

Prospects of development of aquaculture in Russia and its regions

Lyudmila Kalinina, Inga Zelenskaya, Sofya Trufanova, Nicolay Kalinin*

¹Institute of Economics, Management and Applied Informatics, Irkutsk State Agricultural University named after A.A. Ezhevsky, Irkutsk, Russia

Abstract. The state program “Development of aquaculture (commercial fish farming) in the Russian Federation for 2015–2020” (hereinafter referred to as the State Program) determines the main directions for the development of the fisheries complex and its financial support. However, the current program does not sufficiently elaborate the forms of state support for this sphere of agricultural production, which would contribute to the accelerated development of the industry. It should also be noted that the existing potential of aquaculture in Russia is not fully utilized. The Institute of Economics of the Irkutsk State Agrarian University named after A.A. Ezhevsky, in collaboration with the Ministry of Agriculture of the Irkutsk Region, assessed the fulfillment of tasks of the State Program, identified factors hindering the development of aquaculture in Russia and its regions, and developed recommendations for improving the forms of state support for economic entities in the industry.

Russia's fishery complex has always played a key role in country's economy, but for many years fish products provision has been carried out through fishing: first in the inland seas, and then in the oceans. Fish-farming development was given a secondary role, which determined its weak development at the present time, which does not correspond to the potential industry opportunities [1-3].

Russia has the world's largest water fund of inland waters and seas coastal waters, which includes 22.5 million ha of lakes, 4.3 million ha of water reservoirs, 0.96 million ha of multifunctional agricultural reservoirs, 142.9 thousand ha of ponds and 523 thousand km of rivers. Length of the coastline is about 60 thousand km, while marine areas in the Barents, White, Azov, Black, Caspian and Far Eastern seas, suitable for housing mariculture complexes, are about 38 thousand km².

There are 295 typical freshwater fish species in the waters of the Russian Federation. Representatives of 87 fish species are noted in commercial catches in rivers, lakes and reservoirs. Artificial breeding objects in fresh waters of Russia are representatives of 48 fish species, 3 species of crustaceans, and 12 species of marine hydrobionts (Table 1).

Table 1. The main aquaculture objects, cultivated in Russia

*Corresponding author: klausinga@mail.ru

Types of objects	Freshwater species:	Marine species:
<i>Main objects:</i>	Cyprinus carpio	Salmo salar
	Plant-eating fishes	Pectinidae
	Oncorhynchus mykiss, Salmo trutta	Apostichohus japonicas
	Coregonus peled	Ostreidae
	Coregonus	Echinoidea
	Acipenser baerii	Mytilus
<i>Prospective objects:</i>	Sander lucioperca	Psetta maeotica
	Siniperca chuatsi, Morone saxatilis	Mugilidae
	Stenodus leucichthys	Dicentrarchus labrax
	Salvelinus lepechini	Sciaenidae
	Oreochromis	Strongylocentrotus intermedius

More than 40 breeds, crosses and types of Cyprinidae, Salmonidae, Acipenseridae, Coregonidae and other fish species that are adapted to breeding in various zonal-climatic and technological conditions are cultivated in industrial fish-farming in Russia (Table 2) [4,5].

A special reserve for aquaculture (fish-farming) development in Russia is formation of new fish-farming plots and their provision for use.

Taking into account the potential of suitable water areas for accelerated development of this type of activity, active work using system scientific approach and geoinformational analysis methods is carried out to determine suitable for aquaculture implementation water bodies and their parts.

Based on results of Federal Fisheries Agency territorial offices analytical work, it has been possible to implement aquaculture (fish-farming) on an area of more than 250,000 ha .

Table 2. Fish-farming objects included in the State Register of selection achievements admitted to use in the Russian Federation

Fish species	Selection achievements				
	breeds	types	crosses	Domesticated forms	total
Cyprinus carpio	14	2	2		18
Oncorhynchus mykiss	7				7
Hypophthalmichthys molitrix, Aristichthys nobilis	2		1	2	5
Acipenseridae	5		1	5	11
Coregonus peled	1			1	2
Oreochromis	1				1
Mylopharingodon piceus, Ctenopharyngodon idella				2	2
Total	30	2	4	10	46

In Russia, since the early 1990s, there has been a significant decline in the fish-farming production. By 1996, in comparison with 1989, fish production decreased by 4 times. That situation in the industry was stabilized only by 1999, when a positive dynamics in the growth of fish products was reached. In 2016, the volume of harvest (catch) of aquatic biological resources in Russia amounted to 4 657.6 thousand tons (Table 3).

