

Research Article

A SWOT analysis on Iranian fishmeal industry

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Abstract

In the present study, there are examined weaknesses, strengths, opportunities and threats of fishmeal industry using SWOT analysis. Questionnaire was designed after interviewing a number of experts and searching through different resources.. A total of 42 producers and experts involved in this industry were surveyed. There were found 14 strengths such as several years of working experience;, 27 weaknesses such as shortage of raw materials; 14 opportunities such as increased fishmeal demand due to growth in aquaculture; and 19 threats, including increased foreign currency fluctuations, in IFE and EFE. The most important strategies are conservative and defensive approaches, utilizing modern technology and interacting with the global market, using environment friendly technology, having more interaction with the government through unions in order to gain credit facilities, helping to decrease cost of industry accessories, regulating support for Iranian products, helping the production of necessary technology inside the country, examining the possibility of providing more raw materials inside the country and using new reserves. Finally, the aforementioned factors will assist supervisors of this industry in designing and writing strategic plan to develop fishmeal industry.

Keywords: Fishmeal, SWOT matrix, Strategy, Fishery industries, Iran

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Introduction

Experts recognize fishmeal as one of the most digestible and best ingredient added to diet of most raised livestock specifically aquaculture products. Fishmeal contains protein, fat, minerals and vitamins. Moreover, there is little carbohydrate in fishmeal (Miles and Chapman, 2006). Miles and Jacob (2011) also confirmed the nutritious quality of fishmeal and used it for diet of chickens, pigs and cows. The advantage of fishmeal over plant proteins and the increase of people's knowledge about this nutrient caused an increase in its use in diet of raised animals in a way that in 2016 fishmeal formed 69%, 23%, 5% and 3% of aquaculture, pig, birds, and others diet, respectively (Bachis, 2017). In 2013 the world production of fishmeal was 4.9 million tons that compared to 1979 its annual growth rate dropped about 0.1 (Globfish, 2016). In 2017, production of fishmeal reached approximately 5 million tons and that of fish oil reached 958 thousand tons (Bachis, 2017). Consumption of fishmeal in 2030 is predicted to be 10.6 million tons (Alboghbeish *et al.*, 2015). It seems that for producing one ton of fishmeal 4 to 5 tons of fish is needed (Miles and Chapman, 2006). Peru, Chile and Thailand produce almost 45 percent of the world's fishmeal. In 2013 Peru produced approximately 1.2 million tons, Chile produced 605 thousand tons and Thailand produced 450 tons. Peru, Chile, Thailand and Denmark are main exporters of fishmeal. These countries

are responsible for 2.9 tons of the world's fishmeal exports which worth about 4.8 billion dollars (Globfish, 2016).

The first private fishmeal factory in Iran was established in 1989 named "Jonoub Fishmeal Company" (Adeli and Baghahi, 2016). In 2016 companies that produced fishmeal with the capacity of 963 tons of raw material per day were 46 and this number reached 47 in 2018 (IFO, 2019). In modern technology of the recent decades producing fishmeal is considered valuable. Development of modern technology provided fishmeal industry with opportunities to increase production, markets and fishmeal profitability (Ceyhan and Murat, 2015).

In fishmeal industry it is rarely possible for fishmeal producers to be able to apply modern technology. In this research we recognized strength points as resources and ability that can be used as a competitive advantage, moreover they can be used to overcome existing malfunctions. Weaknesses include lack of facilities, infrastructures or expertise that can considerably hinder function of fishmeal industry. Identification of opportunities in surrounding environment of fishmeal may provide incentives for company managers that can act as pioneers of new ways for company development. Along with normal threats, sudden change in development of fishmeal can identify some existing limitations for company. Therefore, evaluating advantages and disadvantages can help

us to develop appropriate approaches for expanding fishmeal industry and guarantee a brighter future for the producers, these factors will lead to reach the full potential production capacity of producers and needs of the country and consumers will be met much more than before (Çelik *et al.*, 2012). Furthermore, the aim of the research was to reach a suitable analysis of strengths, weaknesses, opportunities and threats of Iran's fishmeal industry.

