



## Investigating and Ratings Factors Affecting the Economy of Fishing Aquaculture using Multi-Criteria Decision-Making Methods in Chabahar Port

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**Key words:** Economy of fishing aquaculture in Chabahar port, multi-criteria decision-making methods, fuzzy DEMATEL, fuzzy ANP, environmental factors

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**Abstract:** The study aimed to investigating and ratings factors affecting the economy of fishing aquaculture using DEMATEL multi-criteria decision-making methods and fuzzy ANP in Chabahar port. The study in term of aim is applied and in term of method is descriptive-analytic. In line with this study, factors affecting 4 resources, environmental conditions, suppliers and related industries and markets have been investigated. The data was collected using a paired comparison and then using the combination of the two DEMATEL and fuzzy ANP rating various factors. The results showed that, environmental factors have ranked first, markets ranked second, reference ranked third and suppliers ranked fourth and related industries in terms of the impact on the economy of fishing aquaculture in Chabahar port.

## INTRODUCTION

Aquatic has high nutritional value and plays an important role in providing food rations of human societies. Optimal exploitation can help maintain of these God reserves. On the one hand catches, environmental factors, habitat destruction, vulnerability of aquatic communities, limited the ability of restocking reserves and on the other hand, human societies need would jeopardize the population. Therefore, proper utilization and sustainable development is necessary constantly monitor the aquatic population trend. One of the ways available to achieve this goal is regular research, so, determine any possible changes in aquatic populations. Studies in the Persian Gulf showed that environmental conditions in this area are always by drastic annual changes influenced. Despite the sharp fluctuations in environmental conditions such as temperature and salinity

changes over the years caused consternation in the Gulf marine environment and affect aquatic biological and behavioral characteristics. Therefore, high salt concentration and temperature of water in this area with extreme weather changes in the ecosystem of this region is one of the most important factors. Switching and movement of water through other factors in changes in the environmental conditions of the region as a result, less saline water, oxygen and nutrients are more entered the Persian Gulf.

Although, it seems that Gulf fishes are able to withstand the high temperature and salinity but drastic changes in environmental conditions in surface waters has more effects on pelagic reserves of the Persian Gulf compared with benthoses because changes in temperature and salinity in the surface layers of water is felt more often. This leads to seasonal fluctuations in the development and distribution of pelagic species in benthic

species is sent. Abundance of tiny species and big pelagic fish, especially in the cold months in the Persian Gulf reflects this change. Sardines fishes are pelagic species, in coastal areas and in areas in which the water temperature is lower. However, when the surface water temperature in summer reaches its maximum, more fish migrate to deeper water near the seabed, which is less temperature. In general, the life cycle of fish species largely depends on their living conditions. As we know, one of the most important jobs in coastal cities, especially, the Persian Gulf ports, fish catch is that the income of many residents, aboriginal and the way they are living. The fishing aquatic according to the key of the Persian Gulf Iranian economy is a special place. One of the major ports of the Persian Gulf which is the Chabahar port with an area of 17155 km in the extreme Southeast of Iran near the Oman and Indian Ocean.

Most jobs, especially, for traditional occupations with natural conditions, climatic conditions and different climatic zones are formed. Fishing is one of the occupations among the residents of the beach and common prosperity. Chabahar people due to the access to the sea, fish and fishing for subsistence and depend for their living. Fish and fishing for coastal people has great importance because the fish, plus income on the acquisition is main food for many people of the region. Other traditional occupations like fishing, with equipment and techniques and procedures and mechanisms enjoy the sea by humans and by heart from generation to generation reached. Almost all those who engage in fishing on the banks of the Persian Gulf and similar devices and methods for distributed capture and sell their own products.

Given the importance of the free zones of Iran's Chabahar port as well as jobs in the fishing port, in this study, we decided to review and rank the factors affecting the economy of fishing in Chabahar port by using MCDM.

