Food and agriculture Organization of the United Nations

This project is funded by the European Union

The Fisheries and Aquaculture Sector in Bosnia and Herzegovina

Preparation of IPARD Forest and Fisheries Sector Reviews in Bosnia and Herzegovina

22 January 2015

FAO Regional Office for Europe and Central Asia

Analysis of the Fishery and Aquaculture Sector in Bosnia and Herzegovina

EU funded project "Preparation of IPARD Forest and Fisheries Sector Reviews in Bosnia and Herzegovina"

Regional Office for Europe and Central Asia
Food and Agriculture Organization
of the United Nations

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Contents

ABBREVIATIONS, ACRONYMS AND CURRENCY EQUIVALENTS

AFRD	Agriculture, Food and Rural Development
APR	Annual percentage rate of charges
BAM	Bosnian Convertible Mark
BD	Brčko District
BiH	Bosnia and Herzegovina
CFP	Common Fisheries Policy
CN	Combined nomenclature
COMTRADE	Common Format for Transient Data Exchange
CSI	Core set indicator
DD	Decomposition days[1]
EAPR	Effective annual percentage rate of charges
EC	European Commission
EU	European Union
EUR	Euro
EUROSTAT	Statistical Office of the European Communities
FBIH	Federation of Bosnia and Herzegovina
FAO	Food and Agriculture Organization of the United Nations
b	Instrument for Pre-Accession Assistance
IPARD	Instrument for Pre-Accession Assistance for Rural Development
IRBRS	Investment Development Bank of Republika Srpska
IUU	Illegal, Unreported and Unregulated
MAFWM RS	Ministry of Agriculture, Forestry and Water Management of the Republika Srpska
MAWMF FBIH	Ministry of Agriculture, Water Management and Forestry of the Federation of Bosnia and Herzegovina
MCO	Microcredit Organization
MFN	Most Favoured Nation
MIS	Market Information System
MoFTER	Ministry of Foreign Trade and Economic Relations of BIH
MT	Metric tonne
NAPR	Nominal annual percentage rate of charges
NEAP	National Environmental Action Plan
NMS	New Member States (of the EU)

1 It is 500 for fish in the EU which is calculated on the basis of the actual daily average water temperature. In case the water temperature 10, 15 or 20 oC the needed days to wait after using a drug or medicine registered for other animals will be 50, 33.5 and 25 days respectively.

NPAA	National Program for Adoption of the Acquis
PSC	Project Steering Committee
R&D	Research and Development
RB FBIH	Development Bank of the Federation of Bosnia and Herzegovina
RD	Rural Development
RS	Republika Srpska
SAA	Stabilization and Association Agreement
SFA	Sport fishing Association
SME	Small and Medium Sized Enterprise
SVO	State Veterinarian Office
SWOT	Strengths, Weaknesses, Opportunities and Threats (analysis)
USD	American dollar
TSS	Total suspended solids

ANNEXES

TABLES IN TEXT

2 Calculated by the data of Table A7-2
3 There are no deviations (reductions) for family enterprises.

BOXES IN TEXT

FIGURES IN TEXT

Introduction

This is one of the seven sector analyses (Meat and Dairy; Fruit and Vegetables; Cereals; Wine; Diversification, Fishery and Aquaculture, and Forestry) that have been prepared since spring 2011 for the agricultural authorities in Bosnia and Herzegovina at state, entity and Brčko District level. The sector analyses are inputs to the design of measures to be financed under the European Union (EU) Instrument for Pre-accession Assistance for Rural Development (IPARD), – once available – as well as for the design of the country's policy interventions in general.

The analyses were commissioned and monitored by the Delegation of the European Union to Bosnia and Herzegovina. The overall coordination of the studies was carried out by Gerold Bödeker, Lead Technical Officer, Regional Office for Europe and Central Asia of the Food and Agriculture Organization of the United Nations (FAO) in Budapest.

Report structure

The report is structured as follows:

The report contains an executive summary (Chapter 1), a presentation of context, objectives and methodology (Chapter 2), an overall description and review of the sector (Chapter 3), an overview of sector related governmental policies and the money-lending/financial sector (Chapters 4 and 5), a summary of the attainment of relevant EU standards (Chapter 7), strengths, weaknesses, opportunities and threats (SWOT) identified in the sector (Chapter 7), while in Chapters 7, 8 and 9 there is a conclusion, the needs in the sector are identified and the recommendations are discussed respectively.

The review is supported by eight annexes in which source and basic data is presented. The analysis also contains data tables to provide detailed information for readers and decision makers.

Study team

This review was expounded by the following team:

- Adem Hamzić, National Consultant – survey of fish farms and provision of specific and background information and elaboration of the database
- Nikola Ugarčina, National Consultant – survey of fish farms and provision of specific and background information and elaboration of the database
- András Péteri, International Consultant – coordination of survey of fish farms, provision of specific and background information and calculation of effluent loads and elaboration of the database
- András Woynárovich, International Consultant – backing of the work of consultants, research of general and specific background information and elaboration and evaluation of database and writing up the review
- Éva Kovács, Fishery and Aquaculture Expert, Regional Office for Europe and Central Asia, FAO – technical supervision and coordination, leading of workshops and meeting and writing up of the review
- Thomas Moth-Poulsen, Senior Fishery and Aquaculture Officer, Sub-regional Office for Central Asia, FAO – technical supervision of the preparations and elaboration of the review

Acknowledgements

The FAO team would like to extend its sincere thanks for the assistance and close collaboration in the implementation of the project to the following organizations and individuals:

- Delegation of the European Union to Bosnia and Herzegovina
- BiH Ministry of Foreign Trade and Economic Relations (MoFTER):

  Mr Ljubiša Lalović

  Mr Amir Lubovac
- Federation of BiH (FBiH), Ministry of Agriculture, Water Management and Forestry:

  Ms Tina Orahovac
- Republika Srpska (RS), Ministry of Agriculture, Forestry and Water Management:

  Mr Ranko Grubešić
- Brčko District (BD), Department for Agriculture, Forestry and Water Management:

  Mr Ferhat Čejvanović
- Mr Vlado Pijunović and Ms Amela Kozić, FAO
- Participants of the five SWOT workshops and the multitude of interviewees.

1. EXECUTIVE SUMMARY

1.1 Background objectives and outcome

BiH is a potential candidate country for EU accession following the Thessaloniki European Council of June 2003. On 16 June 2008 the EU and BiH signed the Stabilization and Association Agreement (SAA), which will enter into force once its ratification process has been completed. An Interim Agreement on Trade and Trade-related issu es, which was signed on the same day, entered into force on 1 July 2008 (European Commission, 2014 E).

Some provisions of the Stabilization and Association Agreement clearly state that "*Cooperation between the Parties shall focus on priority areas related to the Community acquis in the field of agriculture and veterinary and phytosanitary domains.*" (European Union, 2012).

After adoption of Council Regulations (EC) No. 1085/2006 establishing the Instrument for Pre-Accession Assistance (IPA) on 1 August 2006, with an effect of that new instrument from 1 January 2007, the Framework agreement between BiH and the Commission of the European Communities on the rules for cooperation to implement EC financial assistance to BiH under the Instrument for Pre-Accession Assistance (IPA) (Delegation of the European Union to Bosnia and Herzegovina and EU Special Representative, 2014; www.europa.ba) was signed. This was a major milestone on Bosnia and Herzegovina's road to Europe.

As a pre-candidate country, Bosnia and Herzegovina cannot yet take full advantage of IPA support. Preparations are being made and should be accomplished by the time Bosnia and Herzegovina becomes an EU candidate country, and when the implementation of the IPARD (Instrument for Pre-Accession Assistance for Rural Development) support for agricultural and rural development is initiated.

The main objective of the report is to provide a comprehensive analysis of the Fishery and Aquaculture sector in Bosnia and Herzegovina. The report contributes to the analysis of the internal strengths and weaknesses of, as well as of the external opportunities and threats to, the sector. In light of the needs of the sector, the problems it is facing and the challenges ahead, investment needs are estimated and policy recommendations are formulated. In this way, the report contributes to the formulation of a number of possible policy interventions for agriculture and rural development policy in line with the needs for the development of the sector. The study presents:

- Background and key figures of the sector;
- Structural characteristics of the sector;
- Market and trade;
- Government policy for the sector at state and entity levels;
- Level of attainment of relevant EU standards;
- Development in terms of investment;
- Identification of potential and needs in the sector and provision for related recommendations.

The outcome of the sector review includes a transparent overview of the sector, an analysis of the potential and obstacles to realizing this potential, as well as IPARD type measures and recommendations in order to target investments.

1.2 Methodology

The fishery and aquaculture sector analysis has been drafted based on both primary and secondary data. Primary data was collected through surveys of fish farms, interviews and workshops with fish producers, anglers and concerned stakeholders, prepared by consultants of the study team. The data and information was processed and analysed, and conclusions will be referred to as those of the "Sector Consultants". Secondary data was collected from various sources through "desk research". These sources are indicated as appropriate.

1.3 Description of the sector

The Fishery and Aquaculture sector in BiH includes artisanal and recreational fisheries on marine and inland waters. The latter is exclusively associated with angling (sport fishing). The main types of aquaculture production systems are pond, tank and cage cultures. In addition to fish culture systems, some enterprises also produce molluscs.

BiH is rich in high quality water resources. In addition to the huge and dense web of rivers there are also natural and artificial lakes. All natural waters in BiH are under state or entity ownership, although ownership rights can be given or leased to public and private organizations. At present no sufficient reliable data is available about ownership structures for inland water.

A department at the Ministry of Foreign Trade and Economic Relations is assigned to act as a mediator between the entities and as an interface in the country's international relations. Consequently, the entities that are competent in water resource issues

are the Ministry of Agriculture, Water Management and Forestry (MAWMF) in FBiH, the Ministry of Agriculture, Forestry and Water Management (MAFWM) in RS and the Department of Spatial Planning in BD.

There are 213 species of fish fauna in BiH. Seventy six (36 percent) of them are marine, 26 (12 percent) are diadromous and 111 (52 percent) are freshwater fish species (Hamzic, A. and Suad, L., 2009).

There are a total of 164 angling associations (with about 17 000 licensed members) (Study Team, 2014). Sport fishing societies do not receive any strategically defined state support, even though sport fishing is a widespread and popular recreational activity. In addition, these organizations are obliged to guard state property fish fauna throughout the country.

There are 123 operational aquaculture culture enterprises in the country while 27 enterprises trade only in fish (Farm surveys of Study Team, 2013 and 2014). The licensing procedure for both fisheries and aquaculture is rather complicated and in many cases competent authorities are also uncertain how relevant laws should be applied. This is mainly because the fisheries laws are not supported by clear by-laws, implementation guidelines and regulations. For these reasons 44 percent of fish farms are not yet licensed in BiH (Farm surveys of Study Team, 2013 and 2014).

Though there are subsidies in two entities (in BD this is entirely missing) they are different both in terms of administration and in technical aspects. In addition, they seem cumbersome to obtain due to complex administrative procedures and insufficiently systematic processes.

At present there is no monitoring and supervision in the fishery subsector, while in aquaculture the national statistical system (which is otherwise EU compatible) is poorly implemented.

There are two development banks (one for FBiH and one for RS) which finance small and medium-sized enterprises, but access to loans is complicated and difficult due to complex administrative procedures and numerous documentation and permissions that are sometimes costly and require time and energy to collect. There are twenty eight commercial banks in BiH. These banks act as partners of the development banks but they do not have their own loan products for fisheries and aquaculture, while the eight micro-credit institutions are considered too expensive for the sector (Association of Leasing Companies in BiH, 2014).

1.4 Recommendations

There are three fields in which actions are needed in order to improve the efficiency and sustainable development of the sub-sectors of both fisheries and aquaculture. These are:

- Sector administration;
- Capacity building of key stakeholders;
- Support for basic investments.

Improved sector administration is the first step to be completed. This should include strategic action in the form of upgrading the status of the sector, improving sector administration with state level coordination measures, fine tuning legislation (defining rules and regulations for the implementation of the laws on fisheries and aquaculture), enforcing laws, and public friendly licensing of existing and new fish farms.

Technical support and trainings are the second main group of recommended actions. Related actions should include technical support and trainings for government organizations to support services and to fisheries/angling organizations and fish farmers.

The third group of recommended interventions in the field of inland fisheries and aquaculture are **investments** in the form of equipping angling associations and fish guards, installing mechanical filters at land based trout farms and equipping fish farms with fish transport devices and with fish processing and preservation units.

In view of the objectives and their implementation through the set measures, the Review Team found that all recommended programs are eligible for IPARD support, once available, totalling about BAM 11 533 500 (about EUR 5 897 000) (see details in Tables 9.1 and 9.2 of Chapter 9).

2. BACKGROUND AND CONTEXT FOR THE SECTOR ANALYSES IN BIH

This introductory chapter provides general information about Bosnia and Herzegovina (BiH). It also describes the context of the sector analyses regarding preparation for EU accession, the objectives of the sector reports and the methodology used in the preparation of the Fishery and Forestry sector analysis. Finally, the section presents central key figures related to the BiH economy and to the agricultural sector specifically.

2.1 General information about BiH

Bosnia and Herzegovina is located in the western part of the Balkan Peninsula and covers an area of 51 129 km^2. In 1990, Bosnia and Herzegovina held its first democratic multiparty elections and in early 1992 it became an independent country (BiH Statistical Agency, 2013).

Fact box 1: Key features of Bosnia and Herzegovina

• Total Area: 51 000 km^2 of which 12.2 km^2 are water bodies • Arable land: 19.84 percent • Permanent crops: 1.92 percent	• Population: 3 831 555 million • Capital: Sarajevo • Major languages: Bosnian, Croatian and Serbian • Life expectancy: 72 years (men), 78 years (women) (UN)

Source: BiH Statistical Agency, 2013 and UNDP, 2013

BiH has borders with Serbia to the East, Montenegro to the South East, Croatia to the North and West, and a 12 kilometre coastline on the Adriatic Sea. Its landscape varies from high altitude central mountains to arable land in the north and Mediterranean vineyards in the south, with most of the major towns being located in valleys. Climatically, Bosnian summers last from May to September and are warm and humid, whilst winters tend to be foggy and snowy and last from November to February. Autumn and spring are usually short.

Figure 2.1: Map of BiH larger cities

Source: FAO, 2012

Bosnia and Herzegovina consists of two entities and the Brèko District (BH). The Federation of Bosnia and Herzegovina (BiH) covers 50 percent of the territory and Republika Srpska (RS) about 49 percent of the territory. Brèko District covers the remaining one percent of the total territory (Agency for Statistics of Bosnia and Herzegovina, 2014).

Fact box 2: GDP and related data

• GDP: EUR 13.485 billion (2013) • Agricultural GDP: 18.5 percent (2013) • GDP per capita: EUR 3 518 (2013)	• Main export products: Wood and paper, metal products • Main agricultural products. Fresh cows' milk and dairy products

Source: Agency for Statistics of Bosnia and Herzegovina, 2014

The current administrative divisions (Figure 2.2) are based on the lines drawn up as part of Dayton Peace Agreement in 1995. The Federation of Bosnia and Herzegovina, Republika Srpska and Brèko District all have their own constitutions. According to the preliminary results of the Census in Bosnia and Herzegovina the total population is 3 791 622, out of which 2 371 603 live in FBiH, 1 326 991 in the Republika Srpska and 93 028 in Brèko District (Agency for Statistics of Bosnia and Herzegovina, 2014).

The Federation of Bosnia and Herzegovina is decentralized. It consists of 10 Cantons (each with its own government) and 79 municipalities. The

Government of the Federation of Bosnia and Herzegovina shares and delegates some of its competencies with the Cantonal administrations. Both the Government and the Cantons have the right to determine policy and to adopt laws that pertain to any of their competencies. Where competencies are further delegated to the municipalities (the lowest administrative level), their activities are financed and supervised by the Cantons (Agency for Statistics of Bosnia and Herzegovina, 2014).

Figure 2.2: Administrative division of Bosnia and Herzegovina

Source: Agency for Statistics of Bosnia and Herzegovina, 2014

Republika Srpska is centralized and has no Cantons. It shares and delegates some of its competencies directly with 58 municipalities and six cities. The Brèko District (comprising the entire territory of the former Brèko municipality) is a self-governing administration under the direct jurisdiction of Bosnia and Herzegovina (Agency for Statistics of Bosnia and Herzegovina, 2014).

2.2 Context and objective of the sector analyses

2.2.1 General Context of the sector analyses: Preparation for EU accession

Bosnia and Herzegovina is a potential candidate country for EU accession following the Thessaloniki European Council of June 2003. In June 2008 the EU and Bosnia and Herzegovina signed the SAA. An Interim Agreement on Trade and Trade-related issues entered into force on 1 July 2008 and the Council adopted a new European partnership with Bosnia and Herzegovina on 18 February 2008 (Agency for Statistics of Bosnia and Herzegovina, 2014).

Bosnia and Herzegovina has benefited from EU autonomous trade measures since 2000. After the Interim Agreement came into force on 1 July 2008, EU access to products from Bosnia and Herzegovina has expanded, and EU exports to the country have been granted trade preferences.

Bosnia and Herzegovina and the EC signed the Financing Agreement for the IPA 2007 National Programme on 31 July 2008, which was a major milestone on Bosnia and Herzegovina's road to Europe. The total financial allocations within the IPA 2007 -2013 are approximately EUR 655.5 million (Delegation of the European Union to Bosnia and Herzegovina and EU Special Representative, 2014; www.europa.eu).

As a pre-candidate country, Bosnia and Herzegovina cannot yet take full advantage of IPA support. Preparations are being made and should be accomplished by the time Bosnia and Herzegovina becomes an EU candidate country, and when the implementation of the IPARD supports for agricultural and rural development is initiated. So far, there are no specific projects toward IPARD, pending the country's progress in ensuring key sector priorities in place, namely a country wide sector strategy and IPARD set up.

2.2.2 Objectives of the fishery and aquaculture sector report

The Fishery and Aquaculture Sector Analysis is one of the two additional sector studies prepared in 2014 as a basis for the design of the EU IPARD Program, once available, and for the country's policies improvements in general.

The main objective of the report is to provide a comprehensive state of the art of the Fishery and Aquaculture sector in Bosnia and Herzegovina. Therefore, the report contributes to the analysis of internal strengths and weaknesses as well as of external opportunities and threats to the sector. Where appropriate, the sector analysis takes into account specific regional development needs. In light of the needs and problems of the sector and the challenges ahead, investment needs are estimated and policy recommendations are formulated. In this way, the report contributes to the formulation of a number of possible policy interventions for agriculture and rural development in line with requirements for the development of the sector.

The objectives of the sector analysis are summarized below and provide:

- Background and key figures about the sector;
- Structural characteristics of the sector: Fish farmers, processing industry and recreational fisheries;
- Market and trade;
- Government policy in the sector at the level of the state, the two entities and Brèko district;
- Level of attainment of relevant EU standards;
- Past trends and future developments in terms of investment;
- Identification of potentials and needs in the sector;
- Identification of training needs in the sector;
- Outcomes.

As an outcome, the analysis of the sector provides:

- A transparent overview of the sector including a quantitative and qualitative description of the situation.
- A detailed analysis of the most important potential for, and obstacles to, realizing these potentials in the production and marketing chain, for the measures identified in the IPARD Programmes.
- Recommendations to target the specific investments (segment/area/beneficiary), primarily focusing on the weakest links in the supply chain.

2.3 Methodology

The fishery and aquaculture sector analysis has been drafted based on both primary and secondary data. Primary data was collected through:

- Surveys of fish farms, which will be made available in this report in aggregate form only in accordance with the laws of BiH;
- Interviews and workshops with fish producers, anglers and relevant stakeholders;
- Case studies.

All primary data and information was collected, processed and analysed by consultants of the study team.

Different methods and techniques have been applied in the study. Among the scientific methods used in the study are analysis, synthesis, classification, comparison and historical methods. These methods are based on existing data from the sector and have been compared to previous research results in order to achieve a realistic picture of the sector. Data was analysed using statistical data processing techniques, where relevant.

2.3.1 Desk research

International and National Consultants were mandated with data and information collection from studies prepared by bilateral and multilateral institutions. However, most data received through desk research comes from official statistics.

2.3.2 Statistics

The main data sources were:

- Agency for Statistics of Bosnia and Herzegovina (http://www.bhas.ba/)
- Institute for Statistics of the Federation of Bosnia and Herzegovina (http://www.fzs.ba/Eng/)
- Institute for Statistics of Republika Srpska (http://www.rzs.rs.ba/)
- Statistical Bureau of Brèko District (http://www.bhas.ba/) for general economic data
- EUROSTAT for general economic statistics especially for international comparisons and for NMS (New Member States of the EU) data
- COMTRADE (http://www.comtrade.com/distribution/markets/bosnia-and-herzegovina/) and customs for international trade data
- FAO and Bosnia and Herzegovina statistics for general agriculture and specific fisheries and aquaculture data
- Review of relevant, previously finished researches

The quality of the data received from the statistical offices at state and the entity levels has been challenged, as assurances that this data fully reflects the real situation in the field may not be considered absolute (see details in Chapter 4.4). FAO statistics were used relating to production. However, FAO statistics are based on State level statistics, meaning that they face the same challenges described above.

Import and export data is based on COMTRADE statistics that are communicated by the customs authorities of Bosnia and Herzegovina as well as exporting and importing countries.

2.3.3 Surveys

Farm surveys were carried out by FAO National and International Consultants. The main objective was to assess production patterns and the economic

performance of different types of fish production enterprises in different regions of Bosnia and Herzegovina. Secondary objectives were:

- To identify good practices and specific factors of success in relation to investments and production characteristics, as well as bottlenecks and weak points in the value chain;
- To contribute to the assessment of the economic performance of the fishery and aquaculture sector.

Data and information collected during farm surveys was recorded on the survey sheet presented in Annex 4. This data and information on 151 fish farming enterprises was included in the survey; 100 in the FBiH, 47 in RS and 4 in BD were included in a database that allowed the statistical evaluation of all important parameters. The document contains several tables and graphs based on the farm surveys, describing all fish production systems practiced in BiH.

A retail survey was conducted in five supermarkets to assess the presence of processed aquaculture products both from Bosnia and Herzegovina and also from export markets.

2.3.4 Case studies

Eight case studies prepared during farm surveys are presented in Annex 8. They were compiled with the objective of presenting good practices and success characteristics of the category of fish farms presented.

2.3.5 Stakeholder and key informant interviews

The two National Consultants personally interviewed 151 fish farmers, most of whom were fish producers. It was done on the basis of a questionnaire presented in Annex 4. In addition many of the leaders of sport fishing associations and societies, fish processors and input suppliers as well as a number of small and medium-sized retailers, wholesale market managers and policy-makers were also interviewed. The objective of these interviews was to collect information on government policy, market and trade, the level of agreement with EU standards and past trends and development opportunities in terms of investments.

2.3.6 Workshops

2.3.6.1 SWOT workshops

A total of four workshops were organized and completed with the stakeholders of the fishery (sport fishing) and aquaculture subsectors of FBiH and RS separately while one SWOT workshop was completed for both in BD with the participation of concerned stakeholders. Strengths, weaknesses, opportunities and threats identified in the sector are presented in Annex 1.

2.3.6.2 Technical workshop

One workshop was organized for members of the Steering Committee Group to present the outcomes of the study and recommendations for the development of the sector. Information gained in the workshop was very useful for finalizing the review and has been fully integrated into the study (see Annex 1).

2.4 General economic indicators for Bosnia and Herzegovina

This section of the report provides basic economic information about the development of the Bosnia and Herzegovina economy to be used as reference data in the specific sector analysis. Generally speaking the Bosnia and Herzegovina economy is characterized by a good level of recovery. Bosnia and Herzegovina has registered a growth for each of the past eight years except 2009.

2.4.1 Demography

The total population of Bosnia and Herzegovina is not known with precision. The census that was performed in 1991 indicated a total population of 4 377 033. At that time, 60 percent of the population was living in rural areas. The war and the economic difficulties resulting from it caused important migration flows internally and towards Western Europe and countries of the region. Official statistics and estimations of different organizations show very different figures for the demography of Bosnia and Herzegovina. The official Statistical Office of Bosnia and Herzegovina shows a total population of 3 831 555 (2013). The last census was carried out in October 2013 and the results are expected to be published in near future, which will ensure an important update in the above parameters for the current country's demographic outline.