Hardy and Tacon (2002) regarded sustainable use of fishmeal as a hard duty for managers, which can be done by the potentials of marine reserves to produce sustainability for aquaculture. On the contrary, Schipp (2008) showed that production of fishmeal and fish oil is going to be constant in future decade and the proportion of fishmeal usage by livestock will reduce drastically and usage of plant's protein and oil will ascend. Moreover, with development of technology an increase in production is expected within the diet and supply which would not be a barrier for fish nutrition in the future. Consequently, this optimism should be dealt with caution and demand for fishmeal and fish oil from developing economies, like China, can affect general demand and production. Jackson (2010) showed that production and price of fishmeal and fish oil remained steady and no replacement is found for them. Their usage during the last few years in aquaculture remained steady while the aquaculture has grown. Jonasson (2010) demonstrated that fishmeal and its

effect in sustainable production and fishing in Iceland. Asche (2016) investigated opportunities and challenges within fishmeal industry and showed that this industry is the first priority for fishing industry and the second priority in food supplement industry. Fishmeal price has increased compared to plant's oils over the past decade. Consequently, producers tend to replace it with cheaper materials. Usage of fishmeal and fish oil to provide feed supplement for aquaculture is increasing, probably because low crude materials species can be replaceable. Referring to the role of fishmeal and fish oil in sustainable aquaculture, Jackson (2016) concluded that 70 percent of fishmeal and fish oil is used in aquaculture. Ceyhan and Murat (2015) used SWOT to structurally and economically study fishmeal and oil industry in Turkey. They designed an information system in fishmeal and oil production and established appropriate laboratories and the required facilities to meet standard of edible products. They also considered raw material preparations, running filters for the smell, solving electrical problems, infrastructural deficits and increase of knowledge of managers to increase competitive power of fishmeal production. Sarter *et al.*, (2010) carried out SWOT analysis to perform HACCP in Madagascar.

There are not many researches on fishmeal industry in Iran. Shiri (1993) investigated the importance and nutrition value of fishmeal in Iran.

Adeli and Baghahi (2016) in their research on production and market of fishmeal stated that problems in preparing raw materials for the production, reduction of imports and increase in demand for fishmeal are the reasons for increase in price of this product. They showed that increased demand for high proportion of fishmeal in diet of farmed fish is a reason for increase in price. Zadsafar and Adeli

(2018) in their study of Iran's fishmeal production and its processes showed that fishmeal factories are producing with 27% of their normal capacity while there is 10.2% aquaculture growth in the last 25 years (IFO, 2019) (Fig. 1).

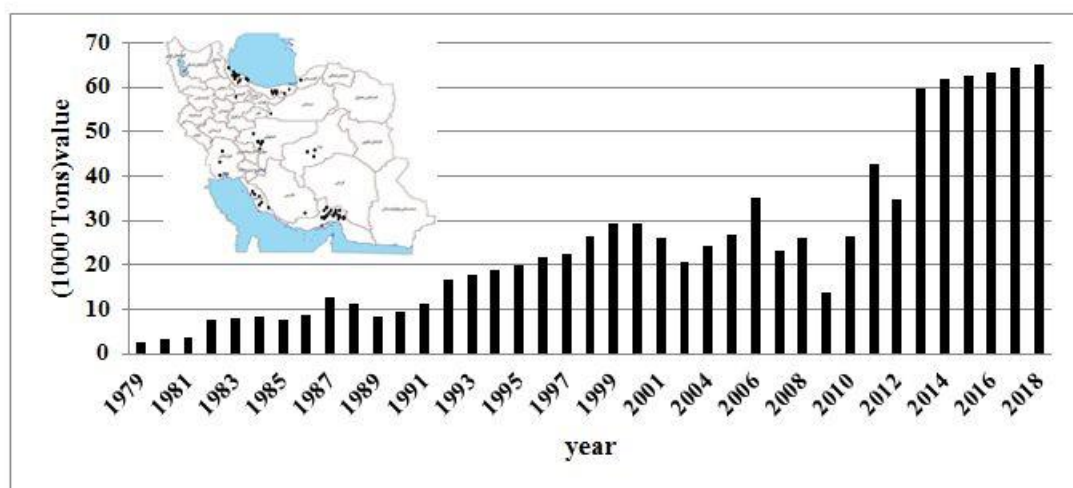


Figure 1: Trend of fishmeal production and distribution of factories in Iran (*Statistics after 2013 are estimated).

Attention is focused on raising quality of produced fishmeal, sustainability, and availability of raw materials with regard to distribution of factories. Export is supported by the government. Therefore, the present study is aimed to undertake a strategic analysis on strengths, opportunities and challenges of the fishmeal industry in order to improve its production.

