Prioritizing Iran's Saffron Target Markets Based on Market Competition Indices

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Abstract

Exporting agricultural products is considered as one of the strategies for developing non-oil exports and achieving sustainable economic growth in developing countries. Saffron, as an export commodity, holds particular significance in Iran's non-oil exports. Given Iran's position among the top four saffron-exporting countries globally, this study aims to prioritize Iran's saffron target markets based on market competition indices and calculate its relative advantage and export stability index in the world market and Iran's export target countries. Comparison of the global market structure of the product during 2003 to 2022 revealed that despite the significant shares of Iran, Spain, England, and Nigeria in most years, the market structure has been characterized by a multi-sided monopoly, open and closed, and in some years dominated by oligopoly, indicating an increase in the number of competitors and the competitiveness of the export market for this product. Iran, with an average share of 13.6% in the saffron export market and producing over 80% of saffron, does not have a direct share in global exports, and most of Iran's saffron is exported to countries such as the UAE, Spain, China, and Oman, and then re-exported to other countries, for which strategies such as market expansion and branding need to be prioritized. The results showed that in 2022, four countries, Nigeria, Sri Lanka, Iran, and Spain, accounted for 93% of the total world exports, and Iran ranked second in terms of export volume in the saffron export market during the study period. Also, Iran had an export stability index of less than one (0.96) but the trend of this index indicates a decrease in Iran's stability. The results showed that the majority of Iran's saffron exports are concentrated in only four countries, with the composition of these countries varying over time. To enhance market stability and growth, it is crucial to expand the target export markets. Prioritization should be given to China, UAE, Spain, India, USA, Germany, France, Italy, Sweden, and Kuwait, with average priority ranks of 4.15, 6.85, 7.7, 7.95, 8.9, 12.3, 14.35, 15.25, 15.5, and 16.45 respectively. Furthermore, the results indicated that the export market for saffron is oligopolistic. Therefore, it is essential for all exporting countries to collaborate in determining the price and market share for each country. This collaborative approach can help in stabilizing the market, ensuring fair pricing, and promoting sustainable growth in the saffron industry.

Keywords: Export stability index, Iran, Market structure, Saffron export, Target markets

Introduction

One of the primary objectives of developing countries is achieving sustainable economic growth and development, and expanding exports can be a direct factor in economic growth. Therefore, countries are always striving to develop their exports to benefit from opportunities, financial resources, income, and assistance to other countries based on their relative advantages (Behzadnia et al., 2019). Exporting goods to foreign markets is done to earn profit and continuous income while satisfying consumers. In this regard, the capabilities and abilities of each country in producing and exporting goods, as well as understanding export markets and target markets, are essential. One of the effective factors in determining a suitable strategy for the economic development of any country is having an export development strategy and relative advantage in the production and export of products. Additionally, the organizational structure of the market indicates the characteristics of the market, which can be used to determine the relationship between market components, competition, and pricing nature (RasekhJahromi & Norani Azad, 2023). Iranian saffron, as the most expensive agricultural and medicinal product in the world, plays a significant role in the country's non-oil export revenues. The main origins of this plant are regions such as Khorasan Razavi, Southern, and Northern provinces, and its cultivation and production also take place in provinces like Fars, Kerman, and Yazd. Saffron production in countries such as Spain, India, Greece, Azerbaijan, Morocco, and Italy has also been economically beneficial (Kafi et al., 2010). According to the International Trade Center statistics, Iran has had an average share of approximately 13.6% of the global saffron export volume during the years 2003-2022 (Fig. 1). Additionally, in 2022, Iran accounted for around 60% of the global saffron export value, with an export value of approximately $85,000 (Itc, 2023). According to global statistics, Iran is recognized as the largest producer of saffron in the world,

accounting for 85 percent of the total global saffron consumption (FAO, 2019). Iran ranked first among saffron-producing countries in 2022, with the production of approximately 408 tons of saffron, which accounts for 86.2% of the world's saffron production (Agriculture Jihad, 2023). As depicted in (Fig. 1), the share of saffron exports from production in Iran increased from 61% in 2003 to 184% in 2008, reaching its highest level during the study period, and then fluctuated, reaching approximately 53% in 2022.

(Fig. 2) illustrates the value and quantity of saffron exports from Iran during the period 2003-2022. The weighted quantity of exports of this product decreased from approximately 141 tons in 2003 to about 66 tons in 2009, indicating a reduction of approximately 53%.

Fig. 3 illustrates the status of Iran's saffron exports in 2022. As observed, Iran exported saffron to 60 countries worldwide, with a total export value of $201.6 thousand. The most important of these countries include the UAE, Spain, China, Qatar, India, and Afghanistan, with export values of $77.8, $44.2, $30.4, $8.4, $7.6, and $5.4 thousand, respectively.

A study on the saffron market structure during the period of 2001-2018 was conducted using the Herfindahl-Hirschman index and numerical taxonomy method to prioritize Iran's target markets based on criteria such as market continuity, average price in US dollars, average share of imports by the target country, price volatility coefficient in US dollars, and share of import volatility coefficient by the target country. The results of this research indicated that the saffron market during the period of 2001-2018 was of the monopolistic, oligopoly, and closed type.

The examination of the global market structure and comparative advantage, along with the measurement of export and import sustainability indices, and prioritization of target markets for Iran in the saffron market, are subjects that always require attention from actors in this sector and agricultural policymakers. This research intends to address these aspects. While most studies have primarily focused on identifying the type of

market structure of a product using comparative advantage methods and non-price indicators to select target markets, this study goes further. In addition to investigating the global saffron market structure, Iran's market structure, and Iran's export advantage to other countries, it also examines the sustainability indices of exports and imports of global countries. Moreover, a more precise prioritization of Iran's target markets is conducted using the Topsis method. These objectives aim to provide a comprehensive framework for making strategic decisions regarding saffron export from Iran, contributing to improving the efficiency and effectiveness of the country's agricultural and trade policies.
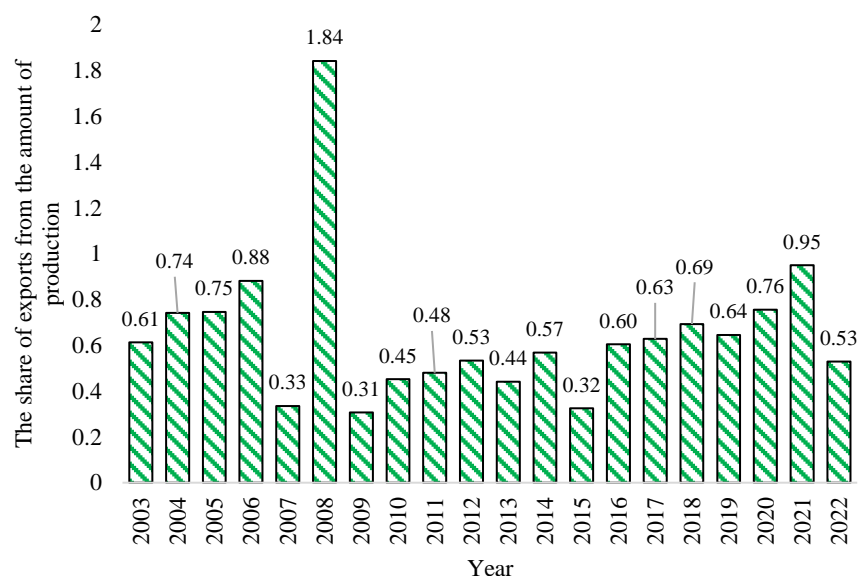