**Literature review:** Jahanifar etc., examined the factors affecting bone fishing in Southeastern coast of the Caspian Sea have been using production functions. In this study, using indirect methods of valuation, identification of factors affecting fishing and were entered as independent variables function. For 88 samples were studied. In this study the performance of 25 Parih fishing cooperatives operating in 87 seine catches in the three groups of factors affecting economic factors, ecological factors and biological factors were divided. In above function fishing in cooperative company as the dependent variable and 14 minor variable in 9 overall variable as the independent variable enter into function. Finally, after estimating function 7 variables were significant at a confidence level of 99%. The results of the estimates indicate that human resources (number of fishers) by a

factor of 76.1 affected the most positive effects on the catches and climate impact by a factor of -07.2 most have a negative impact on the fishing of cooperative company. As well as factors such as member contributions, history and education Lesman and fishing effort with respect to the impact factor of 0.81, 0.5 and 0.21 will play the most important role in the fishing companies.

Yaghobi *et al.*<sup>[1]</sup> examined the performance and cooperatives shrimp unincorporated city of Chabahar using data envelopment analysis (CCR model and FDH). The aim of this study was to evaluate the efficiency and cooperatives unincorporated of shrimp goiter site in Chabahar in Sistan and Baluchestan province in 2009. In this regard, technical efficiency shrimp farms using the basic model of data envelopment analysis (CRS) and free access layer model (FDH). Given the number of units, census questionnaires and eventually the whole society (25 units) were collected. The results showed that only 12% of firms in the basic version and 16% of them are quite efficient model FDH and the average technical efficiency units was 85 and 87 percent respectively. Strategic approach to the issues and make some basic changes in the production process, including adding aeration system in the farm with the help of government agencies could help inefficient firms to improve the efficiency of the process. Given that the aeration system in the farm fields demand a high price for the use of these systems is low; therefore, it is recommended that relevant agencies such as department of fisheries province and the department of cooperatives, in order to get low-interest loans, arrangements for referral managers shrimp farms provide to the bank.

Shafiee identify the factors affecting demand and how increase fish consumption in Kerman province. In this study, using time series data for 1989-2008 Kerman province demand than ideal fish was estimated and elasticity of price and non-price demand functions in Marshall and Hicks were studied. Cross elasticity of substitution between chicken and fish products represent state and aquatic show the necessary income elasticity of this product among consumers between urban and rural consumers have the luxury of this product. Elasticities calculated in urban and rural communities revealed during the period under review the use of price leverage for reforming consumption patterns have been effective which should be controlled by the application of appropriate policies. Salarzahi and Dezhkam<sup>[2]</sup> identify and prioritize the factors affecting the competitiveness of businesses in the fishing industry cluster in Sistan-Baluchistan province have been used ANP.

Samira *et al.*<sup>[3]</sup> examined the profitability and performance seine cooperatives company in Golestan province in the years 2009-2010. In this study, it has been

tried by estimating the relevant financial and economic factors (fixed costs, variable, profit and return on investment) examined the profitability of this type of activity. Data collection tool was field and through questionnaires. The results showed that the lowest and highest payback period in the range of 0.42 and 2.55 years. Average per capita income members from at least 4719870.351 rials to a maximum of 47,787,736.34 rials has been variable. The results of their study showed that the profitability was different in the two regions Miankaleh and Gomishan and profitability in Miankaleh fishing in the area because of bed suitable place in the area is better than Gomishan. Zoheiri etc., examined the issue of consumer perceptions of quality have been farmed fish as an indicator for marketing fish. The results showed the subjective perceptions of consumers and consumer perspective can have a significant impact on the marketing of farmed fish.

Amiri *et al.*<sup>[4]</sup> examined the influence of environmental factors on the distribution of fishing effort and kale, tofu (Pisces: Clupeidae) in the southwest Caspian Sea (Bandar Anzali). In this study, the relationship between the amount of fish caught in Southwestern Caspian Sea kale, tofu with average monthly air temperature, precipitation, wave height and water depth were investigated. To this end, the data captured two consecutive years of industrial fishing kilka a flotation device was evaluated in Bandar-e Anzali. Based on the results, monthly correlation between water depth, wave height and rainfall and the amount of kilka caught was middle. It also increases the amount of fishing in the summer with average air temperature increased significantly closer to the beach and fishing area. Varharami and Hosseini Nikravesh study the factors affecting the Caspian Sea have caught a variety of fish. In this study, using the Schiffer model and VAR method study the effects of various factors and catch the fish from the Caspian Sea were discussed during 1991-2013. The relationship between variables was assessed using Granger causality. The results of the estimates using the VAR Model suggests increase the number of fishermen and fishing boats with as indicators of effort, increases the catches. On the one hand, the environment variable rainfall had a negative effect on the catches of the period under review and economic variables average price of a variety of fish have a positive impact on increasing the amount of effort and finally, the catches of the Caspian Sea has been the period under review. The output of the data analysis also suggests that variable prices greatest impact on the catches of the Caspian Sea in the period under study.

