

# Sector assessment – aquaculture

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Paper part of the project '**Master Plan for Promoting Investments in the Azerbaijan Agricultural Sector**', conducted by Wageningen Economic Research and Delphy, The Netherlands.



## Introduction

In this document investment opportunities for the aquaculture sector in Azerbaijan will be identified, based on an assessment of the key characteristics of this sector. The information for this assessment has been collected by desk research, databases with production and trade data, and meetings with entrepreneurs and government institutes in Azerbaijan.

## Structural features of the sector

### *Cultured fish species*

Aquaculture in Azerbaijan occurs for two purposes: commercial fish production and restocking of commercial fishing areas (FAO, 2013). In this study the focus is on aquaculture for commercial fish production. The most important species that are cultured for consumption are rainbow trout (*Oncorhynchus mykiss*), different species of carp (*Cyprinidae*), and several sturgeon species (*Acipenseridae*). The focus in this assessment will be on these three (groups) of species. Another species cultured in Azerbaijan is brown trout (*Salmo trutta*). There is no information available about the commercial production of other fish species in Azerbaijan.

### *Number of companies and sizes*

No up to date information about the number of companies involved in commercial fish production is available. For the Azerbaijan Competitiveness and Trade Project from USAID, a survey among fish producers was commissioned, of which the majority were carp producers (USAID, 2011). A summary of the survey results refers to 170-180 companies of which the majority produces carp. The majority of the carp farms were small-scale production facilities of 1-3 hectares with 2-4 ponds (Business and Innovation Center, 2011). The number of 170-180 companies could not be verified from other sources, such as the State Statistical Committee of Azerbaijan. During a visit of a trout farm in Girkhbulag the owners estimated the total number of trout farms in Azerbaijan at 10-15, of which about five farms were involved in commercial fish production and the remaining companies sell trout for touristic purposes. No information is available about the number of sturgeon farms. According to the director of the Khilly Sturgeon Hatchery in Neftchala (a government owned restocking hatchery) there are at least seven initiatives to develop hatcheries and production facilities in different parts of Azerbaijan.

### *Production systems for rainbow trout, carp and sturgeon*

Rainbow trout production occurs in open raceway systems mainly in North and West Azerbaijan at higher elevations. The optimal water temperature for rainbow trout production ranges from 7 to 18 degrees Celsius. Other important conditions are a regular supply of fresh water, with the right PH level and oxygen content (FAO, 2011a).

Carp species are mainly cultured in the South East of Azerbaijan in pond cultures. Often production of different species of carp (common carp, grass carp and silver carp) is combined in polycultures. For carp culture usually there is a production season that starts in spring when the water temperature constantly is more than 10 degrees Celsius. The optimal water temperature range for growth of carp species is between 20 and 25 degrees Celsius (FAO, 2011b). Carp production is said to be a good alternative for saline soils that are less suitable for crop production.

For the production of sturgeon different production systems are used in Azerbaijan. Caspian Fish produces sturgeon in a cage system in the Mingachevir Reservoir. The Dutch company Hesy Aquaculture is building a production facility for an unknown private company for the farming of Russian sturgeon (*Acipenser gueldenstaedtii*) and sterlet (*Acipenser ruthenus*) in Baku based on RAS (Recirculating Aquaculture System) technology. This production system will have an annual production of 100 tons of sturgeon and 4 tons of caviar (Hesy website, 2017).



Left: trout farm at Qusar, right: sturgeon farm near Baku

*Biophysical features for aquaculture production*

The figures below indicate the most suitable areas for aquaculture production based on biophysical features. Green areas have the highest potential for aquaculture production.

