
SUPPLY AND DEMAND OF FISH IN BOSNIA AND HERZEGOVINA

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ARTICLE INFO

Original Article

Received: 17 January 2022

Accepted: 28 February 2022

doi:10.5937/ekoPolj2202385J

UDC 338.439.62:636.98(497.6)

Keywords:

fish, production, foreign exchange, self-sufficiency, consumption

JEL: Q13, Q22

ABSTRACT

The primary goal of the paper was to analyze the fish market of Bosnia and Herzegovina (B&H). The paper presents the level of self-sufficiency and import dependence of fish for the period 2014-2020. The source of data was the data of the B&H Agency for Statistics and Indirect Taxation Authority of B&H. The following methods were applied: descriptive statistics, trend data and balance sheet method. On average, 3.161 tons of trout were produced in B&H per year, 82% of total fish production. Carp were produced 510 tons per year. Other freshwater fish are becoming less and less attractive for production. B&H's fish self-sufficiency is low (54%) and the average rate of import dependence is about 76%. The consumption of fish per capita is 2 kilograms. It is necessary to improve the education of the population throughout B&H about the importance of fish nutrition and the health aspects of its consumption.

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Introduction

Fisheries and aquaculture are important sectors, whose main task is to provide food of animal origin for human consumption. The production of fish, crustaceans, molluscs and other aquatic animals in 2018. in the world amounted to 178.5 million tons, which is an increase of 3.4% compared to 2017. (FAO, 2020). The estimated production of freshwater aquaculture in the EU in 2018. had a value of about 910 million euros, with France, Poland and Italy being the main producers (by volume and value) with about

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40% of total freshwater production. EU carp production in 2018. was around 70,000 tonnes, but rainbow trout is the leading freshwater produced species in Europe, with an estimated trout market in the EU in 2018. around 237,200 tonnes (EUMOFA, 2021).

The importance of fish as an agricultural commodity, which has become an important global commodity, is reflected in the steady increase in demand for fish (Kura et al., 2004). Aquaculture is practiced in almost every European country with the largest producers being Spain, France, UK, Greece and Italy (Bostock et al., 2016) Kranai (2018) states that the importance of freshwater fish production is growing at the European level as well as in Hungary, given that in global meat production, the position of fish and fish products is becoming increasingly important because a quarter of the world's supply of animal protein is produced by fisheries and aquaculture.

For decades, trends in fish hunting and aquaculture production have been analyzed and observed to understand changes in fish supply that affect the demand for these resources from rich urban to poor rural areas, and aquaculture has grown steadily since the 1970s making it one of the fastest-growing sectors in the world in whole agriculture (Rosegrant et al., 2004). According to the same authors, the structure of global supply and demand for fish has changed significantly in the last few decades. The gap in global fish demand and supply can be used to measure the growth potential of aquaculture globally because aquaculture is expected to be the main, if not the only source of growth in fish supply. However, in addition to domestic aquaculture, the supply of fish in one country may also be from imports (Cai & Leung, 2017).

The freshwater sector is by far the oldest in European fish farming, it is divided into 2 main components, those of rainbow trout and common carp. This distinction principally reflects climatic conditions where rainbow trout is more suitable for temperate environments with carp being better in the more extreme continental conditions seen in Central Europe (Bostock et al., 2016). Based on intra-EU-28 trade, Denmark is considered a major exporter, followed by Romania and Hungary. Based on market circumstances and consumer habits in the EU, it can be concluded that the market share of trout products is constantly increasing (Karnai, 2018).

The conditions of the aquaculture industry should be more favorable by switching to a healthy lifestyle, with the trend of increasing fish consumption per capita, and with the stabilization or decline of wild fish catches (Oikonomou & Polymeros, 2015). Maciel et al. (2019) state that regular consumption of fish can be associated with a healthier lifestyle that leads to a better perception of quality of life. De Bruyn et al. (2021) state that it is essential to ensure that increases in national fish supply translate to nutritional benefits for the most vulnerable.

EU trade in fishery and aquaculture products (imports and exports) in 2019. amounted to 33.37 billion euros and 8.55 million tons, making the EU the second largest trader in the world, after China. Imports, which accounted for around 80% of the total, amounted to EUR 27.21 billion and 6.34 million tonnes. Most countries, and the EU as a whole, remain highly dependent on resources from outside EU waters. Since 2000, the EU28

member states have reduced their degree of self-sufficiency by 7% – a significant decline (Carpenter and Owen, 2018).