2.4.2 General economic indicators

The changes in Gross Domestic Product (GDP) from 2007 to 2013 are presented in the table below. The economy demonstrated a very positive performance from 2011 to 2013 with an average yearly growth of 13 percent (in current prices), when the international financial crises changed the scene dramatically. 2009 was a year of decline, while 2011 brought the economy back on a positive track and to a higher level than in 2008 (Agency for Statistics of Bosnia and Herzegovina, 2014).

Table 2.: Gross Domestic Product (GDP) of Bosnia and Herzegovina, 2007–2013, Million Bosnia and Herzegovina Convertible Mark (BAM) and Million EUR

Item	2007	2008	2009	2010	2011	2012	2013
GDP Bosnia and Herzegovina, Million BAM	21 778	24 718	24 004	24 484	25 211	24 735	26 297
GDP Bosnia and Herzegovina, Million EUR	1 111	12 611	12 247	12 678	12 929	12 684	13 485
GDP Bosnia and Herzegovina per capita, BAM	5 668	6 433	6 246	6 371	6 533	6 246	6 862
Population, Bosnia and Herzegovina, Million	3 842	3 842	3 843	3 843	3 842	3 843	3 835

Source: Agency for Statistics Bosnia and Herzegovina, 2014 and Study Team, 2014 (exchange rate BAM to EUR = 1.96 all years)

Compared with other countries in the region (Croatia and TFYRM), Bosnia and Herzegovina is performing relatively well. The same is the case with regard to the comparison with EU-27 GDP development (see the table 2.2).

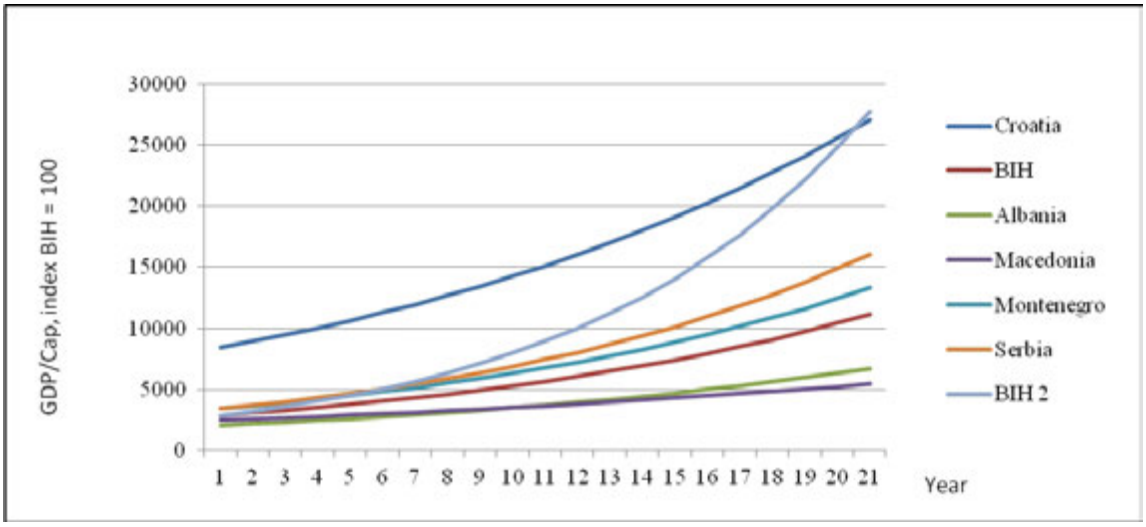
Table 22: Yearly growth rates in GDP, GDP per capita EUR, various countries, 2013

Country	Croatia	Bosnia and Herzegovina	Albania	TFYR Macedonia	Montenegro	Serbia
GDP growth from previous year, %	5	7	6	4	7	8
GDP per capita, EUR	8 443	2 879	2 088	2 488	3 438	3 447

Source: EUROSTAT, 2014

If the growth rates from 2013 are prolonged, a development as presented in the next figure will occur.

Figure 2.3: GDP per capita, 20-year extrapolation of growth rates from 2012, various countries



Source: EUROSTAT, 2014

An extrapolation of the 2012 level of GDP per capita in Bosnia and Herzegovina with 7 percent, which was the growth rate from 2010 to 2012 (illustrated with the line Bosnia and Herzegovina 1 in the graph 2.2), will only keep Albania and The former Yugoslav Republic of Macedonia behind in the growth race within the next 20 years. To catch up with Croatia – which has an annual average GDP per capita growth rate of 5 percent – in 20 years, Bosnia and Herzegovina would need to see 12 percent growth. In other words, catching up with the countries in the region is a major political challenge.

The contribution from the entities to the Bosnia and Herzegovina state level GDP is quite stable over the period, even though an increase in the share of Republika Srpska was observed between 2008 and 2011; namely, from 32 percent in to 34.2 percent, representing a total increase of 7.2 percent. The Federation of Bosnia and Herzegovina and Brèko District both experienced a decrease in their contributions to the overall economy from 2008 to 2011, with a modest decrease of 2.2 percent for Bosnia and Herzegovina and a more substantial 24 percent decrease for Brčko District (EUROSTAT, 2014).

Employment[4]

According to data collected during the fourth Labour Force Survey (LFS) in Bosnia and Herzegovina, carried out by the Agency for Statistics of Bosnia and Herzegovina in May 2012 (over 10 509 households considered) it seems that the labour force numbered 1 131 557 persons for 1 462 619 inactive persons.

Among the labour force there were 859 218 persons in employment and 272 339 unemployed persons. Among persons in employment there were 58 039 unpaid family workers. According to data collected in 2012, the unemployment rate was 24.1 percent (23.1 percent for men and 25.6 percent for women), while in the same period in 2010 it was 23.4 percent (21.4 percent for men and 26.8 percent for women). The unemployment rate was highest among young persons aged 15 to 24 years. It was 47.5 percent (44.8 percent for men and 52.3 percent for women).

In 2010 and 2012, the activity and employment rates revealed by the LFS were 44 percent and 33.5 percent respectively. The activity and the employment rates were by far the highest in the age group 25 to 49 years (69.1 percent and 53.5 percent).

The structure of persons in employment by employment status shows persons in paid employment account for by far the greatest share (72.8 percent). The share of self-employed persons was 20.5 percent (only 27.4 percent of them were women). The share of unpaid family workers was 6.8 percent (68.9 percent of them were women).

The structure of persons in employment by sectors of activity shows that 47.3 percent of them worked in services, 31.5 percent in industry and 21.2 percent in agriculture.

2.4.3. Agricultural indicators

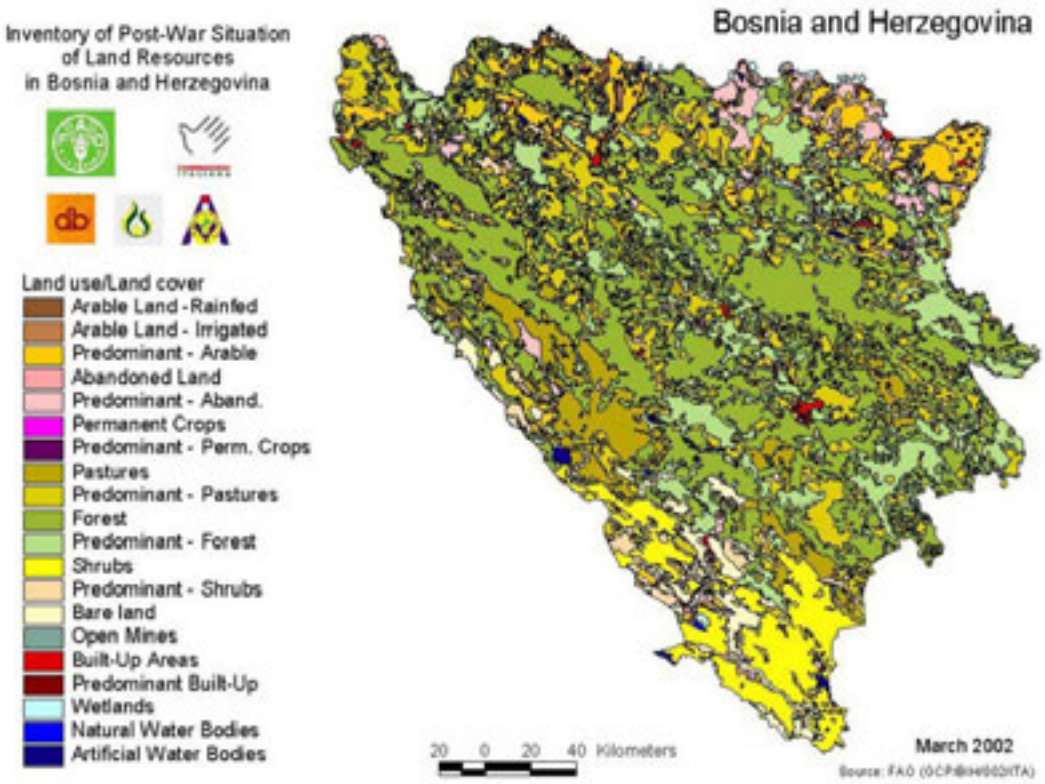
A key constraint for improvement of the agriculture sector management in Bosnia and Herzegovina is insufficiently accurate, reliable and timely data. Despite substantial EU and international donor assistance with initiatives such as a pilot Farm Accountancy Data Network (FADN) and a Pilot Agricultural Census, current information collection, collation and dissemination is still often undertaken in insufficiently harmonised and systematic manner. Existing published sector information is relatively limited and the information made available is often considered to be of a relatively poor quality, lacking statistical rigour or relevance to the emerging market economy. With those caveats made, below is a summary of the situation in Bosnia and Herzegovina agriculture based on available statistics.

Agricultural land in Bosnia and Herzegovina[5]

Bosnia and Herzegovina has a total area of 51 209.2 km^2, of which the sea surface is 12.2 km^2, which means that land surface is 51 197 km^2 (Agency for Statistics, 2014).

4 Source: Agency for Statistics Bosnia and Herzegovina, 2014 and Agency for Work and Employment of BiH
5 Source: Agency for Statistics Bosnia and Herzegovina, 2014

Figure 2.4: Post-war situation of land resources in Bosnia and Herzegovina



Source: FAO/Italy Government Cooperative Programme project GCP/BIH/002/ITA

Land cover in Bosnia and Herzegovina is heterogeneous. About 86 percent of soil is automorphic and the remaining 14 percent is hydromorphic. A large part of Bosnia is exposed to water erosion, particularly its central and southern part.

As with other data for Bosnia and Herzegovina, data on agricultural land are not identical. Depending on the source, this figure varies and differs considerably. According to the report for the agricultural sector in Bosnia and Herzegovina for 2012[6], Bosnia and Herzegovina has 2 572 000 ha of agricultural land which is 50.3 percent out of total land surface in BiH. Out of that, arable land is 1 585 000 ha, which is 62% of agriculture land, in that figure we have around 1 million ha of used arable land, and 47% of that is unused.

Similar information can be found in other sources. For example, Jakšiæ (1997) states that Bosnia and Herzegovina has 2.525 million ha of agricultural land, of which 1.02 million hectares are arable land. According to the same source, 51.3 percent of agricultural land (1.294 million ha) belongs to FBIH, and 48.7 percent (1.23 million ha) to RS. Out of the 1.02 million ha of arable land, 44 percent belongs to the FBiH and 56 percent to RS.

The dominant agro-ecology use of certain parts of the territory of Bosnia and Herzegovina is shown in the map below. This is the outcome of research within the framework of the FAO project “Inventory of the post-war situation of land resources in Bosnia and Herzegovina”.

6 Ministry of Foreign Trade and Economic Relations of Bosnia and Herzegovina (2013): Agriculture report for Bosnia and Herzegovina for 2012.year – Annual Report on status in sector of Agriculture, Food and Rural development, p. 12.

3. THE FISHERY AND AQUACULTURE SECTOR – MAIN CHARACTERISTICS

The fishery and aquaculture sector in BiH includes artisanal and recreational fisheries on marine and inland waters. The latter is exclusively associated with sport fishing (or angling). The main types of aquaculture production systems are pond, tank and cage cultures of fish (see Box 3.1). In addition to fish culture systems there are a few enterprises which produce molluscs.

The fishery and aquaculture sector is linked in many ways to agriculture, water resource management, conservation and environmental protection as presented in Figure 3.1.

Box 3.1:
Fish culture systems in Bosnia and Herzegovina

Pond culture of fish is a system where fish and their natural food are grown together in the same pond. Usually many different fish species are produced together for the best utilization of the various types of natural fish food present in the pond.

Tank culture is an intensive fish culture system where fish are grown in high density in tanks made of concrete, fiberglass, tarp, geo-membrane etc. In such systems used water is continuously exchanged to fresh one and fish receive fully balanced industrial feeds.

Cage culture is practiced both in marine and inland waters under the same principles as tank culture. Fish are kept in cages located in a suitable section of a river, lake or sea.

Figure 3.1: Links and impacts of the fishery and aquaculture sector

Subsectors and culture systems	Water resources			Fish fauna	Agriculture		
	Location of activity	Water received	Effluents discharged		Plant production	Animal husbandry	
Fisheries	Artisanal fishery	Marine and inland waters	-	-	Direct effect on fish fauna	-	-
	Sport fishery		-	-		-	-
Aquaculture	Pond culture	-	The farm needs a seasonal intake and discharge of large quantities of water	Indirect effect on fish fauna	Crops used as feed	Manure used to produce natural fish food	
	Tank culture		Continuous intake and discharge of the water around the year		-	-	
	Cage culture	Marine and inland waters	-	-		-	-
	Mollusc culture	Marine waters	-	-	-	-	-

Source: Study Team, 2014

3.1 Aquatic resources of the fishery and aquaculture sector

3.1.1 Water resources and the management of such resources

The sea coast in BiH is only 12.2 km long with an area of 1 400 ha. BiH is very rich in high quality inland water resources. River basins, natural lakes, huge artificial accumulations and ground water resources rank the country among European countries with significant water resource potentials, where in specific places rivers and springs can be used without previous treatments (OSCE, 2007).

The amount of Total Renewable Water Resources (TRWR) is 37.5 km^3 per year. The dependency ratio is only 5.3 percent, which is exceptionally favourable (FAO, 2014 B and FHMZ, 2010). Rivers in BiH –a total of about 1 125 m^3 per sec – flow either northward through the Danube into the Black Sea (62.5 percent) or southward into the Adriatic Sea (35.5 percent) (Hamzic A., 2005, Hamzic, A., Ecimovic, T. 2004, A., Alexanyan, A., Moth-Poulsen, T., Woynarovich, A., 2011). Within the two main drainage basins nine river basins exist including Korana/Glina, Bosna, Una, Vrbas, Sava, Krka-Cetina, Neretva, Drina and Trebisnjica (Hamzic A., 2005). See Figure 3.2 and 3.3 and Table 3.1.

The hydrological characteristics and capacities of the country are determined by geomorphological and hydrogeological factors. The Dinara and Alps mountain ranges cause high amounts of precipitation. Together with the extensive underground hydrological potential of the karst region's water retaining capacity it is able to feed the numerous river-size springs (FHMZ, 2010 and Hamzic, A., Ecimovic, T., 2004). Consequently, the majority of rivers originate from karst underground waters and strong springs (FHMZ, 2010). Waters originating in the country flow through a total of more than 20 000 km long, dense web of streams and rivers. The total length of the main rivers is 2 630 km while the estimated total length of all water flows longer than 10 km is about 9 000 km (Table 3.1 and 3.2) (FAO, 2014 B, Hamzic, A., Ecimovic, T., 2004).

Bosnia and Herzegovina's total hydropower potential is estimated at 6 100 MW, which is mostly located within the Drina, Neretva and Trebišnjica river basins. At present less than 40 per cent of this potential is exploited. About 40 per cent of the country's total energy production is coming from hydropower (UNECE, 2004). Analyses show that increased use of hydropower would not only be justified from an economic point of view, but would also have positive environmental repercussions (lower emission of greenhouse gases and a lower level of waste water discharge) compared to the use of thermal (coal) energy (OSCE, 2007).

In addition to the huge and dense web of rivers, there are a total of 59 natural and artificial lakes in BiH, 36 of which are natural lakes. Their total area is about 3 111 ha (FAO, 2014 B, Hamzic, A., Ecimovic, T., 2004). Comparing the total size of natural lakes with the size of BiH, it is around one-tenth of the world average. In mountainous regions natural lakes have been important drinking water sources for animal husbandry. Though natural lakes have no economic importance they could still play a special role in sport fishing tourism.

Figure 3.2: The two main water basins in BiH

Figure 3.3: The nine main river basins in BiH

For flood control, water accumulation/storage and electricity generation, 23 water reservoirs were constructed with a total area of 18 773 ha (FAO, 2014 B, Hamzić, A., Ećimović, T., 2004). Administrative and hydrological distribution of water reservoirs are presented in Table 3.3 and 3.4 and Table A5-1 of Annex 5.

Table 3.1 Location, area and proportion of river basins in BiH

Name of river basins	Area (km^2)	Total length of water flows longer than 10 km (km)	Ratio of (%)	
			Main water basin	All water basins
1. Korana/Glina	705.57	-	1.8	1.4
2. Bosna	10 764.00	2 321.9	28.1	21
3. Una	7 962.10	1 480.7	20.8	15.5
4. Vrbas	6 288.60	1 096.3	16.4	12.3
5. Save direct basin	5 391.50	1 693.2	14.1	10.5
8. Drina	7 185.10	1 355.60	18.8	14
Subtotal of the Black Sea	**38 296.87**	**7 947.7**	**100**	**74.7**
6. Krka-Cetina	2 753.10	177	5.4	5.4
7. Neretva	7 947.50	886.8	15.5	15.5
9. Trebišnjica	2 254.90		4.4	4.4
Subtotal of the Adriatic Sea	**12 955.50**	**1 063.8**	**100**	**25.3**
Total	**51 252.37**	**9 011.5**	**0**	**100**

Source: FAO, 2014 A and 2014, Hamzić, A., Ećimović, T. 2004

Table 3.2 Geographical distribution and key parameters of the main rivers in BiH

Name of river	Altitude (m)			Total length (km)	Average water carrying capacity (m^3/sec)
	at spring	at end	Difference		
1. Korona/Glina			**0**	**134**	**NA**
2. Bosna	**560**	**89**	**471**	**279**	**163**
2.1. Krivaja	560	200	360	66	
2.2. Usora	880	145	735	26	
2.3. Spreča	300	143	157	112	
2.4. Tinja	500	80	420	69	
2.5. Tolisa	440	81	359	56	
3. Una	**520**	**94**	**426**	**213**	**240**
3.1. Unac	600	300	300	58	

Name of river	Altitude (m)			Total length (km)	Average water carrying capacity (m^3/sec)
	at spring	at end	Difference		
3.2. Sana	940	139	801	158	
3.3. Gomjenica			0	69	
4. Vrbas	**1 780**	**93**	**1687**	**250**	**132**
4.1. Pliva			0	31	
4.2. Vrbanja	1 520	164	1356	95	
5. Sava	**94**	**87**	**7**	**945**	
5.1. Ukrina	120	96	24	81	
5.2. Pra~a	1 460	329	1131	63	
6. Krak-Cetina				**101**	**31**
7. Neretva	**1 320**	**0**	**1320**	**225**	**184**
8. Drina	**433**	**87**	**346**	**341**	**124**
8.1. ^eotina	1 250	340	910	93	
8.2. Lim	901	299	602	234	
8.3. Sutjeska			0	35	
8.4. Rzav			0	54	
8.5. Drinja~a	730	141	589	91	
8.6. Jadar	600	94	506	53	
9. Trebišnjica	**398**	**224**	**174**	**97**	**185**
9.1. Mušnica			0	42	
Total				**4 071**	**1 125**

Source: Hamzić, A., Ećimović, 2004 and FHMZ, 2010

Table 3.3 Number, area and geographical distribution of stagnant waters in BiH

Water and river basins	FBiH		RS		BiH	
	Number	Area (ha)	Number	Area (ha)	Number	Area (ha)
Natural lakes						
Bosna	4	2 044.8			4	2 044.8
Una	1	4.1	1	5.6	2	9.7
Vrbas	5	154.9			5	154.9
Sava	2	1.3			2	1.3
Drina			10	27.4	10	27.4
Black Sea – total	**12**	**2 205.1**	**11**	**33.0**	**23**	**2 238.1**
Krka-Cetina	3	372.8			3	372.8

Water and river basins	FBiH		RS		BiH	
	Number	Area (ha)	Number	Area (ha)	Number	Area (ha)
Neretva	9	495.6			9	495.6
Trebisnjica			1	4.3	1	4.3
Adriatic Sea – total	**12**	**868.4**	**1**	**4.3**	**13**	**872.7**
Subtotal – natural lakes	**24**	**3 073.5**	**12**	**37.3**	**36**	**3 110.8**
Water reservoirs						
Bosna	2	1 712.5			2	1 712.5
Una	1	34.8			1	34.8
Vrbas			1	233.0	1	233.0
Sava	3	66.9			3	66.9
Drina			3	3 017.7	3	3 017.7
Black Sea – total	**6**	**1 814.2**	**4**	**3 250.7**	**10**	**5 064.9**
Krka-Cetina	3	5 646.9			3	5 646.9
Neretva	5	3 452.1			5	3 452.1
Trebisšjica			5	4 173.3	5	4 173.3
Adriatic Sea – total	**8**	**9 099.0**	**5**	**4 173.3**	**13**	**13 272.3**
Subtotal – water reservoirs	**14**	**10 913.2**	**9**	**7 424.0**	**23**	**18 337.2**
						Fish ponds
Bosna			1	398.0	1	398.0
Sava			3	2 531.5	3	2 531.5
Black Sea – total			**4**	**2 929.5**	**4**	**2 929.5**
Subtotal – fish ponds			**4**	**2 929.5**	**4**	**2 929.5**
Grand total	**38**	**13 986.7**	**25**	**10 390.8**	**63**	**24 377.5**

Source: FAO, 2014 A and 2014 B, Hamzić, A., Ećimović, T. 2004

Table 3.4 Ratio of different still waters in BiH

Water and river basins	FBiH			RS				Grand total
	Natural lakes	Water reservoirs	Total	Natural lakes	Water reservoirs	Fish ponds	Total	
	Area (%)							
As per water basins								
Bosna	20	17	37	0	0	4	4	41
Una	0	0	0	0	0	0	0	0

Water and river basins	FBiH			RS				Grand total
	Natural lakes	Water reservoirs	Total	Natural lakes	Water reservoirs	Fish ponds	Total	
Vrbas	2	0	2	0	2	0	2	4
Sava	0	1	1	0	0	25	25	25
Drina	0	0	0	0	29	0	30	30
Black Sea – total	**22**	18	39	0	32	29	61	100
Krka-Cetina	3	40	43	0	0	0	0	43
Neretva	4	24	28	0	0	0	0	28
Trebišnjica	0	0	0	0	30	0	30	30
Adriatic Sea – total	**6**	64	70	0	30	0	30	100
As per BiH								
Bosna	8	7	15	0	0	2	2	17
Una	0	0	0	0	0	0	0	0
Vrbas	1	0	1	0	1	0	1	2
Sava	0	0	0	0	0	10	10	11
Drina	0	0	0	0	12	0	12	12
Black Sea – total	**9**	7	16	0	13	12	25	42
Krka-Cetina	2	23	25	0	0	0	0	25
Neretva	2	14	16	0	0	0	0	16
Trebišnjica	0	0	0	0	17	0	17	17
Adriatic Sea – total	**4**	37	41	0	17	0	17	58
Grand total	**13**	45	57	0	30	12	43	100

Source: FAO, 2014 A and 2014 B, Hamzić, A., 2003, 2005, Hamzić, A.; Ećimović, T., 2004

All natural waters in BiH are under either state or entity ownership. These rights can be given or leased to public and private organizations. At present no reliable data is available about the ownership structure for inland water (Hamzic, A., Ecimovic, T. 2004).

At state level a department at the Ministry of Foreign Trade and Economic Relations is assigned to coordinate between the entities and acts as an interface in the country's international relations. Consequently, the entities that are competent in water resource issues are the Ministry of Agriculture, Water Management and Forestry (MAWMF) in FBiH, the Ministry of Agriculture, Forestry and Water Management (MAFWM) in RS and the Department of Spatial Planning in BD (UNEP BOSNIA AND HERZEGOVINA, 2011 and Ministry of Foreign Trade and Economic Relations, 2012) See Figure 3.4.