Materials and methods

This study is conducted based on descriptive and deductive approach

using documentary research and face to face interviews. After designing questionnaires for the SWOT matrix they were used to identify problems of Iranian fishmeal industry and appropriate strategies to overcome challenges of this industry. The questionnaires consisted of demography, such as education and last graduated course of interviewees. In addition, those interviewees that had factories were asked to provide a detailed description of their facilities and machineries. They were also asked

about their bank loans, machinery renovations and percentage of domestically produced equipment and machinery. Then special questions were asked to identify the most important factors influencing framework of the strengths, weaknesses, threats and opportunities. After collecting filled questionnaires, they were statistically analysed by SPSS₂₂. Each item was graded based on the Likert scale as: very low, low, medium, high and very high, ranked from one to five, respectively. Relative importance (weight) was determined by respondents as compared to other items, so that relative importance or weighing starts from 0.01 until 0.1, so that the total weight of the items per point of the four SOWT factors must be one. Collectively, rankings were multiplied by weight or relative importance of each item and weight score. Then all of the means were summed up and divided by their number to a total average. By dividing the mean of each item, total mean weight score was obtained. The weight scoring was based on ranking, those above average were considered to be the most effective factors (Rabiei *et al.*, 2016). SWOT analysis method is a situation analysis first reported by management professor Verick in the 1980s from University of San Francisco (Ercui and Man, 2012).

SWOT matrix is an instrument to recognize strength and weakness points, opportunities and threats to devise an approach to analyse the situation and new strategies. SWOT analysis investigated internal factors (strength and weakness points) and external factors (opportunities and threats) in fishmeal factories all over the country (Ercui and Man, 2012). Finally, in order to calculate the proper method of development we need to provide and compare mean strengths and opportunities (SO) with mean weaknesses and threats (WT)(Table 1).

Based on normal regulations of analysing SWOT, if total mean of weaknesses and threats is less than total mean of strengths and opportunities ($WT < SO$) the strategy would be invasive (Rabiei *et al.*, 2016). If it is reverse ($WT > SO$), the strategy would be defensive. If total mean of weaknesses and opportunities is less than mean of strengths and threats ($WO < ST$), the strategy would be conservative and if it is reverse ($WO > ST$), it would be competitive.

Table: SWOT matrix and the strategy determination manner.

Strategic factors	Strengths (s)	Weaknesses (w)
List of:		
opportunities(O)	invasive strategy (SO)	conservative strategy (WO)
List of threats(T)	competitive strategy (ST)	defensive strategy (TW)

Results

Eleven out of 42 participants that answered the questionnaire (25%) were company owners and the others were managers, experts and specialists in Iran. About 54% of the statistical sample had Master's degree, educational background of 35.7 % the participants were related to fisheries and 3.6 % of the participants studied agriculture as their academic field and the rest studied other majors. Mean age of the participants was 47. The youngest participant was 24 and the oldest was 61, and half of them were between 45 and 50. The average amount of experience was 18 years old of working within the field, the least of which was 4 and the most was 33.

About 40% of the factories were located in industrial zones and only 10% of them were in rental locations. About 63.6% of the companies had bank loans and about 82% of them renovated their machinery throughout the years of operation. 71% of the machinery of these factories was domestically made and 2 out of them exported fishmeal. Facilities present in the factories are depicted in figure 2.

The analysis of internal factors evaluation (IFE) is presented in tables 2 and 3 and the investigation of external factors evaluation (EFE) is portrayed in tables 4 and 5. Regarding SWOT analysis items characterized with * are the most important with a weight score above the average. As it is shown in table 2 the most important strengths of fishmeal industry in Iran are high local

demand, several years of working experience and appropriate infrastructure facilities, personnel skill and the average weight gain for strengths was 3.27.

The most important items and factors concerning weaknesses are presented in table 3. Some of which are shortage of raw materials, impossibility of preparation of raw materials in all seasons, lack of a strategic plan in the industry, not using modern technology, environmental problems and effluent exit, expenses of the accessories, shortage of working capital, impossibility of raw materials storage, exhausting equipment and machinery, unpleasant smell, low efficiency, lack of supporting regulations and rules, lack of ability to compete, high cost of production, lack of marketing ability and lack of international competition. The average weight for weaknesses was 3.23.

Table 4 presents opportunities for fishmeal industry and the most important opportunities include: increased demand due to growth of aquaculture, accessibility of scientific manpower, low price of local fishmeal as compared to imported ones and improvement of the market. The average weight for opportunities was 3.39.

Table 5, on the other hand, shows threats towards the industry. Most important of which include increase in foreign currency fluctuation, shortage of marine resources, sanctions imposed

on the country, lack of government support, instability of prices and inflation, increase of production costs, increasing costs of raw materials, lack

of import of raw materials and replacement of fishmeal with plant proteins in diets. The average of the weight score for threats was 3.72.