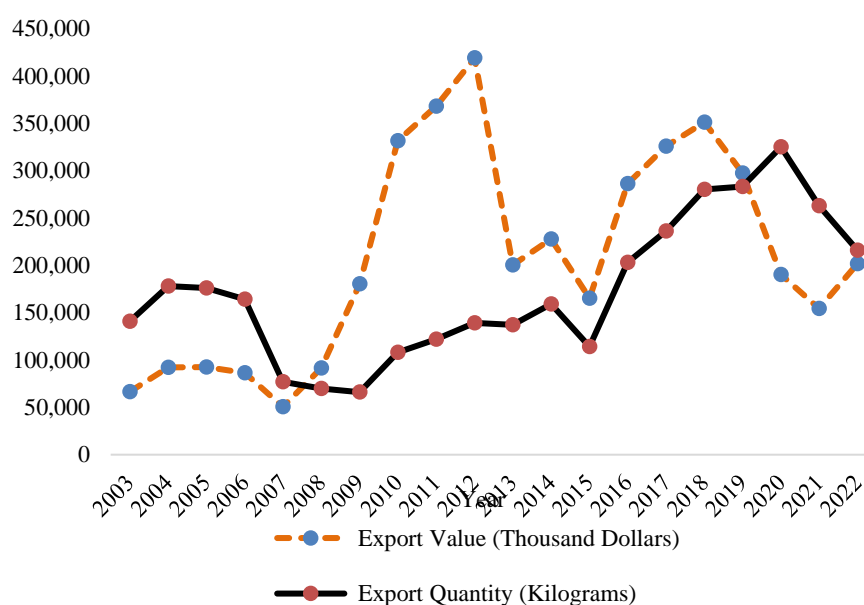**Figure 1- The share of Iran's saffron exports from production during the years 2003-2022**

Figure 2- Export value and export quantity of Iranian saffron products during the years 2003-2022
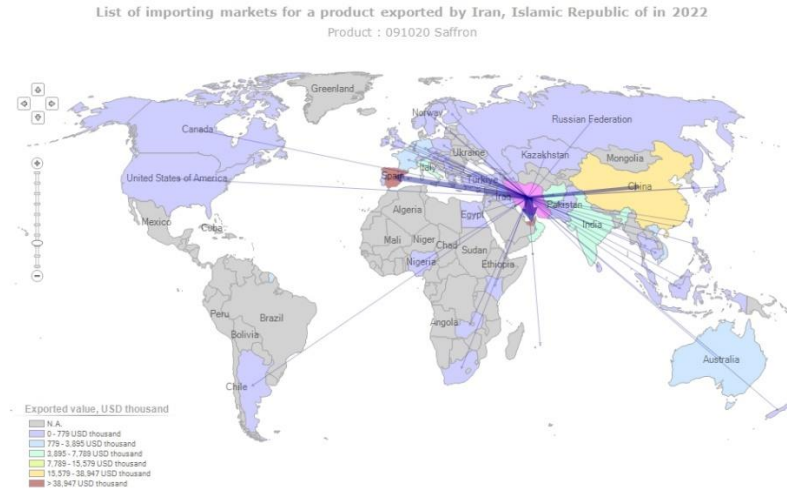
Figure 3- The value export map of Iranian saffron to the world in 2022
Source: International trade center 2023

Methodology

According to theories of international trade, actions must be taken for export development in every country. These actions include identifying relative advantages, ranking industries with comparative advantages, and investing in the development of export activities. This entails first identifying the potentials and advantages that a country possesses, deciding on which industries and economic sectors to concentrate on, and ultimately deploying resources and investments towards the development of export activities (RasekhJahromi & Norani Azad, 2023). According to the law of comparative advantage, if a country can produce and export a product at a lower cost than other countries, it can profit more from trading this commodity (Hanson *et al*., 2015). There are various methods for measuring comparative advantage, which are explained below.

One of the most common indices used to measure comparative advantage is Revealed Comparative Advantage (RCA), which is calculated using equation (1).

$$RCA_{ij} = \frac{\dfrac{x_{ij}}{\sum_i x_{ij}}}{\dfrac{\sum_j x_{ij}}{\sum_i \sum_j x_{ij}}}$$

(1)

Which x_{ij} represents the value of commodity i exports by country j, $\sum_i x_{ij}$ is the total value of exports by country j, $\sum_j x_{ij}$ is the total value of commodity i exports in the world, and $\sum_i \sum_j x_{ij}$ is the total value of world exports. In other words, the numerator represents the share of commodity i in the country j total exports, and the denominator represents the share of commodity i in total world exports. The value of the index ranges from zero to one, indicating the absence of comparative advantage in the examined commodity (Raheli, 2017). An improvement in this index over time can be seen as an indication of a country's improved competitive position in the global market. Since there is an asymmetry in this index, researchers also use the Symmetric Revealed Comparative Advantage index (Equation 2), (Brasili *et al*., 2000):

$$RSCA_{ij} = \frac{RCA_{ij} - 1}{RCA_{ij} + 1}$$

(2)

The range of changes in this index is between positive one and negative one, where negative values indicate a lack of comparative advantage and positive values indicate the presence of comparative advantage in exporting a product.

One of the objectives pursued in this research is to examine market structure. The market structure refers to the organizational characteristics of the market, including the

concentration of sellers, the centrality of buyers, entry conditions, and product homogeneity, which, when identified, can determine pricing nature, market competition, and market type. Market structure indicates the organizational features of the market that can be used to determine the relationship between market competition components and pricing nature (Gajurel & Pradhan, 2012). The number of producers and their scale are two important factors in determining market structures. Therefore, the fewer the number of producers in the market and the larger share of the market held by a limited number of producers, the greater the likelihood that the market structure is monopolistic.

