

# Aquaculture and Organic Aquaculture in Turkey

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## Abstract

Organic aquaculture, whose start of worldwide implementation dates back to 1994, has been implemented in Turkey since 2010. As organic aquaculture represents new practice area and sufficient promotional efforts and governmental support is not available, satisfactory levels have not been achieved yet in this sector having annual figure of 456 tons according to 2012 data. While organic aquaculture constitutes 0.01% of total cultivation in the world, this figure remains at 0.003% levels in Turkey. Turkey has the potential to convert above disadvantage in its favor thanks to its efficient water resources and solid position in aquaculture. In the scope of this study, aquaculture figures in Turkey are explained and expectations regarding organic aquaculture are referred.

**Keywords:** Aquaculture; Organic aquaculture; Turkey; Fisheries; Certification

## Introduction

Having a figure of 3 037 billion people in 1960, the world population has shown an increase by 232% in 2012 and reached to a level of 7,046 billion [1]. Although notable expansion in total agricultural land size has not been experienced in the world, increase by 16% in productivity has been achieved in agricultural production [1]. Despite excessive population and consumption rise, rate of people sustaining their lives under hunger threshold has been decreasing. All such improvements are experienced due to intensive production. While obtaining more products and accordingly, more revenue from unit area draws attention of producers at first glance, excessive usage of chemical materials cause great damage on production area and human health. Increase in income level and consumption awareness has moved people ahead of basic nutrition need and directed them towards healthy food supply. And rise in healthy food demand has resulted with emergence of the term "organic".

Although worldwide organic agriculture activities have been initiated after World War II, its international recognition has been achieved through establishment of International Federation for Organic Agriculture Movements in 1972. The first rules directory was developed as the basis for organic farming, entered into force in 1998 [2]. Today Despite the developments in organic farming, there is no common definition has been accepted by everyone. As a result of this case, the definitions revealed some discussions and differences of opinion. But as a general definition, organic agriculture is agricultural model, not use of chemical and synthetic substances, with minimal outside intervention on implementation and based on ecological sustainability.

Development of organic agriculture had positive impact on aquaculture-part of agricultural production-as a result of which first organic standard in aquaculture sector was published for carp production in Austria in 1994. Since above date, many countries have created their specific standards regarding disseminating aquaculture sector [3]. World aquaculture figure has increased by 95% from 2000 to 2008 and reached to a level of 53,500 tons from 5,000 tons. 240 organic certified aquaculture facilities are available in 29 countries, 72 of which are located in China. It is expected that total organic aquaculture rate will increase to 100,000 tons/year in 2011 and 1 million tons/year in 2030 [3].

Past, current and future condition of aquaculture and organic aquaculture in Turkey is explained and future expectations are addresses in the scope of this study.

## Aquaculture Sector in Turkey

Surrounded with seas in its three sides, Turkey has specific location with its lakes, dams, rivers and spring waters. Total area covered with usable water is approximately 26 million hectares along with seas remaining within continental shelf. About 95% of this area consists of sea (24,607,200 ha), whereas 1.3% is dam lakes (342,377 ha), 3.5% is natural lakes (906,118 ha) and approximately 0.1% consist of lakes (15,500 ha). In addition, Turkey has a river network of 178,000 km in length and the Europe's longest coastal line with an approximate length of 8 300 km [4].

Domestic aquaculture fishing activities were initiated in 1960s by importation of salmon eggs (*Oncorhynchus mykiss*) from Europe and establishment of first private farm in Marmara region [5]. Aquaculture sustained with inclusion of carp in 1970s has gained acceleration due to start of production for sea bream/bass in Aegean and Mediterranean in the middle of 1980s, salmon farming within cages in Black Sea in 1990s and tuna fish farming in Aegean and Mediterranean in 2000s (raising). In 1990s, attempts were made to raise salmon in Black Sea and shrimp in Mediterranean (Manavgat), but positive outcomes could not be achieved. Salmon and carp raising in inland waters and sea bream/bass in seas still continue. As an outcome of R&D efforts intensified more in recent years, culture of sea bream (*Pagrus ehrenbergii*), dentex (*Dentex dentex*), rock grouper (*Epinephelus aeneus*), common seabream (*Pagrus pagrus*), brown meager (*Sciaena umbra*), meager (*Argyrosomus regius*), sharpnout seabream (*Diplodus puntazzo*), sturgeon (*Acipenser spp.*) has been realized and included within the sector [6].