Unal *et al.*<sup>[5]</sup> in a study have examined factors affecting the success and failure of fisheries in cooperatives company of Turkish Aegean. This study

examines the causes of success and failure of fisheries cooperatives, the efficacy of cooperatives in agriculture is calculated. The results showed that small-scale cooperatives have had a significant role in the success of the country's fisheries.

In addition, inefficient firms to internal factors such as lack of integrity in business and weak management skills dependent. Parliament also had weak support from the government, the tax system and lack of training on the inefficiency influenced by external factors. Huy<sup>[6]</sup> in his thesis analyze the performance of black tiger shrimp aquaculture in Trang City of Vietnam. This study due to an input method-oriented and constant returns to scale and by taking two outputs and 5 inputs, measure the efficiency of data analysis method is used. Tung<sup>[7]</sup> in his thesis non-condensing farms' technical efficiency (wide) for the Macau Vietnam province has been modified. The study variables including pool area, experience, type of shrimp, density storage pools and awareness of growers.

## MATERIALS AND METHODS

In this study, after reviewing the literature and research, a set of criteria and indicators were collected. This paper in term of data is qualitative, in term of result is applied and in term of purpose is exploratory and descriptive.

**Introduction of a range of study:** Chabahar port city with an area of 1090 hectares in the extreme Southeast of the country and in the province of Sistan and Baluchistan and near the Oman located at the eastern corner of Chabahar Gulf.

Chabahar is located in an area of 14-10 ha to industrial activities and 4 ha to trade, tourism and financial services are dedicated. Iran's through Chabahar port near Oman could be one of the most important waterways in the world, way finding and it has economic importance because that's waterways and ports large and small seas with the world connects. Special missions in this area include transit, regional trade, trade goods and raw materials, conversion and production of export-oriented industries, fuel supply and oil-dependent industries, tourism.

**Population and sample:** The population of this research consisted of relevant office to fishing, aquaculture experts, professors and researchers, highlights and expert and native-local inhabitants. The 20 members of the population, who were most familiar with the area and its potential, as sample were selected.

**Methods and tools for data collection:** In this study, to collect data and theoretical scientific research studies library contains articles and websites have been used. In