A. Concentration Ratios (CRₙ): This index indicates the concentration of production of a product in several countries and can also indicate various market structures between perfect competition and perfect monopoly. This index is defined by (Equation 3):

$$CR_n = \sum_{i=1}^{n} S_{i_{2,\dots,k}} \quad k > n$$

(3)

In this equation, k represents the total number of producers, n denotes the number of major producers, S_i is the market share of producer i, and CR_n is the concentration ratio of n producers.

B. Herfindahl-Hirschman Index (HHI): To address some of the shortcomings of the concentration ratios, the Herfindahl-Hirschman Index has been proposed to measure market power, which is calculated as the sum of squared market shares of all producers. This index is obtained from (Equation 4), (Gajurel et al., 2012):

$$HHI = \sum_{i=1}^{k} S_i^2$$

(4)

In this equation, k represents the number of countries producing the product worldwide, and S_i denotes the market share of the i-th producer. If there is an infinite number of

firms with equal-sized shares in the market, the Herfindahl-Hirschman Index (HHI) will be very small, and if there are few producers with unequal shares in the market, the index value will be close to one. In other words, the closer its value is to zero, the higher the competitive degree of the market, and the closer it is to one, the higher the degree of monopoly and concentration. One advantage of this index is that it considers the market shares of all producers and reflects the market type (the number of firms with equal shares). The reason for choosing these two indices in this study is that they are the best indicators for measuring the degree of competition and monopoly. The determination of market structure using a combination of concentration ratios and the Herfindahl-Hirschman Index is shown in (Table 1), (Liaghati et al., 2017). Competitive markets, monopolistic competition, monopolistic markets, dominant firms, and perfect monopoly each have their characteristics. In a perfectly competitive market, most economic actors are competing to attract customers, and no country can set prices; prices are determined by supply and demand equality. A monopolistic competition market is similar to a perfectly competitive market, but the goods are heterogeneous, differing in packaging and quality. In an oligopolistic market, a country or group of countries controls a portion of the market and interacts with customers, suppliers, and other market participants, with free entry and exit of countries. However, in a closed oligopolistic market, laws and regulations impose restrictions on the behavior of countries, limiting free entry and exit. In a dominant firm scenario, one country or a group of countries exerts control over others and can influence market conditions. A perfect monopoly market means that one country or a group of countries controls the market, and no other country enters this market, holding the complete market share (100%), (Table 1).

Table 1- Types of market structures

The main feature of the market	(HHI)	Concentration ratio (Percentage)	Market
There are more than 50 competing firms without a monopoly on a significant market share.	$HHI \rightarrow 0$	$CR_1 \rightarrow 10$	Perfect competition
None of the competing firms monopolizes more than 10% of the market.	$(1/HHI) \rightarrow 10$	$CR_1 < 10$	Exclusive competition
4 companies have a monopoly of up to 40% of the market.	$6 < (1/HHI) \leq 10$	$CR_4 < 40$	Open multilateral monopoly
Firms have at least 60% of the market. 4	$3 < (1/HHI) \leq 6$	$CR_4 > 60$	Closed Multilateral monopoly
More than 50% of the market is monopolized by one firm.	$1 < (1/HHI) \leq 3$	$CR_1 \geq 50$	Dominant enterprise
One firm monopolizes the entire market.	$HHI \rightarrow 1$	$CR_1 \rightarrow 100$	Complete monopoly

Source: (Maddala et al., 1995)

One of the most common methods for prioritizing markets based on several indicators is the Topsis approach, which is used to rank regions in terms of relative advantages, potentials, and capacities. The Topsis approach is a multi-criteria decision-making method (Chen & Hwang, 1992). To combine multiple indicators that can provide different perspectives on a specific subject, various methods have been proposed, such as factor analysis, cluster analysis, principal component analysis, and numerical taxonomy. Among these methods, the Topsis approach can calculate both positive ideals (most efficient state) and negative ideals (least efficient state) for each indicator and then measure the distance of each option from these positive and negative ideals. In this method, the selected option is the one with the shortest distance from the positive ideals and the longest distance from the negative ideals. This technique is designed in a way that allows for assessing the type of indicators in terms of their positive or negative impact on the decision-making objective in the evaluation model, and by assigning weights to them, it determines the importance of each indicator in the model, which can be considered an advantage over other methods.

If there are m options and n indicators, the following steps should be taken for prioritization:

Formation of a data matrix based on *m* options and *n* indicators:

$$\begin{bmatrix} a_{11} & \cdots & a_{1n} \\ \vdots & \ddots & \vdots \\ a_{m1} & \cdots & a_{mn} \end{bmatrix} \quad (5)$$

Standardizing the data and forming the standard matrix can be achieved through the following equation:

$$r_{ij} = \frac{a_{ij}}{\sqrt{\sum_{k=1}^{m}(a_{kj})^2}} \quad (6)$$

Determining the weight of each indicator (W_i) based on $\sum_{i=1}^{n} w_i$. In this regard, indicators with greater importance have higher weights. In this study, entropy has been used for weighting the indicators. The matrix (V) is the result of multiplying the standardized values of each indicator by their respective weights.

$$\begin{bmatrix} w_1 r_{11} & \cdots & w_n r_{1n} \\ \vdots & \ddots & \vdots \\ w_1 r_{m1} & \cdots & w_n r_{mn} \end{bmatrix} \quad (7)$$

Determining the distance of the i-th alternative from the ideal alternative (the highest performance of each indicator), denoted by (A^+).

$$A^+ = \{(MaxV_{ij}|j\varepsilon J),(MinV_{ij}|j\varepsilon J')\}$$

$$A^+ = \{A_1^+, A_2^+, \dots, A_n^+\} \quad (8)$$

Determining the distance of the i-th alternative from the minimum alternative (the lowest performance of each indicator), denoted by (A^-).

$$A^-$$
$$= \{(MaxV_{ij}|j\varepsilon J),(MinV_{ij}|j\varepsilon J')\}$$

$$A^- = \{A_1^-, A_2^-, \dots, A_n^-\} \qquad (9)$$

Determining a distance metric for the ideal alternative and the minimum alternative S_i^- is as follow:

$$S_i^+ = \sqrt{\sum_{j=1}^n (V_{ij} - A_j^+)^2}$$

$$(10)$$

Determining the coefficient equal to the distance of the minimum alternative divided by the sum of the distance of the minimum alternative and the distance of the ideal alternative, denoted as C_i^*, calculated from the following equation:

$$C_i^* = \frac{S_i^-}{S_i^- + S_i^+} \qquad (11)$$

The value of C_i^* ranges between zero and one, where a value closer to one indicates a higher rank.