B&H foreign trade in fishery products for the period 2010-2014. indicates that the value of imports exceeds the value of exports, which B&H, within chapter 3 of the harmonized system of customs tariffs, records a deficit in foreign trade (Pavličević et al., 2015). B&H in the period 2014-2017. had a surplus (quantitatively and in value) in the foreign trade of trout (domestic production exceeds domestic needs) which makes the self-sufficiency of this product positive (Ostojić et al., 2019).

In 2018. the world consumption of fish per capita was 20.5 kg (FAO, 2020), while in the EU in 2019. it was 23.82 kg (EUMOFA, 2020).

The EU trout self-sufficiency in 2018. was about 90% and the average consumption of trout was 0.42 kg per capita (live weight equivalent). The highest consumption of carp per capita is in Hungary with 1.41 kg, followed by the Czech Republic with 1.15 kg, Lithuania with 0.9 kg, Poland and Romania with 0.56 kg per capita (EUMOFA, 2021).

The amount and frequency of fish consumption can be increased by certain policies, such as training, advertising, and various marketing strategies (Can et al., 2015). Kaygisiz and Eken (2018) state that insufficient activity of marketing services leads to non-transparency of the fish market. Ostojić et al. (2017) state that during the analysis of the fish market in the city of Banja Luka (B&H) 41% of respondents stated that they are not sufficiently informed about fish as food and 59% of respondents state that they are informed about fish as food through various media, promotion and oral recommendations.

This paper aims to describe the situation in the B&H fish market for the period 2014-2020. in terms of quantity through the analysis of supply and demand.

Material and method

Through the analysis of supply and demand, it was aimed to estimate the level of self-sufficiency on the domestic market as well as the import dependency. The research was conducted based on available official secondary data, the so-called “desk research method”. Certain data were taken from the website of the Agency for Statistics of Bosnia and Herzegovina and referred to:

- fish production in B&H for the period 2014-2020.
- estimated population in B&H for the period 2014-2020.

Foreign trade of Bosnia and Herzegovina, in quantitative terms, is observed according to the harmonized system of product classification (HS) within chapter 3 (fish and crustaceans ...) for customs tariffs 0301 to 0305 (trade in live, fresh or chilled, frozen fish, fish fillets as well as dried, salted, smoked fish, etc.). Data of international fish exchange were obtained on request from the Ministry of Agriculture, Forestry and Water Management of the Republic of Srpska and based on data from the Indirect Taxation

Authority of B&H. Basic indicators of descriptive statistics were used to assess the dynamics and stability of production, exports and imports. Based on the collected data, the import dependency ratio, self-sufficiency ratio and the indicative consumption of fish per capita were calculated. The calculation of these indicators is based on the FAO methodology (2012).

The starting equation in the above methodology is the following:

$$Production + Import = Consumption + Export$$

The assessment of the Import Dependency Ratio (IDR) was calculated according to the formula (neglecting the impact of stocks), (FAO, 2012):

$$IDR = \frac{Import}{Production + Import - Export} \times 100$$

Self-sufficiency is the capacity of the state to satisfy the demand from its production, and it is calculated as the ratio of domestic production to domestic consumption (EUMOFA, 2020). The Self Sufficiency Ratio (SSR) was calculated according to the formula (FAO, 2012):

$$SSR = \frac{Production}{Production + Import - Export} \times 100$$

The indicative consumption of fish per capita is calculated using the following formula:

$$Per\ capita\ consumption = \frac{Production + Import - Export}{Estimated\ population}$$

The success and accuracy of the calculation largely depend on the reliability of the data as the basic inputs in the model.