When the recent past of Turkish aquaculture is analyzed as to cover last 20-25 years, it is possible to see that any data entered in statistical sense is not available until 1985 [7]. According to the data published in 1986, amount of aquaculture is 3,075 tons corresponding with 0.5% of total aquaculture farming in our country. Farming figures have shown increasing trend as of this date. However, due to increasing

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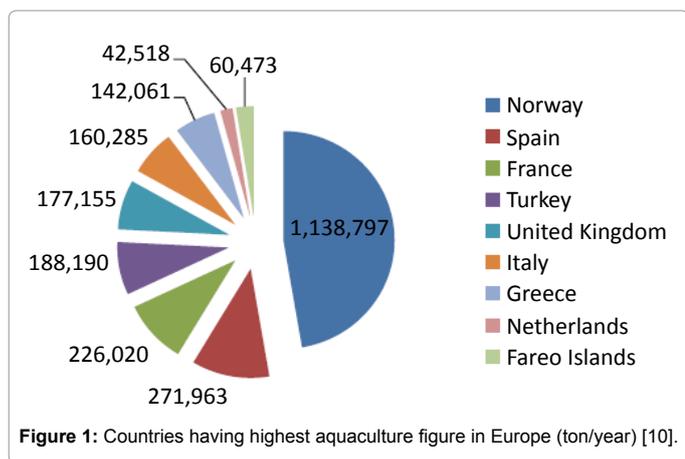
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costs after 2001 economic crisis, production figures have dropped to 61 thousand tons in 2002. In following 10 years, increasing technical capacity, supports of the public, fodder prices decreased with respect to exchange rates and similar positive improvements resulted with an increase rate of 15% every year, which has raised the level up to 212 410 tons and increased share within total aquaculture to 33%. In particular, significant capacity increases were achieved in 2006 and 2007 as an outcome of cash supports provided with respect to the amount of products obtained and new facilities have initiated relevant investments. According to United Nations Food and Agriculture Organization (FAO) data, Turkey is ranked as the 3<sup>rd</sup> country following China and India that achieved the fastest increase in culture fishing rates [8].

In 2012, aquaculture production figures increased to 644,852 tons in Turkey, 212,410 tons of which represented cultivation and 432,442 tons represented hunting [9]. One of the typical characteristics of Turkish aquaculture is its dependence on intensive production of carnivore fish types. 98.5% of production figure is obtained due to carnivore fish (rainbow trout, bass, bream and tuna). Trout has the highest production figure (56.4%) followed by bass (23.4%), sea bream (19.1%), mussel and carp (543 tons). Pacific Bluefin tuna is raised based on cage farming of tuna fish in Aegean and Mediterranean during the last 3 years and 1,600 tons/year production figure is obtained from 7 tuna farms. Share of inland waters and sea fishing is about equal, but marine species farming is of great variety [6].

According to 2011 data, Europe is the third continent following Asia and America in terms of aquaculture figure of 2,680,996 tons, including Turkey and Norway [10]. Having the highest aquaculture figure in Europe, Norway (1,138,797 tons) is followed by Spain (271,963 tons) and France (226,020 tons). In this context, Turkey is ranked as the 4<sup>th</sup> country with its production figure of 188 190 by achieving greater figures than Italy and Greece due to economic crisis in Europe (Figure 1). As EU member countries can only meet half of their water products through hunting and farming, they import remaining half to fill the gap [11].

Sole food of animal origin exported from Turkey to Europe is water products representing satisfactory outcomes in terms of production. Turkey is the first ranked country in Europe in sea bass production with its figure of 47,013 tons. Turkey is followed by Greece having production quantity of 44,300 tons and Spain with a figure of 17,546 tons. In terms of sea bream, Turkey's figure of 44,300 tons follows Greece realizing 70 900 tons of sea bream farming. Turkey is the leading country in salmon production figuring to 107,239 tons. Turkey is followed by Norway (58,311 tons), Italy (41,540 tons) and France (33 890 tons) [10].



