

# AQUACULTURE IN THE TURKEY

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## Introduction

The aquaculture is defined as “the farming of aquatic organisms including fish, bivalve mollusks, crustaceans, algae and others with some sort of intervention in the rearing process to enhance production, such as regular stocking, feeding, protection from predators, etc” (FAO). The most important factor differentiating farming from fishing or fisheries is that farming includes private or cooperative ownership. When aquaculture is compared to the conventional agricultural and animal husbandry, it could be noticed that aquaculture manifests important differences in terms of zootechnique and health management. The main reasons are that fishery products are aquatic and contain many species including different taxonomic groups, which have different needs necessitating different rearing systems or techniques.

Aquaculture has rapidly developed in the world beginning from 1970s and reached today, to a worldwide annual production of 50 million tons constituting more than 1/3 of the total fishery production (FAO). The most important factors influencing the rapid development of aquaculture are that the production from the catching reached to a maximum of 100 million tons/year despite the increase in population and in the level of income while certain species and stocks are being overexploited; and that the catch seasonality is present. Additionally, the production from water resources is

extremely low when compared with the agricultural production in the world 71% of which is covered with water; and important biotechnical developments have occurred in recent years. Accordingly, the main purposes of aquaculture are to promote food production, tropical or aquarium fish culture, stock enhancement and/or fish releasing, sport fishing, and to protect the species and to conduct scientific studies.

## Present Situation and Potential

Aquaculture in Turkey started with carp and trout farming in 1970s and gained momentum with commencement of gilthead seabream/ seabass farming in the Aegean Sea and Mediterranean Sea beginning from the midst of 1980s; cage culture of trout in the Black Sea during 1990s; and tuna rearing in the Aegean Sea and the Mediterranean Sea in early 2000s. In 1990s, the attempts for salmon culture in the Black Sea and shrimp culture in the Mediterranean Sea (Manavgat) have been made but have not been succeeded. Inland culture of trout and carp; and off-shore culture of gilthead seabream/ seabass are still being made.

The production from farming has increased by more than 20% in the last decade and has reached to 61.165 tons in 2002 with 10% share in the total fisheries production (Table 1 and 2). This increase is expected to continue for a few years to come.

Table 1. Production of fishery products in Turkey by years

Years	Fisheries		Aquaculture		Total Tons	Consumption Person/kg
	Sea (Tons)	F.water(Tons)	Tons	%		
1986	539.565	40.280	3.075	0,5	582.920	8,5
1988	627.369	44.535	4.100	0,6	676.004	8,7
1990	342.017	37.315	5.782	1,5	285.114	6,2
1992	404.766	40.370	9.210	2,0	454.346	7,5
1994	542.268	42.838	15.998	2,7	601.104	8,2
1996	474.243	42.202	33.201	6,0	549.646	8,5
1998	432.700	54.500	56.700	10,4	543.900	8,3
2000	460.521	42.824	79.031	13,6	582.376	8,0
2001	484.410	43.323	67.244	11,3	594.977	7,6
2002	522.744	43.938	61.165	9,7	627.847	6,7

One of the typical characteristics of aquaculture in Turkey is that aquaculture is mostly based on the intensive production of carnivorous fish species. 98.5% of the production is from the carnivorous species (window trout, seabass, gilthead seabream and tuna). Trout ranks the first (56.4%) amongst the species cultured, followed by seabass (23.4%), gilthead seabream (19.1%), mussel and carp (543 tons) (Table 2). Bluefin tuna fish captured in the fishing season in last three years have been reared in the cages in the Aegean Sea and the Mediterranean Sea. The total amount of production is approximately 1600 tons/year gained from 7 tuna rearing farms. Inland fisheries and marine fish culture have almost the same share in the production (Table 2); but the farming of aquatic organisms varies in terms of species.

Inland aquaculture is mostly realized in the ponds. Sea cage systems with various types and sizes are used in the lakes, dams and seas for the fish husbandry. Cages made from small and simple materials are still being used in the inland waters and in the protected bays. In the off-shore areas, the cages of 16-24 m in diameter and 12-18 m in net depth are used. Growers of tuna fish and some growers of gilthead sea bream/ seabass started to use cages of 32-50 m. This sector which is

restructuring itself in recent years has provided facilitation for the increasing need of production by off-shore net cage systems and has allowed large scale enterprises to emerge.

The aquaculture production from rearing is mostly done in the Aegean Region with a share of 53% while the lowest production share is from the Southeast Anatolian Region with 1% (State Statistics Institute). Aquacultural sector in Turkey is composed of many small scale enterprises. There are 1215 inland and 345 marine farms at present (Table 3). However, 915 of the inland farms and 260 of marine farms are able to produce actively. The province of Muğla ranks the first in the marine fish culture with 137 farms, followed by the provinces of İzmir, Aydın and Ordu. Gilthead seabream and seabass farming is done in 222 of marine farms while trout and tuna fish farming is realized in 10 and 7 marine farms, respectively. Considering the number of inland farms, the province of Trabzon ranks the first with 65 farms. The provinces of Ordu, Sivas, Muğla, Samsun, Sakarya and Rize rank the second with 20-30 farms. The province of Muğla is at the front rank in inland fish culture with a production of 31000 tons/year.