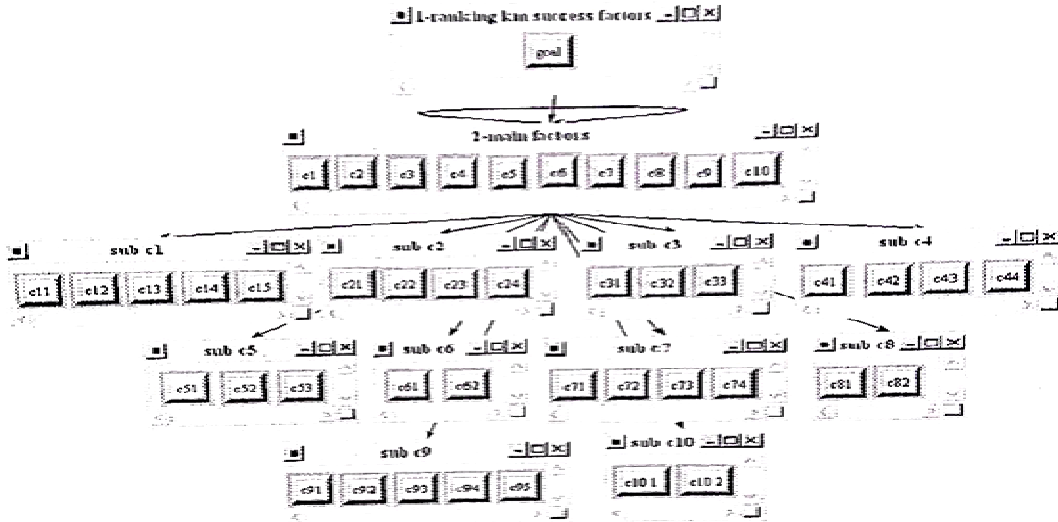


Fig. 1: Decision network

addition, to collect data related to factors affecting the economy of the fishing and aquaculture fishing paired comparison questionnaire was used.

**Analysis of data:** In this study, the analysis of data collected from a combination of decisions that have been made from the combination of the two fuzzy DEMATEL and ANP has been used. It should be noted also that combination is coded in MATLAB. For this purpose, procedures and analyzes are described below.

**First stage: Extraction agents:** At this stage, reviewing the literature and expert opinion 4 factor “resources”, “environment”, “suppliers and related industries” and “market” as the main criteria were extracted. These factors are described in Table 1 together with their related sub- indicators have shown. It should be noted that the factors “resources”, “environment”, “suppliers and related industries” and “market” as independent variables and “marine fishing economy” is dependent variable.

**The second phase of the network decision:** At this stage, after the designation of the final criteria, making up the network. The study includes three levels of network decided that in order to calculate the limited super and it is used to calculate the rate of incompatibility (Fig. 1).

**Implementation of fuzzy DEMATEL Method:** At this stage, experts will be asked to use linguistic variables in Table 2, their comment about the impact of key factors on each others. Language assessments based on Table 2, the corresponding triangular fuzzy numbers and fuzzy method has become the de CFCS and using the relationship 1-9

Table 1: Lists the relevant criteria and sub-criteria

Main criterion	Sub-criteria
References	Manpower (Number of fishermen) Capital (such as the number of boats fishing facilities) Technological (fishing method)
Environmental factors	Weather conditions suitable for fishing Communications infrastructure (transport) Rainfall Height Changes in fish population State laws
Suppliers and related industries	Cooperation with related industries Strong Suppliers Government support for fishermen as lending
Markets	Strong competitors Sales policy Marketing Competitive cost The size of local markets Landscape local markets Distance to foreign markets Obstacles to foreign markets The prospect of foreign markets

are converted to absolute numbers. As a result, the initial matrix direct relationship with final numbers is formed. The initial direct matrix using Eq. 10, normalized and using the general relationship matrix T is calculated using Eq. 11. After normalizing the matrix T as a matrix W22, placed first in the super matrix:

$$x_{ij}^k = \frac{l_{ij}^k - \min_{1 \leq k \leq K} l_{ij}^k}{\Delta_{\min}^{\max}} \quad (1)$$

$$xm_{ij}^k = \frac{m_{ij}^k - \min_{1 \leq k \leq K} m_{ij}^k}{\Delta_{\min}^{\max}} \quad (2)$$

Table 2: Linguistic variables and corresponding fuzzy numbers (Zhu et al., 2012)

Linguistic variable	Certain equivalent	Fuzzy equivalent (a)	Fuzzy equivalent (b)
Very little	0	(0, 0.1, 0.3)	(0, 0, 0.25)
Little	1	(0.1, 0.3, 0.5)	(0, 0.25, 0.5)
Average	2	(0.3, 0.5, 0.7)	(0.25, 0.5, 0.75)
Much	3	(0.5, 0.7, 0.9)	(0.5, 0.75, 1)
Too much	4	(0.7, 0.9, 1)	(0.75, 1, 1)

$$x_{ij}^k = \frac{r_{ij}^k - \min_{1 \leq k \leq K} l_{ij}^k}{\Delta_{\min}^{\max}} \quad (3)$$

$$\Delta_{\min}^{\max} = \max l_{ij}^k - \min l_{ij}^k \quad (4)$$

$$x_{ls_{ij}}^k = \frac{x_{m_{ij}}^k}{1 + x_{m_{ij}}^k - x_{l_{ij}}^k} \quad (5)$$