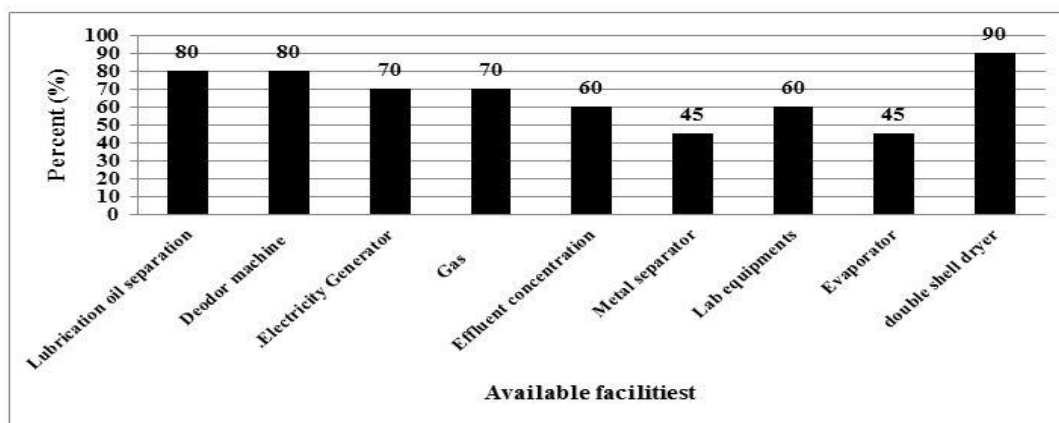


Figure 2: Facilities of Iranian fishmeal industry.

Table 2: Analysis of internal factors evaluation (IFE, Strengths).

Strength	Weight	Rank	Weight score
Several years of working experience *	0.09	4	0.36
Appropriate infrastructure facilities*	0.08	4	0.32
Raising relative fish waste to raw materials	0.06	3	0.18
Demand and high profits	0.07	3	0.21
Making domestic equipment	0.07	3	0.21
Higher quality than the same foreign product	0.07	3	0.21
Existence of Unions	0.06	3	0.18
Utilization of technology	0.07	3	0.21
Personnel skill*	0.07	4	0.28
Having deodorant and ventilation machines	0.07	3	0.21
Following international standards	0.07	3	0.21
A suitable laboratory	0.06	2	0.12
Providing new employment	0.07	3	0.21
High local demand*	0.09	4	0.36

Finally, to come up with a proper solution for the development, it is necessary to calculate and compare mean strengths and opportunities with mean threats and weaknesses. Therefore, SO and WT were 3.33 and 3.47, respectively, because mean weaknesses and threats were more than mean strengths and opportunities (WT>SO). Hence, defensive strategy is

suggested. On contrarily, if mean weaknesses and threats be less than mean strengths and opportunities (WT<SO), invasive strategy measure can be prescribed. Based on the results, mean weaknesses and opportunities were less than strengths and threats (WO<ST) and WO was 3.31, and ST was 3.49 the second strategy would also be conservative.

Table 3: Analysis of internal factors evaluation (IFE, Weaknesses).

Weakness	Weight	Rank	Weight score
Shortage of raw materials *	0.07	4	0.28
Impossibility in preparation of raw materials in all seasons *	0.07	4	0.28
Exhausting equipment and machinery*	0.04	3	0.12
High depreciation of machinery	0.03	3	0.09
Unpleasant smell*	0.04	3	0.12
Not using modern technology*	0.04	4	0.16
Environment problems and effluent exit*	0.04	4	0.16
Lack of sufficient technical knowledge for production	0.03	2	0.06
Lack of machinery and spares	0.03	2	0.06
Expenses of the accessories*	0.04	4	0.16
Unsuitable site selection of factories	0.03	2	0.06
Lack of proper storage	0.03	2	0.06
Shortage of working capital*	0.04	4	0.16
Low quality of production	0.03	3	0.09
Low efficiency*	0.04	3	0.12
Infra structural problems with utilities	0.03	2	0.06
lack of a strategic plan in the industry*	0.04	5	0.2
Lack of supporting regulations and rules*	0.04	3	0.12
Lack of ability to compete*	0.04	3	0.12
High cost of production*	0.04	3	0.12
Lack of marketing ability and lack of international competition*	0.04	3	0.12
Lack of stability in quality	0.03	3	0.09
Impossibility of raw materials storage	0.04	4	0.16
Shipment problems	0.02	2	0.04
Lack of supervision for health standards and quality control	0.03	3	0.09
High cost for raw material commodities	0.03	3	0.09
Lack of skilled labor	0.02	2	0.04

Table 4: Analysis of external factors evaluation (EFE, Opportunities).