The factors considered for the Topsis approach in this study include saffron export value, saffron export quantity, saffron export price, geographical distance between countries, per capita income of countries, Gross Domestic Product (GDP), economic size, and economic structure difference index between countries and population. The reasons for choosing each are as follows:

Population: This indicator reflects the market demand potential of the target country in the future. Assuming other factors remain constant, the larger the population in the coming years, the higher the demand for imported goods will be.

Geographical distance: This indicator shows the distance between the importing and exporting countries. It is evident that, under equal conditions, the shorter the geographical distance, the higher the possibility of imports due to lower costs. Therefore, it is considered inversely in the final ranking.

Per capita Gross Domestic Product (GDP): This indicator indicates the purchasing power of consumers. Assuming other factors remain constant, the higher the per capita income of a country, the higher its demand for goods will be.

Per capita income of saffron-importing countries: Some researchers have incorporated Gross Domestic Product (GDP) and population variables separately in the model, while others have used various variables to prevent an increase in the number of variables. In this study, the per capita income of saffron-importing countries, representing their income effect on the demand for Iranian saffron due to this group of countries, has been used.

Economic structure difference index: The economic difference index between Iran and its trading partners is another variable used in this study. The greater the similarity between two countries in terms of traded products, the greater the commercial potential. Furthermore, as the gap in economic structure decreases, the similarity in exports and imports between them increases. In other words, countries with more similarities are more inclined to trade with each other compared to dissimilar countries. The economic structure difference index in this study has been calculated using (Equation 8), (Antonucci & Manzocchi, 2006).

$$DISSIZE$$
$$= Ln\left[1 - (\frac{GDP_{it}}{GDP_{it} + GDP_{jt}})^2 - (\frac{GDP_{jt}}{GDP_{it} + GDP_{jt}})^2\right]$$

$$(12)$$

Economic Size: In this study, the variable of economic size has been used to assess the impacts of the economy's magnitude. In other words, this variable indicates that the larger the economies of exporting and importing countries, the greater their effect on export volume. Therefore, in this research, the economic size variable, obtained by multiplying the gross domestic product of the exporting and importing countries, has been employed.

Additionally, the stability index of saffron-exporting countries in (equation 13) is introduced to determine the stability of saffron exporters (Ji *et al.*, 2014).

$$XSI_i = \frac{\dfrac{Q_i^{out}}{Q^{out}}}{\dfrac{K_{i \to M}^{out}}{K_M}}$$

(13)

In this equation, XSI_i represents the stability index of the exporting country i, Q_i^{out} and Q^{out} denote the total value of saffron exports of country i and globally, respectively. Moreover, $K_{i \to M}^{out}$ indicates the number of countries importing saffron from country i. Finally, K_M represents the total number of importing countries in saffron trade. Essentially, (equation 9) illustrates the ratio of country i exports to the total global exports. If this index is greater than one, it indicates that country i is more reliant on its saffron exports. Additionally, the share of this country's exports of total global exports exceeds the share of its partners from all importing countries. The larger this ratio, the fewer countries the country exports to, indicating less diversity in partners. Therefore, if there is an issue with limited trading partners, the likelihood of instability for this country increases.

Similar to the stability index of saffron exporters, (equation 10) represents the stability index of saffron importers (Ji *et al.*, 2014).

$$MSI_i = \frac{\dfrac{Q_i^{in}}{Q^{in}}}{\dfrac{K_{i \to x}^{in}}{K_X}}$$

(14)

In which MSI_i represents the stability index of the importing country i, Q_i^{in} and Q^{in} respectively represent the volume of saffron imports of country i and globally. Moreover, $K_{i \to x}^{in}$ indicates the number of markets supplied by country i, and K_X represents the total number of saffron exporters globally. This equation illustrates the contributions of country i to the global saffron imports. The denominator of this index represents the ratio of countries to country i that import saffron from all saffron-exporting countries. If a country's share of imports is greater than one of the total global imports, it indicates that this country relies more on its imports and has less diversity in partners from a limited number of countries. Therefore, if there are issues with limited trading partners for this country, the likelihood of instability increases.

Data

The statistical data required for this research, including export and import values, export prices, geographical distance, per capita income, gross domestic product (GDP), and population of countries was collected from the World Bank for the years 2003-2022, and from the International Trade Centre (ITC) database. It's worth mentioning that for the calculations of Topsis and the coefficients related to each country in this study, an extensive spreadsheet (Excel) was utilized.

Results

The results of the examination of the saffron export showed in (Table 2) indicate that during the years 2003-2022, Iran, England, Indonesia, and Spain held the first to fourth positions among the top exporting countries of this product in the world, respectively. However, in recent years, with Nigeria's continuous and extensive growth in the export of this product, Nigeria has joined the top four saffron-exporting countries in the world, so that in 2022, the first four positions have changed to Nigeria, Sri Lanka, Iran, and Spain, respectively. Studies show that despite Iran's high potential for production and export of this product, it has not been able to maintain its position in exports, and Iran's position has fluctuated between first and fourth variably.

The results of the examination of the structure of the global saffron export market indicate that the export market structure of this product in the world has been monopolistic, bilateral monopolistic, open, closed, and dominant firm variable. Also, in 2022, the top four saffron-exporting countries accounted for 93 percent of the total world exports, and this share has varied between 47 percent and 93 percent in the years under review. Iran's average rank in the 2003-2022 period in the

saffron export market has been second globally, and Iran's average export share in the global market during this period has been about 13.6 percent. Based on market structure indices, the most important export rivals of Iran's saffron product in the years under review have been Spain, England, Nigeria, Bangladesh, Afghanistan, India, and China (Table 2).

The results of the examination of the saffron export sustainability index, with an emphasis on the global market structure, are presented in (Table 3). As observed, Afghanistan, Spain, India, Iran, England, Bangladesh, China, and Nigeria are among the most stable exporting countries, with average

sustainability indices of 0.33, 0.81, 0.85, 0.96, 1, 3.11, 3.7, and 9.95, respectively. The results indicate that Afghanistan has more target markets and higher export sustainability compared to its competitors. This is while Iran, as the largest producer of this product, ranks approximately fourth in terms of export sustainability. The coefficient of fluctuation in the sustainability index indicates that among saffron-exporting countries, Iran had less fluctuation, suggesting that its export volume and target markets have experienced fewer changes compared to other countries. England, Bangladesh, China, and Nigeria have sustainability index values greater than one, indicating instability in their exports.