$$x_{ls_{ij}}^k = \frac{x_{r_{ij}}^k}{1 + x_{r_{ij}}^k - x_{m_{ij}}^k} \quad (6)$$

$$x_{ij}^k = \frac{x_{ls_{ij}}^k (1 - x_{ls_{ij}}^k + x_{rs_{ij}}^k) + x_{rs_{ij}}^k x_{rs_{ij}}^k}{1 + x_{rs_{ij}}^k - x_{ls_{ij}}^k} \quad (7)$$

$$BNP_{ij}^k = \min \min l_{ij}^k + x_{ij}^k \Delta_{\min}^{\max} \quad (8)$$

$$a_{ij} = \frac{1}{k} \sum_k BNP_{ij}^k \quad (9)$$

$$X = s \times A \quad (10)$$

$$S = \min \left[ \frac{1}{\max_i \sum_{j=1}^n |a_{ij}|}, \frac{1}{\max_j \sum_{i=1}^n |a_{ij}|} \right] \quad (11)$$

To obtain matrix T, the following equation is used:

$$T = X + X^2 + \dots + X^k = X(1 + X + X^2 + \dots + X^{k-1}) \quad (12)$$

$$(1 - X)(1 - X)^{-1} = X(1 - X^k)(1 - X)^{-1}$$

It provided  $\lim_{k \rightarrow \infty} X^k = [0]_{n \times n}$ , the overall relationship matrix obtained through the following equation:

$$T = X(1 - X)^{-1} \quad (13)$$

**Fourth step: the implementation fuzzy ANP process and combine it with fuzzy DEMATEL:** In this stage, dual comparison of the main factors is than the sub-factors. This information is collected by a questionnaire and paired comparisons. For example, the composition of expert opinions sub-criteria test compare the financial perspective, inserts can be calculated using Eq. 14, use of

CFCS, defuzzification been using about 3-13, sub-criteria weight is obtained (inconsistency rate is zero at this point). Other sub-criteria for each main criterion also done similar calculations and weights of local weight and the column titled comparisons in sub-agents are recorded. The weights as a matrix W32 falls in early super matrix. Paired comparison of main factors of the target and the result is a matrix W11 placed first in the super matrix. Thus, by calculating the matrix W11, W22 and W23 initial super matrix is formed. Then, so, initial super matrix calculate the final weight of primary and secondary factors:

$$c_j = \sum_{0 \leq i \leq n} T_{ij} \quad (14)$$

$$r_i = \sum_{0 \leq i \leq n} T_{ij} \quad (15)$$

**Step five: prioritize and identify main and sub-factors cause-effect factors:** To perform the required analysis, prioritization factors partly based on the weight of the super matrix, takes place. The specific weight of elements and Prioritize out against it, is inserted. To identify causal factors, ri, cj and ri-cj using relationship between 12 and 13, calculated and their values are recorded.

## RESULTS

**Computational results:** In this stusy, we have tried to analyze the data collected, according to research and analysis of data that were described in the previous section, to review the results of the search. As mentioned, after the assessment and monitoring of defined criteria, to rank the factors using a combination of the two techniques are fuzzy DEMATEL and ANP. Ranking procedure using a combination of these techniques is fully explained in the previous section. In this section, the results of this technique are presented. As mentioned, the first phase of the network decided that this network was presented in the previous sections. In the next phase, the implementation phase DEMATEL described technique to form the matrix of relationships. The overall relationship matrix obtains fuzzy DEMATEL method in Table 3 shown.