Opportunities	Weight	Rank	Weight score
Supporting domestic production	0.07	3	0.21
Low price of the local fishmeal as compared to imported ones*	0.07	4	0.28
Existence of machinery inside the country	0.07	3	0.21
Exportation possibility of fishmeal	0.07	3	0.21
Possibility of using manpower	0.07	3	0.21
Improvement of the market*	0.08	3	0.24
The possibility of obtaining credit facilities	0.06	3	0.18
Small number of competitors with the same level	0.06	3	0.18
Increased demand due to the growth of aquaculture*	0.09	4	0.36
Sanctions and reduction of importing	0.08	5	0.4
Using up sophisticated technology	0.07	3	0.21
Increase of fish wastes because of growth on aquaculture	0.07	3	0.21
Ability to compete internationally	0.07	3	0.21
Accessibility of scientific manpower*	0.07	4	0.28

Table 5: Analysis of external factors evaluation (EFE, Threats).

Threats	Weight	Rank	Weight score
Problematic governmental regulations	0.05	3	0.15
Lack of experienced and skilled labor	0.04	3	0.12
Increasing costs of raw materials *	0.07	4	0.24
Increase in foreign currency fluctuation *	0.07	5	0.35
Lack of import of raw materials	0.05	4	0.2
Increase of salaries and insurance	0.05	3	0.15
Unknown distribution canal	0.04	3	0.12
Inflation*	0.06	4	0.24
Importing of the fishmeal	0.05	3	0.15
Increase of production costs*	0.06	4	0.24
Hardship for getting licenses	0.04	2	0.08
shortage of marine resources*	0.06	5	0.3
Illegal fishing	0.05	2	0.1
Stagnation	0.05	3	0.15
Replacement of fishmeal with plant proteins in diets*	0.05	4	0.2
Sanctions imposed on the country*	0.05	5	0.25
Decrease of the economic power of the Public	0.05	3	0.15
Instability of the Prices*	0.06	4	0.24
Lack of government support*	0.05	5	0.25

Competitive strategy is the exact opposite of conservative strategy and it is fruitful when total mean strengths and threats are more than total mean weaknesses and opportunities (ST>WO). These strategies of making use of strengths, put emphasis on using strengths against threats, but these strategies are not applicable here.

Within the present situation a conservative strategy should be taken in order to overcome internal weaknesses and to use external opportunities in the best possible way. Table 6 shows strategies within fishmeal industry. Therefore, based on SWOT matrix, we can use the following strategies for the fishmeal industry (Table 7).

Table 6: SWOT matrix and different strategies.

SWOT matrix	Strength points	Weakness points
Opportunities	(Invasive strategy) 3.33	(Conservative strategy) 3.31
Threats	(Competitive strategy) 3.49	(Defensive strategy) 3.47

Table 7: Strategies for fishmeal industry of Iran.

Invasive strategy (So)	Conservative strategy (WO)
Increase efficiency of fishmeal product with farmed fish waste usage providing for more exportation	Use new technology and interaction with the global market Using eco-friendly technologies More Interaction with government through Unions to obtain low interest loan Supporting decrease of the final machinery cost Continue to support production of domestic goods
Competitive strategy (ST)	Defensive strategy (WT)
More interaction with the government to the benefit of fishmeal industry	Supporting production of needed technology domestically More efficiency Using more new resources for procurement of raw materials

Discussion

The most important strengths of Iranian fishmeal industry were high local demand, several years of working experience, appropriate infrastructure facilities and personnel skill. High local demand due to growth of aquaculture and possible import restrictions and price due to sanctions can improve fishmeal companies and develop this industry. Nicholas *et al.* (2015) analysed seafood industry of India and recognized aquaculture development as the most important factor of this field; this strength is also mentioned by Ceyhan and Murat (2015). According to several years of working experience and appropriate infrastructure facilities we hope that this industry will develop, while needs careful program and management in order to accommodate producing units with national standards to prevent waste of resources and use the strength points of poultry producing companies of Hamedan, Iran. Moogouei (2014) showed that two

important factors among strengths for developing aquaculture are suitable condition of life and effect of fish consumption on human health. Ceyhan and Murat (2015) showed that among 7 factors, high domestic demand is the most important. Nadanasabesan (2015) investigated sustainable development of small-scale fishing in Sri Lanka and emphasized on established markets and infrastructure, and strong local ecological knowledge as strength. Newsome (2013) analysed seafood industry of North Carolina and recognized that established infrastructure and operators and access to profitable seafood markets as advantages of this industry.