Table 2- Global Saffron Export Market Structure

Market Structure	Active business competitors	1/HHI	HHI	CR$_4$	CR$_1$	Year
Closed Multilateral monopoly	Indonesia, Iran, China, Togo	4.22	0.24	0.77	0.43	2003
Closed Multilateral monopoly	Iran, England, Indonesia, Kenya	6.52	0.15	0.62	0.34	2004
Open and closed Multilateral monopoly	Iran, England, Ethiopia, Spain	9.98	0.10	0.55	0.19	2005
Open and closed Multilateral monopoly	Iran, England, Cambodia, Ethiopia	9.42	0.11	0.59	0.19	2006
Closed Multilateral monopoly	Cambodia, England, Portugal, Iran	7.33	0.14	0.63	0.28	2007
Open and closed Multilateral monopoly	England, Portugal, Spain, Iran	10.74	0.09	0.50	0.21	2008
Open and closed Multilateral monopoly	Ethiopia, England, Bulgaria, Indonesia	10.40	0.10	0.53	0.19	2009
Closed Multilateral monopoly	Indonesia, China, England, Spain	7.10	0.14	0.69	0.26	2010
Closed Multilateral monopoly	England, Iran, Spain, Indonesia	6.50	0.15	0.61	0.34	2011
Closed Multilateral monopoly	Indonesia, England, Iran, America	4.88	0.21	0.79	0.36	2012
Closed Multilateral monopoly	Indonesia, England, Iran, India	4.03	0.25	0.76	0.45	2013
Dominant enterprise	Indonesia, Iran, England, Ethiopia	3.36	0.30	0.75	0.52	2014
Open and closed Multilateral monopoly	China, Bangladesh, England, Iran	12.94	0.08	0.47	0.15	2015
Open and closed Multilateral monopoly	Iran, Ethiopia, England, China	12.28	0.08	0.48	0.13	2016
Open and closed Multilateral monopoly	Iran, England, India, Spain	11.73	0.09	0.52	0.19	2017
Open and closed Multilateral monopoly	Iran, China, England, Bangladesh	9.14	0.11	0.58	0.24	2018
Open and closed Multilateral monopoly	Spain, Iran, Bangladesh, England	9.82	0.10	0.57	0.19	2019
Closed Multilateral monopoly	Nigeria, Spain, Iran, Afghanistan	6.21	0.16	0.69	0.32	2020
Dominant enterprise	Nigeria, Spain, Iran, England	2.03	0.49	0.85	0.69	2021
Dominant enterprise	Nigeria, Sri Lanka, Iran, Spain	2.51	0.40	0.93	0.51	2022

Table 3- The sustainable development index of world countries in saffron export

Year	Iran	Spain	England	Bangladesh	Afghanistan	India	China	Nigeria
2003	1.42	0.46	0.33	-	-	1.04	4.57	-
2004	2.49	1.68	0.85	-	-	2.64	8.31	-
2005	1.18	0.37	0.88	-	-	1.04	2.82	-
2006	1.43	0.46	1.20	-	-	1.20	4.23	-
2007	0.59	0.23	0.98	-	-	1.86	3.85	0.17
2008	0.86	0.68	1.27	1.76	-	0.76	1.85	-
2009	0.58	0.32	0.54	1.33	-	0.88	3.05	-
2010	0.49	0.76	0.68	0.28	-	0.45	4.44	-
2011	0.79	0.47	1.58	0.51	-	0.45	5.77	-
2012	1.17	1.21	1.08	0.22	0.22	0.63	2.39	-
2013	1.28	1.28	2.95	1.09	0.16	0.90	8.39	6.54
2014	0.54	0.25	0.50	0.08	0.05	0.92	4.92	-
2015	0.41	2.55	0.45	1.03	0.15	0.59	3.42	-
2016	0.81	0.26	0.79	5.75	0.16	0.30	4.59	-
2017	0.63	1.44	0.48	3.01	0.15	0.22	3.26	-
2018	1.54	0.34	0.98	5.78	0.61	1.02	6.57	-
2019	1.03	0.81	0.43	13.83	0.36	0.39	0.36	1.17
2020	0.68	0.63	0.23	1.24	0.52	0.11	0.48	10.19
2021	0.65	0.94	1.17	5.48	0.53	0.66	0.24	23.22
2022	0.72	1.01	2.55	5.33	0.76	0.98	0.55	18.43
Average	0.96	0.81	1.00	3.11	0.33	0.85	3.70	9.95
Coefficient of variation	0.51	0.73	0.70	1.18	0.70	0.68	0.65	0.93

Source: Research Findings

The market structure of Iran's saffron exports based on the concentration ratio and Herfindahl-Hirschman index over the study period is examined and reported in (Table 4). As observed, Iran's export market structure has been a closed bilateral monopoly (with a dominant firm in 2003). The combined market share of the top four importing countries of Iranian saffron (based on the CR_4 index) has ranged from 66 to 88 percent, with changes in the composition of these countries over time. The high share of these four countries in saffron imports from Iran indicates that Iran's export target countries have been limited, posing a risk that if imports from these countries are restricted, Iran may face challenges and lose its export power and bargaining power. It is worth mentioning that the most important importing countries of Iranian saffron during the study period have been the UAE, Spain, Saudi Arabia, China, Hong Kong, Italy, and Oman (Table 4).

(Table 5) illustrates the sustainability index of the top importing countries of saffron in the world during the years 2003-2022. The results indicate that Oman, Italy, China, Saudi Arabia, Spain, Hong Kong, and the UAE are respectively the most significant importers of saffron globally, with average import sustainability indices of 0.12, 0.15, 0.17, 0.23, 0.25, 0.26, and 0.47. The results show that among saffron-importing countries, Oman enjoys greater sustainability compared to its competitors, and the number of countries from which it imports saffron is higher than other countries.

