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Prioritize barriers to international supply chain management in Saffron industry

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Abstract

The aim of this study was to determine the main Barriers in the international supply chain management in Iranian saffron industry by the AHP approach in 2016. The results of this study showed that the most important Barrier is the lack of investment in the distribution of saffron. The results showed that the second most important barrier to international supply chain management, processing and packaging in Saffron industry could be limited the Saffron exports and international supply. According to this research's findings it can be concluded that it is useful to allow foreign investors to invest in this sector in order to improve the efficiency of supply chains and to ease the introduction of modern supply chain technologies to Iranian saffron industry.

Keywords: AHP, supply chain, saffron.

Introduction



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Hadfield (2011) defines supply chain management as the active management of supply chain activities to maximize customer value and achieve a sustainable competitive advantage. Every prosperous company owes some of its success to effective supply chain management. Supply chain management covers the procurement of raw materials from suppliers and the distribution of finished products to consumers. In today's business environment inventory management, production planning and scheduling, logistics management, and information management are vital to satiating customers needs and creating competitive advantages (riasi, 2015).

Since most sales of this product is in the international market, the global supply chain management is one of the most important parts of saffron industry.

Growth of agricultural sector is very important due to increasing food security, poverty reduction, economic growth, improve income distribution and reduce unemployment (Mantalv and Rvlyvn, 2010). Developing saffron industry as a major part of agricultural trade, it is very important to identify the supply chain management problems and find ways to solve the problems.

Agricultural sector in Iran with land and climate variations has a high potential in the global markets. So relying on the capabilities of this section can lead augmentation in non-oil export. Saffron with its high value added have a special role in Iran's non-oil exports, but problems in production, distribution and marketing causing lower status rather than foreign samples, despite the high quality of Iranian saffron (maghabl and naderi, 1391). Among the crops with specific traits, saffron has tolerated lake of water in South Khorasan. Thought, exports of saffron in the global marketplace Is an essential research in marketing (kafi,1381).

There are various studies in the context of agricultural supply chain, including Amiri et al (1384) which has reviewed affecting factors on competitiveness of saffron supply chain. Distributing inefficient processing of asymmetric saffron value throughout the supply chain has led to a reduction in the product quality in long time. Khalidi et al (1390) investigated the production, distribution and export of onion with the approach of the supply chain in the East Azerbaijan province. Their results showed that the export sector has many drawbacks, including the lack of export associations, lack of exporters' knowledge of foreign market demand conditions, lack of quality standards. Mojarad et al (1392) examined the management of the supply chain processed food products and the optimal level of production, sales and inventories in the course of production were determined. Alipour et al (1392) inspected factors in maintaining cooperation Manufacturer-supply distributor in the distribution chain from the perspective of providers. The population of this research includes the suppliers of food products and data analysis was performed using structural equation modeling technique. Salajegheh et al (1393) study looked at network marketing and supply chain management. Sabaghpour and tomaj (1394) studied prospects for developing countries on green supply chain management. Hassanzadeh and Golkar (1393) evaluated climate parameters on Torbat land city for saffron cultivation based on AHP method. Mohammadi and Shbanyan (1393) discussed supply chain, distribution and consumption of saffron with emphasis on the challenges and solutions. Nabi Zadeh and Sadeghi (1393) examined Saffron exports and the need of branding and provided solutions using the technique of meta-analysis.

Asian Productivity Organization held several conferences on the supply chain (Don, 2001, Bryksvn and Kandampvly 2004). Based on studies the analysis of the supply chain in the agricultural industry has become a valuable tool in determining where competitive advantages for involved companies or industries can be carried out. (Bymvn 1999) da Silva and colleagues (2007) examined evaluation procedures in the supply chain Agricultur. Kanfra (2016) has examined in his study whether short food supply chain solutions for sustainable development in the food market is efficient. Verdú et al