Most weaknesses of Iranian fishmeal industry were shortage of raw materials, impossibility in preparation of raw materials in all seasons, lack of a strategic plan in the industry, not using modern technology, environment problems and effluent exit, high expenses for accessories, shortage of

working capital, raw materials storage problems, exhausted equipment and machinery, unpleasant smell, low efficiency, lack of supporting regulations and rules, lack of ability to compete, high cost of production, lack of marketing ability and lack of international competition. Ceyhan and Murat (2015) recognized nine items as weaknesses of Turkey's fishmeal industry; shortage of raw material, impossibility in preparation of raw materials, environmental management criteria and financial problems are among those items. Nicholas *et al.* (2015) also analysed seafood industry of India and recognized small number of EIA approved labs for testing as the most important weakness. Rimmer *et al.* (2013) in their SWOT analysis recognized high production cost as a weakness point for aquaculture development in Indonesia. Latifi *et al.* (2013) recognized the following factors as weakness points of poultry raising in Hamedan Province of Iran: old heating and cooling equipment, old equipment, lack of a freezer to keep the produced goods, inconformity between cost and sale price, high cost of machinery, lack of capitals, lack of a comprehensive plan for exportation and not using full potentials.

Environmental shortcomings, sewage disposal, lack of filter and unpleasant smell were some of the weaknesses of fishmeal industry of Iran which should be taken seriously in order to solve them. Ceyhan and Murat (2015) also mentioned environmental problems and sewage

disposal of meal industry as one of the most important weakness points.

Moogouei *et al.* (2017) mentioned pollution of the environment as one of weakness of strategic programs in beach tourism. Moogouei (2014) also mentioned lack of sewage filtering, and supporting rules and regulations as weakness of aquaculture development. Lack of supporting rules and regulations is one of the most important weaknesses and it needs to be controlled by special measures; we are mentioning this and it's obvious that there is an urgent need for supporting fishmeal industry survival. On the other hands, industries are jeopardized by other factors, for example most of them have problems to clear their debts at the due date. Regarding these facts supporting rules and regulations can ensure the endurance of producing industrial section. Ceyhan and Murat (2015) put emphasis on these rules and regulations. Movahed *et al.* (2014) showed that marketing weakness can be one of the reasons that may affect eco-tourism. Çelik *et al.* (2012) mentioned insufficient human capacities from the view of practitioners and seven other factors as weaknesses for aquatic fisheries of Turkey.

The opportunities of fishmeal industry include: increasing demand in development of aquaculture, accessibility of scientific manpower, low price of local fishmeal as compared to imported ones and improvement of market. Increasing demand in development of aquaculture can affect

improvement and development of this industry according to increasing rate of population, human's need of food and also importance of animal protein in Iranian family regimes, demand for fishmeal production for raising of livestock, poultry and fish is increasingly becoming more important. This strength was also dealt with in report of Ceyhan and Murat (2015). Latifi *et al.* (2013) stated scientific background as one of opportunity in poultry producing unions in Hamedan Province. Moogouei (2014) mentioned hatching possibility and need for decreasing food poverty due to valuable high caloric food production resources as opportunity for development of aquaculture. Improvement of market is an important opportunity which can play a key role in development of fishmeal industry. Nicholas *et al.*, (2015) mentioned growth of aquaculture which compensates declining sea catch as the most important opportunity in their analysis of seafood industry of India. Ceyhan and Murat (2015) pointed to five factors including demand in development of aquaculture as one of the opportunities of fishmeal industry in their study. Newsome (2013) also showed that increasing customer demand for seafood is an opportunity. Rimmer *et al.* (2013) regarded increasing market demand as an opportunity.

Most important threats in fishmeal industry are related to increase in foreign currency fluctuation, shortage of marine resources, sanctions imposed

on the country, lack of government support, instability of the prices and inflation, increase of production cost, increasing cost of raw materials, lack of import of raw materials and replacement of fishmeal with plant proteins in diets. Instability of price is one of the threats in fishmeal production industry, in fact, the main reason of this increase and fluctuation of price of fishmeal is related to changes in producing sector's cost, especially commodities because of reduction of import and increase of fishmeal demands the price of this product increases.

Ceyhan and Murat (2015) mentioned 7 factors including illegal fishing as a threat for fishmeal industry of Turkey. Latifi *et al.* (2013) regarded fluctuation of production price, insufficiency of governmental support and increasing price of items as threats for Hamedan's poultry producing complexes. Another threat that fishmeal industry faces is increase in cost of raw materials; in fact, the main reason of this increase and fluctuation of price of fishmeal is due to change in price of raw material, especially commodities such as price of fish waste and production costs. Newsome (2013) mentioned the state and federal regulations as a threat for seafood industry. Nicholas *et al.* (2015) noticed that unsustainable fishing practices are most important threats within the India's seafood industry. Moogouei (2014) showed that aquaculture farmers have limited information about new breeding and

culturing methods and regarded it as a threat for development of aquaculture.