Table 4- Structure of Iran's saffron export market

Market Structure	Active Commercial Competitors in Imports from Iran	1/HHI	HHI	CR4	CR1	Year
Dominant enterprise	Emirates, Spain, Italy, France	2.88	0.35	0.88	0.50	2003
Closed Multilateral monopoly	Emirates, Spain, Saudi Arabia, France	3.27	0.31	0.84	0.44	2004
Closed Multilateral monopoly	Emirates, Spain, Saudi Arabia, India	3.57	0.28	0.80	0.45	2005
Closed Multilateral monopoly	Emirates, Spain, Saudi Arabia, Italy	3.90	0.26	0.83	0.38	2006
Closed Multilateral monopoly	Emirates, Spain, Saudi Arabia, Italy	3.85	0.26	0.84	0.36	2007
Closed Multilateral monopoly	Spain, Emirates, Italy, Saudi Arabia	4.06	0.25	0.83	0.39	2008
Closed Multilateral monopoly	Spain, Emirates, Italy, Saudi Arabia	3.35	0.30	0.86	0.42	2009
Closed Multilateral monopoly	Emirates, Spain, Italy, Saudi Arabia	3.44	0.29	0.86	0.38	2010
Closed Multilateral monopoly	Emirates, Spain, Saudi Arabia, China	3.98	0.25	0.79	0.39	2011
Closed Multilateral monopoly	Emirates, Spain, China, Saudi Arabia	4.41	0.23	0.81	0.36	2012
Closed Multilateral monopoly	Emirates, Spain, Saudi Arabia, Hong Kong	3.93	0.25	0.82	0.39	2013
Closed Multilateral monopoly	Emirates, Spain, Saudi Arabia, China	3.78	0.26	0.82	0.44	2014
Closed Multilateral monopoly	Emirates, Spain, China, Saudi Arabia	4.39	0.23	0.81	0.38	2015
Closed Multilateral monopoly	Emirates, Spain, Hong Kong, Afghanistan	4.47	0.22	0.84	0.33	2016
Closed Multilateral monopoly	Hong Kong, Emirates, Spain, Afghanistan	4.82	0.21	0.84	0.27	2017
Closed Multilateral monopoly	Emirates, Spain, Hong Kong, Vietnam	5.67	0.18	0.80	0.28	2018
Closed Multilateral monopoly	Emirates, Hong Kong, Spain, Vietnam	6.06	0.17	0.75	0.25	2019
Closed Multilateral monopoly	Hong Kong, Spain, Emirates, China	6.61	0.15	0.73	0.23	2020
Closed Multilateral monopoly	China, Emirates, Spain, Oman	4.83	0.21	0.79	0.33	2021
Closed Multilateral monopoly	China, Emirates, Spain, Oman	6.83	0.15	0.66	0.27	2022

Source: Research Findings

In the current study, to examine the relative export advantage of Iranian saffron, the Revealed Comparative Advantage (RCA) index has been utilized, and the symmetric Revealed Comparative Advantage (SRCA) index has been used, the results of which are presented in (Table 6). As observed, the relative export advantage of Iranian saffron has experienced fluctuations but has consistently been present throughout the study period and has increased in recent years. This indicates an increase in Iran's competitive power in the global market for saffron.

The Topsis approach was used to prioritize

the target countries for Iranian exports, and the results are presented in (Table 7). As observed in (Table 4), China, the UAE, Spain, Oman, Saudi Arabia, and Hong Kong have respectively accounted for the highest share of Iran's exports. However, according to the results in (Table 7), these countries are ranked 1, 2, 3, 12, and 25, respectively. As mentioned in previous sections, criteria such as export quantity, export value, export price, geographical distance, per capita income, gross domestic product, economic structure difference index, and population of countries were used for prioritizing the export target

markets of Iran. The results show that among the importing countries of saffron from Iran, China, the UAE, Spain, India, the United States, Germany, France, Italy, Sweden, and Kuwait are in the top priority ranks. Other countries are specified in (Table 7) according to their priority. It is worth noting that there is no significant difference between potential markets and current markets for Iranian saffron.

Table 5- The sustainability index of the most important saffron importing countries from Iran in the world

Year	Emirates	Spain	Saudi Arabia	China	Hong Kong	Italy	Oman
2003	1.16	0.52	0.34	-	2.45	0.13	-
2004	1.27	0.54	0.14	-	-	0.22	0.13
2005	0.76	0.26	0.19	0.05	0.03	0.21	0.10
2006	0.07	0.07	0.03	0.01	0.01	0.02	0.02
2007	0.17	0.20	0.06	0.21	0.02	0.10	0.10
2008	0.33	0.25	0.24	0.03	0.17	0.22	0.11
2009	0.21	0.16	0.33	-	0.15	0.18	0.06
2010	0.42	0.30	0.11	0.06	0.63	1.05	0.04
2011	0.56	0.47	0.13	0.06	0.08	0.11	0.12
2012	0.28	0.29	0.07	0.11	0.06	0.07	0.04
2013	0.24	0.12	0.13	0.07	0.03	0.03	0.02
2014	0.13	0.06	0.08	0.04	0.01	0.02	0.05
2015	0.12	0.12	0.06	0.09	0.02	0.03	0.03
2016	0.23	0.27	0.06	0.04	0.25	0.07	0.06
2017	0.25	0.18	0.06	0.05	0.21	0.07	0.11
2018	0.37	0.24	0.03	0.03	0.12	0.05	0.12
2019	0.27	0.26	0.09	0.08	0.28	0.25	0.17
2020	0.31	0.24	0.24	0.27	0.30	0.05	0.42
2021	1.37	0.29	0.55	0.78	0.10	0.07	0.51
2022	0.95	0.24	1.71	0.96	0.11	0.13	0.09
Average	0.47	0.25	0.23	0.17	0.26	0.15	0.12

Source: Research Findings

Table 6- Iran's saffron export advantage

Year	RCA	RSCA	Year	RCA	RSCA
2003	149.0	0.987	2013	143.4	0.986
2004	151.0	0.987	2014	146.3	0.986
2005	125.2	0.984	2015	167.3	0.988
2006	133.5	0.985	2016	144.2	0.986
2007	80.9	0.976	2017	139.6	0.986
2008	75.2	0.974	2018	148.9	0.987
2009	96.2	0.979	2019	280.6	0.993
2010	102.9	0.981	2020	248.9	0.992
2011	107.9	0.982	2021	157.7	0.987
2012	115.8	0.983	2022	707.2	0.997

Source: Research Findings

Table 7- Results of prioritizing target countries for Iran's saffron exports for the years 2003-2022