Box 3.2: Sector related laws and by-laws in BiH for fisheries and aquaculture

Law related to overall state level coordination of the sector:

The Law on Agriculture, Food and Rural development – Official Gazette of BiH, No 50/08

Laws related to water resource management:

- Law on Water - Official Gazette of FBIH No. 70, 2006
  - Rulebook on general and special water fees - Official Gazette of FBIH No. 92, 2007 and 46, 2009
  - Decision on the rate of special water fees - Official Gazette of FBIH No. 46, 2007
- Law on Water - Official Gazette of RS No. 50, 2006
  - Decision on the rate of special water fees - Official Gazette of RS No. 22, 2008
  - Rulebook on special water fees - Official Gazette of RS No. 92, 2007 and 74, 2009

Laws related to the protection and conservation of nature and the fish fauna:

- Law on Nature Protection - Official Gazette of FBIH No. 33, 2003
  - Rulebook on new measures about significant negative impacts on animal species either by capture or killing - Official Gazette of FBIH No. 65, 2006
- Law on Nature Protection - Official Gazette of RS No. 113, 2008
  - Rulebook on establishing a monitoring system for deliberate keeping and killing of protected animals - Official Gazette of RS No. 113, 2008
- Law on Nature Protection - Official Gazette of BD No. 24, 2004

Laws related to fisheries and aquaculture:

- Law on Freshwater Fishing - Official Gazette of FBIH No. 64, 2004
- Law on Freshwater Fishing - Official Gazette of BD No. 35, 2005
- Law on Fishing - Official Gazette of RS No. 72, 2012

Source: Study Team, 2014

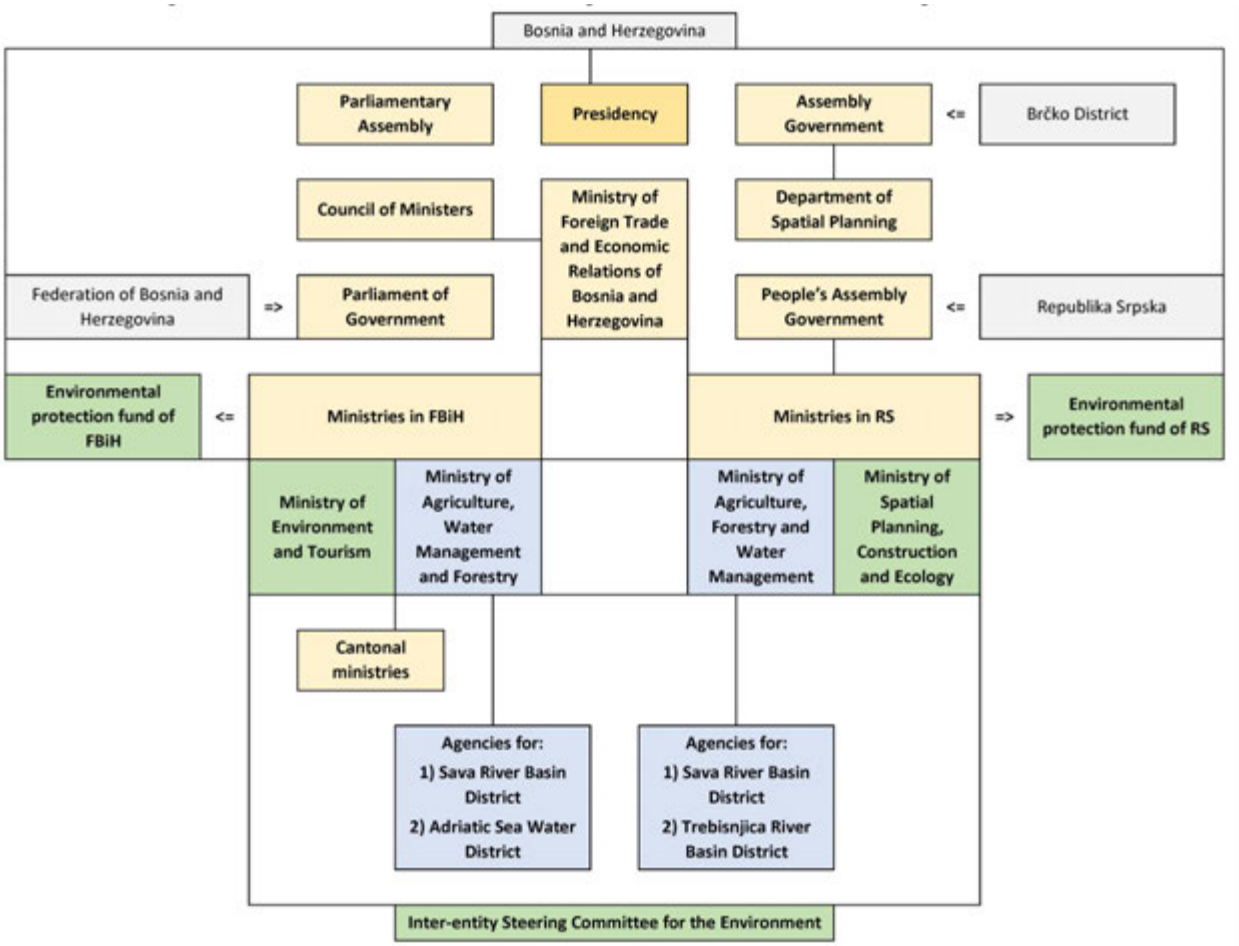
In addition to the ministries, cantons in the FBiH and municipalities in RS, local authorities have influence on uncoordinated micro-level management of waters.

Considering that most of the rivers flow through territories of different entities, an Inter-entity Water Commission was established in 1998. As a result, new, harmonized entity level water laws were introduced from 2006. In these new laws – listed in Box 3.2 – both water protection and water management are included which, in principle, are harmonized with relevant EU regulations. However, these laws are not complemented with by-laws and implementing regulations which would ensure proper enforcement (UNEP BOSNIA AND HERZEGOVINA, 2011 and Ministry of Foreign Trade and Economic Relations, 2012). Public companies for watershed management of the Adriatic coast and for the Sava river were also established in 1998 (UNEP BOSNIA AND HERZEGOVINA, 2011). These companies introduced in Figure 3.4, together with the RS Water Directorate act and make decisions on natural water basin areas of the country.

3.1.2 Fish fauna

There are 213 species of fish fauna in BiH. Seventy six (36 percent) of them are marine, 26 (12 percent) are diadromous and 111 (52 percent) are freshwater fish species, while 60 (28 percent) of the 213 species are cultured or have commercial and/or game values. About 81 (38 percent) fish species have no commercial or game value (Study Team, 2014). The geographical distribution of fish species are presented in Table 3.6 and Table A5-2 of Annex 5.

Figure 3.4: Scheme of environmental governance and water management in BiH



Source: UNEP BOSNIA AND HERZEGOVINA, 2011

There are 3 (1 percent) endemic and 188 (88 percent) native fish species. From the native ones 12 (6 percent) are critically and 23 (11 percent) are endangered. From the 17 (8 percent) introduced fish species eight (2 percent) are invasive and require a systematic plan of action (Study Team, 2014).

Southward flowing rivers have more endemic species as they are separated from the more open Danube water system. All three endemic species belong to the Salmonidae family (Adriatic trout, marble trout and tooth trout) which are also popular game fish. From the endemic and native fish species 35 are endangered and 12 are critically endangered. These species need professional attention and science based action to reduce vulnerability (Study Team, 2014).

Table 3.5 and Table A5-2 in Annex 5 presents detailed statistics on the geographical distribution of fish species in BiH. Both endangered endemic/native and invasive introduced fish species need professional attention and science based actions. Unfortunately, at present there is no provision for such actions.

Table 3.5: Number, geographical distribution and proportion of municipalities in different water basins in BiH

River basins	Number of municipalities				Ratio of municipalities (%)			
	BD	FBiH	RS	Total	BD	FBiH	RS	Total
1. Korona and Glina	0	3	0	3	0	2	0	2
2. Bosna	0	34	6	40	0	24	4	28
3. Una	0	6	10	16	0	4	7	11
4. Vrbas	0	9	8	17	0	6	6	12
5. Sava	1	7	13	21	1	5	9	15
8. Drina	0	4	20	24	0	3	14	17
Black Sea – total	**1**	**63**	**57**	**121**	**1**	**44**	**40**	**84**
6. Krka-Cetina	0	3		3	0	2	0	2
7. Neretva	0	12	3	15	0	8	2	10
9. Trebišnjica	0	1	4	5	0	1	3	3
Adriatic Sea – total	**0**	**16**	**7**	**23**	**0**	**11**	**5**	**16**
Grand total	**1**	**79**	**64**	**144**	**1**	**55**	**44**	**100**

Source: Study Team, 2014

Table 3.6: Status, importance and number of fish species in BiH

Status	Importance	Environment			
		Marine	Diadromous	Freshwater	Total
Endemic					
Critically endangered	Cultured/commercial/game fish			1	1
	Game fish			2	2
	Total			**3**	**3**
Subtotal – endemic				**3**	**3**
Native					
Critically endangered	Cultured/commercial/game fish		6		6
	Game fish			1	1
	None			2	2
	Total		**6**	**3**	**9**

Status	Importance	Environment			
		Marine	Diadromous	Freshwater	Total
Endangered	Cultured/commercial fish	3			2
	Cultured/commercial/game fish	1		2	3
	Game fish		1	3	4
	None		1	12	13
	Total	**3**	2	17	22
Vulnerable	Cultured/commercial fish	4			4
	Cultured/commercial/game fish	33		2	35
	Game fish	4		1	5
	Ornamental fish	26			26
	None	3	2	6	11
	Total	**70**	**2**	**9**	**81**
Steady	Cultured/commercial/game fish	1	1	3	5
	Game fish	1	5	12	18
	None	1	9	32	42
	Total	**3**	15	47	65
Least Concern	Cultured/commercial/game fish		1	1	2
	Game fish			4	4
	None			5	5
	Total		**1**	**10**	**11**
Subtotal – native		**76**	**26**	**86**	**188**
Introduced					
Steady	Cultured/commercial fish			3	3
	Cultured/commercial/game fish			5	5
	Game fish			1	1
	None			3	3
	Total			**12**	**12**
Invasive	Cultured/commercial/game fish			1	1
	Ornamental fish			1	1
	None			3	3
	Total			**5**	**5**

Status	Importance	Environment			
		Marine	Diadromous	Freshwater	Total
Subtotal – introduced				**17**	**17**
Native – introduced[7]					
Endangered	Game fish			1	1
	Total			**1**	1
Steady	Cultured/commercial/game fish			2	2
	None			2	2
	Total			**4**	4
Subtotal - native-introduced				**5**	**5**
Grand total		**76**	26	111	213

Source: Study Team, 2014

Table 3.7: Number of fish species in the sea and in different river basins in BiH

River basins	Environment			
	Marine	Diadromous	Freshwater	Total
Adriatic Sea	76	16		**92**
Korana/Glina			8	**8**
Bosna			50	**50**
Una			38	**38**
Vrbas			48	**48**
Save direct basin		5	60	**65**
Drina			40	**40**
Krka-Cetina			12	**12**
Neretva		21	57	**78**
Trebišnjica		1	32	**33**

Source: Study Team, 2014

7 Native introduced species are those which are native in BiH but in another water or river system from where they were introduced within the country.

Species, fishing season, size and quantity of game fishes allowed to be caught by registered sport fishers is well regulated but not supervised in BiH (see Box 3.2).

Box 3.2: Names, closed seasons and size limitations of catching game fish in BiH

Closed seasons of selected game fishes in FBiH:

Fishing on Salmonids, Cyprinids, pike, pike perch and European catfish is allowed with artificial and natural baits, except live baits. Catching conditions for:

Brook trout: minimal length 30 cm, no fishing between 1 October and 31 March (RS)

Brook trout: minimal length 25 cm, no fishing between 1 October and 28 February (FBiH)

Rainbow trout: minimal length 30 cm, no fishing between 1 October and 28 February

Arctic char: minimal length 30 cm, no fishing between 1 October and 28 February

Brown trout: minimal length 25 cm, no fishing between 1 October and 28 February

Californian trout: minimal length 25 cm, no fishing between 1 October and 28 February

Danube salmon: minimal length 70 cm, no fishing between 1 January and 31 May

Trout (Mormoratus): minimal length 60 cm, no fishing between 1 November and 31 March

Grayling: minimal length 30 cm, no fishing between 1 January and 15 May

Catfish: minimal length 60 cm, no fishing between 16 April and 15 June, allowed quantity – 4 per day

Sterlet: minimal length 40 cm, no fishing between 1 March and 31 May

Sturgeon: minimal length 50 cm, no fishing between April

Pike: minimal length 40 cm, no fishing between 1 February and 31 March, allowed quantity – 4 per day (FBiH)

Pike: minimal length 40 cm, no fishing between 1 March and 31 May (RS)

Pike-perch: minimal length 40 cm, no fishing between 1 March and 31 May, allowed quantity – 4 per day

Eastern pike-perch: minimal length 40 cm, no fishing between 1 March and 31 May

Common carp: minimal length 30 cm, no fishing between 1 April and 31 May, allowed quantity – 4 per day

White chub: minimal length 30 cm, no fishing between 1 April and 31 May, allowed quantity – 4 per day

Turkish chub: minimal length 20 cm, no fishing between 1 April and 31 May, allowed quantity – 4 per day

Pigo: minimal length 18 cm, no fishing between 1 April and 31 May, allowed quantity – 4 per day

Tench: minimal length 18 cm, no fishing between 1 April and 15 June

Barbel fish: minimal length 35 cm, no fishing between 1 April and 3 May

Fish nase: minimal length 20 cm, no fishing between 1 April and 31 May

Noble crayfish: minimal length 11 cm, no fishing between 1 November and 15 May

Swamp crayfish: minimal length 8 cm, no fishing between 1 November and 15 May

Stone crayfish: minimal length 8 cm, no fishing between 1 November and 15 May

Source: Study Team, 2014

In order to maintain well-balanced fish fauna in various waters, it is very important to replace captured fish through planned annual stockings, which is clearly mentioned in the fisheries laws of all three entities. As implementation and enforcement of the laws still need to be improved, restocking remains subjective, occasional and not particularly transparent.

3.2 Management of the fishery and aquaculture sector

3.2.1 Administration

There is no responsible ministry at state level for the fishery and aquaculture sector (Hamzic, A.; Ecimovic, T. 2004). Sector related issues are administered by the Ministry of Foreign Trade and Economic Relations (MoFTER) at state level with a coordinating role. There are responsible authorities

for policy and implementation at entity level; namely, FBiH Ministry of Agriculture, Water Management and Forestry and RS Ministry of Agriculture, Forestry and Water Management. Regarding BD, the responsible authority is the Division of the Department of Spatial Planning.

The only agency also responsible for aquaculture at state level is the Veterinary Office of BiH under the Ministry of Foreign Trade and Economic Relations, which deals mainly with fish diseases. In addition to this body there is a Foreign Trade Chamber of Bosnia and Herzegovina, also at state level, which has certain data on fish exports and imports and on imports of fish feed (see details in Chapter 2.3.2).

3.2.2 Laws of the sector

Although the BiH Law on Agriculture, Food and Rural Development[8] (Official Gazette of BiH, No 50/08) clearly states that fisheries are an integral part of agriculture, there is no properly detailed and harmonized state law regarding the fishery and aquaculture sector. It is administered on the basis of entity level fishery laws listed in Box 3.2 and compared between different entities in Table 3.8. Though the law of the FBiH is the least elaborated, all three laws still uniformly include key sections and are able to serve the purposes declared and detailed below.

The purpose of the law in the Federation of Bosnia and Herzegovina is:

- To regulate fishing waters, fishing, aquaculture, protection of fish species, fish guard services, inspection of the implementation of laws, penalties and other issues that are important for freshwater fisheries in the territory of FBiH.
- To ensure that fish in fishing waters are treated in a sustainable manner that contributes to the conservation of biological diversity of ecological systems.
- To ensure that fish in fishing waters are caught and grown under conditions prescribed by the law.

The purpose of the law in Republika Srpska is:

- To regulate fishing waters and methods for using fishing waters and fish stocks.
- To coordinate and supervise commercial fishing, sport fishing, economic and recreational fishing, aquaculture and protection of fish stocks in fishing waters.
- To ensure fishery records, surveillance and other issues related to the utilization of fishing waters.

Table 3.8: Contents of fishery and aquaculture related laws in BiH

<table>
<tr><th colspan="3">BiH</th></tr>
<tr><td colspan="3">Law on Agriculture, Food and Rural development – Official Gazette of BiH, No 50/08
I. General provisions
II. Objectives and measures of agriculture, food and rural development policy for BiH
III. Competencies at all levels of government within the agriculture, food and rural development sector
IV. Other relevant sector institutional structures and services
V. Monitoring, evaluation and reporting
VI. Inspection supervision
VII. Transitional and final stipulations
Annex: Number in the Brussels Nomenclature – Description of products
LAW ON AGRICULTURE AND RURAL DEVELOPMENT , No. 01-02-389 / 10 of 15 July 2010 Sarajevo[9]</td></tr>
<tr><td>I. General provisions
II. Sources, selection priorities and amount of funds for cash support
III. Models of money cash support and allocation of funds between \ in model</td><td>IV. Model production incentives
V. Model support income
VI. Capital investment
VII. Model of rural development
VIII. Model other type of support</td><td>IX. Clients
X. Realization of money cash support
XI. Administrative and inspection
XII. Penalties
XIII. Transitional and final [provisions</td></tr>
</table>

8 It is based on Article IV.4.a) of the Constitution of Bosnia and Herzegovina, which was adopted on May 15 2008. http://www.agrowebcee.net/fileadmin/content/agroweb_ba/files/Country_profile/M/BH_Law_on_Agriculture_Food_and_Rural_Development.pdf

FBiH	RS	BD
Law on Freshwater Fishing (Official Gazette of FBiH 64, 2004) I. General provisions II. Fishing waters III. Fishing [11] IV. Aquaculture V. Protection of fish VI. Fish guarding services VII. Administrative oversight VIII. Penalties IX. Final provisions	**Law on Fishing (Official Gazette of RS 72, 2012)** [12] I. General provisions II. Fishing waters III. Commercial fishing[13] IV. Sport fishing V. Commercial sport fishing[14] VI. Aquaculture VII. Protection of fish species VIII. Fishery records IX. Supervision X. Penalties XI. Transitional and final provisions	L**aw on Freshwater Fishing (Official Gazette of BD 35, 2005)** I. General provisions of fishing waters II. Commercial fishing III. Recreational sport fishing IV. Aquaculture V. Protection of fish species VI. Compensation for fishing VII. Data about fisheries and aquaculture VIII. Governing and inspection IX. Special provisions X. Penalties XI. Transitional and final provisions

The law on freshwater fishing in Brčko District is aimed at managing fishing waters and this:

- Includes fishing, stocking, protection of fish and their habitats and aquaculture.
- Ensures that fish in natural waters are used in a sustainable manner that contributes to the preservation of biological differences in ecological systems.
- Declares that fish in natural waters are part of the nature of Brčko District and have their special importance and are protected in accordance with provisions of the law.
- Ensures that fish in fishing waters are fished and/or grown under conditions specified by the law.

It is a general opinion that the development of the aquaculture sector is hampered by the fact that there is no state level law on fisheries.

The Ministry of Agriculture, Water Management, Forestry and Food of FBiH is preparing a piece of legislation more or less in harmony with the relevant legislation of RS. The administration and execution will be managed at cantonal level. Accordingly, the ministry is responsible mainly for the preparation of the Fisheries Law.

Fishery and aquaculture at the Ministry of Agriculture, Forestry and Water Management of RS belongs to the Department of Animal Breeding and latest Fisheries Law was released in 2012.

9 Definition of the laws: Fishing waters are: all fresh waters except waters 1/ under protected area, 2/ ponds and 3/water bodies used for human consumption (Official Gazette of FBiH 64, 2004, Official Gazette of RS 72, 2012 and Official Gazette of BD 35, 2005).

10 Fishing area is defined as part of the waters, which makes the hydrological, biological and economic unit for the protection of and sustainable use of fish stock (Official Gazette of FBiH 64, 2004 and Official Gazette of RS 72, 2012).

11 Both commercial and sport fishing are discussed under this chapter.

12 In the future respective sections will be updated

13 Article 14 - (2) Commercial fishing may be carried out only in the Sava River from the state border with the Republic of Croatia to the border with Serbia, according to the state border, perpendicular to the mainstream flow from coast to coast, and to the main embankments.

14 This is fee fishing when a water body is leased to have sport fisher clients who pay for the daily, weekly, monthly licenses.

3.2.3 Licensing

Fishing (commercial and sport/recreational) and fish production units such as ponds, tanks and cage fish farms are licensed separately as summarised below.

Licensing of commercial and recreational fishing on fishing waters[15]

The relevant fisheries laws in all three entities uniformly and clearly define the preconditions for licensing (issuing fishing rights) commercial and sport/recreational fishing. The laws also prescribe how the licensed water (fishing water) should be managed during the authorised period which is 10, 15 and 20 years in the FBiH, BD and RS, respectively.

Uniform key preconditions for obtaining, and conditions for retaining fishing licences for a certain fishing area[16] in different entities include the following:

Long term and annual fishery management plan with information on;

- Planned range of species to be restocked (name, size and number of different fish species).
- Estimated growth of the fish stock and the planned quantity and quality of captured fish.

Long term and annual business plan with information on;

- Planned sport fishing activities.
- Planned amount of resources and incomes.
- Licensing of land based fish farms
- Though the principles of licensing land based fish farms such as pond (carp) and tank (trout) fish farms are similar in all three laws, there are still some specific differences which justify discussions as per entities.

In RS, the process of licensing a land based fish farm is completed in seven steps:

1. The Municipality has to agree to convert the land into a fish farm establishment.
2. The Department of Water Management of the Agricultural Ministry has to issue a license for water utilization.
3. A professional engineering company must elaborate an engineering plan.
4. One of the authorized private engineering companies must approve the elaborated plan.
5. Municipality licenses must be arranged including:

5.1. A license for building construction,
5.2. A license for using the electricity grid,
5.3. A license for using roads,
5.4. A license from the fire department,
5.5. An ecological license.

6. Based on the previous licenses the Department of Water Management will issue a final agreement for establishing the farm.
7. In the end, the Ministry of Agriculture provides a final permission for the establishment of the farm.

In FBiH, the licensing process is similar but it should also be prepared in accordance with the Law on Concessions. This makes the entire procedure more complex than in RS. Thus, the following steps are needed for obtaining a permit in the FBiH:

1. An expert company, which receives permits for aquaculture.
2. Indication of the fishing area or zone where aquaculture activities will be performed.
3. Details of the production area (number and size of ponds, tanks or cages).
4. Type of cultured species.
5. Expert study on the justification of aquaculture activities.
6. Concession for water utilization issued in accordance with specific laws.

In BD approval of aquaculture and application for the authorization of aquaculture production should involve:

1. First name of the entrepreneur or legal entity that is applying for aquaculture approval.
2. The surface of the pond or the water area or volume of the cage to be used for aquaculture.

15 Definition of the laws: Fishing waters are: all fresh waters except waters 1/ under protected area, 2/ ponds and 3/water bodies used for human consumption (Official Gazette of FBiH 64, 2004, Official Gazette of RS 72, 2012 and Official Gazette of BD 35, 2005).

16 Fishing area is defined as part of the waters, which makes the hydrological, biological and economic unit for the protection of and sustainable use of fish stock (Official Gazette of FBiH 64, 2004 and Official Gazette of RS 72, 2012).

3. The name of the fish or other aquatic organisms to be farmed.
4. Terms of environmental protection issued by the Department of Urban Planning, Property and Economic Development and the Department of Public Safety.

Licensing of cage fish farms

Licensing of cage fish farms in all entities is completed after:

1. Obtaining permission from the owner/legally authorized user of the water body where cages will be set.
2. Obtaining permission from the water authorities.
3. Obtaining permission from environmental authorities on the basis of an impact study on the environment regarding the planned production.
4. Approval of a production plan, which must include:

4.1. Location and size of cages
4.2. Produced species and their age groups
4.3. Total number and weight of fish planned to be produced

3.2.4 Taxes, fees and subsidies

Taxes, fees and subsidies of fish farms

Corporate and personal income taxes in BiH are paid according to Table 3.9, where due social security contributions, VAT, and water and pollution fees are lso listed.