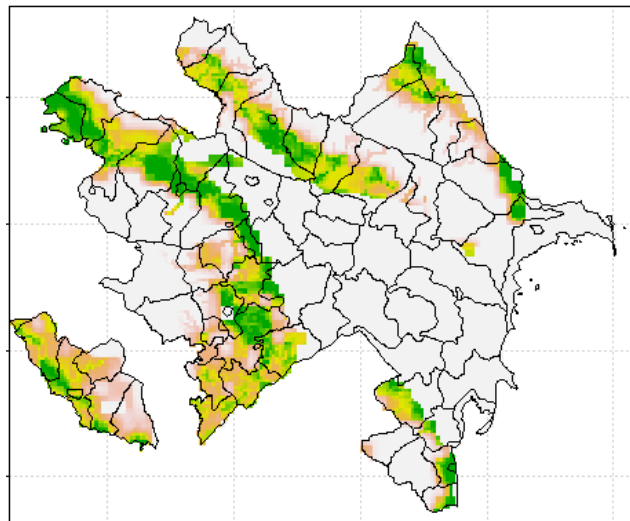


Figure 1. Rainbow trout

For the current production systems of rainbow trout in Azerbaijan, the availability of cool, flowing water is the most important factor. Because information about the water temperature was not available, the altitude is used as proxy for the water temperature. Areas below 200 meter and above 2000 meter are considered as not suitable for trout production. With respect to land use, cropland and pastures in general are used for agricultural production and are less suitable for trout production. Furthermore protected areas, areas with a rocky soil and areas with closed broadleaved deciduous forest are excluded. Information about population and markets in Azerbaijan is also included to identify the more and less favourable production areas. Aspects that are included here are closeness to cities, populated areas (low densely populated areas are favourable, areas with more than 500 people per km<sup>2</sup> are very unfavourable and above 2000 people per km<sup>2</sup> are impossible for production) and the density of roads in an area.

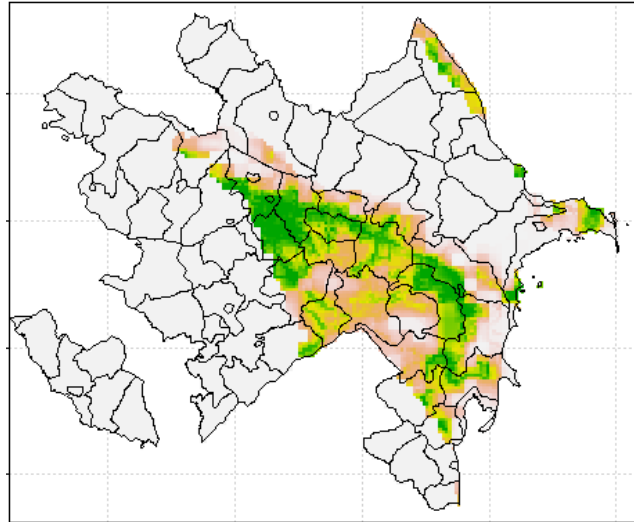


Figure 2. Carp species

For the identification of suitable areas for carp production also water availability and (water) temperature are important. Carp species prefer a higher water temperature than trout. Here also the altitude is been used as indicator for water temperature. Areas higher than 200 meter are considered as areas where the water temperature is too cold, and therefore are excluded as suitable production area. Also areas that have a minimum average temperature in de coldest month lower than -2 degrees Celsius are unfavourable for carp production. With respect to geography, the soil is relevant because pond construction for carp production is less likely to occur in areas with shifting sands and to a lesser extend grasslands. Arid areas are unfavourable when there is no water available. Cropland and pastures can be suitable for carp production when the slope of the area is less than 10%. Areas with a slope higher than 10% are indicated as very unfavourable. Like for trout, protected areas, areas with a rocky soil and areas with closed broadleaved deciduous forest are also excluded for carp production. Information about population and markets to identify the more and less favourable production areas for carp are also included and these conditions are the same as for trout production.

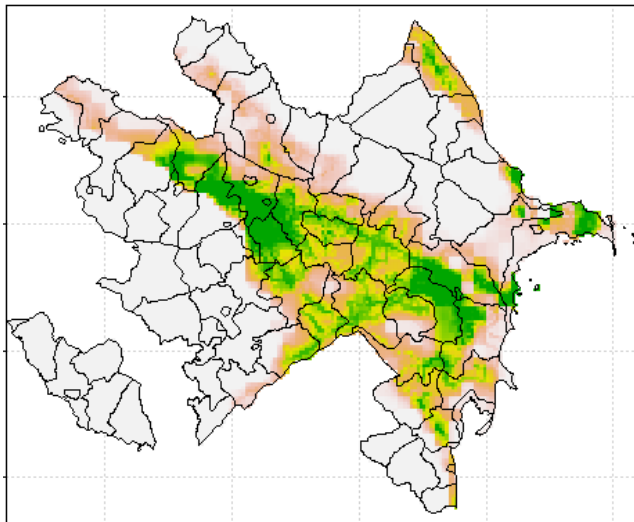


Figure 3. Sturgeon species

Production of sturgeon can occur in modern intensive systems or in more extensive systems. For sturgeon production in more extensive systems the biophysical features are comparable with production of carp species. For sturgeon production in intensive systems the (water) temperature is important but can be regulated. As indicator for the (water) temperature also altitude is used with areas below 200 meter considered as favourable. At higher altitudes the temperature will be lower and it will take more energy to regulate the water temperature. Therefore areas between 200 and 500 meter are still considered as suitable but are less favourable. Areas above 500 meter are excluded. For sturgeon production water availability is also taken into account as important. Land use characteristics are similar

to carp production except the fact that soil characteristics are less important. This is because intensive systems for sturgeon production often are indoors in buildings and ponds do not have to be constructed. Information about population and markets to identify the more and less favourable production areas are the same as for trout and carp production. The only additional factor that is relevant for sturgeon production in intensive systems is access to energy. Therefore the proximity of a production area to power stations is included.

