

FISH PONDS AS A FACTOR OF DEVELOPMENT IN RURAL AREAS OF BOSNIA AND HERZEGOVINA

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Abstract

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This paper explains the impact of fish farms on the development of rural areas in Bosnia and Herzegovina. Fishing in Bosnia and Herzegovina was recognized as an opportunity for industrial production, tourism and placing high quality healthy food on market as well as rural development and the possibility of creating new jobs. In terms of agroclimatic conditions, Bosnia and Herzegovina has a very favorable geographical, hydrological, climatic and ecological conditions for fish production, which is reflected in the availability of water resources of rivers, lakes and marine fish farms. In Bosnia and Herzegovina there are 41 registered fish farms of freshwater and saltwater fish and it is estimated that there are about twenty unregulated fish farms. With the available resources, the existence of tradition in production, decades of existence of lake fish ponds and dynamic development of production in cages classify fish farming as a significant branch of economy, which ensures it in the domestic market, but also on the markets of neighboring countries, the European Union.

Key words

Fish farms, regional development, rural areas, Bosnia and Herzegovina

1. Introduction

The first written records on organized fishing in Bosnia and Herzegovina date back to the early Austrian authorities. Organized water protection and legality were introduced in 1886 when there was founded the first association of fishermen in Bosnia and Herzegovina. At the beginning, the company for exploitation of forests dealt with the development of fishing, and revenues were realized from fees for fishing licenses of professional fishermen. Certainly, what was the most important was the wealth of trees and water (www.organic.ba). Exploitation of forest resources in the 20th century and building of fish ponds in the early twentieth century were simultaneously followed by the development of land reclamation and traffic connections. It is a time of faster population growth and strengthening of urban markets. In connection with fishing, other industries are being developed such as shipbuilding, coal mining industry, production of electricity and salt. (Nurković 2006, 135)

In our work we analyze fish growers (common carp, trout and sea fish), which cover more than 21,000 ha in Bosnia and Herzegovina from a total of 14 large fish farms in Bosnia and Herzegovina (www.lir.ba). Due to the environmental problems, we are now in an absurd situation in which a man has to defend against the catastrophic consequences that he himself has caused solving the fundamental problems of modern life. Primarily it is necessary to point out that fish farms on the whole territory of Bosnia and Herzegovina are always related to the low relief and ecologically least favorable terrain, mostly impermeable composition. Nowadays in Bosnia and Herzegovina technology of fish farming and fish processing is extremely developed, which does not lag behind technology trends in the EU, and the existence of tradition in production and natural resources ensures high quality of fish and fish products. In addition, manufacturers import and consume food (the most important component in the process of fish farming) which is produced in the European Union, which created an additional prerequisite for high quality of products (Aganović 1979, 79).

2. Working methods and data sources

Methodological approach is imperatively suited to the purpose of work, so ponds and fish production have a strong impact on the local and rural development in Bosnia and Herzegovina. Research has covered the local and rural development of areas in Bosnia and Herzegovina. In assessing the economic contribution of the development of ponds and fish production, quantitative methods ranging from stochastic to deterministic are used almost exclusively (Šanić 2007, 147). Rating of direct contribution of fishing to local and rural economic development in Bosnia and Herzegovina. In the research of market potentials in Bosnia and Herzegovina, there were used analytical methods for determining of tendencies and the interdependence of phenomena, conditions and opportunities i.e. limiting factors of market development. There were used a standard desk research methods with the use of secondary data, including the data of companies engaged in the production of fish in Bosnia and Herzegovina. There were also used historical and normative methods, common for agro-economic researches. For the study of overall relations in production and fish market, there was used the balance sheet method, and for the assessment of further developments in the development of local fishing, the appropriate quantitative method. As a basic method of collecting primary data

sources, there was used a test method, i.e. in-depth interview, where the main instrument was an interview reminder.