Table 3.9: Taxes and fees paid by fish culture enterprises and their employees in BiH[17]

Type of taxes	In FBiH	In RS	In BD
	% of profit, gross wage or sale price of product		
Corporate income/profit tax	10.0	10.0	10.0
Personal income tax	10.0	10.0	10.0
Social security contributions			
Employee's share:	31.0	33.0	30.5 – 31.5
• pension insurance	17.0	18.5	17 or 18
• health insurance	12.5	12.0	12.0
• health insurance	1.5	-	
• unemployment insurance 1.0%	-	1.0	
• child protection	-	1.5	1.5
Employer's share:	10.5	-	6.0
• pension insurance	6.0	-	6.0
• health insurance	4.0	-	-
• health insurance	0.5	-	-

Source: Study Team, 2014

17 There are no deviations (reductions) for family enterprises.

Type of taxes	In FBiH	In RS	In BD
	% of profit, gross wage or sale price of product		
VAT	17.0	17.0	17.0
Water fees			
Paid after the quantity of produced fish (BAM per kg)	1.5	0.3	-
Paid after the volume of used water (BAM per month/1 000 m^3)	-	0.5	-

Trout farming is subsidised in BiH. In FBiH it is BAM 0.75 (in 2013) and 1.5 (in 2014) per kg of produced fish with a limit of a total of BAM 35 000 per fish farm which is equivalent to a yearly production of about 200 MT of fish. This limit may slightly vary from canton to canton. In RS subsidy is BAM 0.3 per kg of produced fish (maximum 15 percent) with a limit of 250 MT of a yearly production.

Taxes and fees of sport fishing associations

From the membership fees of sport fishing societies in RS, the utilization fee and a support to the national association is covered. These financial obligations are 20 percent and 10 percent, respectively.

3.2.5 Monitoring and supervision

There is practically no monitoring and supervision in the fishery subsector. There is no clear, publicly available list of sport fishing territories and fishermen's societies are not obliged to report the range of species and number of stocked and captured fish species.

Monitoring and supervision of the aquaculture subsector is completed as follows:

- A questionnaire is submitted each year by registered fish farms. Technical contents and the accuracy of questionnaires sent to the statistical agencies are not cross checked.
- The quantity of produced fish is reported when official documents about fish sales are submitted. This serves as a basis for imposing water fees and claiming subsidies after the amount of produced fish.
- Sales, purchases and the use of industrial fish feed in general – and their imports in particular – are indirect ways of monitoring fish production of the country.
- Sales of produced fish are also considered to be an efficient way of monitoring fish farm production, although no such activity is performed.

3.3 Structure and geographical distribution of the fishery and aquaculture sector

3.3.1 Marine fishery

The role of maritime areas in the total national economy is very small. There are no exact figures on the performance of the economy but it is estimated (Strategy for development of tourism of Bosnia and Herzegovina) that the GDP from the maritime area of Bosnia and Herzegovina is less than 1 percent of the total GDP of the country (European Commission, 2014 H). Nevertheless, the sea and coastal ecosystem experiences high pressure even though there are practically no marine fisheries in BiH (FAO – EIFAC, 2008). Only around 20 small-scale fishers work on the sea using gill nets. Their reported catch is very low, about 5 MT (FAO, 2014 B). Fish caught by artisanal fishers are sold directly to customers or are transferred to the fish stores of the marine cage farms for marketing.

3.3.2 Inland fisheries

Unlike in the 1980s and early 1990s, today there are no licensed fishers working on natural or man-made water bodies. Except for a few unregistered fishers on Sava River and local poachers who work with fish traps, there are practically no commercial fisheries activities in the traditional sense on inland waters in BiH.

Though legal commercial fisheries are missing from the inland fisheries subsector in BiH, recreational fishing is a popular activity all over BiH. For this reason the only legal users of inland waters are sport fishing organizations. There are a total of 154 angling societies in BiH (95 in FBiH, 58 in RS and 1 in BD). These angling societies affiliate almost a total of 17 000 sport fishers. In addition to the registered members of the angling societies there are also unlicensed/illegal anglers in the country (Table 3.10 and Table A5-3 of Annex 5) (Study Team, 2014).

Table 3.10: Number, geographical distribution and proportion of angling associations and societies in BiH

River basins	BD		RS		RS		BiH	
	Angling Societies	Members	Angling Societies	Members	Angling Societies	Members	Angling Societies	Members
Number of angling societies and their members								
Korona and Glina			5	381			5	381
Bosna			45	1 083	5	929	50	2 012
Una			8	1 732	6	620	14	2 352
Vrbas			7	516	8	2 253	15	2 769
Sava	3	220	6	460	13	2 760	23	3 440
Drina			4	435	20	2 008	24	2 443
Total of Black Sea	**3**	**220**	**75**	**4 607**	**52**	**8 570**	**130**	**13 397**
6. Krka-Cetina			6	234			6	234
7. Neretva			14	2 877	2	30	16	2 907
9. Trebišnjica					4	434	4	434
Total of Adriatic Sea			**20**	**3 111**	**6**	**464**	**26**	**3 575**
Grad total	**3**	**220**	**95**	**7 718**	**58**	**9 034**	**156**	**16 972**
Proportion of angling societies and their members								
Korona and Glina			3	2			3	2
Bosna			29	6	3	6	32	12
Una			5	10	4	4	9	14
Vrbas			5	3	5	13	10	17
Sava	1	1	4	3	8	16	13	19
Drina			3	3	13	12	16	15
Total of Black Sea	**1**	**1**	**49**	**28**	**34**	**51**	**83**	**79**
6. Krka-Cetina			4	1			4	1
7. Neretva			9	17	1	0	10	17
9. Trebišnjica			0	0	3	3	3	3
Total of Adriatic Sea			**13**	**19**	**4**	**3**	**17**	**21**
Grad total	**1**	**1**	**62**	**46**	**38**	**54**	**100**	**100**

Source: Study Team, 2014

It is estimated that the yearly quantity of fish caught by registered anglers is about 10 kg per person. Consequently, the yearly total amount of legally captured fish varies from 160 to 170 MT, while the quantity of unreported, illegally captured fish in the inland waters might be almost 150 MT a year.

3.3.3 Aquaculture

The main species used in Bosnian aquaculture are Salmonids, mainly rainbow trout produced in tanks and cages. This can be explained by the huge karst and cold surface water resources. In spite of the available official data (about 40 trout farms), surveys proved that there are at least a total of 97 trout farms in BiH, which are located in the mountainous regions. Out of these trout farms there are 80 tank and 17 cage farms. More details see in Tables 3.11 and 3.12 and in Tables A5-4.1 and A5-4.2 of Annex 5.

Large pond fish farms which produce mainly carp (common carp and Chinese major carp) and predatory fish (European catfish, pike and pikeperch) are found on the plains. There are 28 of these farms in total. For more details see Table 3.7 and in Tables A5-4.1 and A5-4.2 of Annex 5.

Marine aquaculture in the form of cage culture of sea bass and sea bream[18] is practiced by only one farm on the Adriatic Sea. There is also one fish farm which produces Mediterranean molluscs[19] (see Tables A5-4.1 and A5-4.2 of Annex 5).

Table 3.11: Official statistics of fish farms and fish production in BiH in 2012 and 2013

Entity and culture system	In absolute terms			Produced fish		
	Number of farms	Water surface of ponds (ha)	Volume of tanks and cages (m^3)	Total production (kg/year)	In ponds (kg/ha)	In cages (kg/m^3)
Statistics in BiH in 2012						
Pond culture	Missing	2 130.1	-	575 216	270.0	-
Tank culture	Missing	-	91 759.6	2 819 211	-	30.7
Cage culture	Missing	-	109 197.2	189 830	-	1.7
All culture systems	**Missing**	**2 130.1**	**200 956.8**	**3 584 257**	**-**	**-**
Statistics in BiH in 2013						
Pond culture	Missing	2 099.0	-	317 000	151.0	-
Tank culture	Missing	-	85 367.3	2 381 800	-	27.9
Cage culture	Missing	-	102 948.3	154 500	-	1.5
All culture systems	**Missing**	**2 099.0**	**188 315.6**	**2 853 300**	**-**	**-**

Source: Institute for Statistics of the Federation of Bosnia and Herzegovina, 2012, 2013 A, 2013 B and 2014, Institute for Statistics of Republika Srpska, 2012, 2013 and 2014

18 Common dentex (Dentex dentex), seabream (Sparus aurata) and European seabass (Dicentrarchus labrax)
19 European flat oysters (Ostrea edulis) and Mediterranean mussels (Mytilus galloprovincialis)

Out of the surveyed fish farms presented in Table 3.12, about 67 (44 percent) do not have aquaculture licenses. See further details in Tables A5-4.1, A5-4.2, A5-5 and A5-6 of Annex 5.

Table 3.12: Number, area and volume of licensed and unlicensed fish farms in BiH

Type of activity and status of license	Number, area and volume of farms			Proportions of farms		
	No. of farms	Total area (ha)	Total water volume (m3)	Farms (%)	Total area (%)	Total water volume (%)
BD	**1**	**0**	**420**	**1**	**0**	**0**
Trading	1	0	420	1	0	0
FBiH	**53**	**5**	**178 959**	**35**	**0**	**58**
Pond	4	5	0	3	0	0
Tank	31	0	69 351	21	0	22
Cage	13	0	97 378	9	0	31
Trading	4	0	571	3	0	0
Mollusc	1	0	11 660	1	0	4
RS	**21**	**2 852**	**92 183**	**14**	**99**	**30**
Pond	6	2 852	0	4	99	0
Tank	12	0	14 450	8	0	5
Cage	3	0	77 733	2	0	25
Licensed farms – total	**75**	**2 857**	**271 562**	**50**	**99**	**87**
FBiH	**5**	**0**	**4 175**	**3**	**0**	**1**
Pond	1	0	0	1	0	0
Tank	3	0	422	2	0	0
Cage	1	0	3 753	1	0	1
RS	**4**	**4**	**18 949**	**3**	**0**	**6**
Pond	1	4	0	1	0	0
Tank	3	0	18 949	2	0	6
License in progress – total	**9**	**4**	**23 124**	**6**	**0**	**7**
BD	**3**	**1**	**280**	**2**	**0**	**0**
Pond	2	1	0	1	0	0
Trading	1	0	280	1	0	0
FBiH	**42**	**13**	**11 088**	**28**	**0**	**4**
Pond	6	8	0	4	0	0
Tank	18	0	6 287	12	0	2
Cage	1	0	2 250	1	0	1
Trading	13	6	2 551	9	0	1
No prod./info	4	0	0	3	0	0
RS	**22**	**13**	**4 798**	**15**	**0**	**2**
Pond	8	13	0	5	0	0
Tank	13	0	4 768	9	0	2
Trading	1	0	30	1	0	0
No license of farms – total	**67**	**27**	**16 166**	**44**	**1**	**5**
Grand total	**151**	**2 888**	**310 852**	**100**	**100**	**100**

Source: Study Team, 2014

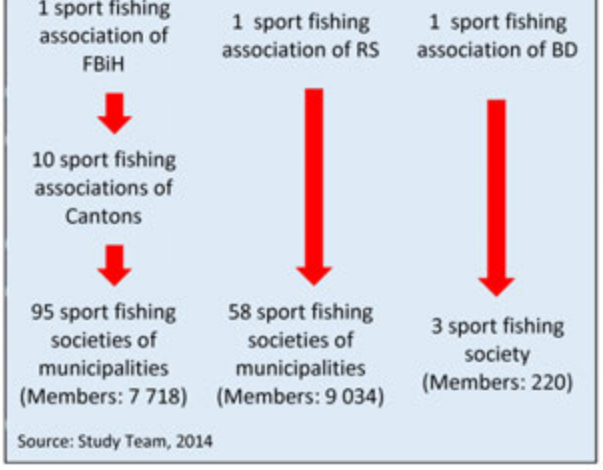
3.4 Structure and organization of fisherfolk and fish producers

3.4.1 Sport fishing associations and societies

In 2004 there were two entity associations plus one in Brèko District, 10 cantonal associations and 122 sport fishing societies in the municipalities in BiH. The total number of registered sport fishers was 35 000 (Hamzic, A.; Ecimovic, T., 2004, FAO, 2014B). Though today there are about 25 percent more associations but less registered members as demonstrated in Box 3.4 and Table A5-6 of Annex 5.

Most of the activities in the associations and societies are organized on a voluntary basis, but there are around 70 people who receive a regular salary. The salaries of most of the professionals in these organizations are covered from fishing permits issued for sport fishers, while a very small number receive salaries from the budget of the municipality. Only a few associations have their own premises, the rest have rented offices (Study Team, 2014).

Box 3.4: Hierarchy and number of sport fishing associations and societies in BiH in 2013



Source: Study Team, 2014

Sport Fishing Association of the Federation of Bosnia and Herzegovina

The Sport Fishing Association of the Federation of BiH is made up of 95 sport fishers' societies, three of which work under concession. In total there are 7 718 sport fishers in the societies. The societies employ 291 guards. About 60 percent of the guards receive salaries for their work. The estimated annual catch, including non-reported catches, is between 5-10 kg per person (61.5 – 123 MT per year). About 60 percent of the catches are Cyprinids and the rest are Salmonids.

The annual fee for sport fishing licenses is BAM 100 between the ages of 22 and 50. It is lower for younger members; namely, BAM 50 for people between the ages of 18 and 22, and only BAM 25 for under-18s. The daily fee for sport fishing outside the area of a particular society is BAM 20 for Salmonids and BAM 10 for Cyprinids.

Sport fishing societies use 8 percent of their income for restocking. Occasionally, in case of personal connections restocking is supported by hydropower centres. It is estimated that they spend about BAM 500 000 annually on restocking, but this is only a small proportion of what should be spent on restocking waters.

Sport fishing societies do not receive any state support, even though sport fishing is a popular recreational activity.

Sport Fishing Association of the Republika Srpska

In RS the right to utilize certain water areas is transferred from the Ministry of Agriculture, Forestry and Water Management to users of water bodies, streams and rivers. In order to receive the right to use waters, fishing societies must fulfil many obligations including the employment of a secretary and at least one fish guard. They must also complete a fish restocking plan for each year, which must be adapted to the specific water area.

The Sport Fishing Association (SFA) of RS has 58 Sport Fishing Societies in 12 Regions. In 2012 the societies had about 9 034 members. SFA estimates that in 2012 the average catch was slightly below 10 kg per person (Review Team).

The annual fee for licenses varies between BAM 28 and 80 depending on the age of the applicant. In addition, there is a small extra fee (BAM 1 per day) for fishing outside the licensed water territory of the society. As the sum collected from members is usually not enough to fulfil restocking obligations, hydropower centres should also contribute to restocking activities in a predictable and reliable manner. Sport fishing societies in RS receive state support on request submitted yearly (Review Team, 2014).

The Sport Fishing Association of RS conducts trainings for children, and new sport fishers need to pass an exam.

The Sport Fishing Association of RS maintains a fish hatchery in Bosanska Krupa. The hatchery, which was built with the financial support from Norway and the technical support of FAO, produces between 500 000 and 1 million brown trout annually

(5-7 cm), which are mainly used for restocking. If any surplus remains, the association sells it for BAM 0.1 per fish. The hatchery has a part-time manager and tasks are completed by volunteers.

3.4.2 Fish producers' associations

There are two organizations (one in each entity) for producers of freshwater and marine fish species (Hamzic, A.; Ecimovic, T., 2004). From these, the Association of Fish Producers has been established and is being maintained by the Agricultural Department of the Foreign Trade Chamber of Bosnia and Herzegovina. There are nine registered members of the Association. These member companies are the main fish exporters in BiH and they mainly receive support for their export and import activities. The membership fee is 0.03 percent of the gross income. The Chamber also plans to prepare trainings for farmers. These trainings are planned to be carried out by using financial support from SIDA and would be implemented by the Republic Agency for SME Development.

3.5 Fish production

3.5.1 Marine fisheries

Though it is estimated that the total production of marine fisheries is not more than 5 MT, there is no official data to back this up.

Considering that commercial marine fisheries are non-existent in BiH, determining marine potential by making comparisons with neighbouring and nearby Adriatic countries is not possible.

3.5.2 Inland fisheries

As in other European countries there are both legal and illegal (IUU) inland fisheries in BiH. There is no official statistical data on inland fisheries because angling associations are not obliged to submit statistics. Therefore such data is missing from the statistical reports of the country.

According to estimations, the total yearly inland fisheries production of registered anglers is around 160-170 MT.

3.5.3 Aquaculture

Production of Salmonids is carried out in flow through or cage systems. (There is only one hatchery which works as water recirculation system, although this has not been used recently.)

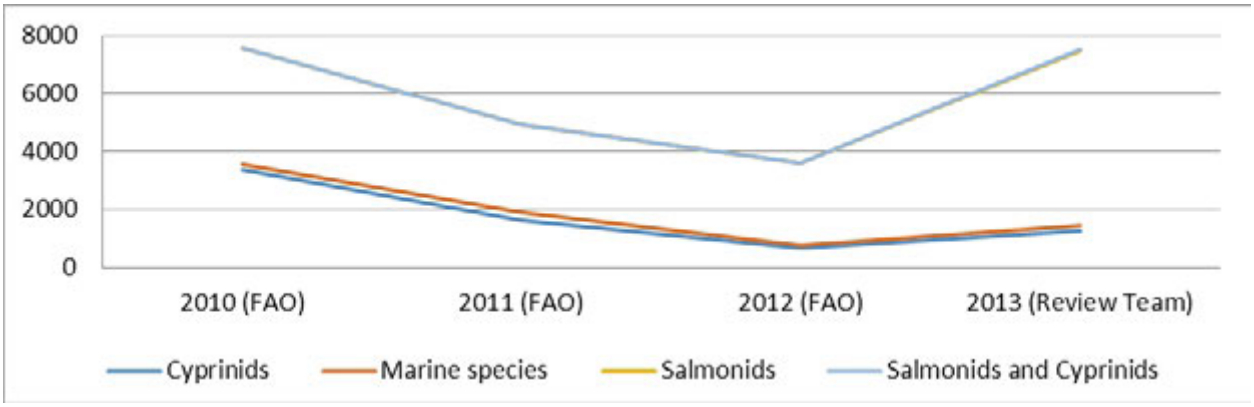
The annual production of land based trout farms depends on the available quantity of water. As a rule of thumb, farmers calculate fish production of 100 kg per year on a 1 litre per second water supply. (Supplying 1 MT of trout on a 12-14 litres per second water is necessary.)

The majority of Salmonids' farms have hatcheries, but only a few farms are specialized solely in the production and sale of stocking material (see Table A5-5 in Annex 5).

Carp are produced in traditional farms with large areas and shallow water. Pelleted or extruded feed is usually used on carp farms. Imported feed is used to feed carp up to fingerling size. The significance of supplementary feed in carp production is not so dominant as in other carp producing countries in Europe. Even though thousands of hectares are used for carp production, only one small capacity carp hatchery is in operation in the country. Carp are allowed to spawn naturally or the stocking material is purchased from Serbia, Croatia or Hungary.

Farm surveys have revealed that a sharp rise in fish production would be shown (see Figure 3.5 and Table 3.13) if official statistics involved all existing fish farms. This is because there is a considerable gap between the official and reported fish production figures of both Cyprinids and Salmonids. This gap – which grew larger in 2013 (see Table 3.11) – should be considered a warning sign of inadequate national and international statistical systems and practices.

Figure 3.5: Trends of fish production (MT) in 2010, 2011, 2012 and 2013



Source: Study Team, 2014 and FISHSTAT, 2014

Table 3.13: Production and proportions in licensed and unlicensed fish farms in BiH (2013) versus FAO relevant statistics of 2010, 2011 in 2012[20]

Status of license, culture system and entities	Cyprinids	Marine species	Salmonids	Salmonids and Cyprinids	Total
Fish production (MT)					
Pond fish farm surveyed	**1 220**				**1 220**
FBiH	5				5
RS	1 215				1 215
Tank fish farm surveyed			**2 790**	**24**	**2 814**
FBiH			1 871		1 871
RS			919	24	943
Cage fish farm surveyed		**160**	**2 161**		**2 321**
FBiH		160	871		1 031
RS			1 290		1 290
Licensed fish farms – total	**1 220**	**160**	**4 951**	**24**	**6 355**
Pond fish farm surveyed	**12**				**12**
FBiH	1				1
RS	11				11
Tank fish farm surveyed			**904**		**904**
FBiH			12		12
RS			892		892
Cage fish farm surveyed			**20**		**20**
FBiH			20		20
Farms with license in progress – total	**12**		**924**		**936**
Pond fish farm surveyed	**31**				**31**
BD	1				1
FBiH	11				11

20 There is no national hence FAO statistics available on the fish production for the year 2013 until the finalization of the Sector study.

Status of license, culture system and entities	Cyprinids	Marine species	Salmonids	Salmonids and Cyprinids	Total
RS	18				18
Tank fish farm surveyed			**164**	**4**	**168**
FBiH			72	4	76
RS			92		92
Cage fish farm surveyed			**15**		**15**
FBiH			15		15
Farms with no license – total	**31**		**179**	**4**	**239**
Grand total of fish farms	**1 263**	**160**	**6 054**	**28**	**7 505**
FAO statistics					
Production in 2010	3 350	190	4 010		7 550
Production in 2011	1 627	270	3 024		4 920
Production in 2012	670	97	2 819		3 586
Proportion of fish production					
Pond fish farm surveyed	**97**				**16**
FBiH	0				0
RS	96				16
Tank fish farm surveyed			**46**	**86**	**37**
FBiH			31		25
RS			15	86	13
Cage fish farm surveyed		**100**	**36**		**31**
FBiH		100	14		14
RS			21		17
Licensed fish farms – total	**97**	100	82	86	85
Pond fish farm surveyed	**1**				**0**
FBiH	0				0
RS	1				0
Tank fish farm surveyed			**15**		**12**
FBiH			0		0
RS			15		12
Cage fish farm surveyed			**0**		**0**
FBiH			0		0
Farms with license in progress – total	**1**		**15**		**12**
Pond fish farm surveyed	**2**				**0**
BD	0				0
FBiH	1				0
RS	1				0
Tank fish farm surveyed			**3**	14	2
FBiH			1	14	1
RS			2		1
Cage fish farm surveyed			**0**		**0**
FBiH			0		0
Farms with no license – total	**2**		**3**	14	3
Grand total of fish farm	**100**	**100**	**100**	**100**	**100**
FAO relevant statistics[21]					
Production in 2010	**265**	**119**	**66**		**101**
Production in 2011	**129**	**169**	**50**		**66**
Production in 2012	**53**	**61**	**47**		**48**

Source: Farm surveys of Study Team, 2013 and 2014 and FISHSTAT, 2014

21 Baseline: survey results of the sector study team

Table 3.14: Production and size categories of surveyed fish farms in BiH in 2013

Categories of active fish	Absolute terms				kg/ha or kg/m^3)	Relative terms			
	Farms (No.)	Total area (ha)	Total volume (m^3)	Total production (MT)		Farms (%)	Total area (%)	Total volume (%)	Total production (%)
Production of carp in ponds									
Pond fish farms - total	**28**	**2 883**		**1 263**	**438**	**100**	**100**		**100**
Below 1 ton	9	7		4	495	32	0		0
Between 1 - 5 MT	13	20		34	1 658	46	1		3
Between 5.1 - 10 MT	1	2		5	2 386	4	0		0
Between 10.1 - 25 MT	1	4		11	2 763	4	0		1
Between 25.1 - 50 MT	0	0		0	0	0	0		0
Between 50.1 - 100 MT	1	670		70	104	4	23		6
Between 100.1 - 500 MT	2	1 539		484	315	7	53		38
Between 500.1 - 1 000 MT	1	640		656	1 024	4	22		52
Production of trout in tanks									
Tank fish farms - total	**80**		**114 226**	**3 886**	**34**	**100**		**100**	**100**
0) No production	4		812	0	0	5		1	0
Below 1 ton	5		1 529	3	2	6		1	0
Below 1 ton	28		11 936	82	7	35		10	2
Between 1 - 5 MT	12		8 127	89	11	15		7	2
Between 5.1 - 10 MT	13		7 681	240	31	16		7	6
Between 10.1 - 25 MT	8		10 475	277	26	10		9	7
Between 25.1 - 50 MT	4		18 429	302	16	5		16	8
Between 50.1 - 100 MT	3		24 391	761	31	4		21	20
Between 100.1 - 500 MT	3		30 847	2 132	69	4		27	55
Production of trout in cages									
Cage fish farms - total	**18**		**181 114**	**2 356**	**13**	**100**		**100**	**100**
Below 1 ton	0		0	0	0	0		0	0
Between 1 - 5 MT	2		538	7	14	11		0	0
Between 5.1 - 10 MT	2		1 738	15	9	11		1	1
Between 10.1 - 25 MT	3		7 128	50	7	17		4	2
Between 25.1 - 50 MT	2		8 643	70	8	11		5	3
Between 50.1 - 100 MT	2		24 239	164	7	11		13	7
Between 100.1 - 500 MT	5		86 096	1 009	12	28		48	43
Between 500.1 - 1 000 MT	2		52 733	1 040	20	11		29	44
Total	**126**	**2 883**	**295 340**	**7 505**					

Source: Farm surveys of Study Team, 2013 and 2014

Surveys have shown that out of all operating land based trout fish farms 66 (83 percent) are small and medium-sized enterprises. These are farms with fish production up to 50 MT per year. See more details in Table 3.14.