## Input supplying industries

### *Fish feed*

Fish feed is an important cost driver in aquaculture production. Feed costs usually are 50% or more of the total production cost. According to USAID feeding practices at carp farms in general can be optimised. Most farmers do not use commercial fish feed, but make use of agricultural products such as wheat, barley and alfalfa. Sometimes no feed is used at all (USAID, 2011). The daily practices of a carp farmer that was visited in May 2017 show that fish feed production still can be improved. The carp farmer produced his own fish feed by using rice and sunflower by-products. Pre-mixes were also used that were bought from local companies. In the past also fish meal was used but currently there is no industrial production of fish meal available. With commercial feed the farmer explained that he only needs 1.5-2 kg for production of 1 kg of carp. With his own feed he needs 4-5 kg for the production of 1 kg carp.

Trout farmers depend on commercial fish feed that is imported. A trout farmer in Qusar that was visited previously sourced locally produced fish feed, but the quality was not good enough. Trout farmers that were visited sourced commercial fish feed from Poland and Iran. The devaluation of the Manat increased the costs for importing fish feed. Before the devaluation in 2015 the cost for 1kg of fish feed was 1.8 Manat, while after the devaluation in 2017 it was 4 Manat. Also there is an import tax on fish feed of 18%. These factors contributed to the fact that expensive fish feed is seen as a key issue for profitability. One trout farmer considered the production of fish feed but it turned out to be too expensive because of large investments in an extruder for feed production. A trout farmer in Girkhbulag indicated that cost for fish feed and medicines were up to 80% of his total production costs.

The Khilly sturgeon hatchery uses fish meal from Turkey or Iran for the production of mature fish and also produces plankton-based feed for fingerlings. Locally sourced anchovy is also used for protein requirements for fingerlings. Production occurs at small-scale level because of the lack of anchovy resources (Blue Marine Foundation, 2015). A visited sturgeon farm in Baku also used locally sourced anchovy feeds.

### *Eggs, fry and fingerlings (juvenile fish)*

Azerbaijan has several hatcheries that produce juvenile carp and sturgeon species (FAO, 2013). However, current production activities (i.e. in 2017) are unknown. Most of the carp farms do not have broodstock fish (mature fish that are used for reproduction purposes) and depend on hatcheries (Business and Innovation Center, 2011). A carp farm was that visited produced its own eggs. The reproduction facilities could be further professionalised. A reported problem for carp farms is that the survival rate of fry purchased from hatcheries is low (USAID, 2011).

Trout farms that were visited have different strategies for sourcing eggs and juvenile fish. One trout farm previously imported fry from Turkey and Iran, and now has broodstock for reproduction purposes. The other farm currently imports eggs from France. No statements were made about the quality of eggs.

There is not much information about the general availability of fry and fingerlings of different sturgeon species in Azerbaijan. The Khilly sturgeon hatchery supplies fingerlings of Beluga sturgeon (*Huso huso*), Fringebarbel sturgeon (*Acipenser nudiventris*), Russian sturgeon (*Acipenser gueldenstaedtii*), Persian sturgeon (*Acipenser persicus*) and Stellate sturgeon (*Acipenser stellatus*) (Blue Marine Foundation, 2015). The hatchery also supports sturgeon farmers with technical knowledge. Caspian Fish has its own hatchery for fingerling production. The sturgeon farm near Baku that was visited sourced its fingerlings from an Azeri company in the Barda region. The name of this company could not be traced.

### *Equipment and machinery*

Most facilities for carp and trout farming interviewees talked about seem to exist for several years. Some trout farms were built when Azerbaijan was part of the Soviet Union. No information exist about Azeri companies specialised in building and developing production systems for aquaculture. Basic equipment for aquaculture practices probably is available in Azerbaijan but could not be traced during the field visits. Newly developed sturgeon farms are most likely only few and such new facilities are probably build by foreign companies. An example of a modern facility recently constructed is the sturgeon farm build by Dutch company Hesy in Baku.