3. Fish farms in rural areas of Bosnia and Herzegovina

It is primary to establish a regional dimension of fish farms in rural areas of Bosnia and Herzegovina. It is also important to see to what extent the fish farms in these areas impacted on regional gathering in terms of the development of settlements and population as well as the development of traffic (Nurković 2012, 231-247). We should mention the importance of the fish ponds in the tourist valorisation and their impact on the possibilities for development of industry. Bosnia and Herzegovina has significant unpolluted water resources. Bosnia and Herzegovina has the centuries-old tradition of breeding salmonid and cyprinid fish species. On the territory of Bosnia and Herzegovina on average falls around 1,250 l/m² of rainfall per year, that is 250 l/m² more than the European countries average. Water resources are seven river basins: the Una, Vrbas, Bosna, Drina, Sava, Neretva with Trebišnjica and Cetina, of which 75,7% belong to the Black Sea catchment and 24,3% to the Adriatic Sea catchment, a large number of river (on the Pliva and Una) and mountain lakes (in the Dinarides) and underground (thermal, geothermal and mineral) water. Bosnia and Herzegovina also has 27 water reservoirs with a total usable volume in 1991 amounted to 3,000 million m³. Besides, the 25 km coast of the Adriatic Sea belongs to Bosnia and Herzegovina, which is all located in the municipality of Neum. In Bosnia and Herzegovina, there are 41 fish farms of freshwater and saltwater fish registered in the Veterinary Office of Bosnia and Herzegovina. The existing capacities in aquaculture in 2008 were used about 75%, and a number of high-quality farms, due to devastation, scarce material resources and problems with property rights and privatization use only 35% capacity (Hamzić 2003, 118-129).

Aquaculture products in Bosnia and Herzegovina are competitive to global market, and built processing facilities allow more quality products. Due to the quality hydrographic resources, production facilities, processing capacities, long-standing tradition and education of staff, and with the help of the state, it is possible to successfully develop this branch of agriculture (Dujmušić 2000, 32). The first fish farm in Bosnia and Herzegovina was the fish farm "Vrelo Bosne" in Ilidza from 1894 and it had a capacity of 600,000 pieces of fish roe. In Prijedor, in 1902, carp fishing started. Production of salmonid fish farms in 1982 amounted to 1,086 tons, and the production of fish for consumption in 1990 was 3000 tons. Many fish farms are expanding their capacities and the new ones are being built. In 1991 in Bosnia and Herzegovina "Gornji Ribnik" - Ključ expands the surface area of 1,6 hectares, and "Martin-Brod" - Bihać for 0,86 hectares. A new fish farm "Grahovo vrelo" - Ljubuški of the area of 0,7 hectares is being built, and many other fish farms are being prepared for the construction (Pavličević 2004, 1-2). Therefore, in Bosnia and Herzegovina in this period, the usable area of cultivated salmonid fish farms of about 6,46 hectares increases (Tab. 1, Fig. 1).

Average yields of consumer trout amounted to about 180 tons per hectare. The new technology and the transition from feeding slaughterhouse remains to dry pallets food have contributed to such yield on salmon farms (Jahutka Mišura Suić 2005, 149-170). Every full-system fish farm also produces fish spawn for their own needs, and buys the ones that are not full-system (Jahutka Mišura Homen 2004, 71-77). In the period of 1992-1995 most ponds stopped working, and most of it was

destroyed. New momentum and strong development began in 1996 with the expansion of capacity, using better quality fish food and new technologies (Baltić Tadić 2001, 34-57).

Tab. 1: Leading fish farms in Bosnia and Herzegovina, area and production of 2010.

Fish farms	Useful volume water (m ³)	Production 2010 in t
Norfish Blagaj	6.100	250
Tropik Ribnik	12.000	500
Jezero Bočac	15.000	120
Okašnica Bugojno	5.000	64
Salmon Ljubuški	5.500	150
Neretva Konjic	12.500	120
Norfish Blagaj - Salakovac	kafez	450
Tropik Bočac - Crna Rijeka	kafez	250
Riba Co Drežnica	kafez	40
Zeriko Drežnica	kafez	37
Forele Salakovac	kafez	30
Duboka Bugojno	1.000	10
Šanica Jablanica	300	12
Maoča Brčko	600	14
Ribogojilište Milići	560	20
Perići Prozor	650	20

Source: Agency for Statistics of Bosnia and Herzegovina, 2008-2013.