Table 3. The volume of harvest (catch) of aquatic biological resources and aquaculture production in Russia, thousand tons

Years	Indicators		
	Harvest (catch) of aquatic biological resources - total	Aquaculture production	Proportion of aquaculture in total harvest (catch) of aquatic biological resources, %
2007	3438	105,5	3,1
2008	3336	115,4	3,5
2009	3801	116,6	3,1
2010	4028	120,4	3
2011	4265	128,8	3
2012	4270	144,9	3,4
2013	4281	154,9	3,6
2014	4236	162,3	3,6
2015	4457	160	3,6
2016	4658	174	3,7
2016 to 2007, %	135,4	164,9	X

Main share of harvest (catch) was in Far Eastern fishery basin - 66.9% (3114.2 thousand tons) and Northern fisheries basin - 12.2% (566.9 thousand tons). In Baikal fishery basin, where Irkutsk region is territorially included, catch was 3.9 thousand tons or 0.08% (91.0% by 2015).

Commercial aquaculture production in the Russian Federation in 2016 was 174.0 thousand tons. Compared with 2007, production increased by 64.9%. However, aquaculture production share in total harvest (catch) of aquatic biological resources was only 3.7% in 2016, while in China this parametr is over 70%, in India - 50%, in Norway - almost 40%. Main volume of commercial fish grown in Russia are Cyprinidae (its share is 65%), Salmonidae (24%), share of other species is 11% [6-10]. Bulk was produced on small- and medium-sized enterprises (Table 4).

Table 4. Grouping of aquaculture enterprises in Russia by annual production in 2016

Commercial aquaculture production on enterprises	Share in total number of enterprises, %
less than 50 tons per year	67
50-100 tons per year	19
101-1000 tons per year	12
more than 1000 tons per year	2

The main volume of aquaculture production is mainly produced in Southern and North-Western Federal Districts, where were produced 63.5 thousand tons and 37.2 thousand tons of commercial fish in 2016, which was 36.5% and 21.4%, respectively, from the all-Russian production.

The largest volumes of production (by regions of the Russian Federation in 2016) were achieved in Rostov region - 20.3 thousand tons, Krasnodar region - 18.8 thousand tons, Astrakhan region - 16.7 thousand tons, Karelia region – 14.7 thousand tons, Murmansk region – 12.6 thousand tons, Stavropol region – 10.8 thousand tons.

Commercial aquaculture development by federal districts is characterized by following indicators:

Production leader in 2016 was Southern Federal District – 63.5 thousand tons of commercial aquaculture. The largest products volume was grown in Rostov region (20.5 thousand tons) and Astrakhan region (20 thousand tons). High indicators was in Krasnodar region (20 thousand tons).

The next largest aquaculture producer is North-West Federal District (37.2 thousand tons). The leader in the North-West Federal District is Karelia region - 14.7 thousand tons. In addition, the high outputs are in Murmansk (13.7 thousand tons) and Leningrad regions (7.6 thousand tons).

The third largest producer of commercial aquaculture products was Central Federal District – 24.8 thousand tons. The leader in this district is Belgorod region (6.4 thousand tons).

The average level of production are reached in North Caucasus Federal District (16.3 thousand tons), Volga Federal District (12.2 thousand tons), Far Eastern Federal District (6.9 thousand tons), Urals Federal District (5.8 tons), Siberian Federal District (5.8 thousand tons).

In Siberian Federal District, the leaders in production of commercial aquaculture are Krasnoyarsk region (1438 tons of fish were grown in 2016), Novosibirsk region (876 tons) and Kemerovo Region (732 tons). Salmonidae (*Salmo trutta*) are prevail among the species of aquatic bioresources - 36% of total aquaculture production. Cyprinidae (*Cyprinus carpio*, *Tinea tinea*) are 34%, Coregonidae (*Coregonus peled*) - 12% and others (*Acipenser*, *Huso huso* × *Acipenser ruthenus*, *Esox lucius*) - 18 %. The type of farms in the district is dominated by industrial aquaculture enterprises (53%), pond and pasture aquaculture enterprises together constitute 47%. In terms of production, 83% of farms produce less than 50 tonnes of commercial aquaculture per year, 7% - from 50 to 100 tonnes per year, 10% - over 100 tonnes per year (Table 5).

Table 5. Characteristics of fish-farming development in Siberian Federal District in 2016

Characteristics of fish-farming development in Federal District	Indicators
Number of commercial aquaculture enterprises	126
Commercial aquaculture production in 2016, thousand tons	5.6
Place in the Russian Federation in terms of output	8
The share of the District in the all-Russian production, %	3.3

Characteristics of fish-farming development in Federal District	Indicators
The main types of farmed aquatic bioresources	Salmo trutta Cyprinus carpio Coregonus peled
Regions of the Russian Federation - leaders in the production of aquaculture in the federal district	Krasnoyarsk region Novosibirsk region Kemerovo Region
Volume of governmental support (the volume of subsidies in 2015 – 2016), million rubles	186.0

Leading suppliers of fish seeding material are Central Federal District (8.4 tons), Northwestern Federal District (7.1 tons) and Southern Federal District (9.3 tons).