### *Energy*

Energy supply in general is not a major issue because the existing farming systems for carp and trout are not heavily depending on energy. For modern, intensive farming systems for sturgeon the energy availability is more important but not as essential as it is for other agricultural sectors.

### *Capital*

Like for other agricultural sectors interest rates are high, which makes it expensive for aquaculture producers to get access to capital. Current interest rates from commercial banks on loans can be 15-20% or even higher. In the survey results of the Azerbaijan Competitiveness and Trade Project from USAID in 2011, high interest rates were already mentioned as the most important reason for aquaculture producers for not approaching banks. Most carp and trout farmers have financed their business with private capital, while a small amount was able to receive credit from a bank (Business and Innovation Center, 2011).

## **Production**

### *Domestic production*

There are considerable differences between production data of fish from the State Statistical Committee in Azerbaijan and the Food and Agricultural Organisation (FAO) of the United Nations (see table 1). The main reason for these differences is that the data from the State Statistical Committee also include fish caught by 'physical persons'. It is not clear what is meant by this statement. One possible explanation could be that this refers to non-commercial catches that are used for own consumption. Other categories that are used by the State Statistical Committee are 'fish caught by quota' and 'fish caught by farms engaged in lake and puddle fishing'. The total value of these two categories is comparable with the production data used by FAO.

Table 1. Domestic fish production (wild caught and aquaculture, tonnes)

	2012	2013	2014	2015
Production (SSC)	57,667	50,960	50,067	51,237
- Fish caught by quota and fish caught by farms engaged in lake and puddle fishing	1,346	1,242	1,299	1,229
- Fish caught by physical persons	56,321	49,718	48,768	50,008
Production (FAO)	1,618	1,384	1,253	1,220
- Black and Caspian Sea sprat (wild caught)	372	206	164	139
- Kutum (wild caught)	81	117	162	117
- Sturgeons (wild caught)	45	0	0	0
- Common carp (aquaculture)	152	148	141	175
- Rainbow trout (aquaculture)	89	89	89	304
- Other species	879	824	697	485

Source: State Statistical Committee of the Republic of Azerbaijan and FAO.

When comparing FAO data, the level of fish production has declined seriously compared to 20-30 years ago. In 1990 41,665 tonnes of fish were produced, while in 2000 total fish production was 18,937 tonnes (FAOSTAT website, 2017). The decline in fish production is caused by a decrease in the catches of Black and Caspian Sea sprat due to overfishing and pollution (FAO, 2013). In the nineties Black and Caspian sprat catches amounted to more than 80% of the total fish production in Azerbaijan.

### *Regional production*

Countries like Turkey, Iran and Russia produce significant volumes of fish. Table 2 presents the total fish production of these three countries in 2015, as well as the main aquaculture species in Azerbaijan:

Table 2. Fish production Azerbaijan, Iran, Turkey and Russia in 2015 (wild caught and aquaculture, tonnes)

	Azerbaijan	Iran	Turkey	Russia
Total production	1,220	983,897	670,873	4,620,901
- Common carp	175	61,536	7,429	61,505
- Grass carp	20	33,153	0	18,397
- Silver carp	24	119,527	0	23,635
- Rainbow trout	304	140,632	100,411	24,474
- Sturgeons	0	1,107	28	3,893

Source: FAO.

The comparison of these production data reveals that Iran and Russia have a large carp production sector, and that all three countries produce large amounts of rainbow trout. This indicates that the sectors for carp and trout in these countries probably are well developed and more competitive than Azerbaijan. This limits export opportunities for carp and trout to these large regional markets. For sturgeon the situation is different. If Azerbaijan would be able to farm sturgeon by using sustainable practices there might be opportunities to export farmed sturgeons to these regional markets.

### *Cost, revenues and profitability*

No information about production costs, revenues and profitability are provided by the State Statistical Committee in Azerbaijan. During field visits only incidental information about these economic aspects was collected. Both trout farms visited, indicated that they were profitable. One trout farm had an average farm gate price of 14 Manat/kg while total production costs were 11 Manat/kg. A sturgeon farm visited indicated that for the purchase of 4.5 hectares of land and the development of the facilities, investment costs were 1 million Manat.