Cheap fishmeal compared to foreign samples is because of providing necessary commodities from Oman Sea and Persian Gulf marine resources. It is a great advantage for production of fishmeal with reasonable cost, if there would be a need for more raw materials catching in open waters as a good alternative, it can lead to some problems.

Furthermore, if increase and fluctuation of the exchange rate is not controlled it may cause hindrance to aquacultures development. Lack of governmental support is another threat and government is not able to support fishmeal companies. Regarding expert's opinion, Iran has the appropriate geographical situation for development of fishmeal industries, so we can absorb company owners to build up the industry. Fishmeal industry developed greatly during recent years compared with food industry. Considering fishmeal's part in diet of animals, the importance of governmental support and decisions for controlling the market has intensified. Considering Iran's high capacity for fishmeal production, this opportunity can be used by designing and accumulating a comprehensive plan so that it will lead to development of this industry and also development of raising livestock industry and aquaculture.

A conservative strategy can be used to increase modern technology that adjust with the environment and

interact with global market and interact with the government through unions in order to utilize non-remunerative facilities, to help to reduce the cost of accessories and to add continuity to the support of domestic goods. Ceyhan and Murat (2015) proposed to take international chances to compensate the shortage of fish as a conservative strategy in fishmeal industry of Turkey. Defensive strategy also can be used to help producing necessary technology within the country, to investigate the possibility of providing more raw materials, to use new marine resources and to increase efficiency of the industry. Concerning aggressive strategies, it is possible to increase efficiency of production of fishmeal products with aquaculture waste and further export, and with competitive strategy industry activists can cooperate more with the government in order to take advantage of government supports.

The other supplementary suggestion can be adopting policies and strategies according to Iran's agricultural development plans to encourage fishmeal based industries to increase products, developing a solution to solve problem of wastewater of the factories by filtration and proper treatment of their produced oil, recycling wastes, reconsidering importing policies of fishmeal, not using sophisticated technologies, new machinery, low interest loan facilities by banks, providing more resources of raw material including more exploitation of

lantern fish stocks, providing a comprehensive plan for fishmeal productions, lifting sanctions and controlling exchange rate fluctuation.

References

- Adeli, A. and Baghaei, F., 2016.** Status of production and market of fishmeal on the aquaculture development. *Journal of Aquaculture Development*, 10(3), 137-149, in Persian.
- Alboghbeish, M., Mohammadiazarm, H., Yavari, V. and Zakeri, M., 2015.** Effect of fish meal replacement by soybean meal and baker's yeast on growth performance and feed utilization of juvenile *Mesopotamichthys sharpeyi* Gunther, 1874. *Journal of Animal Researches (Iranian Journal of Biology)*, 28(2),136-145, in Persian.
- Asche, F., 2016.** *Fishmeal and Oil: Why Bother? Opportunities and Challenges*. Nordic Marine Think Tank Symposium held on 29-30 August 2016 at the North Sea Centre, Hirtshals, Denmark, 5p. www.nmtt.org/images/documents/Fishmeal_and_Oil_Why_Bother.pdf.
- Bachis, E., 2017.** *Fishmeal and fish oil. A summary of global trends*. 57th IFFO Annual Conference, Washington DC, The Marine Ingredient Organization, 63P.
- Çelik, A., Metin I. and Çelik, M., 2012.** Taking a photo of Turkish fishery sector: A Swot analysis. *Procedia-Social and Behavioral Sciences*, 58, 1515-1524. DOI: 10.1016/j.sbspro.2012.09.1138
- Ceyhan, V. and Murat, E., 2015.** Structural and economic analysis of Turkish fishmeal and fish oil. *Turkish Journal of Fisheries and Aquatic Sciences*, 15(4), 841-850.
- Ercui, Z. and Man, Q., 2012.** The SWOT analysis of qingdao marine culture industry. *Advances in Asian Social Science*, 3(1), 629-634.
- Globfish, 2016.** *Commodity statistics update. Fishmeal and fish oil*. Food and Agriculture Organization of the United Nations, Rome, Italy, 39P.
- Hardy, R.W. and Tacon, A.G.J., 2002.** *Fish meal: historical uses, production trends and future outlook for sustainable supplies*. In: responsible marine aquaculture, first edition. Stickney R.R. and McVey J.P., editors, CABI (Commonwealth Agricultural Bureaux International) Publishing, Wallingford, UK, 311–326.
- IFO, 2019.** *Iran fisheries statistics 2013-2018*. Iran Fisheries Organization, Tehran, Iran, 64P.
- Jackson, A., 2010.** Fishmeal, fish oil prime feed ingredients not limiting factors for responsible aquaculture. *Global Aquaculture Advocate*, 14-17.
- Jackson, A., 2016.** *Fishmeal and fish oil its role in sustainable aquaculture*. Symposium on Perspectives for Fishmeal and Fish Oil. Hirtshals, Denmark. International Fish Oil and Fishmeal Organization(IFFO), UK, 12P.