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(2016) have virtualized food supply chain via the Internet. Ho et al (2015) discussed international food safety standards and supply chain organizations in Morocco's fruit and vegetable export. Kradv (2016) showed study advances in genetic modification in agriculture and studied food supply chain. Latra et al (2016) studied using AHP barriers to adoption of sustainable consumption and production initiatives in the supply chain. Mighty et al (2016) developed an integrated intuitive fuzzy AHP method which was used for reverse logistics outsourcing. Riasi (2016) determined the major barriers to international supply chain management in Iranian flower industry. The results of the research revealed that the most important barrier is lack of investment in Iranian flower distribution sector. The results also indicated that the second most important barrier to international supply chain management in Iranian flower industry might be the rules that limit the presence of international distributors in the country's flower industry. According to research findings, it can be concluded that it is useful to allow foreign investors to invest in this sector in order to improve the efficiency of supply chains and to ease the introduction of modern supply chain technologies on Iranian flower industry. According the recent surveys, it is essential to be identifying barriers of international saffron supply chain management. In this study, barriers of international supply chain management in Saffron industry are investigated based on the analysis of hierarchical process.

Materials and Methods

There are processes for saffron from harvesting to consumer which are shown in figure 1.

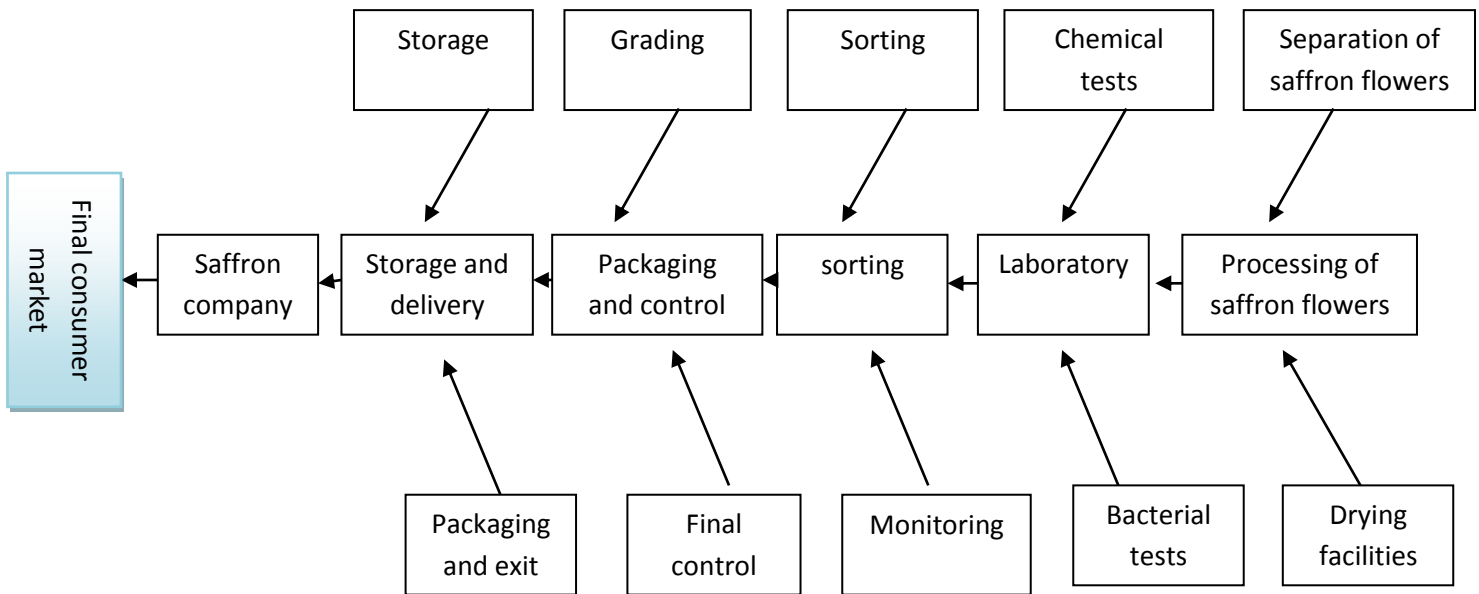


Figure 1- Saffron Fish- bone

The Analytical Hierarchy Process (AHP) developed by Saaty (1977) is a decision approach designed to aid in the solution of complex multiple criteria decision problems and has successfully been used in a wide variety of application domains. This method models a complex decision problem into a hierarchy descending from an overall objective at the top to various criteria, sub-criteria, and so on until the decision alternatives at the lowest level. (Huang and Miller, 2003). Matrix of paired comparisons is as follows (Lee et al., 2008):