As can be seen in Table 3, in the area of computing, according to the output method on data collected DEMATEL phase, resource and environmental factors are

Table 3: Matrix of relations (fuzzy DEMATEL output)

Parameters	References	Environmental factors	Suppliers and related industries	Markets	$r_i$
References	0.0742	0.475	0.565	0.297	1.411
Environmental factors	0.842	0.803	0.955	0.838	3.438
Suppliers and related industries	0.142	0.384	0.088	0.082	0.695
Markets	0.172	0.332	0.379	0.936	1.818
$c_j$	1.230	1.993	1.997	2.153	
$r_i-c_j$	0.181	1.445	-1.338	-0.335	
Kind of agent	Cause	Cause	Caused	Caused	

Table 4: Weight of factors operating subsidiary of resources

Criteria name	Weight
Manpower (Number of fishermen)	0.289
Capital (such as the number of boats fishing facilities)	0.401
Technological (fishing method)	0.310

Table 5: The weight of the sub-factors, environmental factors

Criteria name	Weight
Weather conditions suitable for fishing	0.210
Communications infrastructure (transport)	0.120
Rainfall	0.103
Wave height	0.280
Changes in fish population	0.201
State laws	0.086

Table 6: The weight of the sub-suppliers and related industries

Criteria name	Weight
Cooperation with related industries	0.370
Strong suppliers	0.322
Government support for fishermen as lending	0.308

Table 7: The weight of the sub-factor of markets

Criteria name	Weight
Strong competitors	0.1000
Sales policy	0.1020
Marketing	0.1330
Competitive cost	0.1210
Size of local markets	0.0205
Landscape local markets	0.1130
Distance to Foreign markets	0.1170
Obstacles and Foreign markets	0.1100
The prospect of Foreign markets	0.1840

due and suppliers and related industries and markets are caused. As mentioned in the previous section, this matrix as a matrix W 22 early in the super matrix fuzzy ANP method is used. To form the super matrix of matrices W32 and W11 also is the primary need. As mentioned, the pair-wise comparison matrix W32 sub-factors of the main factors is achieved. At this stage, for each of the sub-factors “resources”, “environment”, “suppliers and related industries” and “market” initially using fuzzy de CFCS and then using Eq. 15 the weight of each of the 4 listed subsidiary, is calculated. Table 4-7 show the calculated weight to sub-factors.

As shown in Table 4, it can be seen in the following sub-factors of resources, “capital (such as the number of boats fishing facilities)” with a weight of 0.401 in the first place, “technology (fishing method)” weighing 0.310 in second place and “human resources” with a weight of 0.289 in the third rank.

As shown in Table 5, it can be seen in the following sub-factors, environmental factors, “height” with a weight of 0.28 in the first place, “weather conditions suitable for fishing”. 0:21 weight in second place, “fish population changes” with a weight of 0.201 in the third, “communications infrastructure (transportation)” weighing 0.12 in fourth place, “Rainfall” with a weight of 0.103 in the fifth and final “state law” is in sixth place with a weight of 0.086.

As shown in Table 6, it can be seen in the following sub-agents, suppliers and related industries, “cooperation with related industries” 0.370 weight in the first place, “Strong suppliers” weighing 0.322 in second place and “Government support for fishermen as lending “is in third place with a weight of 0.308.

As shown in Table 7, it can be seen, in the subplot, market, “prospect of foreign markets” weighing 0.184 in the first place, “marketing” with a weight of 0.133 in the second, “competitive price” with a weight of 0.121 in the third, “Foreign markets” with a weight of 0.117 in the fourth, “Landscape for the local market” with a weight of 0.113 in the fifth, “obstacles to Foreign markets” weighing 0.11 in sixth place, “sales policy” with a weight of 0.101 in the seventh grade, “strong competitors” with weight 0.1 in eighth and the “size of the local market” was in ninth place with a weight of 0.0205.

Weight factors calculated in Table 4-7 is constituent of w32 matrix in the super matrix are preliminary. To form the W11 matrix, pairwise comparisons of the main factors was used. After preparing three matrices W22, W32 and W11, initial super matrix is prepared and then the first to bring super matrix, the super matrix is partially formed. The study initial super matrix is expected to be 5 to deliver initial super matrix obtained partly due to the super matrix, weight factors and prioritization is done as Table 8.

As can be seen in Table 8, the environmental factors weighing rated 0.0041 first, then 0.0016 markets, with the weight of a second, weighing 0.0013 resources in third place and finally weighing 0.0009 suppliers and related industries is in fourth place.