Despite its high level of sea and inland water fish farming figures, Turkey is ranked as the 4<sup>th</sup> country in Europe in respect of total aquaculture values. This is mainly due to insufficient rate of species farmed in our country. Countries ranked after our country in sea and inland water fish farming, such as France and Italy represent the first two countries with their shellfish and mollusk production figures. Greece is the most significant rival of Turkey. As Greece and Turkey have same profile with regard to the species farmed, two countries compete with each other when European Union potential is taken into consideration. Economic crisis experienced in Greece in recent years has caused shrinkage in farming sector resulting with decrease in production quantities. Responding this situation with its sectorial growth, Turkey has become leader of European Union in sea and inland water farming. To gain much more share in European Union market, Turkey should increase type of water products farmed. Otherwise, production based on limited species shall encounter fluctuations with respect to market demands, which may sharpen difficulties experienced by the producers. However, increase in number of species farmed shall balance marketing in production area and hence, aquaculture sector shall gain more stable structure.

Thanks to positive status of Turkey in farming and integration with EU standards, increase in its export capacity is achieved. Italy holds the largest share in terms of export figures and is followed by Greece, Spain, France and Japan. Even though the markets where Turkey has turned to in aquaculture export are mainly the European ones, she exports to all regions; particularly to Japan and China from the Far Eastern Markets, as well. Main reasons for such an increase in export figures may be counted as high production capacity, quality, logistics, food safety and superior position in terms of processing technologies when compared to rivals, as well as promotional and marketing activities [12]. Turkey is both importing and exporting country from the point of water products having positive foreign trade balance. Our trading system includes export of high value products (mollusk, canned fish) and import of low-value products (mackerel) and raw material inputs (fish feed and frozen tuna fish) [13]. Import-export data of water products for the last 10 years shows that 26,860 tons having a volume of 96 728 389 dollars in 2002 increased to 74,006 tons representing a volume of 413 914 863 dollars in 2012. As for import figures, an increase from 22,532 tons having a value of 18,754,783 dollars in 2002 to 65,384 tons and 176,496,516 dollars as been achieved in 2012 [9].

### Organic Agriculture in Turkey

Organic agricultural activities have been initiated in the middle of 1980s when firms acting in Europe demanded for organic agricultural products from Turkey (raisin, dried figs, dried apricots, hazelnut, pulse and cotton) and they attempted to introduce this new production technique. Organic agricultural activities have been initiated not due to demands of consumers in these products as in the case of developed countries; where the main objective has become to increase export level of Turkey in basic agricultural products and to enter into new markets [14].

To illustrate, first organic agricultural activities were initiated by introducing the technique to limited rate of grape producers in Aegean Region by representatives of European organic agriculture companies [15]. In parallel to the increase in demand of European countries, organic production diversified and organic production projects have been executed in country-wide after middle of 1980s. Production and marketing works related with both export and domestic market have

been sustained through representatives of foreign companies, but then by entry of domestic companies to organic agriculture and food market [16].

First legal regulation regarding organic agriculture was December 24, 1994 dated and 22145 numbered “Regulation for Production of Herbal and Animal Products by Ecological Methods”, which is an adaptation of JEEC 2092/91 numbered Regulation issued in EU on 24, 1991 and relevant authorities were assigned to the Ministry of Agriculture and Rural Affairs. Afterwards, additional regulation amending some articles of above regulation was put into force after its issue in June 29, 1995 dated and 22328 numbered Official Gazette [17].

Former regulation was revised under the name of “Regulation for Principles and Implementation of Organic Agriculture” entered into force with 11.07.2002 dated and 24812 numbered Official Gazette. This new regulation has brought regulatory provisions for production, processing, packaging, labeling, storage, marketing, control and certification of organic products, work units and consultancy services, as well as penal and legal issues [18]. Some articles of this regulation were amended with 2004-dated arrangement [14]. Latest legal arrangement about organic agriculture is the “Organic Agriculture Law” put into force with December 03, 2004 dated and 25659 numbered Official Gazette to enable consumers to use more reliable and higher quality organic products [14].