3.6 Physical and human conditions of aquaculture production

In addition to the size of fish farms, their production in general and their financial success in particular are also determined by water supply, farm infrastructure and their mobility (transport facilities) which allows them to take their fish to the market, as well as how skilled and motivated their employees are. In this regard most fish farms in BiH are well endowed.

3.6.1 Use of water and the impact of farms on the environment

Seventy four percent of all fish farms get their water from surface water while most of the rest (22 percent) use spring water. These fish farms use a total of 797 244 368 m^3 water per year (see details in Table 3.15).

Table 3.15: Water use of fish farms in BiH

Water source and entities	Farms (No.)			Farms (%)		
	Pond	Tank	Total	Pond	Tank	Total
Surface water - total (about 79% or 632 191 580 m^3)	**16**	**53**	**69**	**84**	**72**	**74**
From river	7	26	33	37	35	35
FBiH	3	16	19	16	22	20
RS	4	10	14	21	14	15
From spring	**1**		**1**	**5**		**1**
From stream	**7**	**27**	**34**	**37**	**36**	**37**
BD	1		1	5		1
FBiH	3	20	23	16	27	25
RS	3	7	10	16	9	11
From stream and river	**1**		**1**	**5**		**1**
RS	1		1	5		1
Surface/underground water - total (about 4% or 30 692 600 m^3)		**4**	**4**		**5**	**4**
From river/spring		**1**	**1**		**1**	**1**
FBiH		1	1		1	1
From spring/stream		**3**	**3**		**4**	**3**
FBiH		2	2		3	2
RS		1	1		1	1
Underground - total (about 17% or 134360188 m^3)	**3**	**17**	**20**	**16**	**23**	**22**
From spring	**3**	**17**	**20**	**16**	**23**	**22**
BD	1		1	5		1
FBiH	3	17	16	16	18	17
RS		4	4		5	4
Total (100% or about 797 244 368 m^3/year)	**19**	**74**	**93**	**100**	**100**	**100**

Source: Farm surveys of Study Team, 2013 and 2014

In terms of the quality of effluents, pond culture releases unpolluted water while intensive culture systems have an impact on the environment. This is discussed in Annex 7.

Environmental permission is one of the preconditions of fish farms' operation. This is because complex procedures are not carried out at unlicensed fish farms, which is an additional reason for simplifying the permission procedures and maintaining obstacles only for those cases which really need special attention of the concerned authorities.

3.6.2 Fish farm facilities and equipment

Except for the few larger units, farms are poorly equipped, as summarized in Table 3.17.

Table 3.16: Status of environmental permission on the surveyed fish farms in BiH in 2013

Status of license	Fish farms (No.)				Fish farms (%)			
	BD	FBiH	RS	Total	BD	FBiH	RS	Total
Yes		51	21	72	0	51	45	48
In progress		4	3	7	0	4	6	5
No	4	35	9	48	100	35	19	22
No information		10	14	24	0	10	30	16
Total	**4**	**100**	**47**	**151**	**100**	**100**	**100**	**100**

Source: Farm surveys of Study Team, 2013 and 2014

3.6.3 Fish transport facilities at fish farms

Having proper transport facilities of produced live or frozen fish both allows and guarantees their timely marketing. According to farm surveys most fish farms have no proper means of fish transport as shown in Table 3.16 and Tables A5-8.1 and A5-8.2 of Annex 5.

Table 3.17: Production, transport and marketing facilities on the surveyed fish farms in BiH in 2013

Items	Farms	
	No.	%
Presence of fish farm facilities		
8.5 Fish feed store (m^2)	151	100
8.6 Fish feed silo (m^3)	1	1
9.1 Boats without engine (No.)	15	10
9.2 Boats with engine (No.)	20	13
9.4 Bird nets (m^2)	6	4
9.5 Water pumps (No.)	39	26
9.6 Water pumps (total capacity m^3/sec)	38	25
9.7 Egg counter (No.)	3	2

Items	Farms	
	No.	%
9.8 Aerators (No.)	5	3
9.9 Oxygen diffusers (No.)	0	0
9.10 Grinding machine (MT/hour)	3	2
Pelleting machine (MT/hour)	1	0
9.12 Mechanical feeder (No.)	5	3
9.13 Automatic feeder (No.)	50	33
9.14 Fish grading machine (Max. MT/hour)	34	23
9.18 Automatic water quality alarm system	1	1
Presence of fish transport		
Vehicle	75	50
Live fish transporting facilities	51	34
Fish transporting tanks	43	28
Iced fish transporting capacity	6	4
Frozen fish transporting capacity	20	13
Presence of fish processing and marketing facilities		
Ice making machine	16	11
Fish stunning machine	6	4
Fish gutting machine	16	11
Fish filleting machine	3	2
Fish smoking facilities	8	5
Fish packing facilities	5	3
Cold storage capacity	11	7
Deep freezing capacity	4	3
Live fish storing capacity (aquarium)	4	3
Own fish processing unit	5	3
Own fish shop	19	13
Own fish restaurant	34	23

Source: Farm surverys of Study Team, 2013 and 2014

3.6.4 Fish health and veterinary services

The fish stocks of all surveyed fish farms were found to be healthy due to the professional veterinary services and the fish farmers who are very serious about fish health related issues (see Table 3.18).

Table 3.18: Fish health and the veterinary services on the surveyed fish farm in BiH in 2013

Status of license	Fish farms (No.)				Fish farms (%)			
	BD	FBiH	RS	Total	BD	FBiH	RS	Total
Fish health								
No problem	4	60	19	83	100	60	40	55
Normal		11	9	20		11	19	13
Occasional problems		5	3	8		5	6	5
Frequent problems		2		2		2		1
No information		22	16	38		22	34	25
Total	**4**	**100**	**47**	**151**	**100**	**100**	**100**	**100**
Cooperation with veterinary services								
Yes		5	1	6		5	2	4
Occasional	1	2	9	12	25	2	19	8
Seasonal			1	1			2	1
Regular	2	54	12	68	50	54	26	45
No		3		3		3		2
No information	1	36	24	61	25	36	51	40
Total	**4**	**100**	**47**	**151**	**100**	**100**	**100**	**100**
Dead fish disposal place								
No		3	4	7		3	9	5
Yes	4	55	10	69	100	55	21	46
Municipality depot			2	2			4	1
No information		42	31	73		42	66	48
Total	**4**	**100**	**47**	**151**	**100**	**100**	**100**	**100**

Source: Farm survesy of Study Team, 2013 and 2014

3.6.5 Employees of fish farms

Out of the surveyed 151 fish farms three (2 percent) are cooperatives, 47 (31 percent) are limited companies, three (2 percent) are non-profit organizations and 97 (64 percent) are family enterprises.

According to official statistics, there were only 340 men and 67 women employed in the aquaculture sector in BiH in 2012. The state report concludes that fisheries employ about 0.1 percent of the workforce (Agency for Statistics of Bosnia and Herzegovina, 2012, Institute for Statistics of the Federation of Bosnia and Herzegovina, 2012 and 2013*B*). In FBiH there were 143 people employed in

the subsector. Of these, 54 percent finished the secondary school and 48 percent were skilled workers.

The relevant sections of the farm surveys evaluated and presented in Table A5-7 in Annex 5 show that a total of 622 people are employed on fish farms. Out of these 97 (16 percent) are women. The educational background of employees varies between elementary school and university degree level.

3.7 Fish feed production and use

3.7.1 Production of fish feed

At present there is only one producer of fish feed in BiH, namely the Slavnic d.o.o. fish feed factory. In addition to feed for different terrestrial animals this factory also produces three types of feeds for common carp:

Feed for fry rearing: Dust, protein content is 47 percent

Grow-out feed with 32 percent protein and 10 percent fat (FCR: 1.3-1.7 and price: BAM 1.3 per kg)

Grow-out feed with 25 percent protein and 7 percent fat (FCR: 2.0-2.5 and price: BAM 1.2 per kg)

Box 3.5: Types of fish feeds used in the different culture systems

Supplementary fish feeds are the different grains and agricultural by-products which are given to common carp in ponds in order to supplement the natural fish food grown in pond water.

Industrial fish feeds are those which are made according to given receipts. These feeds can vary from a simple mixture of different energy or/and protein rich ingredients to fully balanced fish feeds. The latter ones contain all ingredients (energy, proteins, vitamins and minerals) and are also pellet. Today, almost exclusively, industrial fish feeds are used in the intensive fish culture systems such as tank and cage culture. The FCR of the modern feeds is near to 1.

Farm made fish feeds are a less rigorously compiled type of feed usually made for common carp reared in ponds.

Source: Review Team, 2014

This is the only factory which produces pelleted feed for common carp table fish production. This feed has a protein content of either 25 or 32 percent. In the past the demand for industrial carp feed was high. Until 2007 the factory could sell up to 4 000 MT of carp feed annually but in recent years production has only been 600-700 MT per year which is a consequence of declining carp production. In addition, imported carp feed from Serbia also contributes to reduced production, as the company cannot compete with Serbian industrial fish feed imports, which are only subject to a 1 percent tax, while the ingredients imported to RS have a much higher tax, regardless of whether they come from CEFTA countries or from the EU.

Veterinarian inspectors sample the feed and feed ingredients regularly. They send the samples to the Veterinarian Department of the Agricultural Ministry for quality control. The Ministry assigns Vaso Butozan Institute in Banja Luka or accredited private labs to examine the quality.

3.7.2 Use of fish feed

Imported fish feeds are used to feed Salmonids, most frequently in extruded forms. The main feed suppliers are from Italy and the Netherlands. They supply feeds for 76 percent of trout farms; Skretting (65 percent), Coppens (11 percent), while other fish feed producers supply much less fish farms; Les Guessant (7 percent), BioMar (4 percent), Veronesi (4 percent), Aller Aqua (2 percent) and Aqua Grant (1 percent), Natur Alleva (1 percent), Slavnic (1 percent) and MB Mins (1 percent). The price of imported feeds for Salmonids varies between BAM 3.5 and 3.6 per kg. Use of farm made trout feed is exceptional.

Statistical import figures of fish feeds show that from EU countries about 3 994 MT (10.3 million BAM) and from Serbia 536 MT of trout feed were imported into BiH in 2013. These figures are fully in harmony with those reported by the fish farmers during farm surveys as an about 2000 MT of gap appears (see Table 3.19).

Table 3.19: Types and estimated quantities of fish feed used in BiH in 2013

Culture system	Used supplementary feeds		Used farm-made feed		Used industrial fish feed	
	MT/yr.	%	MT/yr.	%	MT/yr.	%
Pond	5 921	100	522	83	548	8
Tank	0	0	76	12	3 859	54
Cage	0	0	25	4	2 521	36
Trading	4	0	4	1	18	0
Mollusc	0	0	0	0	150	2
Total	**5 925**	**100**	**626**	**100**	**7 096**	**100**

Source: Study Team, 2014

3.8 Fish processing

There are three modern fish processing plants in the country; in Banja Luka, in Salakovac and in Rogatica. These factories use modern technologies in accordance with EU standards and are authorized to export fish to the EU. The total annual potential capacity of these three factories is about 3 700 MT (Ministry of Foreign Trade and Economic Relations, 2012).

Foreign owners run a processing plant (located in Stolac, Herzegovina-Neretva Canton) for salting anchovies. Between 500 and 1 400 MT fish are transported from Croatia to this plant annually for processing. The quantity of fish processed here depends on the catch (FAO, 2014 A and Study Team, 2014[22]).

Farm surveys proved that practically all fish farms process some of the fish they produce and sell it on the farm. This may include simple cleaning and gutting but also packing for selling elsewhere than the farm. Accordingly, all small or medium-sized farms have a cleaning place for fish. This is because these farms sell fish in small portions either live or cleaned. The number and proportion of fish farms which are equipped with fish processing facilities are presented in Table 3.17 and Tables A5-9.1 and A5-9.2 in Annex 5, while the total capacities are summarised listed in Table 3.20.

Table 3.20: On farm fish processing equipment and capacities on the surveyed fish farms in BiH in 2013

Items	Culture system					
	Pond	Tank	Cage	Trading	Mollusc	Total
Ice making capacity (kg/hour) (11 % of farms)	10	890	270	20	50	1 240
Fish stunning capacity (kg/hour) (4 % of farms)		3 000	1 850			4 850
Fish gutting capacity (kg/hour) (11 % of farms)	40	3750	3400			7190

22 Travel report provides different information: There are two specialized fish processing plants in the country; the first can be found in Banja Luka owned by Tropic Holding and the other one in Blagaj (Slavniæ d.o.o.).

Items	Culture system					
	Pond	Tank	Cage	Trading	Mollusc	Total
Fish filleting capacity (kg/day) (2 % of farms)		1 960				1 960
Fish smoking capacity (kg/day) (5 % of farms)	30	455		0		485
Fish packing capacity (kg/day) (5 % of farms)		22 100	20 000			42 100
Deep-freezing capacity (m3) (5 % of farms)		270	10			280
Cold store capacity (m3) (7 % of farms)	68	920	85	150		1 223
Live fish storing capacity - aquarium (m3) (3 % of farms)	5	962	2			969
Own fish processing unit - total area (m2) (11 % of farms)		1 059	200			1 259
Own fish shop - total area (m2) (13 % of farms)	235	407	418			1 060
Own fish restaurant - total area (m2) (23 % of farms)	1	23	1	8	1	34

Source: Farm surveys of Study Team, 2013 and 2014

3.9 Trade and marketing of fish and seafood in Bosnia and Herzegovina

3.9.1 Export and import of fish and seafood

The Agricultural Department of the Foreign Trade Chamber of Bosnia and Herzegovina has established and maintains the Association of Fish Producers. The Chamber supports the nine registered members, which are the biggest producers and main fish exporters of the country, in their export and import activities. The main objective of the chamber is to increase tax free export quotas.

According to the data of the Chamber of Commerce and Industry received by the Study Team, 3 406 MT, which is a substantial part of fish production, was exported in 2011. More than half of exports went to EU countries as fresh products on ice. A small amount of fish is exported in smoked form. In 2011 the total export of fish and fishery products was found to be USD 12.3 million, while the value of imports (around 13 200 MT) were USD 33.9 million (Study Team, 2014). Data from FIGIS, presented in Table 3.21, shows similar figures for 2011.

Table 3.21: Export and import of fish and seafood in BiH in 2011

Commodity	Export	Import	Balance	Export	Import	Balance
	MT			1 000 USD		
Crustaceans, frozen	0	37	-37	4	377	-373
Crustaceans, not frozen	0	3	-3	1	57	-56
Crustaceans, prepared or preserved	0	2	-2	0	26	-26
Crustaceans subtotal	0	42	-42	5	460	-455
Fish fillets, frozen	2	816	-814	29	2 759	-2 730
Fish meat, whether or not minced, and fillets, fresh or chilled	1	46	-45	10	312	-302
Fish meat, whether or not minced, frozen	1	32	-31	14	128	-114
Fish prepared or preserved	0	4 866	-4 866	9	28 626	-28 617
Fish, dried, salted or smoked	647	8	639	2 878	193	2 685

Commodity	Export	Import	Balance	Export	Import	Balance
	MT			1 000 USD		
Fish, fresh or chilled, excluding fillets and meat	1 179	1 355	-176	6 039	2 492	3 547
Fish, frozen, excluding fillets and meat	313	2 408	-2 095	1 467	6 941	-5 474
Fish, live	838	215	623	3 576	844	2 732
Fish subtotal	**2 981**	**9 746**	**-6 765**	**14 022**	**42 295**	**-28 273**
Molluscs, aquatic invertebrates	**102**	**994**	**-892**	**639**	**3 545**	**-2 906**
Total	**3 083**	**10 782**	**-7 699**	**14 666**	**46 300**	**-31 634**

Source: FAO-FIGIS, 2014

Trade (export and import) of fish is well regulated and fish import and export quotas and applicable duties with the EU are clearly set in various documents, such as:

- The Council Regulations 3.7.2012 on trade related measures to guarantee the supply of certain fishery products to the Union, process from 2013 to 2015 amending regulations (EC) No 104/2000 and (EU) No 1344/2011 and repealing Regulation (EC) No 1062/2009
- Commission Decision (23.2.2008) of 18 February 2008 amending Decision 2006/766/EC regarding the list of third countries and territories from which imports of fishery products in any form for human consumption are permitted (see Box 3.6).
- Interim Agreement on Trade and Trade-Related Matters between the European Community, of the one part, and Bosnia and Herzegovina, of the other part – Official Journal of the European Union 30.6.2008 (see extract in Table 3.22).
- Interim agreement on trade and trade-regulated matters between the European Community, of the one part, and Bosnia and Hercegovina, of the other part – Chapter II Agriculture and Fisheries, Article 9 (SAA Article 24).
- Commission Regulation (EU) No 354/2011 of 12 April 2011 opening and providing for management of tariff quotas of the Union for certain fish and fishery products originating from Bosnia and Herzegovina

Box 3.6: Conclusion of Commission inspection regarding the export of fishery products into the EU

The inspection, which was completed between 29 August and 2 September 2005, concluded: "It has been proven that competent authorities in BiH have provided all necessary guarantees to satisfy the relevant sanitary conditions of import of fishery products in any form for human consumption in the EU. Bosnia and Herzegovina should therefore be included in the list of third countries from which Member States may authorize imports of fishery products." (*Bondad-Reantaso, M.G.; Arthur, J.R.; Subasinghe, R.P. (eds), 2009)*

Table 3.22: Duties applicable to goods produced in Bosnia and Herzegovina to import into the EU

Description	CN Code	MFN duty (%)	Duty free quota (MT)	Proportion of MFN duty over import quota (%)
Trout[23]**:** live; fresh or chilled; frozen; dried; salted or in brine, smoked; fillets and other fish meat; Flours, meals and pellets, fit for human consumption.	0301 91 10	10.0	60	70
	0302 11 10 0302 11 20 0302 11 80	10.7		
	0303 21 10 0303 21 20 0303 21 80	8.0		
	0304 19 15 0304 19 17 0304 29 15 0304 29 17	10.8		
	0305 49 45	14.8		
Carp: live; fresh or chilled; frozen; dried, salted or in brine, smoked; fillets and other fish meat; flours, meals and pellets, fit for human consumption	0301 93 00	8.0	130	70
	0302 69 11	9.9		
	0303 79 11	9.7		
Sea bream[24]**:** live; fresh or chilled; frozen; dried, salted or in brine, smoked; fillets and other fish meat; flours, meals and pellets, fit for human consumption	0302 69 61	9.9	30	30
	0303 79 71	9.7		
Sea bass[25]**:** live; fresh or chilled; frozen; dried, salted or in brine, smoked; fillets and other fish meat; flours, meals and pellets, fit for human consumption	0302 69 94	9.9	30	30
	0303 77 00	10.8		
Processes or canned sardines	1604 13 11 1604 13 19	6.0	50	100
Processed or canned anchovies	1604 13 11 1604 13 19	12.5	50	100

Source: European Commission, 2008 B

23 Salmo trutta, Oncorhynchus mykiss, Oncorhynchus clarki, Oncorhynchus aguabonita, Oncorhynchus gilae, Oncorhynchus apache and Oncorhynchus chrysogaster
24 Dentex dentex and Pagellus spp.
25 Dicentrarchus labrax

3.9.2 Fish and seafood supply chains

Fish produced on farms are sold directly to farm-gate consumers or to supermarkets, specialised fish shops and restaurants. There is no wholesale fish market in the country. Approximately 65 percent of the total production of fish is sold on domestic markets. The fish supply in the country is mainly maintained through supermarkets, specialized units of food markets and retailer shops. A significant part of the fish is sold on-farm in gutted form while in supermarkets, fish shops and fish markets it is sold mainly in gutted and iced form. The majority of fish is consumed as feast food during the Christmas period in Republika Srpska (Hamzic, A.; Ecimovic, T. 2004).

3.9.3 Fish and seafood prices

The price of smaller trout up to fingerling size is calculated on the basis of the number of fish multiplied by the average weight in kilograms multiplied by 0.1 KM. BAM 6 is then added to this amount.

Regarding table fish, only a very limited number of relevant official statistics are available in RS; the average price of "river and lake fish" was BAM 4.1 per kg in 2013 in the entity. A similar price is indicated in the statistical report of FBiH and in a state level report in BiH (Study Team, 2014).

Discussions during farm surveys cleared some details. The price of trout sold on a large scale varies from between BAM 5.5 and 6.5 per kg across the country. The retail farm-gate price of live trout is about BAM 7 per kg while that of gutted ones is BAM 9.

Farm-gate prices and retailer prices of table fish on the Banja Luka fish market are shown in Table 3.23. These prices which may seasonally change are similar in the FBiH and BD.

Table 3.23: Price of different fish species in BiH

Fish species	Farm gate price		Retailer price		Gutted/cleaned fish	
	BAM per kg	EUR per kg	BAM per kg	EUR per kg	BAM per kg	EUR per kg
Trout	5.5 - 6.5	2.25- 3.25	8.5	4.25	14.0	7.00
Common carp	4.7	2.35	8.0	4.00	14.0	7.00
Silver carp	2.5	2.25	6.0	3.00	11.0	5.50
Grass carp	3.0	1.50	6.0	3.00	14.0	7.00
European catfish	8.0	4.00	-	-	-	-
Pike perch	8.0	4.00	-	-	-	-

Source: Study Team, 2014

3.10 Fish and seafood consumption

According to FAO statistics, per capita consumption of fish and fish products was estimated to be 6.8 kg in 2007 (see Table 3.24). It has remained stagnant in the last years as recent FAOSTAT data, presented in Table 3.25, shows.

Table 3.24: Fish consumption in BiH

Items	Production	Imports	Exports	Total Supply	Per Capita Supply (kg/y)
		MT of live weight			
Fish for direct human consumption	10 014	13 218	3 512	24 000 (19 720 in 2011)	6.8 (5.1 in 2011)
Fish for animal feed and other purposes		959 MT			
Value of fisheries imports					USD 37 196 000
Value of fisheries exports					USD 13 262 000

Source: FAO, 2014 A and 2014 B

Table 3.25: Fish consumption in BiH

Item	Total quantity in 2011 (MT)	Per capita consumption in 2011 (kg)
Crustaceans	73	0.02
Demersal Fish	2 561	0.67
Fish Meal	0	0.00
Fish, Body Oil	0	0.00
Fish, Liver Oil	7	0.00
Freshwater Fish	7 757	2.02
Marine Fish, Other	4 010	1.05
Molluscs, Other	1 729	0.45
Pelagic Fish	6 282	1.64
Total	22 419	5.85

Source: FAO-FIGIS, 2014

4. GOVERNMENT POLICIES FOR THE SECTOR

4.1 Overview of policy frameworks in Bosnia and Herzegovina

Support policy measures in BiH are the competence of two entities and Brcko District. In the FBiH, cantons have a certain influence on such measures, while other policy issues such as role of coordination remains at the level of harmonization and coordination. To strengthen the latter "Strategic Plan for Harmonization of Agriculture, Food and Rural Development (AFRD) (2008 – 2010)" was elaborated, which is in harmony with the state level law on Agriculture, Food and Rural Development issued on 15 May 2008.

Objectives of this law are to:

- Define frameworks for institutional structures, competencies, responsibilities, reporting lines, legislative drafting, coordination mechanisms, consultation processes, rights, obligations and enforcement measures in all ministry levels of Bosnia and Herzegovina (BiH) involved in the development of the agriculture, food and rural sector.
- Define frameworks and mechanisms to strengthen competitiveness, the quality of agricultural and food products and the application of standards needed to achieve a dynamic development of the agriculture, food and rural development sector.
- Define frameworks and mechanisms required for the association with and accession to the European Union (EU) and for the fulfilment of all obligations defined by international agreements related to the agriculture, food and rural development sector in BiH.
- Define frameworks to ensure conformity of sector strategies and agro-economic policies, specific implementing measures and enforcement procedures required for the coordinated development of the sector of agriculture, food and rural development in BiH.
- Define framework objectives for the agriculture and rural development sector and set up a framework of measures required for realization.
- Encompass terminology for proper utilization in the agriculture, food and rural development sector. This should cover legislation, objectives, principles and mechanisms for the development of strategies and policies, structures and competencies at all levels of authorities, institutional support structures and services together with their functions and linkages, monitoring and evaluation mechanisms, and the supervision of administration and inspection.