Government of the Russian Federation, Ministry of Agriculture of the Russian Federation, Federal Fisheries Agency makes decisions that are aimed at increasing the production of aquaculture. Law on aquaculture was adopted in 2013, which laid legal basis for development of industry; resolutions and orders to ensure implementation of this law were also adopted; ministerial program for development of aquaculture was prepared [11].

These steps made it possible to increase the production of marketable fish output in 2014. According to data of head of Federal Fisheries Agency I.V. Shestakov, Russia annually produces about 160 thousand tons of commercial fish, which is less than 4% of the total Russian catch, while the potential capacity of industry is quite high [12]. So, the largest share in fish imports by Russia - about 20% of total volume - is made by fresh and chilled fish, which gives aquaculture industry wide opportunities for import substitution [13-15].

Increase in volume of commercial fish largely depends on level of governmental support, increasing investment attractiveness of industry, consumer demand and other factors.

In ministerial program, by 2020, the production of commercial aquaculture is expected to double to 330 thousand tons. At the same time, according to scientists, possible volume of production can be increased up to 700 thousand tons.

Reserve for increasing production of aquaculture outputs is seen in geography expansion of fish farms. Natural and climatic conditions of country make it possible to develop fish culture in all regions of the Russian Federation. So, in regions of Southern Federal District almost all types of fish farming can be developed: pond, industrial (trout farming in foothill areas), pasture aquaculture in lakes, estuaries and reservoirs. In North-West Federal District, it is promising to conduct pasture fish farming and industrial (cage fish culture) in cultivation of salmon and whitefish species. Far Eastern Federal District may become a leader in cultivation of marine hydrobionts. Siberian Federal District has largest fund of freshwater water objects, where it is possible to develop pasture and industrial aquaculture. At the same time, the district is rich in geothermal sources, which makes industrial fish farming promising and economically prospective. It is also possible to grow cold-water (mainly whitefish) and warm-water (sturgeon, carp) fish species, which expands the sales markets.

Also, a system of governmental support for subjects of aquaculture and commercial sturgeon breeding is developing.

The main objective of this system is to provide and distribute subsidies from federal budget to budgets of regions of the Russian Federation to recover part of paying interest costs on loans received in Russian credit institutions for commercial aquaculture (commodity fish-farming) development, including commercial aquaculture of sturgeon species, in accordance with Appendix №5 to the Russian Federation state program "Development of fishery complex", approved by decree of Government of the Russia Federation of April 15, 2014, № 314.

Federal Law of December 14, 2015, №359 "On Federal Budget for 2016" (taking into account optimization of federal budget expenditures for 2016) provides budgetary allocations for implementation of State Program part "Development of state support system for aquaculture and commodity sturgeon" in the amount of 396.1 million rubles.

By the decrees of Government of the Russian Federation № 1439-r of July 7, 2016, and № 1463-r of July 9, 2016, distribution of subsidies granted in 2016 from federal budget to budgets of regions of the Russian Federation for co-financing expenditure obligations of regions of the Russian Federation related to reimbursement part of the costs of agricultural producers to pay interest on loans received from Russian credit institutions to develop aquaculture (fish-farming) and commercial sturgeon under State Program parts "Aquaculture Development" and "Development of sturgeon farming" was approved.

According to above-mentioned decree, agreements on granting subsidies between the Russian Federal Fisheries Agency and regional authorities of Novgorod, Kaluga, Murmansk, Leningrad, Karelia, Dagestan, Primorsky and Krasnoyarsk regions were concluded by July 15, 2016.

A number of regions of the Russian Federation have begun to develop and implement their own programs to support fishery industry, in particular the aquaculture industry. Thus, Government of Murmansk region has developed Governmental Program "Development of Fisheries Complex", which provides for governmental support to aquaculture enterprises, by providing subsidies to producers to refund a portion of interest rate on loans received from Russian credit institutions for commercial aquaculture (commercial fish farming) development. Similar programs operate in Kostroma, Astrakhan, Chelyabinsk, Belgorod, Krasnoyarsk, Buryatia, Komi, Khakassia and other regions, which provide for various directions of governmental support for aquaculture industry.

On basis of our study, to increase the interest of agricultural producers in increasing aquaculture production, it is proposed to provide subsidies for:

- reimbursement of part of paying interest costs on investment loans received for development of fish farming;
- reimbursement of part of costs for payment of interest on loans received for construction, reconstruction, modernization of fish farming and (or) fish processing;
- reimbursement of part of costs for payment of interest on loans received for construction and reconstruction of freezing capacities, capacities for production of processed fish products;
- design, reconstruction, overhauling of hydraulic facilities;
- purchase of machinery and equipment used in aquaculture, including the purchase of installations for closed water cycle;
- performance of works (provision of services) for supply of water to fishery water bodies;
- reimbursement of part of costs of sold aquaculture products grown by intensive technologies;
- reimbursement of part of costs for sold fish seeding material (for fish farms), as well as for purchased fish seeding material (for fish farms);
- purchase of feed.

Implementation of recommendations above will solve the problem of increasing aquaculture production in Russian regions.

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