Priority based on TOPSIS	The average weighted importance coefficient	The average rank of importing countries from Iran	Country	Priority based on TOPSIS	The average weighted importance coefficient	The average rank of importing countries from Iran	Country
22	0.009807673	29.45	Greece	1	0.030242027	4.15	China
23	0.009603794	29.55	Austria	2	0.033468714	6.85	Emirates
24	0.010125	30.75	Bahrain	3	0.028946286	7.7	Spain
25	0.0101	32.7	Oman	4	0.024623211	7.95	India
26	0.011303	32.75	Netherlands	5	0.028389397	8.9	United States
27	0.010592	33.2	Kazakhstan	6	0.014952526	12.3	Germany
28	0.009474	33.35	Finland	7	0.014465873	14.35	France
29	0.01159	33.55	England	8	0.014498992	15.25	Italy
30	0.010799	33.7	Afghanistan	9	0.0143701	15.5	Sweden
31	0.010514	34.05	Romania	10	0.01225312	16.45	Kuwait
32	0.010416	34.3	Russia	11	0.012929441	17.1	Qatar
33	0.009619	34.45	Belgium	12	0.014522008	19.1	Saudi Arabia
34	0.00911	36.3	Azerbaijan	13	0.010759091	22.7	Pakistan
35	0.009232	37	Ukraine	14	0.014539867	24.45	Hong Kong
36	0.009293	37.85	Slovakia	15	0.010066546	24.75	Iraq
37	0.009396	39	Denmark	16	0.009976362	25.05	Egypt
38	0.009033	39.6	Czech	17	0.013724528	25.15	Japan
39	0.010055	39.8	Hungary	18	0.010413286	26.05	Bangladesh
40	0.00906	40.4	Poland	19	0.011506631	26.55	Switzerland
41	0.009078	40.5	Thailand	20	0.010237802	27.05	Turkey
42	0.009713	42.75	Norway	21	0.010281649	29.05	Indonesia
69	0.008120155	63.15	Macau	43	0.009187	43	Algeria
70	0.008814274	63.3	Slovenia	44	0.010468	43.05	Nigeria
71	0.008070041	63.95	Georgia	45	0.008974	43.6	Turkmenistan
72	0.00812959	68	Morocco	46	0.008946	44.7	Uzbekistan
73	0.007900674	68.25	Lithuania	47	0.010144	45.7	Vietnam
74	0.007837067	70.25	Nepal	48	0.009121	47.75	Singapore
75	0.007934116	70.85	Kyrgyzstan	49	0.009186	47.85	Ireland
76	0.008509062	71.55	Bosnia and Herzegovina	50	0.0089	50.05	Syria
77	0.007995967	72.1	Estonia	51	0.008721	50.1	Lebanon
78	0.007775057	72.6	Tajikistan	52	0.009657	50.1	Malaysia
79	0.008100592	73.35	Tunisia	53	0.010417	50.2	Argentina
80	0.008370596	74.25	Kenya	54	0.010438	50.25	Jordan
81	0.007650348	74.9	Zambia	55	0.008911	51.4	Australia
82	0.007492555	76.15	South Africa	56	0.010918	52	Luxembourg
83	0.007163496	77.75	Colombia	57	0.008543	53.65	Bulgaria
84	0.007134313	78.45	New Zealand	58	0.008542	54.4	Korea
85	0.007138522	78.95	Mexico	59	0.009345	55.1	Armenia
86	0.006950576	79.75	Chile	60	0.00906	55.95	Portugal
87	0.006782278	82.65	Malta	61	0.008431	56.15	Libya
88	0.007565742	83.2	Tanzania	62	0.008354	56.95	Brazil
89	0.007335999	85.1	Uganda	63	0.008561	58.35	Sri Lanka
90	0.006315378	86.2	Cambodia	64	0.008317	59.3	Croatia
91	0.00633173	87.05	Laos	65	0.008302	59.4	Canada
92	0.005836798	89.3	Brunei	66	0.008316318	60.05	Philippines
93	0.006997772	89.8	Uruguay	67	0.009475527	62.65	Myanmar
94	0.005936474	90.5	Mauritius	68	0.008407745	63.1	Serbia
95	0.005883516	90.85	Madagascar				
96	0.005112691	91.95	Panama				
97	0.003542596	95.05	Namibia				
98	0.00320185	95.6	Mauritania				

Source: Research Findings

(Table 8) illustrates the relative export advantage of Iranian saffron to the most important target markets. The most important target countries for Iranian exports are determined based on the export market structure, with Afghanistan, the UAE, Spain, Saudi Arabia, Oman, Hong Kong, and China being the top priorities. Although China is a major market for Iranian saffron, the results show that Iran's export advantage to Afghanistan is greater than to China, possibly due to the proximity of Iran and Afghanistan and the cooperation between these two countries in expanding saffron cultivation and production. Examining the coefficient of changes in relative export advantage indicates that the highest fluctuation is related to China and the lowest fluctuation is related to Spain, which can indicate the market risk in these two countries and be considered as a criterion for instability in a country's trade system (Salami & Pishbahar, 2001). Based on the coefficient of changes, Iran's relative export advantage to Spain, the UAE, Saudi Arabia, Oman, Afghanistan, Hong Kong, and China has had the least fluctuation, indicating market stability despite competitiveness.

Table 8- Relative advantage for saffron exports to Iran's export target countries in 2003-2022

Year	Emirates	Spain	China	Afghanistan	Oman	Saudi Arabia	Hong Kong
2003	51.23	7.53	0.01	0.00	8.70	5.30	0.10
2004	53.53	6.65	0.00	0.14	5.89	9.97	0.14
2005	64.20	6.77	0.02	0.00	9.90	16.81	0.32
2006	36.78	6.74	0.00	0.23	8.21	15.00	0.21
2007	19.39	10.46	0.00	0.51	7.02	7.62	0.18
2008	15.29	11.84	0.00	0.00	5.49	5.65	0.24
2009	19.51	10.09	0.02	0.01	4.66	4.04	0.10
2010	37.36	7.74	0.01	0.07	4.13	8.36	0.26
2011	43.15	6.22	0.02	0.00	3.77	11.38	0.25
2012	68.04	12.74	0.03	0.03	5.25	20.60	0.49
2013	32.57	12.27	0.03	2.27	4.76	10.62	0.54
2014	42.12	10.93	0.04	38.87	4.27	11.23	0.34
2015	23.79	13.20	0.03	62.65	4.08	5.54	0.32
2016	31.28	12.22	0.16	118.40	5.18	4.95	1.08
2017	28.72	10.82	0.54	135.79	4.92	8.18	2.37
2018	33.34	5.97	0.11	158.26	4.39	6.80	10.37
2019	32.16	7.43	0.10	228.18	29.18	9.04	5.02
2020	13.87	5.89	0.35	143.21	16.14	6.93	4.07
2021	20.73	6.69	1.12	43.24	15.60	7.14	1.49
2022	2.45	12.29	0.66	0.00	1.75	1.85	0.25
Average	33.48	9.22	0.16	46.59	7.67	8.85	1.41
Maximum	68.04	13.20	1.12	228.18	29.18	20.60	10.37
Minimum	2.45	5.89	0.00	0.00	1.75	1.85	0.10
Coefficient of variation	0.50	0.29	1.81	1.51	0.81	0.51	1.79