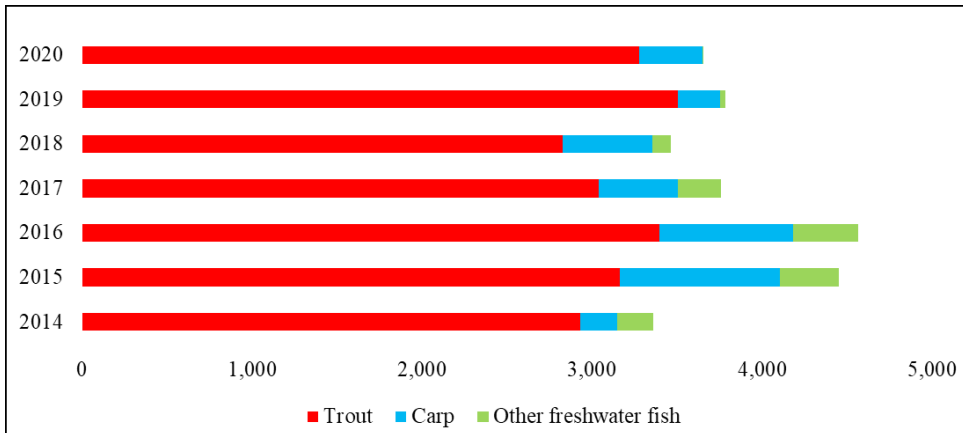
Results and discussion

Fish production in Bosnia and Herzegovina

Freshwater fish species production in Bosnia and Herzegovina has a long tradition, while farmed marine fish species have a negligible share in total fish production, and catches of fish from the sea have not been registered. The production of trout, carp and other freshwater fish species at the level of B&H is shown in *Figure 1*. It is noticeable that in the structure of fish production, trout dominates. Average annual production of freshwater fish species in B&H (trout, carp and other freshwater fish) for the period 2014-2020. was 3,862 t, of which the share of trout was 3,161 t (82%), carp 510 t (13%) and other freshwater fish species 190 tons (5%) of the total production of freshwater fish species. Trout production in Bosnia and Herzegovina increased at an average annual rate of 1.9%. Carp had an even more pronounced growth for the analyzed period,

growth of 9.3%, but with modest produced quantities. In general, fish production at the level of B&H had a significant growth rate of 1.42% in the observed period and varied 12.09%, which shows that the production depends on yearly conditions of production. Aquaculture has been growing steadily since the 1970s, making it one of the fastest-growing sectors in agriculture (Rosegrant et al, 2004).

Figure 1. Fish production (t) in Bosnia and Herzegovina

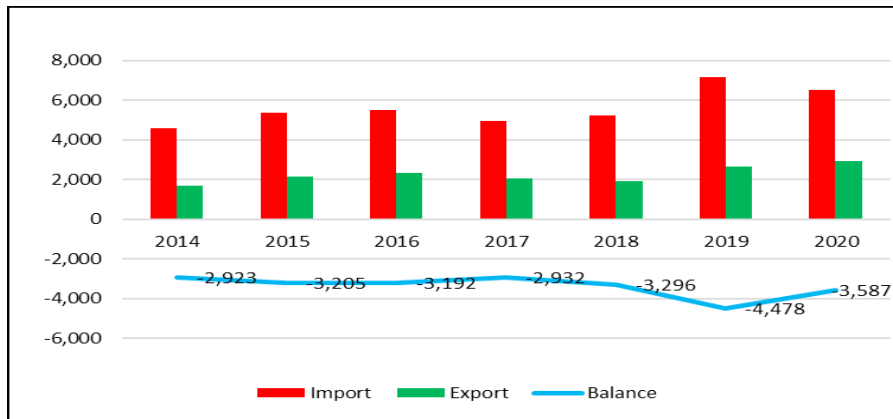


Source: Agency for Statistics of Bosnia and Herzegovina, authors calculation

Karnai (2018) and the data of EUMOFA (2021) showed that trout is the species that is mostly grown in Europe, which is also the case for B&H as well. When it comes to carp production, it is modest in B&H. EUMOFA (2021) states that of the total world production in the EU is produced only 2% of carp (about 4.2 million tons in 2018), and most of that production (71%) is concentrated in Central and Eastern Europe (the Czech Republic, Poland and Hungary).

Bosnia and Herzegovina's fish trade exchange

The foreign trade of fish of Bosnia and Herzegovina was analyzed only quantitatively. In the analyzed period, B&H imported on average 5,479 t of freshwater and marine fish, while export was much lower and averaged 2,141 t. *Figure 2* shows the foreign trade deficit, which averages about 3,400 tons per year for the analyzed period. The largest deficit is presented in 2019. and the smallest was in 2014. i.e. the foreign trade balance is increasingly unfavorable because the deficit grows every year at an average rate of 3.5%. The presented results confirm the previous research of Pavličević et al. (2015) on the deficit in B&H foreign trade in fishery products. Fish imports to Bosnia and Herzegovina from 2014. to 2020. grew by 6.0% per year. Exports also grew on average at 9.8%. The stability of imports and exports is relatively stable because there were no pronounced oscillations in the exchanged quantities ($Cv_i = 16.02\%$ and $Cv_e = 19.49\%$).

Figure 2. Fish trade exchange balance of Bosnia and Herzegovina

Source: Ministry of Agriculture, Forestry and Water Management of the Republic of Srpska, based on data from the Indirect Taxation Authority of B&H, author's calculation

It is interesting to note that B&H exports almost 59% of the produced quantities of fish on average (2014-2020.). One of the reasons is probably the higher price when exporting fish, and the other fact is that trout dominates in production and that the duty-free quota for trout exports to the EU market is up to 500 tons (Savić et al, 2018). Kura et al. (2004) state that the growth of demand for fish is pronounced, while Cai and Leung (2017) point out that globally is expected that aquaculture will be the main, if not the only source of growth in fish supply. In addition to domestic aquaculture, fish supply in one country can also be from imports.