A great majority of the farms are small (<50 ton/year) scale family-owned enterprises, but the producers have considerably increased

**Table 2.** Production (ton/year) gained from aquaculture in Turkey by species and years

Species	1986*	1990	1995	2000	2001	2002
Rainbow trout (fresh water)	990	3.512	12.689	42.572	36.827	3.707
Rainbow trout (sea)	-	-	-	1,961	1,240	846
Gilthead seabream	-	102	4.847	17.877	15.546	14.339
Seabass	34	1.031	2.773	15.460	12.939	11681
Carp	2.050	1.136	424	813	687	590
Mussel	-	-	180	321	5	2
Salmon	-	-	654	-	-	-
Prawn	-	-	40	27	-	-
Total	3.075	5.782	21.607	79.031	67.244	61.165

\*: Reference DIE

**Table 3.** Number of fish farms, their capacity and amount of production

Tür	Number of fish farms	Capacity (tons/year)	Product (tons/year)
Rainbow trout (fresh water)	1215	29998	39674
Rainbow trout (sea)	11	1139	1194
G.seabream and Seabass	345	51211	37773
Mussel	2	320	815
Carp	86	2613	543
Total	1659	85281	79943

Reference: Tarımsal Üretim ve Geliştirme Genel Müdürlüğü (TUGEM)

their capacity in recent years. Additionally since 2000, the sea cage projects below 100 tons and inland cages below 25 tons have been approved.

Especially, a great majority of the trout farms have their own hatchery. On the other hand, although there are 18 hatcheries in the marine fish culture, only 11 of these are making production regularly. They are producing 50 million tons of seabass fries and 25 million tons of gilthead seabream fries. Additionally, a few hatcheries are making trials for rearing new species e.g. common seabream, common pandora, dentex, sharpnout seabream, white grouper and brown meager. In 3 public (the Ministry of Agriculture and Rural Affairs) marine fishery hatcheries, the researches are being conducted to culture new species.

Also the General Directorate of State Hydraulic Works (DSİ) has 8 hatcheries – fry rearing stations which are generally used for fish releasing in dam lakes and ponds. Except for that in Gölköy, these hatcheries the goal of which is to rear 10-15 million fries annually, rear carp fries most of which are used for fish releasing in the dam lakes and ponds that are connected to the DSİ.

In addition to off-shore net cage farming of trout, considerable amount of rainbow trout (approximately 5000 tons) is produced in the dam lakes of DSİ. Moreover, approximately 1000 ponds which were constructed for the purpose of irrigation and prevention of floods have been opened for aquacultural activities as of 2004.

The production of fish feed has recorded important developments in last ten years. When the annual fish production of 80 thousand tons is taken into account, Turkey's need for fish feed is estimated to be around 120-150 thousand tons. At the moment, there are approximately 10 factories producing fish feed in addition to animal feed for cattle, sheep/goats. The number of factories producing only fish feed is 5. Moreover, some important European producers of fish feed are also active in Turkey. The need for fish flour and fish oil, which are the major crude material of fish feed are estimated as 55-60 thousand tons and 15-20 thousand liters, respectively. Presently, there are 9 factories producing 23-25 thousand tons of fish flour and 14-15 thousand liters of fish oil. Considerable amount of fish flour needed is imported.

The other services supporting rearing activities are tank and cage systems that are provided by sufficient number of local and international firms. Net cages are mostly

imported. Besides, there are firms providing vaccine, medication, live bait (*Artemia*) and equipments.

Even though certain domestic and international insurance companies provide service to the fishery firms, the insurance system in fisheries is not widespread. Ziraat Bank is providing loans with low interest rate to the entrepreneurs.

The most important problems preventing fisheries from sustainable development are that there is limited diversity of species and rearing methods, and that the major data such as production, use of feed and medication are lacking. In addition to the complicated and time consuming licensing procedures, there are severe problems pertaining to the investment and business management. Specifically, marine fish culture is concentrated in specific regions which are sharing the same environment with the tourism sector. This gives rise to the sectoral conflicts.

Over concentration of fisheries in certain regions and misapplications have caused problems in terms of the continuity of fishery activities and their environmental impacts. Increased level of producers' awareness is rapidly solving this type of problems.

In conclusion, that the annual aquacultural production in Turkey does not exceed 600 tons despite rich natural water resources, and that the per capita consumption is less than 7 kg/year is due to the fact that these resources are not managed and valued in the desired way, and that large public does not intensively consume the fish flesh which is a healthy food source. The world average of per capita consumption of fishery products is 16 kg and the EU average is 22 kg. Therefore, the present production figures should be doubled to attain the world average, and tripled to attain the EU average for the purpose of increasing per capita consumption of fishery products. The only way to increase production is rearing and rearing-based aquaculture (stock enhancement and sports fishing). The development of aquaculture in Turkey is embraced as a general policy. According to the Five-Year Development Plans of the State Planning Organization, it is foreseen to use the natural resources rationally and to develop the rearing activities and marine fish culture for the purpose of increasing the sustainable production in aquaculture. Similarly, the Ministry of Agriculture and Rural Affairs emphasizes that the aquaculture production between 2020-2025 could be increased to 250000 tons.