## **Processing industry**

### *Industrial processing of fish*

Industrial processing of fish in Azerbaijan occurs on a small scale. Caspian Fish is the largest company in the country. According to the director of the company, Caspian Fish has about 500 employees of which 130 are working on the fish processing facility in Baku. The fish processing facility of Caspian Fish has a production capacity of 300 tonnes of fish/day (FAO, 2013). The company processes a wide variety of fish products, including different species of processed fresh, frozen (e.g. sturgeon, sprat, pike perch, trout), canned, cold/hot smoked fish (e.g. salmon, mackerel, shamai) and caviar. Caspian fish is the only company in Azerbaijan who meets all the requirements to export caviar to the EU. Recently the company also exports fish products and caviar to Russia. The export of fish products is currently not profitable, because the company heavily depends on the imports of raw material (about 80% of the raw material is imported). The devaluation of the Manat and an import tax of 15% makes importing fish products expensive.



Caspian Fish products: canned fish products (left) and smoked mackerel (right)

Besides Caspian Fish, no other companies with industrial processing facilities have been identified. There might be a few companies specialised in the import and export of fish products. Furthermore there are local traders, who trade in locally farmed and wild caught species for the domestic market.

In the period 2011-2015 Azerbaijan imported fish and fish products with an annual volume between 14,000 and 20,000 tonnes. The value of the imports in this period ranged from 10 to 16 million US\$ (table 3). The main imported species are frozen or preserved mackerel and sardines for processing. Other imported fish species and products are salmon, catfish and caviar. Most imports come from the Russian Federation, although in 2014 and 2015 the value decreased by almost 50%. Also from Vietnam, Iceland and Latvia fish and fish products are imported. Regional imports from Turkey and Iran are very small.

Table 3 Imports of fish and fish products 2011-2015 (million US\$)

	2011	2012	2013	2014	2015
Russian Federation	6,882	7,193	6,468	6,771	3,638
Vietnam	660	469	1010	1121	1155
Iceland	106	210	530	920	991
Latvia	570	527	685	703	812
Turkey	71	173	153	262	225
Iran	22	117	10	66	33
Other countries	1,083	1,107	1,799	3,684	4,435
Total	11,404	11,807	12,667	15,540	13,303

Source: UNCOMTRADE.

More than 95% of the fish and fish products in Azerbaijan are sold on the domestic market and used for consumption (table 4). The consumption of fish and fish products also includes the fish caught by physical persons as mentioned in table 1. A small amount (1-2%) is used for the production of non-food products, probably for the production of (fish) feed products. Export of fish products does not occur annually and accounts for less than 1% of the total utilization of fish and fish products in Azerbaijan.

Table 4 Utilization of fish and fish products 2011-2015 (tonnes)

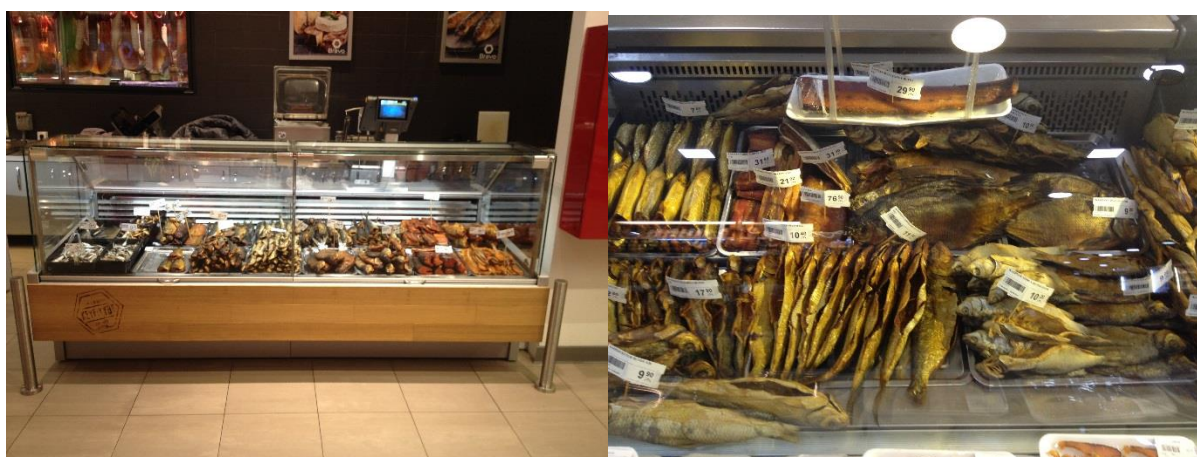
	2011	2012	2013	2014	2015
Consumed as food products	63,263	75,254	69,655	67,828	67,145
Production of non-food products	557	600	871	854	828
Export	277	-	32	-	-

Source: stat.gov.az

## Markets and marketing

### Market segments

Most fish products are sold at retail chains, local markets (bazaars) and local shops. Retail chains sell the highest variety of fish products and fish species. Most fish products offered in retail shops in Baku were fresh smoked products with a large variety of species including farmed fish (carp and trout), local wild caught fish (e.g. shemaya, kutum) and imported species (e.g. salmon and mackerel). Some retail shops also have basins with live carp or trout that are directly for sale. A retailer in Baku expressed the interest in the development of a fresh fish counter similar to fish counters in retail shops in Southern Europe. The Green Bazaar in Baku is an example of a local market where fish products are sold. The assortment consist of mainly fresh fish sourced domestically (both wild-caught and aquaculture) or imported (e.g. fresh salmon). Local shops sell mainly domestically sourced fish products. The availability varies due to seasonality.