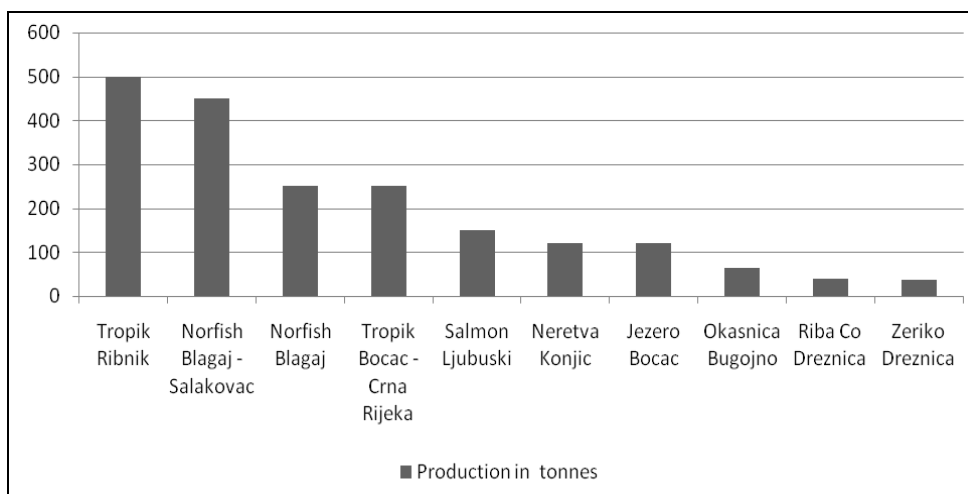


Fig. 1: Leading fish farms in Bosnia and Herzegovina, area and production of 2010.

Source: Agency for Statistics of Bosnia and Herzegovina, 2008-2013.

The existing capacities in aquaculture today are used about 75%, and a number of high-quality farms, due to devastation, scarce material resources and problems with property rights and privatization use only 35% capacity. With long-term strategy development, quality investments of the state and registration of all fish producers, this branch of agriculture could raise its production to 15.000 tonnes of fish for consumption. In addition to these, it is estimated that there are about twenty unregistered fish farms. Of course, among these farms there are major differences when it comes to capacity, the surface of objects, and at an annual production. During the year 2010, total production in aquaculture of Bosnia and Herzegovina

amounted to 7246 tons, or 3743 tons of salmonids, cyprinids 3325 tons and 178 tons of sea fish (Tab. 2).

Tab. 2: Total production in aquaculture of Bosnia and Herzegovina (in tons), 2010.

Fish Species	Production	Production	
Rainbow trout	3650	Salmonids	3.743 (52%)
Brown trout	62		
Brook trout	31		
Carp	2.670	Cyprinids	3.325 (46%)
Amur	236		
Bighead Carp	394		
Catfish	20		
Perch	5		
Sea Bass	69	Sea fish	178 (2%)
Bream	88		
Dentex	21		
Total fish	7246	7.246	
Total area		3.113 ha	

Source: www.organic.ba

In Bosnia and Herzegovina, fish farms are generally distributed in three main regions: cyprinidae, salmonid and marine (Fig. 2).