Source: Research Findings

Conclusion

This research has conducted a comprehensive analysis of the global saffron market structure, focusing on the saffron supply chain and the relative export advantage of Iran. The study spans the period from 2003 to 2022, examining export market dynamics, target countries for Iranian exports, and the competitive landscape. We concluded that i) the global saffron market structure oscillated

between oligopoly and dominant firm configurations; ii) Iran's export market structure was oligopolistic, with Iran being the dominant firm in 2003; iii) by 2022, Nigeria, Sri Lanka, Iran, and Spain accounted for 93% of global saffron exports, with Iran holding a 13.6% share; iv) Spain, England, Nigeria, Bangladesh, Afghanistan, India, and China emerged as the main competitors for Iranian saffron exports; v) Afghanistan, Spain, India, Iran, England, Bangladesh, China, and Nigeria were identified as the most stable exporting countries; vi) Iran's export stability index was 0.96, indicating a trend of decreasing stability and potential challenges for export revenues; vii) the CR4 index showed that the top four importers of Iranian saffron accounted for 66% to 88% of imports, although the composition of these countries varied over time; viii) this high concentration highlights the limited and unstable nature of Iran's export target markets, posing risks if import restrictions are imposed by these countries. Despite challenges, Iran maintained a relative export advantage in saffron, with an increasing trend in recent years. From the 98 countries importing Iranian saffron, 53 were identified as target markets, with China, the UAE, Spain, India, the USA, Germany, France, Italy, Sweden, and Kuwait being top priorities. However, exports to the USA, Germany, Sweden, and Kuwait were minimal. We suggested that given the increasing production by competitors like Afghanistan, India, and Morocco, Iran should invest in saffron production technology to sustain its leading position. Although Iran produces over 80% of the world's saffron, it only holds a 13.6% market share in exports. Most Iranian saffron is re-exported by countries such as the UAE, Spain, China, and Oman. Therefore, expanding market presence and enhancing branding should be prioritized. As the saffron market is oligopolistic, price setting and market share distribution should involve all exporting countries. Iran should leverage international cooperation to regain its influence in the market. With exports concentrated in a few countries, and the composition of these countries being unstable, Iran should focus on market retention and maintenance strategies. Developing strong diplomatic and trade relations with target countries is crucial to mitigate risks and ensure sustained export volumes and revenues. These strategic recommendations aim to enhance Iran's competitiveness and stability in the global saffron market, ensuring sustainable growth and profitability for its saffron exports.

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اولویت‌بندی بازارهای هدف زعفران ایران بر اساس شاخص‌های رقابت بازاری

مرتضی مجیدیان ۱ – آرش دوراندیش ۲*

چکیده

صادرات محصولات کشاورزی یکی از راهبردهای توسعه صادرات غیرنفتی و رشد پایدار اقتصادی در کشورهای در حال توسعه به شمار می‌آید. زعفران به‌عنوان یک محصول صادراتی دارای اهمیت ویژه‌ای در صادرات غیرنفتی ایران است. از آنجاکه ایران در صادرات زعفران در بین چهار کشور برتر جهان قرار دارد، هدف این مطالعه اولویت‌بندی بازارهای هدف زعفران ایران بر اساس شاخص‌های رقابت بازاری و محاسبه مزیت‌نسبی و شاخص پایداری صادرات آن در جهان و کشورهای هدف صادراتی ایران می‌باشد. مقایسه ساختار بازار جهانی محصول طی دوره ۲۰۰۳-۲۰۲۲ نشان داد که با وجود سهم بالای کشورهای ایران، اسپانیا، انگلیس و نیجریه در بیشتر سال‌ها، ساختار بازار به شکل انحصار چند جانبه باز و بسته و در برخی سال‌ها بنگاه مسلط بوده است که بیانگر افزایش تعداد رقبا و رقابتی شدن بازار صادراتی این محصول است. ایران با متوسط سهم ۱۳/۶ درصدی در بازار صادرات زعفران و تولید بیش از ۸۰ درصد زعفران، به‌طور مستقیم سهمی در صادرات جهانی نداشته و بیشتر زعفران ایران به کشورهایی مانند امارات، اسپانیا، چین و عمان صادر می‌شود و از آنجا مجددا به سایر کشورها صادر می‌گردد که لازم است برای این منظور استراتژی‌هایی مانند توسعه بازار و برندسازی در اولویت قرار داده شود. نتایج نشان داد در سال ۲۰۲۲ چهار کشور نیجریه، سریلانکا، ایران و اسپانیا ۹۳ درصد از کل صادرات جهان را به خود اختصاص داده‌اند و میانگین رتبه مقدار صادرات برای کشور ایران در دوره مورد مطالعه در بازار صادراتی زعفران رتبه ۲ را به خود اختصاص داده است. همچنین ایران با شاخص پایداری صادرات کمتر از یک (۰/۹۶) صادرات پایداری داشته است اما روند تغییر این شاخص بیانگر کاهش پایداری ایران است. نتایج نشان داد که عمده صادرات زعفران ایران تنها به چهار کشور صورت می‌پذیرد و ترکیب این کشورها نیز ثابت نیست، لذا توجه به گسترش بازارهای هدف صادراتی به‌ترتیب با اولویت کشورهای چین، امارات، اسپانیا، هند، آمریکا، آلمان، فرانسه، ایتالیا، سوئد و کویت به‌ترتیب با میانگین رتبه ۴/۱۵، ۶/۸۵، ۷/۷، ۷/۹۵، ۸/۹، ۱۲/۳، ۱۴/۳۵، ۱۵/۲۵، ۱۵/۵ و ۱۶/۴۵مورد توجه قرار گیرد. همچنین نتایج نشان داد که بازار صادراتی این محصول انحصار چندجانبه بوده است، بنابراین باید از طریق مشارکت تمامی کشورهای صادرکننده به تعیین قیمت و سهم بازار هر یک از کشورها اقدام نمود.

واژه‌های کلیدی: ایران، بازارهای هدف صادرات زعفران، ساختار بازار، شاخص پایداری صادرات

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