Fish counters in retail shops with mainly fresh smoked fish products in Baku

Most producers of carp and trout have several distribution opportunities. The majority sells their fish to distributors who trade the fish at local markets or distribute the fish to markets in Baku. Only some producers sell their fish at local markets by themselves, or sell directly from the farm to restaurants in the neighbourhood. Most fish are sold live or fresh. Distribution of live fish occurs by car with tanks with oxygenerators (Business and Innovation Center, 2011).

### Consumption of fish and fish products

Consumption of fish and fish products in Azerbaijan is low and was 2 kg per capita per year in 2013 (FAOSTAT website, 2017). The main competing source of animal protein for fish seem to be poultry products, which in general are cheaper than fish products (table 5). According to the FAO (2013), the general demand for fish products is higher than the available supplies, and there is potential to increase the overall fish consumption. During the visits to Azerbaijan insufficient information could be collected that gave insights in the current development of the overall fish consumption in Azerbaijan.

Table 5 Retail prices of fish and poultry production in Baku in August 2017 (Manat/kg)

Fish	
Whole grass carp (fresh)	8.60
Whole carp (live)	10.90
Kilka (cold smoked)	3.15
Whole perch (fresh)	7.00
Whole rainbow trout (fresh)	17.00
Beluga sturgeon meat (fresh)	50.00
Beluga caviar	155.00
Poultry	
Whole chicken (fresh)	3.77
Chicken filet (fresh)	5.99
Whole chicken (frozen)	4.39

According to Caspian Fish, consumers in Azerbaijan tend to have a preference for fresh fish products. There is a significant difference between the monthly production of Caspian Fish during the year, because consumers believe that fresh fish deteriorates quickly in summer with high temperatures. In the summer months the monthly production from Caspian Fish is said to be 50-60 tons, while in winter this is about 150 tons/month. Also sales from carp species and trout show that demand for these species is low in summer (June – August) and high in winter (October – February) (Business and Innovation Center, 2011). Sturgeon and caviar used to be highly preferred fish products in earlier days in Azerbaijan, with stories of daily consumption of caviar. Nowadays sturgeon meat and caviar are scarce and expensive. Despite the fact that consumption of sturgeon and caviar currently is only affordable for the upper class, sturgeon still is the most famous fish species in Azerbaijan with a good reputation. Also Caspian salmon (*Salmo trutta caspiensis*) is a species that is currently endangered and used to be popular.



Caviar sold retail shops in Baku. The retail price of the small can of Beluga caviar (left) was 155 Manat



Beluga sturgeon (left, 50 Manat/kg) and salmon (right, 30 Manat/kg) at the Green Bazaar in Baku

## Policy and business environment

### *Policies for the aquaculture sector*

The Ministry of Ecology and Natural Resources (MENR) is responsible for the development of policies for the fisheries and aquaculture sector in Azerbaijan. The Law on Fisheries that was formulated in 1998 defines the legal basis and policy for the fisheries sector. Legal descriptions and regulations for the aquaculture sector however are not included in this Law (FAO, 2013). A Law on Aquaculture has been prepared and should be adopted, but it is not clear if this new Law is actually approved. In their 2015 report, Blue Marine Foundation mentioned that there was still no legal and policy framework for the aquaculture sector. During a meeting with the Azerbaijan Fisheries Research Institute (AzerFRI) in May 2017 it became clear that this new legal and policy framework still was not put in place. The drafted legal and policy framework includes policies to collect more data about the aquaculture sector to get a better overview of sector (e.g. the number of companies, turnover and employment). The absence of a legal and policy framework is an important barrier for the development of a professional and competitive aquaculture sector. Without this framework, investments in the aquaculture sector are less likely to occur.

The government of Azerbaijan did have a State Programme to Ensure Food Security from 2008 to 2015, with special objectives related to aquaculture. These objectives were: lake aquaculture development, Cyprinidae (Carp) soil pond aquaculture development and rainbow trout cage culture development (FAO, 2013). No information could be obtained about the results of this State Programme for the aquaculture sector.