The law states that AFRD sector includes:

1. Agriculture and food (primary production, processing and distribution of food)
2. Rural development
3. Forestry and forestry products (as related to EU integration)
4. Fisheries and fish products
5. Water management (as related to agriculture and rural development)
6. Agricultural machinery, equipment and buildings
7. Agricultural land
8. Agri-environment

With the exception of forestry and forestry products, all the above listed areas of the agriculture, food and rural development sector can be linked directly or indirectly to fisheries and aquaculture even if no references are available or details are described in the law.

4.2 Strategies regarding the fishery and aquaculture sector at state and entity level

4.2.1 Development strategies

In order to achieve the objectives of the AFRD Harmonization Strategic Plan six priority areas have been identified (European Commission, 2013 C, 2014 A, 2014 D and 2014 E):

1. Establishment of a functional institutional capacity with proper coordination and implementation mechanisms at all levels.
2. Enhancement of the quality and safety of domestic products with a competitive advantage in production, processing and trade.
3. Support for primary production through direct farm support measures and gradual alignment between entities and with EU mechanisms.
4. Increasing competitiveness through indirect support measures for production, processing and trade.
5. Protection of the rural environment through agro-environmental programs.

6. Diversification of rural activities and improvement of living standards in rural areas.

From the listed six priority areas the second, the fourth, the fifth and the sixth are specifically applicable to fisheries and aquaculture.

Strategic priorities of entities directly or indirectly related to the fishery and aquaculture sector are listed in Table 4.1.

Table 4.1: Priorities of entity strategies applicable for the fishery and aquaculture sector

Federation of Bosnia and Herzegovina Mid-Term Agricultural Sector Development Strategy (2006 - 2010)	Republika Srpska Rural Development Strategy Plan (2009 - 2015)	Brčko District Development Strategy for Agriculture, Food and Rural Areas (2009 - 2013)
Support to food processing		
Establishment of a sustainable and competitive agriculture and food processing industry.	-	Farm investments
Building of new facilities for food processing.	Investments in the processing and marketing of agricultural products.	Supporting the revitalization of the food processing industry.
Cooperation of producers and improvement of human resources		
Strengthening cooperatives, enterprises and other producers' organizations.	Supporting the organization of agricultural producers.	Development of vertical and horizontal integration with strengthening market infrastructures.
-	Improving professional education and producers' skills.	Improving human resources in rural areas.
Financial support to rural enterprises		
-	Financial support to rural areas.	Developing financial resources and increasing financial support for the agricultural sector.
Management of the environment and natural resources		
Protection and rationalization of the use of natural resources and support to a sustainable and economic utilization of water.	Sustainable management of natural resources.	Application of instruments for environmental preservation including sewage treatment in rural areas.
Diversification of rural activities		
-	Diversification of agricultural activities in rural areas.	Supporting the development of complementary activities of farms.
Support to rural enterprises		
-	Establishment of micro-, small- and medium-size enterprises.	Supporting the establishment of micro-, small- and medium-size enterprises.
Support to rural tourism		
Implementation of external media campaigns to attract tourists to BiH.	Improvement and development of rural tourism.	Supporting the development of agro-tourism.
Support to rural initiatives		
-	Supporting local initiatives for rural development.	Establishment of Local Action Groups and development of capacities for implementation of rural development.
Supplying a sufficient quantity and quality of food to consumers at an affordable price.	-	-

Source: FAO, 2012

4.2.2 Sector policies and cross-cutting policies

There is no direct inter-entity coordination of fisheries and aquaculture. It only exists in the field of environment and water management which indirectly concerns the sector. Both the Inter-entity Steering Committee for the Environment and the Inter-Advisory Commission for the Coordination of Water Management are under the direct control of the state government (UNEP BOSNIA AND HERZEGOVINA, 2011).

4.3 Operational programmes and measures in support of the fishery and aquaculture sector

There are neither operational programs nor coordinated state level support measures for the fishery and aquaculture sector in BiH. The Study Team concluded that such support is only provided at entity level as summarised in the following chapters.

4.3.1 Support measures in the FBiH

The Ministry of Agriculture, Water Management, Forestry and Food of FBiH provides financial support to farmers by subsidizing production (0.75-1.5 BAM per kg produced fish). Subsidies are only available for registered fish farmers who receive support on the basis of taxed quantities of produced fish only after water pollution fees are paid.

The ministry has a limited budget to support investments in the sector. The amount of support is a maximum of 25 percent of the total investment. The contribution is paid on the basis of official bills after the completion of the investment.

4.3.2 Support measures in RS

The Ministry of Agriculture, Forestry and Water Management of RS is responsible for the allocation of subsidies to registered producers, which is BAM 0.3 per kg of table fish.

In RS farms and companies can also receive 25 percent of investment costs as a subsidy but the relevant budget of the Ministry is limited. It is planned to introduce a new type of support for farm establishments. This will be around 35-40 percent of investment costs, up to a limit of BAM 35 000.

4.3.3 Support measures in BD

There are no support measures for the fishery and aquaculture sector in BD.

4.4 Institutional support for the fishery and aquaculture sector

4.4.1 Research and development

In RS, the Ministry supports research related to fish nutrition and fish diseases. However, the budget which can be devoted for this purpose is limited. The main research bodies in RS are the Faculty of Agriculture and the Faculty of Natural Sciences and Mathematics.

In the FBiH there are no regular research and development programs for fisheries and aquaculture.

4.4.2 Education and extension services

Aquaculture is not part of the education program in secondary schools. In public state universities in Banja Luka, Tuzla, Sarajevo and Mostar students have the opportunity to study aquaculture. In most cases they can only receive academic knowledge without any practical education. In private universities there are no opportunities to study aquaculture.

Fish producers' associations have not organized any kind of entity or local level trainings either with local, or with international experts.

Regular and *ad hoc* organizations of academic and practical courses on fisheries management and aquaculture would be very important, especially as in most cases the completion of such trainings is a precondition for obtaining licenses in all three entities (see Table 4.2).

Table 4.2: Sector related activities and regulations on obligatory trainings/exams for such activities

Activity	Regulations on obligatory trainings/exams in BiH		
	FBiH	RS	BD
Commercial fishing	Under presently applicable law there is no need for an exam to receive a fishing license. In the new fishery law under still preparation a fishery exam will be required for that.	Employer or employee should pass an exam qualifying for commercial fishing. Leaders of associations and societies need to pass a management exam for a fishery zone.	Exam on commercial fishing is needed.
Commercial sport fishing	No such criteria are specified in the law.	Exam for management of fishery zone and employees with relevant exams.	No such criteria are specified in the law.
Sport fishing	Exam is required for a license.	Exam is required for recreational and sport fishing .	Exam is required for recreational and sport fishing.
Fish guards	Exam is required for a license.	Exam is required for a license.	Exam is required for a license.
Aquaculture	Under presently applicable law there is no need for an exam to receive a license. In the new fishery law still under preparation a fishery exam will be required for that.	Exam is required for managing aquaculture.[26]	Professional training/education is required to receive a licence for aquaculture.
Observations	A commission appointed by the FBiH Minister prepares the exams and issues certificates.	The Ministry prepares the exams and issues certificates. Those who have a university degree on fisheries and aquaculture do not need to pass the above mentioned exams.	Exams are prepared and certificates issued by a committee appointed by the Mayor based on a proposal prepared by the Head of Department.

Source: Study Team, 2014

Levels and types of professional education opportunities in BiH are presented in Table 4.3.

Table 4.3: Matrix of existing and missing professional education for stakeholders of the fishery and aquaculture sector

Type of education	Technical education for levels of educational background			Activity/position			
	Elementary school	Secondary school	University	Commercial fishers	Sport fishers	Fish guard	Managers
State exam for receiving license	-	-	-	Exists	Exists	Exists	Exits
School/training for skilled fishers	Missing	-	-	-	-	-	-
School/training for skilled fish farm worker	Missing	-	-	-	-	-	-

26 To receive a license for shorter than one year no exams need to be passed.

Type of education	Technical education for levels of educational background			Activity/position			
	Elementary school	Secondary school	University	Commercial fishers	Sport fishers	Fish guard	Managers
MSc course on fisheries and aquaculture	-	Exists	Exists	-	-	-	-
Ph.D course on fishery and aquaculture		Exists	Exists	-	-	-	-
Training courses to update already existing knowledge	Missing	Missing	Missing	Missing	Missing	Missing	Missing
Training courses and scholarship programs	Missing	Missing	Missing	-	-	-	-

Source: Study Team, 2014

There are no organized extension services in BiH (Study Team, 2014).

4.4.3 Statistics and information services

Statistics and information services can play an important role in sector administration and management if reliable data and information is equally provided to all stakeholders. On the other hand, unreliable and misleading statistical data can be an obstacle to further development of the sector.

The statistical system in BiH is very well established, with state and entity level agencies working in close cooperation with the Central Bank of BiH. They have the organizational structure and professional capacities to collect process and publish statistical data and information of different branches of the agriculture and food industry.

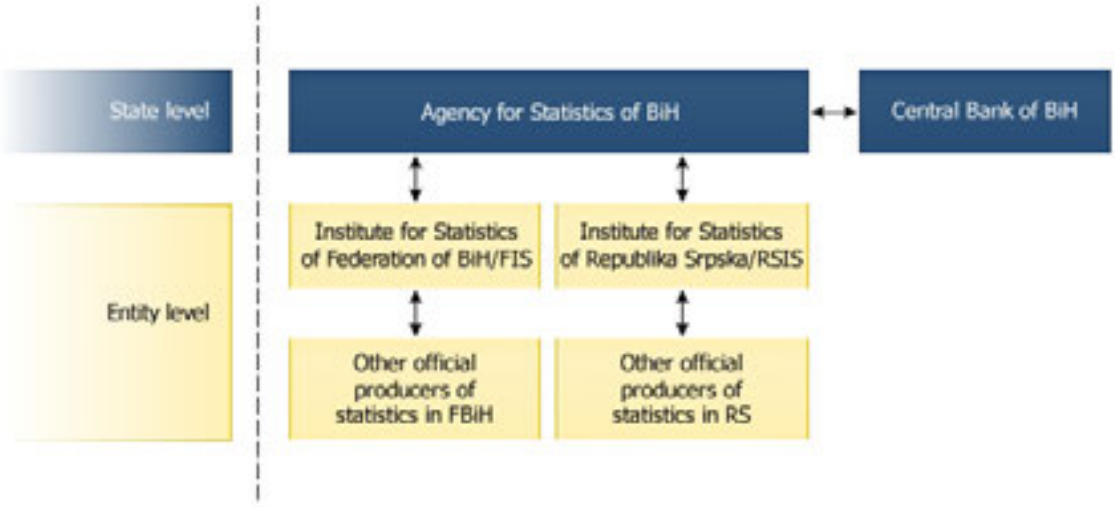
As presented in Figure 4.1 there are three statistical offices in Bosnia and Herzegovina. According to the law on statistics, the competent authorities for organizing, producing and disseminating statistical data are: the Agency for Statistics of Bosnia and Herzegovina at the state level, (BHAS), the Institute for Statistics of Federation of BiH (FZS) and the Institute for Statistics of Republika Srpska (RZRS). As of 1 January 2006, the Agency for Statistics of BiH has compiled and presented all statistical data and information of BD on its website. The Statistical Bureau of Brèko District operates a branch office of BHAS. In addition to these three institutions, the Central Bank of BiH compiles monetary information, balance of payments and financial statistics for BiH (CBBiH) (Agency for Statistics of Bosnia and Herzegovina, 2012 and Central Bank of Bosnia and Herzegovina, 2014).

Statistics on marine and inland fisheries

No information is available about data collection, processing and publication of marine fisheries in BiH (see Table 4.4).

At present, the collection, processing and publication of statistical data on inland fisheries is not implemented by statistical institutions as no inland fishery statistics are required by the EU. However, such data is collected in most EU member states. In BiH, it is involved in the laws of all three entities that annual fisheries management plans and reports are required (both form commercial and sport/recreational fishers) to receive and maintain licenses. These reports should contain detailed data both about stocking and removing fish from water bodies.

Figure 4.1: Statistical offices in BiH



Source: Agency for Statistics of Bosnia and Herzegovina, 2012

Table 4.4: Data and information collected and published by BiH statistical institutions

Type of information	FBiH		RS		BD		BiH	
	Collected	Published	Collected	Published	Collected	Published	Collected	Published
Marine fisheries								
Captured fish by species (kg)	No	No	N/A	N/A	N/A	N/A	N/A	No
Amount of captured fish /month	No	No	N/A	N/A	N/A	N/A	N/A	No
Inland fisheries								
Captured fish by species (kg)	No	No	No	No	No	No	N/A	No
Captured fish by water bodies (kg)	No	No	No	No	No	No	N/A	No
Captured fish by angling society (kg)	No	No	No	No	No	No	N/A	No
ultCatches/month (kg)	No	No	No	No	No	No	N/A	No
Aquaculture – all types of fish farms								
Number of farms	Yes	Yes	Yes	No	Yes	No	N/A	No
Total size of tanks (m^3)	Yes	No	Yes	No	Yes	No	N/A	No
Total fish production (kg)	Yes	Yes	Yes	Yes	Yes	No	N/A	No
Total production by species (kg)	Yes	Yes	Yes	Yes	Yes	No	N/A	No
No./gender/education of employees	Yes	Yes	Yes	Yes	Yes	No	N/A	No
Fish feed used (MT)	Yes	No	Yes	No	Yes	No	N/A	No

Type of information	FBiH		RS		BD		BiH	
	Collected	Published	Collected	Published	Collected	Published	Collected	Published
Aquaculture – pond farms								
Number of farms	Yes	No	Yes	No	Yes	Yes	N/A	No
Total size of ponds (ha)	Yes	No	Yes	No	Yes	No	N/A	No
Total production by species (kg)	Yes	No	Yes	No	Yes	No	N/A	No
No./gender/education of employees	Yes	No	Yes	No	Yes	No	N/A	No
Fish feed used (MT)	Yes	No	Yes	No	Yes	No	N/A	No
Aquaculture – tank fish farms								
Number of farms	Yes	No	Yes	No	Yes	Yes	N/A	No
Total size of tanks (m^3)	Yes	No	Yes	No	Yes	No	N/A	No
Total production by species (kg)	Yes	No	Yes	No	Yes	No	N/A	No
No./gender/education of employees	Yes	No	Yes	No	Yes	No	N/A	No
Fish feed used (MT)	Yes	No	Yes	No	Yes	No	N/A	No
Aquaculture – cage fish farms								
Number of farms	Yes	No	Yes	No	Yes	Yes	N/A	No
Total size of cages (m^3)	Yes	No	Yes	No	Yes	No	N/A	No
Total production by species (kg)	Yes	No	Yes	No	Yes	No	N/A	No
No./gender/education of employees	Yes	No	Yes	No	Yes	No	N/A	No
Fish feed used (MT)	Yes	No	Yes	No	Yes	No	N/A	No

Source: Study Team, 2014

Statistics on aquaculture

Data collection on aquaculture is prepared on the basis of the same questionnaire which is used in EU member states. However, annual data is only collected from licensed fish farms. Data sent by farmers is processed but only a very small portion of the results obtained are available in publications (see Table 4.4).

As presented in Table 3.13 of Chapter 3.5 FAO has much more detailed statistics received from the Agency of Statistics of BiH and it is publicly available in Bosnia and Herzegovina.

Table 4.5: List of aquatic species registered in FAO statistics

Group of species captured or cultured in marine and fresh waters		
Crustaceans	**Fishes**	**Molluscs**
Crabs, sea-spiders Freshwater crustaceans King crabs, squat-lobsters Krill, planktonic crustaceans Lobsters, spiny-rock lobsters Miscellaneous marine crustaceans Shrimps, prawns	**Diadromous fishes** Miscellaneous diadromous fishes River eels Salmon, trout, smelts Shads Sturgeons, paddlefishes	Abalones, winkles, conchs Clams, cockles, arkshells Freshwater molluscs Miscellaneous marine molluscs Mussels Oysters Scallops, pectens Squids, cuttlefishes, octopuses
	Freshwater fishes Carps, barbels and other cyprinids Miscellaneous freshwater fishes Tilapias and other cichlids	
	Marine fishes Cods, hakes, haddocks Flounders, halibuts, soles Herrings, sardines, anchovies Marine fishes not identified Miscellaneous coastal fishes Miscellaneous demersal fishes Miscellaneous pelagic fishes Sharks, rays, chimaeras Tunas, bonitos, billfishes	

Source: Study Team, 2014 and FISHSTAT, 2014

5. AGRICULTURAL LENDING AND THE FINANCIAL SECTOR IN BOSNIA AND HERZEGOVINA

5.1 Role of the Central Bank of BiH in the lending and credit service sector

This chapter is aimed at providing a round picture on agricultural lending and the financial sector in Bosnia and Herzegovina[27].

5.2 Financing through development banks of the entities

There are two development banks in BiH.

The FBiH Development Bank was established in accordance with the relevant law (Official Gazette of the Federation of Bosnia and Herzegovina, 2008) and started its operations in 2008 as a legal successor to the FBiH Investment Bank. The FBiH Development Bank is one of the key mechanisms in the implementation of projects essential for the FBiH and BiH, in line with the balancing of the structural and regional principle, harmonized economic development, especially in the fields in which commercial banks' show no interest, as well as fields in which only mid-long term loans with development-oriented interest rates are possible (Central Bank of Bosnia and Herzegovina, 2014). Its scope of services and conditions are:

- Financing small and medium-sized enterprises under the most favourable conditions (interest rates) with special credit lines;
  - Long-term loans for investments;
  - Long and short-term loans for working capital;
  - Loans for financing export activities conducted payment operations in the country and abroad;
- Guarantee operations in the country and abroad.
- Loans are given directly or indirectly, through commercial banks.

When loan instruments are placed directly with the client (Central Bank of Bosnia and Herzegovina, 2014):

- The client submits a loan application to the RB FBiH together with all required documents to justify reliability of the investment or financing the company's current business activities, in accordance with the Decree on the Bank Supervision Criteria and Procedures of the Development Bank of the Federation of Bosnia and Herzegovina (Official gazette of the Federation of BiH, No.: 57/08).
- The bank reviews and evaluates the application material submitted and forwards it to the Credit Board proposing a further review of the loan application.
- RBF Credit Board makes a final approval decision based on the appraisal of client creditworthiness, project quality and investment justification.
- When loan instruments are placed through commercial banks (Central Bank of Bosnia and Herzegovina, 2014):
- The company submits the investment program to the commercial bank with a justification of the investment, together with all additional documents needed for the loan file.
- The commercial bank evaluates, reviews and approves the loan application via its Credit Board.
- The commercial bank sends a request to the RB FBIH to grant a loan to finance the project in question, ensuring that all supporting documents for the content of the loan file, as stipulated by the Banking Agency Rules, are forwarded as well. The RB FBIH Credit Board approves the loan based on:
  - Current assets available;
  - Overall project quality and company rating;
  - Evaluation of the Bank credit rating.
- RB FBIH submits the approval decision on the loan application to the commercial bank, based on which the bank concludes an agreement with the client.
- RB FBIH regulates the collateral for the approved loan following the RB FBIH decision in accordance with RB FBIH Rules on Collateral.
- Once all the described requirements are met, the bank and RB FBIH sign a loan agreement and grant the loan.

27 No available information traced/found on if and how the Central Bank supports credit and loan for agriculture in general and for fisheries in particular.

The Republika Srpska Investment-Development Bank (IRBRS) was founded in 2006 pursuant to relevant laws (Republika Srpska Investment-Development Bank, 2014). The bank is registered as a joint-stock company which is 100 percent owned by Republika Srpska.

The strategic goals of the IRBRS are to encourara investments and to stimulate development in Republika Srpska. The objective of the bank is to become the most important pillar of financial support for development and investments through partnerships with the private sector and international financial institutions and thus enable the building of a competitive and viable economy of Republika Srpska. Accordingly, the bank takes a leading role in the development and diversification of the financial market with the aim to meet the demands of Republika Srpska's economic subjects.

IRBRS's strategic goals are to encourage investment and stimulate development in Republika Srpska, with the main priorities of:

- Improving agricultural production;
- Supporting small and medium-sized entrepreneurs;
- Housing and business constructions;
- Constructing infrastructure facilities in Republika Srpska;
- Employment growth;
- Supporting production to reduce the foreign trade deficit;
- Balanced regional development;
- Boosting corporate governance and capital market;
- Investment support;
- Environmental protection;
- Support to the financial sector.

IRBRS provides different types of financial, technical and advisory support to legal and physical persons in RS with the aim of stimulating development and investments. These include:

- Loans intended to support development projects in Republika Srpska being provided through seven credit lines.
- Make access to long-term funds available through credit lines at affordable interest rates to the least financed economic sectors – small and medium-size enterprises and local authorities.
- Securities issue – support by purchasing issued securities, providing financial support to development projects in RS and encouraging capital market development.
- International projects – implementation of development projects in cooperation with international financial institutions.
- EU grants – significant grants from EU pre-accession assistance are available to legal persons in Republika Srpska.

5.3 Financing through commercial banks

There are twenty eight commercial banks in BiH (see Table A3-1 in Annex 3). These banks act as partners of the development banks in the entities (as outlined in the previous chapter) and also offer credit opportunities for agriculture and aquaculture activities (both for investments and for covering running cost). However, at present credit is expensive in commercial banks and mortgages are too high for many applicants.

Governments have established a guarantee fund for agricultural investments. Although this fund is limited at present, it is increasing year by year.

5.4 Loans through micro credit institutions

There are eight micro credit institutions (MCIs) in BiH (see Table A3-2 of Annex 3). These institutions offer a wide range of loan products for agricultural activities. Loans are offered to:

- Any small business owners in the area of production, trade, services and agriculture.
- Registered and unregistered small businesses.
- Women.
- One-purpose loans are provided, among other things, for:
- Business improvement;
- Business activity support;
- Organic agricultural food production;
- Agricultural production.
- The conditions for receiving loans from MCIs are less stringent than from commercial banks. Only a loan request, a copy of personal identity card and a copy of residency confirmation is required. Loans are provided in a relatively short period of time, within days or maximum of a few weeks.
- At MCIs the amount of loans range between BAM 1 000 and BAM 100 000 with different grace periods (12-24 months) and loan commitment periods (6-60 months). The usual interest rate and APR (annual percentage of rate) – both nominal and effective – may be

14.9-18.9 percent and 19.5-25.5 percent, respectively.

5.5 Loans through savings and credit organizations

With the support of the International Fund for Agricultural Development's (IFAD) Livestock and Rural Finance Development Project, a total of three savings and credit organization were established in 2008. Due to insufficient savings these organizations have had no effect on the credit market in BiH (FAO, 2012).

5.6 Leasing

The Association of Leasing Companies in BiH lists seven companies (see Table 3-3 of Annex 3). They offer a wide range of services in purchasing vehicles including tractors and various other items of machinery.

6. LEVEL OF ATTAINMENT OF EU STANDARDS

Instruments for the accession process to the EU also include a pre-accession strategy and national programs for the adoption of the *acquis* (NPAA).

6.1 Pre-accession strategy

The pre-accession strategy is defined for each accession process and each applicant country in order to help them to prepare for future accession. This strategy provides structures and instruments (listed below) which can assist applicant countries in the process of preparation.

6.2 National programs for the adoption of the acquis

National programs for the adoption of the *acquis* are at different stages, from which the following chapters are directly related to the fishery and aquaculture sector:

- Chapter 11 – Agriculture and rural development
- Chapter 12 – Food safety, veterinary and phytosanitary policy
- Chapter 13 – Fisheries[28]
- Chapter 18 – Statistics
- Chapter 27 – Environment

6.2.1 Chapter 11 of the *acquis* – Agriculture and rural development

Box 6.1: Chapter 11 of the *acquis* – Agriculture and rural development

The agriculture chapter covers a large number of binding rules, many of which are directly applicable. Proper application of these rules and effective enforcement and control by an efficient public administration is essential for the functioning of the common agricultural policy (CAP). Running the CAP requires the establishment of management and quality systems such as a paying agency, an integrated administration and control system (IACS) and capacity to implement rural development measures. Member States must be able to apply the EU legislation on direct farm support schemes and to implement common market organizations for various agricultural products (European Commission, 2014 B).