Fish self-sufficiency of domestic market

Table 1 shows the elements of the relationship between the supply and demand of fish on the domestic market (B&H) for the observed period. The rate of dependence on imports was the most unfavorable in 2020. B&H had the lowest dependence on imports in 2015. The average dependency rate in the analyzed period was 77.66%. In the observed period, it is noticeable that with the increase in domestic production, self-sufficiency is also increased, according to Carpenter and Owen (2018), which also conclude that the EU level of self-sufficiency in 2016. was around 52%. On average, slightly more than half of the domestic needs (54%) can be satisfied from own production. B&H had the lowest self-sufficiency in 2019. and the highest in 2016.

According to the OECD-FAO (2019) Agricultural Outlook in Europe, consumption in the world is projected to increase by about 0.5 kg per capita by 2028. In comparison with these values, it can be concluded that the consumption of fish per capita in B&H is extremely low. According to the author's calculation, it is estimated that in B&H for the analyzed period on average 2.07 kg of fish per capita was consumed. EUMOFA (2020) data can also be used as a comparison of fish consumption, where it is stated

that per capita consumption in the EU decreased from 24.79 kg in 2017. to 24.36 kg in 2018. which means that EU citizens consumed on average 0.43 kg less fishery and aquaculture products.

Fish dependence is a powerful concept that illustrates how much excessive consumption exceeds domestic resources (Carpenter and Owen, 2018). Bosnia and Herzegovina produced 1.1 kg of fish per capita in the observed period. Babović et al. (2011) also reported low fish production in Serbia (1.7 kg/capita) while total consumption was 5.7 kg/capita. This indicates that the requirements of the fish market in our country and the region are significantly higher than the quantities of produced fish. Global increases in consumption of food fish will predominantly take place in developing countries where the population is growing and higher-income allow the purchase of high-value fisheries items for the first time by many people (Rosengrant et al., 2004)

Table 1. Basic indicators of fish self-sufficiency in B&H (2014-2020.)

Parameter/Year	2014.	2015.	2016.	2017.	2018.	2019.	2020.
Production, t	3,358	4,450	4,564	3,761	3,465	3,782	3,655
Import, t	4,609	5,362	5,534	4,977	5,232	7,158	6,545
Export, t	1,686	2,157	2,342	2,045	1,936	2,680	2,958
Import Dependency Ratio (IDR, %)	73.38	70.06	71.35	74.36	77.39	86.66	90.38
Self Sufficiency Ratio (SSR, %)	53.46	58.13	58.85	56.19	51.25	45.79	50.47
Production per capita fish (kg)	0.95	1.26	1.30	1.07	0.99	1.08	1.05
Per capita consumption, kg	1.78	2.18	2.21	1.91	1.93	2.37	2.08

Source: Author's calculation

The degree of self-sufficiency is important because it reflects the current state of affairs, trends are also important because they reflect the longer-term implications (Carpenter and Owen, 2018). The results from **Table 1.** shows that fish production in B&H is oscillating, which is of course compensated by imports.

EUMOFA (2020) also confirms this market situation by stating that the decrease in total production is partially offset by an increase in imports. Fish consumption is also related to consumer habits, lifestyle but also the approach to consumption between and within the household (Karnai 2018., Maciel et al., 2019. and De Bruyn et al., 2021). Can et al. (2015) believe that the amount and frequency of fish consumption can be increased by certain policies, such as training, advertising, and various marketing strategies.

Conclusion

The analysis shows that the fish market of Bosnia and Herzegovina has a strong demand and needs to increase domestic fish production to harmonize the relationship between supply and demand. Production showed small variation during the seven years and a slight increase which is certainly not enough to meet domestic needs for this product.

For the observed period, imports increased more intensively than export. Bosnia and

Herzegovina showed a quantitative deficit in foreign trade exchange in fish during the analyzed period. The smallest deficit was recorded in 2014. while the largest in 2019. The foreign trade deficit increased by slightly less than 700 tons from 2014. to 2020.

During most of the observed seven-year period, there is an imbalance between production and consumption. According to the results of the research, there is a high dependence on the import of fish into the domestic market. Consumption of fish per capita in B&H is significantly below the world and European average. Consumption of fish is largely conditioned by the habits and traditions of consumers in consumption, which is not particularly pronounced in our market. To influence the higher demand and consumption of fish in the diet, it would be necessary to intensify the promotion of fish consumption from the nutritional and health aspect.

Conflict of interests

The authors declare no conflict of interest.

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