### *Sector associations*

Sector associations or other types of cooperation in the aquaculture sector seem absent. The results from the survey for the Azerbaijan Competitiveness and Trade Project from USAID indicate that a majority of the carp and trout producers have a positive attitude towards a sector association for aquaculture. The majority of these producers would also be interested to join this association. Aspects that an association should take into account according to producers are: protection against corrupt officials, the establishment of business relationships, information about changes in legislation and training on fish farming (Business and Innovation Center, 2011).

### *Business environment*

The absence of a legal and policy framework creates uncertainty for aquaculture producers and hinders the further development of this sector. In the survey results of the Azerbaijan Competitiveness and Trade Project from USAID, only a few carp and trout producers indicated that they were fully informed about the relevant legislation for their companies. The majority was only partially informed and a significant number of producers was totally uninformed. Friends and colleagues were stated as the most important source of information for new regulations, while only a small number got their information from government organisations. Administrative barriers mentioned were: uncertainties about property regulations, uncertainties with respect to farm registration, uncertainties regarding leasing/renting of land, problems with market access and bribery from the road police (Business and Innovation Center, 2011).

Another important element that enables a business environment is the possibility to attract capital. Current interest rates from commercial banks are high (15-20% or higher). According to the survey results of the Business and Innovation Centre, reasons why banks rejected the requests from carp and trout producers were: the aquaculture sector was seen as a sector with a high risk profile, the company was not considered to become profitable and the business plan did not meet the requirements. Another reason mentioned was that the loan was rejected because the applicant did not have property in Baku (Business and Innovation Center, 2011).

## Conclusions and suggestions for investment opportunities

### *Conclusions*

- The aquaculture sector in Azerbaijan traditionally focuses on the production of rainbow trout (*Oncorhynchus mykiss*), different species of carp (Cyprinidae). The sector mainly consists of small and medium-sized producers. There is no up-to-date information about the number of companies involved in the aquaculture sector. Rainbow trout is farmed in open raceway systems in mountainous areas in North and West Azerbaijan; carp production takes place in pond culture and is concentrated in the South East of the country. More recently commercial production of different sturgeon species (Acipenseridae) also is gaining interest.
- Input supplying industries for the aquaculture sector in general seem to be moderately developed in Azerbaijan. Eggs, fry and fingerlings in general are available in Azerbaijan and can be sourced from state-owned hatcheries. Some companies also have their own broodstock for reproduction purposes or import eggs. There is no information about the current existence of commercial fish feed companies and companies specialised in the construction of aquaculture production facilities in Azerbaijan. Feed is imported or produced from local by-products, or locally sourced fish meal is used. For sturgeon feed also fish species from the Caspian Sea are used, which is questionable from a sustainability perspective.
- Total fish production seriously decreased in the last 20-30 years because of overfishing and pollution in the Caspian Sea. According to the FAO, in 2015 the fish production from wild-caught and aquaculture in Azerbaijan was 1,220 tonnes. Countries like Iran, Turkey and Russia produce large volumes of carp and trout. This limits export opportunities to these large regional markets. Sturgeon production in Iran, Turkey and Russia is small. When sturgeon can be farmed sustainably, this could reduce the pressure on sturgeons stocks and create opportunities for export.
- Caspian Fish dominates the fish processing industry in Azerbaijan. The majority of the raw material for fish processing by Caspian Fish is imported, which is hampered by high import taxes and the devaluation of the Manat. Next to Caspian Fish there might be a few companies specialised in the import and export of fish products. Also there are local traders that buy and sell locally farmed and caught species for the domestic market. Azerbaijan is a net-importer of fish products with imports between 11 and 16 million US\$. According to trade statistics export of fish and fish products are very small and do not occur annually.
- Fish consumption in Azerbaijan is low with 2 kg per capita per year in 2013. Consumers in Azerbaijan have a preference for fresh fish products. Throughout the year the consumption is low in summer, when consumers believe that fresh fish deteriorates quickly, and highest in winter months. In general fish products are more expensive than poultry products. According to the FAO overall demand for fish and fish products is higher than supply and there is potential to increase fish consumption. This statement, however, could not be verified.
- Currently there is no specific legislation for the aquaculture sector in Azerbaijan. A Law on Aquaculture has been prepared, but so far it seems that new legislation and policies have not been put in place yet. The new legislation and policies also will include mechanisms to collect data about the socio-economic situation in the aquaculture sector. The absence of legislation and policies are an important barrier for investment in the aquaculture sector and further development and professionalization. The absence of a legal and policy framework, and difficulties to attract capital are considered as important factors that should be approved in order to create a better business environment for aquaculture producers.