Organic product range has achieved increase in terms of both production and export. On the basis of data covering the period from 2002 to 2012, an increase by 36% in organic products, 340% in number of organic product producers and 1125% in agricultural areas used for organic agriculture purposes has been recorded (Table 1). Turkey holds significant position with respect to dry and dried fruits, processable fruit and vegetable trading. However, protection of available markets for processed organic foods, identification of new possibilities and increase in marketing opportunities are of great importance in terms of sustainability of organic agricultural product trading [14].

Diversity of organic products has been increasing in recent years in Turkey. This product range includes fresh fruit and vegetable, pulses, arable crops (cotton and wheat), medical and aromatic plants and dried fruits (apple, hazelnut, walnut, pistachio, dried figs, apricot and grape). In addition to meat, milk and egg, organic production of honey has been realized recently. Organic products are mainly provided to foreign markets in the scope of which 80% of such products are delivered to EU countries and 15% is provided to America. Germany is the first country among EU countries with its market share of 60% [19]. Apart from Germany, France, the Netherlands, England, Denmark, Sweden should

also be considered. In addition, North European countries, Canada and Japan reflect great potential [14].

In order to further spread of organic farming identifying of organic arable land with local participation, farmers in this region supported by local organizations for transition to organic production, the possibilities of marketing of organic products and organic markets need to be developed [20].

## Organic Aquaculture in Turkey

The aquaculture sector in the 1980s, especially in the 1990s, faced many problems such caused by high production price crisis, the increase in stocking density, irresponsible use of antibiotics and other chemicals, environmental pollution and negative prejudices [21]. Like other segments of agricultural production, aquaculture has also been affected due to organic production practices.

In general sense, organic aquaculture is an integrated system design where production is realized at optimum level without endangering balance of ecosystem including benthic organisms, seaweeds, hydrophytes, living things cultured and humans. In particular, organic aquaculture standards prohibits usage of antibiotics, herbicides and genetically modified organisms and allows as a last resort application of parasitic substances for treatment purposes under veterinary supervision [22].

Representing the latest regulation addressing organic aquaculture in Turkey comprehensively, “Regulation for Principles and Implementation of Organic Agriculture” was entered into force after its publication in August 18, 2010 dated and 27676 numbered Official Gazette. This regulation is still applicable [23].

When the sector is compared with worldwide organic aquaculture initiated in 1994, 6 facilities located in Rize province has been provided with entrepreneur certificate in February 2010 and started organic salmon production under supervision of control and certification entity. Total project capacity of above 6 facilities is 456 tons/year [23]. Organic farming activities were first applied in Black Sea region due to virginity of its water resources and nature and inability to realize intense agricultural activities as an outcome of geographical drawbacks. It is expected that organic farming activities shall be disseminated in neighboring regions and then, all country through which our organic aquaculture figure shall achieve striking increases. Along with the rise in organic aquaculture, it is expected that species having limited with rainbow trout and Black Sea trout shall also show increasing trend.

Turkey is productive for organic aquaculture due to its water resources. However, many issues are currently available, which should be eliminated in technical sense. Most of the farming facilities are small-

Years	Varieties of organic products	Number of organic producers	Organic area (ha)	Production amount (kg)
2002	150	12,428	57,365	310,125
2003	179	14,798	73,368	323,981
2004	174	12,806	108,598	378,803
2005	205	14,401	93,134	421,934
2006	203	14,256	100,275	458,095
2007	201	16,276	124,263	568,128
2008	247	14,926	109,387	530,225
2009	212	35,565	325,831	983,715
2010	216	42,097	383,782	1,343,737
2011	225	42,460	614,618	1,659,543
2012	204	54,635	702,909	1,750,127

Table 1: Organic vegetable production figure in Turkey by years [9].

scaled family enterprises. Cost incurred by these facilities to obtain organic farming certificate creates great burden, hence, development of organic farming is affected negatively in our country. In addition, legal regulations about organic farming are adapted from other countries' standards, which, in turn, reflect contradictory situation with respect to the nature of organic farming. In fact, ecological properties may change according to the regions meaning that relevant standards should have specific structure. Therefore, Turkey should create its own legal regulations and standards on the basis of region based scientific efforts.