$$A = \begin{bmatrix} 1 & a_{12} & \dots & a_{1n} \\ a_{21} & 1 & \dots & a_{2n} \\ \dots & \dots & \dots & \dots \\ a_{n1} & a_{n2} & \dots & 1 \end{bmatrix} \quad [1]$$

matrix of pairwise ratios is made from Decision making and each level elements separately. Matrixes, are included paired comparisons among evaluated criteria and paired comparisons among alternatives based on any criteria. Generally, if the number of alternatives and criteria are m and n, the matrix of alternative pairwise ratios are m*m and matrix of criteria pairwise ratios are n*n. Elements of the matrix of pairwise is shown with a_{ij} . In the Analytic Hierarchy Process is assumed that $a_{ij} = 1/a_{ji}$. So, if $i = j$ then $a_{ij} = 1$ (containers and Ahmad, 2007). To measure alternative performance (degree of importance), comparison do pairwise. That is means y particular alternative compared with other alternatives. At one time given, it can only be compared with another alternative. (Aranraj and Mighty 2010). The general view is analytic hierarchy as Figure 2.

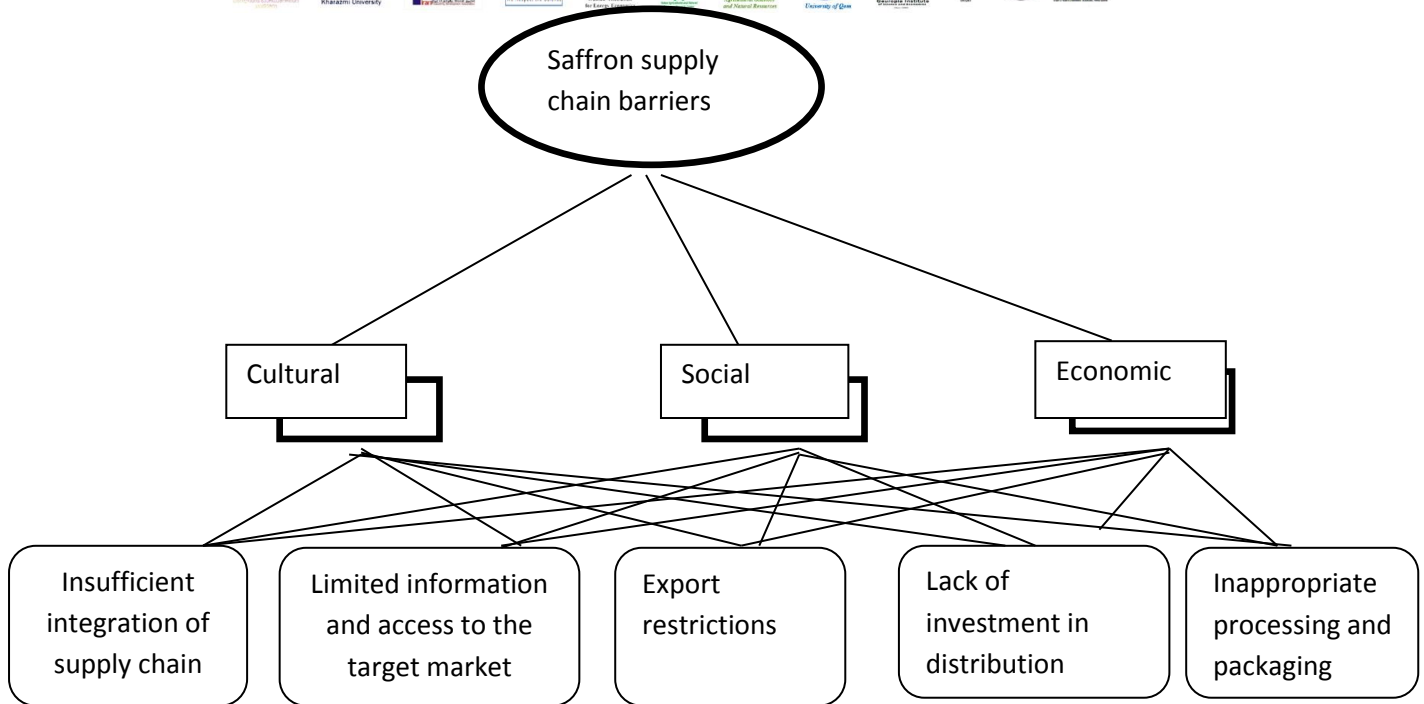


Figure 2-hierarchy to prioritize the saffron supply chain barriers

In this structure, objectives, criteria and alternatives are placed in orders. The main objective is to determine barriers off saffron supply chain management with three criteria: economic, social and cultural. Saffron supply chain barriers alternatives included: inadequate processing and packaging, lack of investment in distribution, export restrictions, limited information and access to the target market and insufficient integration of supply chain management are designed in the form of hierarchical structure. Partial and final weights of each branch are obtained by pairwise comparisons. Decision-maker preferences or the value of any comparison are calculated in Table 1. Data were obtained by questionnaires from Iranian exporter saffron companies in 2016, and has been calculated in Excel software.

RESULTS AND DISCUSSION

To make a decision in an organized way to generate priorities we need to decompose the decision into the following steps.

1-Define the problem and determine the kind of knowledge sought.

2-Structure the decision hierarchy from the top with the goal of the decision, then the objectives from a broad perspective, through the intermediate levels (criteria on which subsequent elements depend) to the lowest level (which usually is a set of the alternatives).



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3- Construct a set of pairwise comparison matrices. Each element in an upper level is used to compare the elements in the level immediately below with respect to it.

4-Use the priorities obtained from the comparisons to weigh the priorities in the level immediately below. Do this for every element. Then for each element in the level below add its weighed values and obtain its overall or global priority. Continue this process of weighing and adding until the final priorities of the alternatives in the bottom most level are obtained (saaty,2008).