### *Suggestions for investment opportunities*

To create investment opportunities for the aquaculture sector, the investment climate in Azerbaijan in this sector must improve. An important aspect of this investment climate is the implementation of legislation and policies for the aquaculture sector. Clear legislation and policies provide more certainty and less risks for companies and entrepreneurs. This can also increase the interests of foreign investors.

Of the three species (rainbow trout, carp species and sturgeon species ) that have been taken into account in this assessment, investment opportunities for sturgeon farming have the highest potential. Sturgeon is the most well-known fish in Azerbaijan with a long standing reputation, and both sturgeon meat and caviar are in demand. Besides production for the domestic market, there also seem to be

opportunities to export sturgeon meat and caviar to other countries around the Caspian Sea. Caviar is a well-known exclusive product, so high end markets in e.g. Europe and the Middle East might also be targeted. For investments in sturgeon and caviar production the following aspects have to be taken into account:

- Given the current endangered status of sturgeon species and the pressure on the remaining wild stocks, fishing efforts should be strictly minimized or even prohibited. The farming of sturgeon can be a sustainable alternative for wild-caught sturgeon. Responsible farming practices and sustainable use of inputs (e.g. feed, fingerlings and water resources) are highly important. Responsible farming practices can also be an opportunity for marketing.
- Investment costs are high. For caviar production broodstock fish are needed. Depending on the exact species of sturgeon, broodstock fish have to be 8 to 15 years old before caviar production is possible. This makes the production of caviar a capital-intensive investment with a high risk-profile. Also intensive sturgeon farming requires modern facilities with high investment cost. For small or medium sized companies it is therefore probably not possible to invest in sturgeon farming.

Investment opportunities for rainbow trout are less clear. Given the production volumes of trout in other countries in the region, investment opportunities for the export of trout seem limited. Although there are indications that the domestic demand for trout is good, further insights in the market potential of trout in Azerbaijan is needed. It can be interesting to see if it would be better to invest in more up-to-date production systems than investments in new facilities.

Investment opportunities for carp species are similar as those for trout. Export opportunities seem limited, so the focus should be on the domestic market. Also here further insights in the market potential for carp species is relevant, before investment decisions can be made. It would be worthwhile to explore, if it can be interesting to invest in solving the current production problems, rather than in developing new facilities.

Finally, there might be other fish species that have investment potential. Species that have a certain tradition and who are familiar for most consumers in Azerbaijan. A species with a good reputation and that also is endangered is Caspian salmon. There are three hatcheries in Azerbaijan that focus on the restocking of Caspian salmon. Opportunities for grow-out facilities for this species should be further explored.

#### *Final remarks*

This analysis shows that some regions in Azerbaijan have biophysical potentials for aquaculture production of rainbow trout and/or carp. However, the economic prospects are limited. Moreover, due to a lack of economic data on the sector's performances, a solid ground for picturing an promising investment opportunity is missing. Therefore, investment sheets are not included in the Master Plan web tool for these two species. For sturgeon, we neither build an investment sheet. Although compared to trout and carp market prospects are more favourable for sturgeon meat and caviar, investment costs of sturgeon farming are high, which would make any business case a special one. For all aquaculture production holds that if investors show an interest in it, in-depth market research for its potential sales is necessary and then, if consumer demand shows to be positive, a specific business plan should be developed to find whether the investment could have satisfactory returns. Drafting business plans is yet beyond the scope of the current stage of the Master Plan project, but could be part of follow-up activities.

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<http://www.fao.org/faostat/en/#data/CL>, visited 23-09-2017

<http://www.fao.org/fishery/statistics/global-production/query/en>, visited 03-08-2017

### *Databases used*

UNCOMTRADE database, visited 17-05-2017

### *Consulted organisations and companies*

Azerbaijan Fisheries Research Institute – Mehman Akhundov (Director)

Blue Marine Foundation - Rory Moore (project manager)

Caspian Fish - Guluyev Jamaladdin (Director)

Girkhbulag Trout farm – Hamid and Anar Mikayilov

Khilly Sturgeon Hatchery – Zaur Salmonov (Director)

Machtaga Sturgeon farm

Neftchala Carp farm

Qusar Trout farm

Yashar Farajov – consultant, involved in market survey for Azerbaijan Competitiveness and Trade (ACT) Project