One of the objectives of the state law on Agriculture, Food and Rural Development of BiH is to "Define the framework and mechanisms required to prepare for association with, and accession to, the European Union (EU) and fulfilment of all obligations defined by international agreements related to the sector of agriculture, food and rural development in BiH" (European Commission, 2014 B). As part of the fulfilment of Chapter 11 of the *acquis* presented in Box 6.1 this law formulates responsibilities and obligations harmonized with the payment system in Article 13. Accordingly, the Ministry is responsible for the consistency, transparency and coordination of the payment system with the following actions:

a) In coordination with competent bodies of entities and Brčko District, develop the legal framework for the establishment and development of institutional structures to support the implementation of policy measures and attract EU and other international funds;
b) Establish uniform practices and procedures for the authorization, execution and accounting of transactions in the sector of agriculture, food and rural development, which shall be applied at all levels of the government in BiH;
c) Conciliate the system of administrative control in coordination with competent bodies of entities and Brèko District which will ensure transparency and traceability of data for all support measures and payments;
d) Establish control functions in coordination with competent bodies of entities and Brčko District;
e) Promote harmonized application of payment procedures and claims at all levels in accordance with EU rules;
f) Coordinate staff trainings at all levels to ensure the uniform application of procedures and correct implementation of measures;
g) Assist in the establishment of registers and other records as defined in Article 14 of this law and coordinate the work of relevant service providers and technical teams at all levels to ensure the consistent use of registration referencing systems and data storage systems within the entire technical framework;

28 This includes also aquaculture.

h) Communication with payment organizations and other relevant internal and external bodies concerning procedures and data exchange for statistical and other purposes as required;

i) Establish an effective, harmonized monitoring and evaluation system in accordance with the best European practices;

j) Define and assist in the development of other relevant services to promote agricultural products or foodstuffs;

k) Define and assist in the development and implementation of import export regime and market interventions measures.

Box 6.2: Chapter 12 of the *acquis* – Food safety, veterinary and phytosanitary policy

This chapter involves detailed rules in the area of food safety. The general foodstuffs policy sets hygiene rules for foodstuff production. Furthermore, the *acquis* provides detailed rules in veterinary issues essential for ensuring and monitoring animal health, animal welfare and the safety of food of animal origin in the internal market. In the phytosanitary field EU rules cover issues such as seed quality, plant protection, harmful organisms and animal nutrition (European Commission, 2014 B).

6.2.2 Chapter 12 of the *acquis* – Food safety, veterinary and phytosanitary policy

Food safety and fish health protection are indirectly covered in Chapter 12 of the *acquis* (see Box 6.2).

A strategic plan of the Council of Ministers and medium to long-term priorities have been elaborated, including competent authorities at central, entity and local levels (cantons and municipalities) and audit systems.

A proper functioning of well-set authorities in BiH is fundamental for exporting fish and fish products to the EU. Also for this reason, Bosnia and Herzegovina has fully transposed, adopted and published all EU regulations on the food hygienic package including fish products. Accordingly, two regulations:

- the regulation for the organisation of official controls on products of animal origin intended for human consumption (org. Regulation (EC) No 854/2004); and
- the regulation on specific hygiene rules for on the hygiene of foodstuffs, including for fishery products (org. Regulation (EC) No 853/2004);

were published in the Official Gazette BiH, No 103/12 on 25 December 2012.

Regarding animal health related data collection from the field, both annual and multiannual control plans and control systems are prepared for fish hygiene, import of fishery and aquaculture products, fish health, and residues in fishery and aquaculture products. In Bosnia and Herzegovina the quality control of produced, exported and imported fish is carried out by the State Veterinarian Service (through veterinarian inspectors) and by the Department of Food Industry. According to FAO (Bondad-Reantaso, M.G.; Arthur, J.R.; Subasinghe, R.P. (eds). 2009) "the State Veterinary Office (SVO) of Bosnia and Herzegovina on aquatic animal health management to support sustainable and healthy aquaculture production of the country. The SVO would be the main authority supporting the implementation of the policy and strategy and stressing that all processes should be transparent. Principles purely focused on aquatic animal health that were modified from *Health Management for the Responsible Movement of Live Aquatic Animals* (FAO, 2007) include:

- Aquatic animal health is important for economic, social, development and public resource purposes.
- Collaboration among all stakeholders including governments, public institutions, the private sector and existing aquaculture and fishing industries is important for achieving effective health management.
- The role of aquatic animal health management is to reduce the risks arising from the culture, reproduction, potential entry, establishment or spread of pathogens and the diseases they cause. This is necessary to protect living aquatic resources, the natural aquatic environment and aquatic biodiversity in Bosnia and Herzegovina and neighboring regions, countries or territories.
- SVO encourages the Bosnia and Herzegovina aquaculture sector to use preventative measures to limit exposure to pathogens and disease. Such measures include, but are not limited to, the use of better management practices, health certification, specific pathogen free and high health stocks, biosecurity and vaccination protocols.
- Collaboration with international organizations and countries in the European region will be sought wherever possible to further increase Bosnia and Herzegovina's capacity in aquatic animal health issues".
- The control system for fish hygiene is operated by the Veterinarian Institute of Republika Srpska. This institute – as a public institute – collects and prepares samples for virus

examination. It also helps farmers with diagnostics and provide advice for treatments in cases when Veterinarian Inspectors are not able to solve a particular problem.

Box 6.3: History of the CFP

1970 – Rules were established concerning access to EC fishing grounds, markets and structures.

1976 - Member States started to follow an international movement which extended rights over marine resources from 12 to 200 miles from the coasts of a nation.

1983 - The Common Fisheries Policy (CFP) was launched.

2002 - Reform of the CFP; a more simple system for limiting fishing capacity was introduced. The new system gave more responsibility to Member States to establish a better balance between fishing capacity of the fleets and available resources.

Funding for the modernization of fishing fleets became available through the Financial Instrument for Fisheries Guidance (FIFG; 2000-06) and the European Fisheries Fund (EFF; 2007-13) (European Commission 2009).

The institute also receives food samples from the State Veterinarian Department for examination. On the basis of the results, the State Veterinarian Department issues licenses both for the import and export of fish and fish feed.

In FBiH, the actual quality control is done by the Veterinary Faculty of the University of Sarajevo. The Faculty is also responsible for the collection and preparation of samples from every fish farm two times per year. These are routine examinations regardless of the stocks being infected or not. Prepared samples are sent to Belgrade for examination. The State Veterinarian Department is informed about the results.

On the basis of the FBiH government decision, a reference laboratory, the Institute of Virology will be established in Sarajevo, where examinations of viral diseases and infections of fish populations will be carried out. Consequently, in the future, the Faculty will be able to concentrate more effort on trainings for students and on postgraduate trainings for veterinarian inspectors. In line with the practices of EU member states, courses on fish diseases are planned to be offered providing a certificate for participants.

6.2.3 Chapter 13 of the *acquis* – Fisheries[29]

The Common Fisheries Policy (CFP) is an instrument of the EU for the management of fisheries and aquaculture. Fish stocks are regarded as a common resource to be managed collectively, as:

Fish are a natural, mobile and renewable resource.

Fish cannot be owned until they have been caught.

Actions of one group of fishers have an impact on other groups.

CFP manages fisheries both for the benefit of fishing communities and consumers and for the protection of resources. CFP is active in four main areas:

Box 6.4: Chapter 13 of the *acquis* – Fisheries

The *acquis* on fisheries consists of regulations which do not require transposition into national legislations. However, it requires the introduction of measures to prepare administration and operators for participation in the common fisheries policy. The fisheries policy covers market policy, resource and fleet management, inspection and control, structural actions and state aid control. In some cases existing fisheries agreements and conventions with third countries and/or international organizations need to be adapted. (European Commission, 2014 B).

The policy mentioned above requires commitments on international obligations regarding fulfilment of Article 96 coming from the Stabilisation and Association Agreement.

1. <u>Conservation</u>

Fish stocks need to be able to renew themselves due to natural mortalities, fishing or other causes. To this end, the CFP regulates the amount of fish allowed to be removed from the sea by defining:

1.1. The total allowable catch (TAC) - the maximum quantities of fish that may be caught each year. It tries to ensure that young fish are able to reproduce.

1.2. A national fishing quota for each country

2. <u>Structuring</u>

CFP helps fishing and aquaculture industries to adapt to the constraints imposed by scarce resources and to the market by developing certain organizations and equipment.

29 In this context this also includes aquaculture.

3. Markets

CFP organizes the market of fish products and aims to harmonize supply and demand both for the benefit of producers and consumers.

4. Relations with the outside world

CFP negotiates agreements with non-EU countries concerning conservation measures in deep-sea fishing.

Republika Srpska and the Federation of Bosnia and Herzegovina have adapted a piece legislation on freshwater fisheries which is partially aligned with the *acquis* (see Box 6.4). Bosnia and Herzegovina needs to increase its efforts to implement the *acquis* for this field in order to facilitate an increase of exports of fish and fishery products to the EU (European Commission, 2009 and 2014 B).

Box 6.5: Chapter 18 of the *acquis* – Statistics

The *acquis* in the field of statistics requires the existence of a statistical infrastructure based on principles as impartiality, reliability, transparency, confidentiality of individual data and dissemination of official statistics. National statistical institutes act as a reference for the methodology, production and dissemination of statistical information. The *acquis* covers methodology, classifications and procedures for data collection in various areas such as macro-economic and price statistics, demographic and social statistics, regional statistics and statistics on business, transport, external trade, agriculture, environment, science and technology. No transposition into national legislation is needed as the majority of the *acquis* is formulated as a regulation (European Commission, 2014 B).

6.2.4 Chapter 18 of the *acquis* – Statistics

In BiH statistics on aquaculture and marine fisheries are prepared according to EU regulations. However, for inland fisheries relevant EU regulations are still missing (see Chapter 4.4.3). From these three areas only aquaculture statistics (methodology, classifications, procedures for data collection, etc.) are compatible with EU standards.

6.2.5 Chapter 27 of the *acquis* – Environment

Conservation of fisheries resources and water biodiversity

The richness of life in BiH is a result of spatial ecological heterogeneity, geomorphologic and hydrological diversity, the country's specific geological past and climate diversity. The flora and fauna of BiH are characterized by a high number of endemic and relict forms of living organisms. However, data on biodiversity in BiH is scarce, and no central coordination body has been established to monitor the status of biodiversity. There is also no data available for the majority of generally accepted indicators for monitoring the status of biodiversity. Territories covering protected areas in BiH are relatively small and the ratio of such territories compared to the total territory of BiH is extremely low, and far below European standards.

However, fish fauna is relatively well researched in BiH. In total, there are 111 freshwater, 26 diadromous and 76 marine fish species (Study Team, 2013 and 2014).

Results available in the UNECE (2011) 2nd Environmental Performance Review present a synthesis of conclusions from key reports and strategies prepared for BiH. They reflect the main problems and threats to biological diversity.

Main threats are as follows:

- Habitat conversion followed by an excessive exploitation of natural resources;
- Development of the energy sector based on hydropower plants with a number of impacts (e.g. destruction of river beds with a high level of biological diversity and endemism, destruction of habitats due to changes in the hydrological regime, eutrophication etc.);
- Pollution;
- Invasive alien species;
- Uncontrolled fishing.

Box 6.6: Chapter 27 of the *acquis* – Environment

The EU environment policy aims to promote sustainable development and the protection of the environment for present and future generations. It is based on preventive actions, on the polluter pays principle, fighting environmental damage at the source, shared responsibility and the integration of environmental protection into other EU policies. The *acquis* comprises over 200 major legal acts covering horizontal legislation, water and air quality, waste management, nature protection, industrial pollution control and risk management, chemicals and genetically modified organisms (GMOs), noise and forestry. Compliance with the *acquis* requires a significant investment. A strong and well-equipped administration at national and local levels is imperative for the application and enforcement of the environment acquis (European Commission, 2014 B).

The main pressures on fisheries and aquaculture related landscapes and ecosystems are:

- Habitat conversion (especially karst habitats) into agricultural land;

- Redirecting water flows to the construction of hydro accumulation facilities combined with poor water management;
- Water contamination with different industrial and agricultural pollutants;
- Unbalanced fishing;
- Increased appearance of invasive species.

The entity laws on water classify and categorize water qualities. Reference conditions of ecological and chemical state of waters (Article 43 of the Law) should be defined by the Government of the Federation of BiH, though this is yet to be finalized. Until the adoption of the norms on classification of water statuses, the legal source is the Regulation on the Characterization of Waterways (Provision for waterways categorization, Official Gazette of BiH no.42/67) (Ministry of Foreign Trade and Economic Relations, 2012 and UNEP BOSNIA AND HERZEGOVINA, 2011). On the basis of this document, all waterways, underground waters, natural lakes and coastal seas in the Federation of BiH are divided into four categories. Maximum concentrations are defined as presented in Table 6.1.

In the water law of Republika Srpska, Article 14 defines acceptable values of parameters presented in Table 6.2.

Monitoring the impact of aquaculture on the environment

In aquaculture it is a basic principle that the quality of the inflow and outflow water should be in the same category. To ensure this, the quality of discharged water of registered fish farms is regularly controlled. Water samples are examined four times a year by accredited institutes/companies. Examined components and allowed concentrations of key components are listed in Tables 6.1 and 6.2.

Table 6.1: Classification of waters by quality in FBiH[30]

Parameter	Unit	Quality class of surface water			
		1	2	3	4
BOD5	mgO_2/l	< 2.0	2.0 - 4.0	4.0 - 7.0	7.0 - 20.0
COD	mgO_2/l	< 10.0	10.0 - 12.0	12.0 - 20.0	20.0 - 40.0
NH3-N	gm^{-3} N	0.25	0.25	1.0	No data
NO2-N	mg/l	<0.020	0.02 - 0.03	0.200	No data
NO3-N	mg/l	< 1.5	1.5	10.0	No data
Total N	mg/l	No data	No data	No data	No data
Total P	mg/l	<0.25	0.25	1.5	No data

30 Sources: Decision on characterization of the underground waters, reference conditions and rating parameters for the waters condition and monitoring of the waters (Official Gazette of Federation of BiH no. 1/94, 8/95, 58/02, 19/03, 2/06 and 8/06), Government of Federation of Bosnia and Herzegovina, session 91, held on 12 December, 2012 (Official Gazette of Federation of BiH, no.70/06).

Table 6.2: Classification of waters by quality in RS[31]

Parameter	Unit	Quality class of surface water				
		1	2	3	4	5
BOD5	$gO2m^{-3}$	< 2.0	2.0 - 4.0	4.0 - 7.0	7.0 - 15.0	> 15.0
COD	$gO2m^{-3}$	< 12.0	12.0 - 22.0	22.0 - 40.0	40.0 - 50.0	> 50.0
NH3-N	gm^{-3} N	< 0.10	0.10 - 0.20	0.20 - 0.40	0.40 -1.00	> 1.00
NO2-N	gm^{-3} N	< 0.01	0.01 - 0.03	0.03 - 0.05	0.05 - 0.20	> 0.20
NO3-N	gm^{-3} N	< 1.0	1.0 - 5.0	5.0 - 10.0	10.0 - 25.0	> 25.0
Total N	gm^{-3} N	< 1.0	1.0 - 6.0	6.0 - 12.0	12.0 - 30.0	> 30.0
Total P	gm^{-3} P	< 0.010	0.01 - 0.03	0.03 - 0.05	0.05 - 0.10	> 0.10

Sector related environment policy and measures

According to the State of the Environment Report of Bosnia and Herzegovina 2012, sector related environmental indicators are partially or completely missing, (Ministry of Foreign Trade and Economic Relations, 2012) as listed below.

Surface and groundwater resources:

- Sedimentation level in water streams;
- Contaminated sediment;
- Irrigation for agricultural production;
- Estimates on economic losses due to floods and draughts;
- Nutrients in transitional, coastal and sea waters (CSI 021), trends in the concentration of nitrates and phosphorus in winter months and N/P ratio in the Adriatic Sea in BiH;
- Chlorophyll in transitional, coastal and sea waters (CSI 023) – mean surface concentration of chlorophyll during summer months (mg/L) in the Adriatic Sea in BiH;
- Gross balance of nutrients (CSI 025) – (a) quantity of nitrogen that is taken into the water through mineral fertilizers and manure, nitrogen fixation of Leguminosae, deposition from the air and other smaller sources; (b) production of nitrogen from crops, grass or crops eaten by cattle;
- Data about mineral resources and indicators of metal and non-metal mines in RS have not been available during the preparation of this Report. Such data was partly collected from other sources.

Biological and landscape diversity:

- CSI 009 Species diversity – trends of changes in division of certain species groups;
- SEBI 025 Financing biodiversity management;
- SEBI 026 Public awareness – public opinion on certain aspects of biological diversity;
- CLIM 021 Freshwater biodiversity and water quality;
- CLIM 024 Distribution of animal species - effects of climate change;
- CSI 007 Endangered and protected species – number of species.
- Some data is available, but it is not compatible as different methodologies were used during data collection and calculating indicators:
- CSI 008 Areas under some kind of protection – different trends depending on the size of the area.

31 Source: Assessment of the ecological and chemical status of surface waters in accordance with Law on Waters (Official Gazette of Republika Srpska no 50/60 and in accordance with the Regulation on the water classification and categorization of the waterways (official Gazette of Republika Srpska no. 42/01).

Fishery and aquaculture:

- CSI 033 – Aquaculture production (total and by types) in the whole country;
- CSI 034 – Fishing fleet capacity;
- Status of marine fish stocks – important for Neum for the purpose of planning sustainable fishery;
- Aquaculture caught in adjacent waters;
- Eco-efficiency in fishing;
- Impact of production on freshwater and marine eco-systems;
- Amount of fish food used;
- Consumption of imported vs. domestic products.

6.3 Summary of compliance of key issues with EU standards

The following key issues should be observed and considered when assessing the level of compliance with EU standards:

- **Water management** – In BiH water management is based on river basins which are natural geographical and hydrological units. This approach is in line with the Water Framework Directive of the EU.
- **Fisheries laws** – In BiH these are detailed, and embrace all important aspects. The *acquis* on fisheries consists of regulations that do not require transposition to national legislation thus no new laws need to be introduced.
- **Implementing regulations to fisheries laws** – In BiH there are no regulations for implementation which could define how to apply the laws. In EU member states all laws are supported by such regulations.
- **Unregistered fish farms** – There are certain unregistered fish farms in the country. In member states all fish farms must be registered.
- **Water cadastres and registers** – Though laws demand the elaboration of water cadastres and registers of all water bodies, they are hardly prepared in BiH. In EU member states such cadastres and registers exist and are widely accessible to the public.
- **Certification and export to the EU** – Certification of fish and fish products is mandatory to export them to EU markets. The competent authority (CA) in BiH is well organized and is present but export quotas limit increased exports to the EU.
- **Statistics on aquaculture** – Data collection is fully compatible with EU regulations but the publication of collected data is inadequate.
- **Statistics on inland fisheries** – No such provisions exists for collecting and processing data on inland fisheries in the EU. Even though all EU member states collect, process and publish this data, no such statistical activity was found in BiH.

7. IDENTIFICATION OF SWOT AND POTENTIAL IN THE SECTOR

7.1 Strengths, weaknesses, opportunities and threats in the sector

Annex 1 of this review summarizes the findings and problems of SWOT workshops in which stakeholders participated. Table 7.1 presents the key SWOT of the entire sector while the chapters below (excluding Chapter 7.2.1) incorporate their views and recommendations.

Table 7.1: Key SWOT of the fishery and aquaculture sector

Strengths	Weaknesses
Natural resources of the country are perfect for: • Developing a prosperous subsector of sport fishing. • Generating employment and further income through sport fishing tourism. • Operating family fish farms	• Natural fisheries resources are underutilized. • There is no state level ministry for agriculture and rural development. • Fishery and aquaculture is not a priority sector. • Laws are not harmonized, coordinated and supported by implementing guidelines and regulations. • Supervision, monitoring and annual statistical evaluation of the sector is missing.
Opportunities	Threats
• Creation of a well-integrated prosperous fishery and aquaculture sector	• Lack of a national strategy for fisheries. • Lack of water cadastre and unpredictable allocation/renting of waters. • Unlicensed fish farms and fishing organizations. • Qualitative and quantitative damages to fish fauna.

7.1.1 Marine fisheries

Marine fisheries are a white spot in the legislation of fisheries and aquaculture of BiH in general and the FBiH in particular to which the administration of this area belongs. Table 7.2 presents key aspects which best characterize the SWOT of marine fisheries.

Table 7.2: SWOT of marine fisheries

Strengths	**Weaknesses**
• The BiH coast is a popular holiday location.	• Relevant laws, implementation/enforcement guidelines and regulations are entirely missing.
Opportunities	**Threats**
• Establishment of a sport fishing association for marine waters could develop and run marine sport fishing tourism.	• Unregulated and uncontrolled commercial and sport fishing destroy fish fauna.

7.1.2 Inland fisheries

In BiH national and international tourism of inland fisheries could be one of the driving subsectors. In order to reach that status existing weaknesses and future threats summarized in Table 7.3 should be considered and eliminated.

The underutilized natural fisheries resources are the result of some **state and entity level weaknesses** which can be listed as follows:

- The lack of stronger state level representation and coordination.
- Sport fishing is not a priority sector and is not supported despite its popularity as a recreational sport activity in BiH. In addition, the subsector is treated differently in each of the entities.
- The laws on fisheries are not harmonized between the entities and with other laws such as concessions and labour. Some of the articles of the fishery laws are not well elaborated and related secondary legislation in the form of implementation and enforcement guidelines and regulations are also missing. Therefore, these laws cannot be properly implemented as there is scope for individual interpretations.
- Ministries do not have legal power to protect fishers' interests. In addition, there is a lack of coordination at different levels and departments of the ministries.
- Local communities and regulations do not always follow higher level decisions.

Table 7.3: SWOT of inland fisheries

Strengths	Weaknesses
Natural resources of the country are perfect for: • Developing a prosperous subsector of sport fishing. • Generating employment and income through sport fishing tourism.	• Natural fisheries resources are underutilized. • There is no state level ministry for agriculture and rural development. • Sport fishing is not a priority subsector. • The laws on fisheries are not harmonized. • Lack of coordination at different levels. • Influence of local communities and regulations. • No appropriate working conditions and equipment of fish guards. • Supervision of activities and cooperation of fishers' associations and societies are loose. • Regular monitoring of water quality and fish fauna are missing.
Opportunities	**Threats**
• Creation of flourishing sport fishing tourism for both national and international clients.	• Lack of national strategy on fisheries. • Lack of water cadastre. • Unpredictable allocation/renting of waters. • Qualitative and quantitative damages of the fish fauna.

Key weaknesses at field level are:

- Supervision and cooperation of sport fishers' associations and societies are lacking. This is the reason for the huge qualitative and quantitative differences between sport fishing organizations.
- Working conditions and equipment of fish guards are missing. Though this is an official post, fish guards are not authorized for immediate, on the spot actions.
- Regular monitoring of both water quality and actual state of fish fauna are missing.

There are some specific **threats** which may seriously endanger the fishery subsector:

- Lack of a country wide strategy on inland fisheries which seems to exclude the subsector from prioritized national and international support programs.
- The lack of water cadastres perpetuates the situation in which there is no reliable information on physical parameters of rivers, lakes and artificial water bodies.
- Unpredictable allocation of waters prevents sport fishers' associations and societies and enterprisers from making long term investments due to a lack of guaranties for long-term management of leased/allocated waters.
- Qualitative and quantitative damage to fish fauna can also be a threat due to:
  - Different treatment of sport and commercial/economic fishing. Only sport fishers' associations/societies are obliged to stock, while commercial fishers are not required to do so.
  - Missing systematic and regular restocking of waters. Though proper restocking of fish in natural waters is obligatory by law, both important details and enforcement and supervision of restocking are missing.
  - Missing monitoring of the fishery management of waters.
  - Blocked migration of fish caused by dams and hydroelectric power stations together with the lack of restocking. Moreover, roles and obligations of dams and hydroelectric power stations are not clearly set, which means that their participation is subjective and unpredictable.
  - Legal and illegal excavation of stone and sand in rivers destroys habitats and spawning grounds.
  - Pests – Pests that are under protection (cormorants, otters and beavers) can cause serious losses to fish fauna.
  - Industrial and household sewage pollution of waters. Solid waste, including plastic bottles, are especially problematic. Leaking oil from old excavation machines is also a serious source of pollution.
  - Inadequate (or even missing) inspection and patrol services on waters. There are no inspection or patrol services on border waters. Poaching of licensed and unlicensed commercial and sport fishers[32] is not controlled. Police cannot or do not support the work of guards. Therefore, poachers can work with impunity.