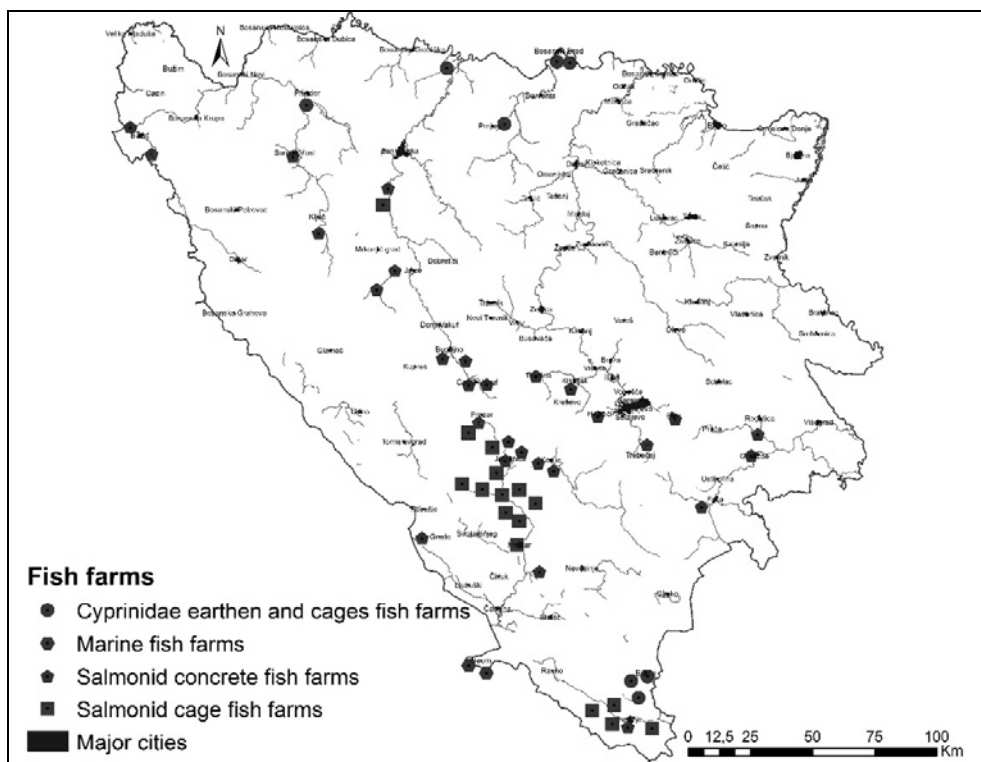


Fig. 2: Distribution of fish farms in Bosnia and Herzegovina, 2010.

Source: Nurković 2014.

4. The role and importance of ponds in the development of settlements and traffic

Building of fish farms necessarily imposed the need to build some permanent settlements, which took a part of the staff employed in fish farms (Woods 2009, 26-31). The essential feature of these settlements is that they in its development bind to the already existing surrounding places, so that neither of them became independent. In a functional sense, the settlements, expressed as parts of settlements, are exclusively focused monofunctionally, i.e. on fish farming and maintenance of the ponds. This is also reflected in their layout, i.e. in the existing content, where there is the blend of warehouses for food and fertilizer, then workshops, residential buildings, administration building, restaurants and so on. According to its location, built facilities are always connected to the main traffic, rail or road highway, which links the ponds to the loading terminal for fish (Potočnik Slavič 2010, 31-37). The mentioned settlements were developed as a direct result of the construction of the ponds at the beginning of this century. However, in some places near the built fish ponds, there already existed small settlements or economic activities, which parallel with the construction of the ponds became their center. Residents of these and such settlements are included immediately in the activities of fish farming, i.e. have become permanent labor on farms. A typical example is fish farming along the river courses of the Neretva, Trebišnjica, Bosna, Drina, Una, Sana, Sava and along natural and artificial lakes in Bosnia and Herzegovina. The first ponds were being built near the settlement of Mostar.

Here we primarily refer to the construction of access road highways and industrial trails that connected economic centers and ponds with reloading terminals on railway lines of normal track. Access roads, as well as access industrial tracks, had been already built in the initial development phase of the pond. Narrow gravel roads served as road access routes that are only in recent times, following the lifting of some railway trails, upgraded and paved. For distant markets fish were transported by trucks, along asphalt road, to the consumer. It should be added that beside these access roads and industrial rail tracks between the ponds and transfer stations, there were built adequate rail and road networks within each pond. This was necessary due to their more functional exploitation (supply of food and fertilizers, fish transport, etc.). In recent years, we have maintained the narrow-gauge railway in the fish ponds, due to the normal functioning of work. Construction of the railway and road network in the period of building of ponds, had not only the function of normal course of life and work technology in the fish ponds but also the function of shipment of fish on the market (Lorber 2005, 61-73).

5. Possibility of tourist valorization and industrial fish processing

In the modern period which is characterized by a relatively good traffic correlation, ponds distance from major urban centers is no longer a big obstacle. Nowadays ponds in Bosnia and Herzegovina are becoming interesting for urban part of the population that "escapes" from the polluted environment to yet "uncontaminated" nature. First of all, we refer to the people engaged in sport fishing and which number is growing more and more every year. In Bosnia and Herzegovina, in the year 1991, there were around 157 sports fishing associations with 19.234 members, and in 2013 there were 67 associations with 13.231 members. On the fish farms on certain waters, every holiday one can meet a relatively large number of these people. In particular, those are the residents of local centers who come to fish

ponds and catch fish. Increasing the number of sports fishermen and visits to the fish ponds, which have become more frequent, have given rise to construction of catering and tourist facilities on some ponds. They serve various fish specialities there, and some facilities offer even lodging. The fact that people are frequently visiting fish ponds confirms that ponds became in a sense a gathering place, especially on weekends and festive days. In terms of tourist valorization, the importance of fish ponds and depression zone, has significantly increased (Nurković 2013, 182-184).

