-}{S_j^-}} = Q_i$$

Based on the obtained results, the *golden beehive*, *expectancy* and *anonymous bee* scenarios are in the first, second and third positions, respectively. By considering three indicators, i.e. consistency with current trends, compliance with current statistics and data, and fact-based plausibility, the most plausible scenario is *black beehive*. The *black beehive* is the worst-case scenario, and the *golden beehive* is the best-case scenario. According to experts, the *black beehive* scenario is more likely to be realized.

## 5. Discussion and conclusion

The present study sought to identify plausible scenarios for the future of Iranian apitourism. For this purpose, the drivers influencing the future shaping of Iranian apitourism were identified by reviewing the research literature and surveys with experts. These factors were apitourism information system and promotional activities (Suna, 2018; Insani *et al.*, 2020; Arih and Korošec, 2015); organizing and providing ecological infrastructure (Beigi, 2018); planning and policy-making; quality of apiaries' tourist attractions; awareness and education (Wos, 2014); providing services required by tourists and accommodation facilities (Suna, 2018; Insani *et al.*, 2020); investment; policy-makers pro-ecological attitude (Wos, 2014; Hegarty and Przezborska, 2005; Arih and Korošec, 2015); area location (Insani *et al.*, 2020); seasonality of tourism demand; cooperation and coordination between institutions and organizations involved (Wos, 2014; Arih and Korošec, 2015); economic benefits; government proposal to support apitourism practices (Insani *et al.*, 2020; Wos, 2014); pricing (Suna, 2018); holding festivals (Brščić *et al.*, 2013); tourists' demand.

Based on the two key factors, “apitourism information system and promotional” and “organizing and providing ecological infrastructure,” four scenarios of *golden beehive*, *expectancy*, *anonymous bee* and *black beehive* were developed for Iranian apitourism. The *golden beehive* scenario combined “the existence of apitourism information system and promotional activities” and “organizing and providing ecological infrastructure,” which was ideal for apitourism in the future. The *expectancy* scenario resulted from the coincidence of two states, “the existence of apitourism information system and promotional activities” and “lack of organizing and ecological infrastructure.” The *anonymous bee* scenario combined two situations, “the lack of apitourism information system and promotional activities” and “organizing and providing ecological infrastructure.” Finally, the *black beehive* scenario resulted from the coincidence of two states, “the lack of apitourism information system and promotional activities” and “lack of organizing and ecological infrastructure” that indicated the worst case of apitourism in the future.

After developing plausible scenarios, it was time to choose a possible scenario. Based on the obtained results, the *golden beehive*, *expectancy* and *anonymous bee* scenarios are in the first, second and third positions, respectively. By considering three indicators, i.e. consistency with current trends, compliance with current statistics and data, and fact-based plausibility, the most plausible scenario is *black beehive*. The *black beehive* is the worst-case scenario, and the *golden beehive* is the best-case scenario. According to experts, the *black beehive* scenario is more likely to be realized. Consistent with the research findings, some suggestions are presented as follows:

- (1) Given Iran’s very favorable geographical and climatic conditions and having a global ranking of honey production, integrated planning for better distribution of bee fields should be on the agenda of tourism officials. Stricter attention should also be paid to apitourism as an option along with other branches of tourism.
- (2) Visiting apitourism attractions in the form of one- and multi-day recreational and educational tours, in addition to familiarizing tourists with the production and process of honey extraction, facilitates their better access to healthy and energizing food called honey.
- (3) Success in the apitourism industry depends on collaboration between key players, including apiarists, associations, tourism providers, local communities, authorities and government, to develop, position and market products. Therefore, it is suggested that according to the critical drivers extracted in this study, integrated planning be done with consensus among these key actors.
- (4) Apitourism services have an excellent potential for positioning beekeepers in the tourism market, but this depends on proper advertising. Since tourists visiting apiaries are considered the best missionaries in these areas, it is suggested that more attention be paid to the relevant authorities’ word-of-mouth advertising and organized advertising of tourist tours.
- (5) It is recommended to hold training workshops for apiarists to increase their awareness of various apitourism services. Creating interest in apiarists to provide tourism services in apiaries is considered an essential stimulus for developing this type of tourism.

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