The weight of the sub-criteria, sub-criteria in the “prospect Foreign markets” with a weight of 0.0201 in the first place, “cooperation with related industries” with a weight of 0.0098 with second place, “marketing” with a weight of 0.0086 in the third, “distance to Foreign markets” with a weight of 0.0068 in the fourth,

Table 8: The weights of primary and secondary factors and prioritize them

The main criterion name (weight)	Sub-criteria	Weight	Rank
Resources (0.0013)	Manpower (Number of fishermen)	0.0004	18
	Capital (such as the number of boats fishing facilities)	0.0005	17
	Technology (fishing method)	0.0015	11
Environmental factors (0.0041)	Weather conditions suitable for fishing	0.0007	16
	Communications infrastructure (transport)	0.0062	5
	Rainfall	0.0008	15
	Wave Height	0.0009	14
	Changes in fish population	0.0032	6
	State laws	0.0012	12
Suppliers and related industries (0.0009)	Cooperation with related industries	0.0098	2
	Strong Suppliers	0.0007	16
	Government support for fishermen as lending	0.0007	16
Markets (0.0016)	Strong competitors	0.0031	7
	Sales policy	0.0011	13
	Marketing	0.0086	3
	Competitive cost	0.0008	15
	The size of local markets	0.0023	9
	Landscape local markets	0.0019	10
	Distance to foreign markets	0.0068	4
	Obstacles to foreign markets	0.0026	8
	The prospect of foreign markets	0.0201	1

Table 9: Determination of the causal factors

Kind of agent	R <sub>-c<sub>j</sub></sub>	c <sub>j</sub>	r <sub>i</sub>	Agent
Cause	0.0034	0.0066	0.01	References
Cause	0.0186	0.0129	0.0315	Environmental factors
Caused	0.0043-	0.0114	0.007	Suppliers and related industries
Caused	0.0177-	0.0301	0.0125	Markets

“communications infrastructure (transportation)” with a weight of 0.0062 in fifth place, “changes in fish populations” with a weight of 0.0032 in the sixth, “strong competitors” with a weight of 0.0031 in the seventh, “obstacles to foreign markets” with a weight of 0.0026 in the eighth, “size of the local market” with a weight of 0.0023 in the ninth, “landscape local markets” weighing 0.0019 in tenth place, “technology (fishing method)” weighing 0.0015 in the eleventh grade, “the rules state” with a weight of 0.0012 in the twelfth, “sales policy” with a weight of 0.0011 in thirteenth place, “height” with a weight of 0.0009 in the fourth rank, “rainfall” and “competitive price” with weight 0.0008 in fifteenth place, “weather conditions suitable for fishing” and “strong suppliers” and “government support for fishermen as lending” with a weight of 0.0007 in sixteenth place, “capital (such as the number of boats fishing facilities)” weighing 0.0005 ranked seventeenth and finally “human resources (number of fishers)” weighing 0.0004 are ranked eighteenth.

To identify causal relationships,  $r_i$ ,  $c_j$ ,  $r_i - c_j$  calculated and the results of which are shown in Table 9. As can be seen in Table 9, the results, according to the output method on data collected fuzzy ANP, resources, environmental conditions are due and dimensions suppliers and markets are disabled.

### DISCUSSION

The study aimed to investigating and ratings factors affecting the economy of fishing aquaculture using

DEMATEL multi-criteria decision-making methods and fuzzy ANP in Chabaha port. In order to achieve the goal of the contributing factors in the four dimensions of resources, environmental conditions, suppliers and related industries and markets have been checked. The data was collected using a paired comparison and then use the combination of the two fuzzy DEMATEL and ANP rating factors are discussed. The results showed that, environmental factors have ranked first, markets second, suppliers and related industries third affect the economy of fishing aquatic in Chabaha port. Also check out cause-disabled relationships, resources and environmental conditions and dimensions suppliers and markets are disabled.

### CONCLUSION

This means that the dimensions of resources and environmental conditions have an impact on the economy of fishing and aquaculture fishing and environmental factors is more effective between these two dimensions.

With due respect to these two dimensions by optimizing the dimensions can be raised fish catching sector performance. Dimensions of suppliers and markets also affected other aspects and market is more sensitive among them.

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