<http://www.eufishmeal.org/cmwebpic/symposium%20pr%C3%A6sentationer/andrew%20jackson.pdf>.

- Jonasson, T., 2010.** *Fish meal in Iceland fishing and production*, 21p. <http://www.mast.is/Uploads/document/fraedsluefni/FishmealinIcelandFishingandproduction.pdf>.
- Latifi, S. Saedi, H. and Zolikhai, Sayar, L., 2013.** Strategic analysis on livestock cooperatives and Hamadan Province animal husbandry. *Journal of Co-operation and Agriculture*, 2(5), 25-48, in Persian.
- Miles, R.D. and Chapman, F.A., 2006.** *The benefits of fishmeal in aquaculture diets*. *EDIS*, 2006 (12). <https://journals.flvc.org/eids/artice/view/115917>.
- Miles, R.D. and Jacob, J.P., 2011.** *Fishmeal in Poultry Diets: Understanding the production of this valuable feed ingredient*. PS12, Animal Science Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences (IFAS), University of Florida. <https://ufdcimages.uflib.ufl.edu/Ir/oo/oo/42/60/00001/p500700.pdf>, 3p.
- Moogouei, R., 2014.** A SWOT analysis of aquaculture development in rural areas of Iran, an application to Rainbow trout (*Oncorhynchus mykiss*). *International Journal of Aquatic Biology*, 2(1), 36-42.
- Moogouei, R., Hosseini, S. and Almozafar, R., 2017.** Strategic programming of coastal tourism (case study: Nowshahr). *Journal of Oceanography*, 8(29), 25-33, in Persian.
- Movahed A., Kuhzadi, S. and Abdinzadeh, F., 2014.** Kurdistan's ecotourism development strategies with applied of SWOT and QSPM mode. *Journal of Applied Researches in Geographical Sciences*, 14(32), 181-204, in Persian.
- Nadanasabesan, N., 2015.** *The need for sustainable development of the small-scale fisheries. A case study from the Northern Province, Sri Lanka*. Master's thesis in international fisheries management, Faculty of Biosciences, Fisheries and Economics, The Arctic University of Norway (UIT), 80P.
- Newsome, J., 2013.** *An analysis of North Carolina's seafood industry national and state perspective*. Center for Environmental Farming Systems, North Carolina State University, Raleigh, USA, 44P.
- Nicholas, S.S.S., Maheswaran, M.L., Gunalan, B., 2015.** Indian seafood industry strength, weakness, opportunities and threat in the global supply chain. *International Journal of Fisheries and Aquatic Studies*, 3(2), 199-205.
- Rabiei, Z., Sadighi, H. and Abbasi, E., 2016.** Developing of dry-bed rice seeding in Khuzestan Province: strengths, weaknesses, opportunities and threats (SWOT), Iran. *Journal of Agricultural science and Sustainable*

- Production*, 26(3), 171-185, in Persian.
- Rimmer, M.A., Sugama, K., Rakhmawati, D., Rofiq, R. and Habgood, R.H., 2013.** A review and SWOT analysis of aquaculture development in Indonesia. *Reviews in Aquaculture*, 5(4), 255–279.
- Sarter, S., Sarter, G. and Gilabert, P., 2010.** A Swot analysis of HACCP implementation in Madagascar. *Food Control*, 21(3), 253-259.
- Schipp, G., 2008.** Is the Use of fishmeal and fish oil in aquaculture diets sustainable? Report number 124, Department of Primary Industry and Resources, Darwin, Australia, 15p.
- Shiri, A., 1993.** Nutritional value and Importance of Fishmeal. *Technical Journal for Fishing and Fisherman*, 4(4), 59-69, in Persian.
- Zadsafar, S. and Adeli, A., 2018.** Fishmeal production and its processes. *Aquatics World Journal*, 13(44), 24-31 in Persian.