Satellite

Table 1- The fundamental scale of absolute numbers. source: saaty (2008)

1	Equal Importance	Two activities contribute equally to the objective
2	Weak or slight	
3	Moderate importance	Experience and judgment slightly favor one activity over another
4	Moderate plus	
5	Strong importance	Experience and judgment strongly favor one activity over another
6	Strong plus	
7	Very strong or demonstrated importance	An activity is favored very strongly over another; its dominance demonstrated in practice
8	Very, very strong	
9	Extreme importance	The evidence favoring one activity over another is of the highest possible order of affirmation
Reciprocals of above	If activity I has one of the above non-zero numbers assigned to it when compared with activity j, then j has the reciprocal value when compared with I	A reasonable assumption
1.1–1.9	If the activities are very close	May be difficult to assign the best value but when compared with other contrasting activities the size of the small numbers would not be too noticeable, yet they can still indicate the relative importance of the activities.

Analytic Hierarchy Process based on of pairwise ratios decision-maker comparisons, in the form of a matrix of pairwise ratios. To make comparisons, we need a scale of numbers that indicates how many times more important or dominant one element is over another element with respect to the criterion or property with respect to which they are compared. Table 1 exhibits the scale.



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Table 2- Pairwise comparison matrix of the criteria with respect to the Goal. Source: research results

Criteria	economic	social	culture
Economic	1	5	7
Social	0.2	1	3
Culture	0.14	0.33	1

In Table 1, the criteria listed on the left are one by one compared with each criterion. Listed on top as to which one is more important with respect to the goal of selecting a important barrier. In Table 2, the criteria on the left are compared with the criteria on top as to their importance with respect to goal.

Table 3- Pairwise comparison matrix for the criteria with respect to economic. Source: research results

	inadequate processing and packaging	lack of investment in distribution	export restrictions	Limited information and access to the target market	insufficient integration of supply chain management
inadequate processing and packaging	1	0.33	0.33	7	7
lack of investment in distribution	3	1	9	3	5
export restrictions	3	0.11	1	1	5
Limited information and access to the target market	0.14	0.33	1	1	7
insufficient integration of supply chain management	0.14	0.2	0.2	0.14	1

In Table 3 the alternatives on the left are compared with those on top with respect to relative preference for economic.