So far ponds had no significant impact on the development of industrial processing of fish in Bosnia and Herzegovina. In short, the reason is that a very narrow range is included in the sale of freshwater fish. The freshwater fish is sold while still alive. Sales are, with some exceptions, focused mainly on the 3-4 months during the year, therefore almost exclusively seasonal. Because of the way of sale, trade networks for the trading of fish is almost completely separated from the other commercial networks. It is also numerically insufficient, so that marketing of fish represents a bottleneck of fishing industry in Bosnia and Herzegovina. Today's way of selling live fish will have to be supplemented in the future by selling concessionary fish. Fish production in Bosnia and Herzegovina is one of the few branches of the food industry which has succeeded to meet the standards and criteria set and ensure placing on the market of the European Union. In Bosnia and Herzegovina there are four fish-processing plants that have obtained an export license for the European Union, Tropic Banja Luka, Laks Mostar, Norfish Mostar and Zuvela Stolac. Bosnia and Herzegovina is, in spite of such a treatment of government, among the top ten producers of fish in Europe. According to statistical data of the State Statistics Agency in Sarajevo, it produces about 10.000 tonnes of fish for consumption, to which we still need to add roes, juvenile fish and 70% of the production is exported.

6. Conclusion

Fishing in Bosnia and Herzegovina was recognized as an opportunity for the production and placing of high quality healthy food on the market, then as rural development, as well as the possibility of creating new jobs. In Bosnia and Herzegovina in the former state, there were not any built and organized fish processing plants. As Bosnia and Herzegovina has a very rich water resources for freshwater fish production and as fish production is constantly on the rise, fish processing has prospects, especially if you want to achieve greater domestic production and consumption and reduce imports. The impact of new socio-geographic factors at the end of the 20th century (rapid population growth, urbanization and strengthen the cities' markets, hydromelioration activities, logging, construction of road and rail transport), and natural and geographical preconditions (depression character and tight composition, water and more favorable climate conditions) were important factors in the development of fishing in Bosnia and Herzegovina.

The construction of Norfish modern plant for freshwater fish processing in Salakovac, according to the standards of Norway, which is among the leading countries in the world in the production, fish farming, processing and placing of fish and fish products on the market, production and processing of fish in Bosnia and Herzegovina is also done in the plant Salmo Ljubuški, where only cleaning and freezing is performed in the process of fish processing. Fishing in Bosnia and Herzegovina at the beginning of its current development is a young production

branch, in spite of the multitude of natural resources we have for this economic activity. Contrary to the needs, it has been rarely found in the interest of official economic policy, so there are rare project approaches towards planning in this area. In the contemporary period which is characterized by a relatively good traffic correlation, ponds distance from major urban centers is no longer a big obstacle. Nowadays ponds in Bosnia and Herzegovina become interesting for the urban part of the population that "escapes" from the polluted city centers to yet "uncontaminated" nature. Besides that, it was found that it is necessary to raise awareness of the citizens about the importance of this sector, in which the veterinary services of countries play an important role.

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Summary

Fishing in Bosnia and Herzegovina was recognized as an opportunity for the production and placing of high quality healthy food on the market, then as rural development, as well as the possibility of creating new jobs. In Bosnia and Herzegovina in the former state, there were not any built and organized fish processing plants. As Bosnia and Herzegovina has a very rich water resources for freshwater fish production and as fish production is constantly on the rise, fish processing has prospects, especially if you want to achieve greater domestic production and consumption and reduce imports. The impact of new socio-geographic factors at the end of the 20th century (rapid population growth, urbanization and strengthen the cities' markets, hydromelioration activities, logging, construction of road and rail transport), and natural and geographical preconditions (depression character and tight composition, water and more favorable climate conditions) were important factors in the development of fishing in Bosnia and Herzegovina.

The construction of Norfish modern plant for freshwater fish processing in Salakovac, according to the standards of Norway, which is among the leading countries in the world in the production, fish farming, processing and placing of fish and fish products on the market, production and processing of fish in Bosnia and Herzegovina is also done in the plant Salmo Ljubuški, where only cleaning and freezing is performed in the process of fish processing. Fishing in Bosnia and Herzegovina at the beginning of its current development is a young production branch, in spite of the multitude of natural resources we have for this economic activity. Contrary to the needs, it has been rarely found in the interest of official economic policy, so there are rare project approaches towards planning in this area. In the contemporary period which is characterized by a relatively good traffic correlation, ponds distance from major urban centers is no longer a big obstacle. Nowadays ponds in Bosnia and Herzegovina become interesting for the urban part of the population that "escapes" from the polluted city centers to yet "uncontaminated" nature. Besides that, it was found that it is necessary to raise awareness of the citizens about the importance of this sector, in which the veterinary services of countries play an important role.