## Conclusion and Expectations

Turkey is one of the leading countries in aquaculture sector and shall reinforce its position thanks to the increase in production rates. However, many unfavorable situations are experienced by aquaculture sector, which contributes to the country's economy and has great export figures among foods of animal origin. Discussions between water products farmers and consortium of environmentalist and tourism professionals have been come to the fore and defamations directed towards aquaculture have put the sector into a hole officially and created negative impacts on public's point of views about farming. Although increase in aquaculture is available, amount of fish consumed per capita annually has not shown any increase. Such a confliction arises due to significant change in region based consumption level of water products and lack of consumption habits. For example, while per capita consumption level of water products is 25 kg in Black Sea coasts, this figure is 16 kg in metropolises (Ankara, Istanbul, Izmir) and 0.5 kg in East and South East Anatolia regions [24]. Rate of consumption representing extremely low figure in country-wide has dropped due to above counted reasons. Demand matters experienced in domestic market have made aquaculture sector depend on foreign countries. Water products to be supplied and production planning is related with demand of foreign countries, in particular European countries. Due to its foreign market oriented structure, sector does not have stable production figures. Emphasizing importance and reliability of aquaculture farmed for our public is a prerequisite to eliminate such export fluctuations and to have stable and well-planned production structure along with domestic market demands.

Demand for fishmeal, which is the basic substance of the primary farming input named fish feed, increases every day in line with worldwide cultivation. In terms of Turkey, while production acquired due to cultivation increases, production rates obtained from hunting decreases. This drawback causes rate of fishmeal to remain at insufficient levels as to increase dependency of Turkey on fishmeal import. Prices are also unstable in the scope of fishmeal import due to foreign currency based trading. Price instability causes the producers to encounter economic bottlenecks and the production to experience fluctuations. In particular, elimination of this problem is of great importance in Turkey whose farming sector mainly depends on carnivore species. To mitigate above counted problems, production of omnivore-herbivore species may be prioritized. Demand for fishmeal shall increase along with usage of herbal products in the scope of nutrition and dependency of Turkey on foreign countries shall be decreased gradually. Farming of species having plant-based nutrition habits and plants, as well as plant wastes not having economic value shall be evaluated and conversion into meat shall be enabled. In addition, inclusion of alternative types within the scope of cultivation shall increase aquaculture consumption. Consumers are no longer interested in species produced intensely for years, such as rainbow trout. Alternative species shall draw attention of consumers, which shall result with per capita consumption of water products.

As in the case of many other segments of organic agriculture, aquaculture disseminates rapidly. Although the sector still experiences its development stage in Turkey, organic aquaculture exhibits promising future. Many discussions exist about organic aquaculture even though its share within worldwide aquaculture figures shows increasing trend. Despite the fact that farmers are certified in organic sense in the world and in our country, organic farming standards have not been clearly defined and serve as recommendation, except for some prohibitions. It is not realistic that organic farming standards respond expectations in healthy manner, as its limits are not defined clearly and subjective structure has not been assigned yet. Therefore, scientists and researchers should conduct in-depth studies and identify specific and applicable standards, which should be legitimated by governmental authorities and supervised strictly.

Pricing in the course of organic certification of water products and high selling price of organic products in the market cause class differences in production. If objective of organic aquaculture is to achieve sustainable production in economic and ecological sense, science based, applicable and environment-friendly standards should be created in the scope of which not only certified farmers, but also all facilities are integrated regardless of its naming whether sustainable farming or good agricultural practices or organic farming.

Turkey has a strong position in terms of its water resources. Rehabilitation efforts should be given to enable best usage of this potential and to protect these resources for long years, potential areas where aquaculture can be performed should be identified and carriage capacity of water resources over which farming is performed should be determined. aquaculture sector shall overcome social, ecological and economic problems along with above studies and environment-friendly cultivation practices.

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