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Table 4- Pairwise comparison matrix for the criteria with respect to social. Source: research results

	inadequate processing and packaging	lack of investment in distribution	export restrictions	Limited information and access to the target market	insufficient integration of supply chain management
inadequate processing and packaging	1	0.2	0.33	5	7
lack of investment in distribution	5	1	5	3	5
export restrictions	3	0.2	1	3	3
Limited information and access to the target market	0.2	0.33	0.33	1	1
insufficient integration of supply chain management	0.14	0.2	0.33	1	1

In Table 3 the alternatives on the left are compared with those on top with respect to relative preference for social.

Table 5- Pairwise comparison matrix for the criteria with respect to culture. Source: research results

	inadequate processing and packaging	lack of investment in distribution	export restrictions	Limited information and access to the target market	insufficient integration of supply chain management
inadequate processing and packaging	1	0.33	0.33	5	5
lack of investment in distribution	3	1	7	1	3
export restrictions	3	0.14	1	1	3



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Limited information and access to the target market	0.2	1	1	1	5
insufficient integration of supply chain management	0.2	0.33	0.33	0.2	1

In Table 3 the alternatives on the left are compared with those on top with respect to relative preference for culture. The priorities for each matrix are obtained as they were from the matrix of comparisons for the barriers.

Table 6- partial weight for alternatives respect to relative criteria. Source: research results

	economic	social	culture
Partial weight	0.72	0.19	0.08
inadequate processing and packaging	0.24	0.21	0.24
lack of investment in distribution	0.43	0.46	0.36
export restrictions	0.17	0.19	0.17
Limited information and access to the target market	0.13	0.08	0.18
insufficient integration of supply chain management	0.04	0.06	0.05

In Table 6 the rankings of the alternatives are given against the tree covering criteria. We need to multiply each ranking by the priority of its criterion or criterion and add the resulting weighs for each alternative to get its final priority. We call this part of the process, synthesis. It is given in Table 7.

Table 7- Synthesising to obtain the final results. Source: research results

	Final weight
inadequate processing and packaging	$0.24*0.72+0.21*0.19+0.24*0.08=0.23$ 0.23
lack of investment in distribution	$0.43*0.72+0.46*0.19+0.36*0.08=0.43$ 0.43
export restrictions	$0.17*0.72+0.19*0.19+0.17*0.08=0.17$ 0.17
Limited information and access to the target marke	$0.13*0.72+0.08*0.19+0.18*0.08=0.12$ 0.12
insufficient integration of supply chain management	$0.04*0.72+0.06*0.19+0.05*0.08=0.04$ 0.04

According to table 2 and matrixes of pairwise ratios of criteria, economic criteria adopted 0.72 partial weight, social criteria adopted 0.19 partial weight and cultural criteria adopted 0.08 partial weight.



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Final weights of each alternative are obtained by multiply partial weight in each relevant alternative. Thus, Lack of investment in distribution with 0.43 partial weight has the highest priority, inadequate processing and packaging with 0.23 partial weight has second priority, export restrictions with 0.17, Limited information and access to the target market with 0.12 and insufficient integration of supply chain management with 0.04 partial weight have other priorities. So lack of investment in distribution is the most important barrier to saffron international supply chain management and appropriate and programmed distribution can be as the most important objective in the international saffron supply chain management and it is important to allow foreign investors to invest in this sector in order to improve efficiency of saffron supply chains.

Conclusion

This study has been designed with aim to assess the saffron barriers of international supply chain management, with AHP approach. Analytical Hierarchy Process (AHP) partial weights are obtained based on the decision-making and pairwise ratios comparisons. Hierarchical structure in this study contains five alternatives included: : inadequate processing and packaging, lack of investment in distribution, export restrictions, limited information and access to the target market and insufficient integration of supply chain management. Among the main barriers to international supply chain management in saffron industry, lack of investment in distribution sector has the highest priority for being resolved. Then inadequate processing and packaging has the second priority, which is important to invest in this sector in order to improve efficiency of saffron supply chains. An efficient international supply chain management can help Iranian saffron producers to expand their exports.



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