7.1.3 Aquaculture

Similarly to the fisheries subsector, the manifestation of strengths and potential in the aquaculture subsector depends on how the weaknesses and threats summarized in Table 7.4 can be reduced or eliminated.

Weaknesses to be reduced and eliminated in the aquaculture subsector are:

- Insufficient utilization of natural resources.
- The lack of a stronger and better state level representation and coordination.
- The lack of a country wide strategy for aquaculture.
- Administration of the subsector is complicated and implementation and enforcement laws are incomplete.
- Entity laws should be harmonized and supported by by-laws and implementing guidelines and regulations. There is no harmonized/coordinated work between the ministries and concerned authorities and organizations.
- Inadequate government support:
  - Too many different expenses exist in the form of fees and taxes for which no government services are received.
  - Incentives for and duties of fish farmers are not harmonized between the entities and they cannot be applied to unregistered fish

32 The review Team was extensively informed that many of the sport fishers are not committed to act "sport-like".

farmers. Incentives for fish farmers are missing in BD.

- There is no government support for widely available, affordable loans for cost reduction and marketing of produced fish. Government subsidies are limited and complicated, and in most cases it is slow to receive them as well.
- Small scale farmers are not involved in the VAT system and thus they do not receive incentives.
- Unregistered and small scale fish farmers are excluded from government support.

- Trainings would be beneficial to update the technical knowledge of fish farmers.
- Many fish farms are poorly equipped and fish transport facilities and equipment are missing.
- It is difficult to purchase production materials and to market fish.
  - There are no drugs and medicines specifically registered for fish[33].
  - The export quota is too low which limits the development and expansion of the subsector.
- Imported feed is too expensive but locally produced feed is less effective.
- Coordinated marketing strategies and campaigns are missing.

Table 7.4: SWOT of aquaculture

Strengths	Weaknesses
Natural resources of the country are perfect for: • Developing a prosperous subsector of sport fishing. • Generating employment and income through sport fishing tourism.	• Natural fisheries resources are underutilized. • There is no state level ministry for agriculture and rural development. • Sport fishing is not a priority subsector. • The laws on fisheries are not harmonized. • Lack of coordination at different levels. • Influence of local communities and regulations. • No appropriate working conditions and equipment of fish guards. • Supervision of activities and cooperation of fishers' associations and societies are loose. • Regular monitoring of water quality and fish fauna are missing.
Opportunities	**Threats**
• Creation of flourishing sport fishing tourism for both national and international clients.	• Lack of national strategy on fisheries. • Lack of water cadastre. • Unpredictable allocation/renting of waters. • Qualitative and quantitative damages of the fish fauna.

33 Drugs and medicines which are not registered for veterinary purposes in general and for fish farming in particular are not allowed to be used. Those products which are registered for other animals can also be used for fish with the restriction that 500 DD (decomposition day) must pass before consumption of treated fish is allowed.

The most critical **threats** are as follows:

- The lack of a country wide strategy for aquaculture which likely excludes the subsector from prioritized national and international support programs.
- Complicated unpredictable bureaucracy and unpredictable treatment discourages fish farmers from working legally. Unclear regulations discourage fish farmers from licensing their fish farming activities.
- A lack of a dialogue with fish farmers. This results in a growing gap between legislators and administrators, and fish farmers.
- A lack of technical education, trainings and an efficient information system hinder fish farmers from developing and also prevent them from updating their knowledge about the sector in general and statistical data in particular.
- Lack of licenses of many fish farms creates both uncertainty and opacity within the sector. It deprives the state of considerable revenue on one hand and fish farmers from incentives and official support from the government on the other hand.
- Lack of professional planning of construction and expansion of farms results in some improperly located fish farming units (exposed to or causing floods, landslides etc.).

7.2 SWOT recommendations

The essence of SWOT recommendations presented by stakeholders during the workshops can be summarized as follows:

1. Stronger and better state level representation and coordination.
2. Harmonization of laws:

2.1. Harmonization of the fishery laws of the entities

2.2. Harmonization of the other laws with fishery laws

3. Better law enforcement through transparent and efficient sector administration
4. Introduction of a fair and uniformly applied monitoring and supervision of stakeholder activities
5. Simplification of bureaucracy for the registration of new farms, legalization of already existing ones and obtainment of approvals, permissions and licenses
6. Introduction of government incentives and support for sport fishers' organizations
7. Harmonization of government incentives and affordable loans to ensure a wide availability for eligible fish farms
8. Reduction and harmonization of financial dues (fees and taxes).
9. Provision for government support on fighting against illegal fishing and poaching
10. Supporting the objectives of the sector with specific trainings and campaigns (marketing, against poaching etc.)

8. CONCLUSIONS AND IDENTIFICATION OF NEEDS IN THE SECTOR

8.1 Necessary actions in sector administration

With effective and efficient sector administration, fisheries and aquaculture in BiH could develop into a prospering sector, in which case it would considerably contribute directly and indirectly to the development of agriculture and rural life through income and employment generation, especially through existing and new fish farming SMEs and angling tourism. The following chapters present the needs that have been identified in the sector.

8.1.1 Upgrading the status of the sector

Although the state Law on Agriculture, Food and Rural Development[34] (2008) considers fisheries and fish culture to be an integral part of agriculture the status of the sector within agriculture and rural development is smaller than its actual and potential weight. This is because the sector itself not only ensures significant food production and extensive recreational activities, but also links in several ways to the environment, nature and conservation. It is also indispensable for sustainable utilization of the country's water resources. At present the fisheries and aquaculture sector is practically unmentioned in government documents in which agriculture and rural development is discussed (Review Team, 2014).

8.1.2 Improving sector administration

At present sector administration of fisheries and aquaculture is segmental by entities, cantons and municipalities and its field implementation depends on subjective interpretation of relevant entities' fishery laws. This is because five elements of successful implementation are missing:

- A state level coordination.
- Inclusion of marine fisheries into the fisheries law of FBiH.
- Coherent harmonization of specific sections of fisheries laws.
- Relevant implementation and enforcement guidelines and regulations.
- Coordinated overall enforcement of fishery laws.

Table 8.1: Status of fish farm licensing in BiH

Status aquaculture license	Number of farms						Proportion of farms					
	Before 1990	1990 - 1999	2000-2009	2010-2014	No info	Total	Before 1990	1990 - 1999	2000-2009	2010-2014	No info	Total
There is license	10	21	30	14		**75**	7	14	20	9		**50**
No production	1	5	2			**8**	1	3	1			**5**
below 1 MT	1		4			**5**	1		3			**3**
1 - 5 MT	1	4	6	4		**15**	1	3	4	3		**10**
5.1 - 10 MT			3	1		**4**			2	1		**3**
10.1 - 25 MT	1	4	4	3		**12**	1	3	3	2		**8**

34 Based on Article IV.4.a) of the Constitution of Bosnia and Herzegovina, the Parliamentary Assembly of Bosnia and Herzegovina, at the 28th session of the House of Representatives held on April 17 2008 and the 17th session of the House of Peoples held on May 15 2008

Status aquaculture license	Number of farms						Proportion of farms					
	Before 1990	1990 - 1999	2000-2009	2010-2014	No info	Total	Before 1990	1990 - 1999	2000-2009	2010-2014	No info	Total
25.1 - 50 MT	1	1	3	4		**9**	1	1	2	3		**6**
50.1 - 100 MT	2	2	2			**6**	1	1	1			**4**
100.1 - 500 MT	1	4	5	1		**11**	1	3	3	1		**7**
500.1 - 1000 MT	2	1	1	1		**5**	1	1	1	1		**3**
License in progress	**1**	**1**	**2**	**5**		**9**	**1**	**1**	**1**	**3**		**6**
No production												
below 1 MT			2			**2**			1			**1**
1 - 5 MT				1		**1**				1		**1**
5.1 - 10 MT		1		1		**2**		1		1		**1**
10.1 - 25 MT	1			1		**2**	1			1		**1**
25.1 - 50 MT												
50.1 - 100 MT				1		**1**				1		**1**
100.1 - 500 MT												
500.1 - 1000 MT				1		**1**				1		**1**
No license	**6**	**10**	**22**	**13**	**16**	**67**	**4**	**7**	**15**	**9**	**11**	**44**
No production	3	4	6	2	4	**19**	2	3	4	1	3	**13**
below 1 MT		1	5		1	**7**		1	3		1	**5**
1 - 5 MT	2	5	6	7	7	**27**	1	3	4	5	5	**18**
5.1 - 10 MT	1		4	1	3	**9**	1		3	1	2	**6**
10.1 - 25 MT			1	3		**4**			1	2		**3**
25.1 - 50 MT					1	**1**					1	**1**
50.1 - 100 MT												
100.1 - 500 MT												
500.1 - 1000 MT												
Total	**17**	**32**	**54**	**32**	**16**	**151**	**11**	**21**	**36**	**21**	**11**	**100**

Source: Farm surveys of Study Team, 2013 and 2014

8.1.3 Licensing of existing and new fish farms

According to farm surveys summarised in Tables 3.12 and 8.1, at present, 44 percent of fish farms are unlicensed. This can be explained by the complicated licensing procedure which is often unclear even to the acting authorities. An unambiguous and simple regulation on how to licence fish farms of the different culture systems is needed.

After the revision of present practices all not yet licensed fish farms should be allowed and helped to be registered without any consequences.

8.2 Technical support and training

Technical support and training are the second main group of identified needs in the sector. These needs emerge on three different levels.

8.2.1 Technical support and training to government organizations

Technical support for upgrading sector administration

The technical support would include upgrading:

- The status of the sector

- Sector administration
- Licensing of existing and new fish farms

Elaboration of water cadastres

Without a reliable water cadastre it is not possible to conduct proper management of inland waters of BiH. A reliable water cadastre including physical, chemical and biological (fish fauna) parameters of waters is still missing despite being required by law. For this reason technical assistance combined with training is needed for the elaboration of the water cadastres in BiH.

Technical support and training to government officers

It was one of the conclusions of SWOT workshops that angling organizations and fish farmers cannot obtain the needed information and support from the acting officers in the different government offices and authorities.

This constraint would be eliminated if sector administration and management was more efficient and if concerned and responsible government officers were equipped with specific sector managerial knowledge and skill, including the knowledge of efficient "user friendly" interpretation and implementation of existing laws.

8.2.2 Technical support and training to support services

Support to statistical services

A reliable statistical service is the most important precondition of a prospering sector. This is because statistics provide basic information, as well as feedback for both administrative decision makers and the stakeholders participating in production (fish farms, fish processors) and service provision, such as fish traders and angling organizations.

At present there are no statistical services in the field of marine and inland fisheries and the statistics on aquaculture are not up to the mark. For this reason a detailed revision of the present practices and in depth training of statisticians involved in the sector is needed.

Support to police services

Poaching in public waters is a widespread problem in BiH, against which relevant laws prescribe the employment of fish guards, who extensively fail to enforce the law because structured cooperation and police backup is typically missing. A regularly repeated workshop on poaching could improve the knowledge and thus the efficiency of local police forces.

8.2.3 Technical support and training to fisheries/angling organizations and fish farmers

Technical support to upgrading of MSc courses at state universities

At present there is no practice related elements of the MSc courses at state universities. An overall science based but practice oriented MSc course is needed which would ensure the required quality and level of knowledge on fisheries and aquaculture.

Technical support and training to angling organizations

Though members of angling organizations should pass a compulsory examination, anglers' organizations are hindered due to a lack of knowledge on the part of their decision makers on sustainable fishery management of inland waters. Therefore, it is necessary to elaborate and implement a training program for the leaders and decision makers of angling organizations.

Technical support and training to fish farmers

One of the obstacles of widespread practice of advanced fish production technologies on the fish farms is the missing basic knowledge which would allow those technological details which are indispensable to improve productivity and efficiency both in physical and financial terms to be properly perceived (see Box 8.1). A well designed and properly implemented training program for fish farmers would provide the necessary knowledge.

Box 8.1: Technical perceptions which make the difference

Some technical terms among others "produced eggs", "produced feeding larvae" and "produced advanced fry" are not used by trout farmers in BiH. Instead, they distinct less accurate terms such as "number of eyed eggs", "hatched out fry" and "feeding larvae". However for example the accurate/professional evaluation of the quality of broodfish populations cannot be done without knowing the number of stripped eggs and the rate of their fertilization (Study Team, 2014).

8.3 Investments

8.3.1 Inland fisheries

Equipping angling associations of the entities

The 151 angling societies in the three entities are under the direct coordination of three angling associations. Their efficient coordination and

support depends on how well the data and information of their member angling societies are known, processed and evaluated and made know by them in the form of regularly issued periodicals.

New hardware and software are needed to complete such tasks. This would allow the efficient and effective use of elaborated water cadastres. Working with the technical support of university professionals specialized on geographical mapping, water quality, fish fauna etc. could maintain a regularly updated database for the benefit of the entire subsector.

Equipping fish guards

Angling organizations are legally required to employ fish guards. However, most of the organizations have no financial resources to equip their guards, who thus cannot complete their key tasks[35] obligated by law.

Table 8.2: Key parameters of the different applicable mechanical filters of trout farm effluents

Items	Units	Farm capacities			
Production	t/year	5-10	10-25	25-50	100 -200
Water used for 1 kg production	m^3/kg/year	@390	@390	@390	@200
Water use per day	m^3/day	5 000 - 10 000	1 000 - 25 000	26 000 - 52 000	55 000 - 110 000
Method for decreasing the TSS		Lamella separator		Radial Flow Settler	Drum filter
Filtering capacity	m^3/hour/m^2	3		20	21<
Removal of SM bigger than 70 um	Percent	~ 80		~ 80	~ 80
Removal efficiency of TSS	Percent	25		40-45	30
Size/type of the unit	m^2	70 - 140	140 - 350	8 - 16	2 pcs Hydrotech

Source: Study Team, 2014

8.3.2 Aquaculture

Installation of mechanical filters at land based trout farms

In order to comply with relevant strict environmental laws, as well as to further reduce the negative effect of effluents of trout farms on the recipient waters, mechanical filters should be installed. These easy to install and free to operate mechanical filters could reduce the environmental load on trout farms by 25-45 percent (see Table 8.2). This together with the diluting effect of nature discussed in Annex 7 would ensure land based environmentally friendly trout production.

Equipping of fish farms with fish transport devices

The farm surveys presented in Tables 3.17 and 8.3 and the tables in Annex 5 show that most of the fish farms have no transport facilities/fish transporting tanks (34 percent), iced fish transporting capacities (4 percent) and frozen fish transporting capacities (13 percent). The missing fish transportation facilities hinder fish farms in getting to markets.

35 Guarding fish stock which is one of the valuable natural resources of the country.

Equipping fish farms with fish processing and preserving units

There is increasing demand for on farm fish processing and many of the fish farms try to comply with their own artisanal fish cleaning and preservation initiatives (see Table 8.3). Not all of these are up to EU standards that require professional equipment and machinery, which are missing from most of the fish farms (see Tables 3.17 and the relevant tables of Annex 5). Out of fish processing and preserving machines mostly; ice making (89 percent), stunning (96 percent), gutting (89 percent), filleting (98 percent), smoking (95 percent) professional packing and labelling (97 percent) machines are missing but cold storage (93 percent) and deep freeze (97 percent) facilities are also missing on the fish farms.

Table 8.3: Number and proportion of surveyed fish farms equipped with fish transporting facilities in BiH

Production categories	Number of farms which have transporting capacities of			Proportion of farms by categories which have transporting capacities of			Proportion of all fish farms which have transporting capacities of		
	Live fish	Iced fish	Frozen fish	Live fish	Iced fish	Frozen fish	Live fish	Iced fish	Frozen fish
No production	5	1	1	10	5	17	3	1	1
Below 1 ton	3	2		6	10		2	1	0
Between 1 - 5 MT	8			16			5	0	0
Between 5.1 - 10 MT	6			12			4	0	0
Between 10.1 - 25 MT	8	5		16	25		5	3	0
Between 25.1 - 50 MT	5	4		10	20		3	3	0
Between 50.1 - 100 MT	5	1		10	5		3	1	0
Between 100.1 - 500 MT	7	4	2	14	20	33	5	3	1
Between 500.1 - 1000 MT	4	3	3	8	15	50	3	2	2
Total	**51**	**20**	**6**	**100**	**100**	**100**	**34**	**13**	**4**

Source: Farm survey of Study Team, 2013 and 2014

9. RECOMMENDATIONS

9.1 Priority actions for the sector

There are three fields in which actions are required in fisheries and aquaculture:

- Administration
- Capacity building of key stakeholders
- Support for basic investments

9.1.1 Recommendations for sector administration

Improved sector administration is the first factor that needs to be addressed. This should include:

- Strategic action in the form of upgrading the status of the sector[36]
- Improving sector administration with measures on:
  - State level coordination.
  - Inclusion of marine fisheries into the fisheries law of FBiH.
  - Coherent harmonization of specific sections of fisheries laws.
  - Relevant implementation and enforcement of guidelines and regulations/by laws.
  - Coordinated overall enforcement of fishery laws.
- Licensing of existing and new fish farms[37]

The quantification of resources required to fulfil the above listed recommendations is presented in Table 9.1. In addition to the listed quantified recommendations, state and entity level intervention should also be considered such as support and coordination of campaigns for:

- Marketing fish and fish products in order to increase national consumption.
- Increasing public awareness about clean water environment, correct sporting approach of sport fishers and combating illegal fishing and poaching.
- Promoting fish consumption.
- Promoting recreational sport fishing for both national and international public.

9.1.2 Recommendations for capacity building of key stakeholders

Technical support and training is another area of recommended actions. Related actions should be:

- Technical support and training for government organizations
  - Technical support for upgrading sector administration
  - Elaboration of water cadastres[38]
  - Training of government officers
- Technical support and training for support services
  - Support and training for statistical services
  - Support for the police
- Technical support and training to fisheries/sport fishing organizations and fish farmers
  - Support for upgrading MSc courses at state universities
  - Training for sport fishing organizations
  - Training for fish farmers

The quantification of resources required to cover the above recommendations is presented in Table 9.1. In addition to listed recommendations, field level interventions could also include some actions listed below.

Focusing on sport fishing associations and societies:

- Provision for long term concessions for sport fishing societies in terms of demand for proper planning and correct implementation of ecosystem friendly management plans;
- Support sport fishing societies by all legal means (police, law enforcement, etc.) to combat poaching;
- Organization of public awareness TV campaigns on the correct management of waters and against poaching;
- Finding sustainable financial resources for the proper and lawful operation of sport fishing organizations.

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36 Include fishery and aquaculture in the strategy of agriculture, rural tourism and recreational sport activities.
37 Legalization of already existing and operating but unlicensed fish farms without sanctions (with "no-consequence approach").
38 This should also contain a survey on water quality and the fish fauna.

Supporting fish farmers and their cooperation:

- Elaboration of a predictable and transparent procedure for issuing and renewing production and operation related permissions;
- Facilitate cooperation on purchase inputs (feeds) and marketing of produced fish;
- Investment programs on the basis of needs identified by fish producers and their organizations;
- Organization of regular and specific trainings;
- Support marketing campaigns for increased fish consumption.

9.1.3 Recommendations for supplying sport fishing organizations and fish farms

In the field of inland fisheries and aquaculture the following investments are recommended:

- Inland fisheries
  - Equipping sport fishing associations of entities
  - Equipping fish guards
- Aquaculture
  - Installation of mechanical filters to land based trout farms
  - Supplying fish farms with fish transport equipment
  - Supplying fish farms with fish processing and preserving units
- The quantification of resources required to cover the above listed recommendations is presented in Table 9.1.

Table 9.1: Quantification of resources needed to finance support measures

Issues and their description	Consultants			Training		Investment			Beneficiaries			Total (BAM)
	Number of experts	Man-days	Total (BAM)	No.	Total (BAM)	Type	No.	Total (BAM)	Category	No.	Average per beneficiaries (BAM)	
Grand total			**4 595 000**		**1 510 000**			**5 428 500**			**3 674 483**	**11 533 500**
1. Upgrading the status of the sector			**2 085 000**		**0**			**0**			**2 085 000**	**2 085 000**
1.1 Upgrading the status of the sector			**295 000**		**0**			**0**			**295 000**	**295 000**
1.1.1 Preparation of relevant study	13	65	295 000		0			0	Entire sector	1	295 000	295 000
1.2 Sector administration			**1 680 000**		**0**			**0**			**1 680 000**	**1 680 000**
1.2.1 Preparation of a feasible proposal	13	360	1 680 000		0			0	Entire sector	1	1 680 000	1 680 000
1.3 Licensing of existing and new fish farms			**110 000**		**0**			**0**			**110 000**	**110 000**
1.3.1 Revision of existing process of licensing	5	70	110 000		0			0	Entire sector	1	110 000	110 000
2. Technical assistance and training			**2 510 000**		**1 510 000**			**0**			**1 508 433**	**4 020 000**
2.1 Technical assistance and training to government organizations			**935 000**		**0**			**0**			**940 333**	**935 000**
2.1.1 Elaboration of water cadasters	9	280	935 000		0			0	Entire sector	1	935 000	935 000
2.1.2 Training to government officers			**0**		**60 000**			**0**	**Government**	**40**	**5 333**	**60 000**
National workshops			0	1	10 000			0	Government	30	333	10 000
International workshops			0	1	50 000			0	Government	10	5 000	50 000
2.2 Technical assistance to statistical services			**225 000**		**50 000**			**0**			**230 000**	**275 000**

Issues and their description	Consultants			Training		Investment			Beneficiaries			Total (BAM)
	Number of experts	Man-days	Total (BAM)	No.	Total (BAM)	Type	No.	Total (BAM)	Category	No.	Average per beneficiaries (BAM)	
2.2.1 Elaboration of statistical monitoring of marine fisheries	4	40	55 000		0			0	Statistical services	1	55 000	55 000
2.2.2 Elaboration of statistical monitoring of inland fisheries	7	40	80 000		0			0	Statistical services	1	80 000	80 000
2.2.3 Enforcement of the use of statistical regulations on aquaculture	5	50	90 000		0			0	Statistical services	1	90 000	90 000
2.2.4 Study tour of statisticians to an EU member state			0	1	50 000			0	Specialized statistician	10	5 000	50 000
2.3 assistance to police services			**0**		**1 000 000**			**0**			**400**	**1 000 000**
2.3.1 Training of police force			0	In several groups	1 000 000			0	Policemen	2 500	400	1 000 000
2.4 Technical assistance and training to fisheries/angling organizations and fish farmers			**1 350 000**		**400 000**			**0**			**337 700**	**1 750 000**
2.4.1 Technical assistance to upgrading of the MSc courses at state universities	12	315	1 350 000		0			0	State universities	4	337 500	1 350 000
2.4.2 Technical assistance and training to angling organizations			0	In several groups	250 000			0	Angling associations	2 500	100	250 000
2.4.3 Technical assistance and training to fish farmers			0	In several groups	150 000			0	Fish farmers	1 500	100	150 000
3. Investments			**0**		**0**			**5 428 500**			**81 050**	**5 428 500**
3.1 Inland fisheries			**0**		**0**			**2 876 500**			**19 050**	**2 876 500**

Issues and their description	Consultants			Training		Investment			Beneficiaries			Total (BAM)
	Number of experts	Man-days	Total (BAM)	No.	Total (BAM)	Type	No.	Total (BAM)	Category	No.	Average per beneficiaries (BAM)	
3.1.1 Equipping angling associations of the entities			0		0	Set of computer and programs	151	226 500	Angling societies	151	1 500	226 500
3.1.2 Equipping fish guards			0		0	Set of equipment	151	2 650 000	Angling societies	151	17 550	2 650 000
3.2 Aquaculture			**0**		**0**			**2 552 000**			**62 000**	**2 552 000**
3.2.1 Installation of mechanical filters at land based trout farms			0		0			277 000			27 000	277 000
for fish farms below 5 t/yr. production			0		0	Set of lamella separator	45	135 000	Small fish farms	45	3 000	135 000
for fish farms between 5 - 10 t/yr. production			0		0	Set of lamella separator	13	52 000	Small fish farms	13	4 000	52 000
for fish farms between 10 - 25 t/yr. production			0		0	Set of radial flow settler	8	40 000	Small fish farms	8	5 000	40 000
for fish farms between 25 - 50 t/yr. production			0		0	Set of radial flow settler	4	20 000	Medium size fish farms	4	5 000	20 000
for fish farms between 50 - 100 t/yr. production			0		0	Set of radial flow settler	3	30 000	Medium size fish farms	3	10 000	30 000
for fish farms above 100 t/yr. production			0		0	Set of dram filter	3	255 000	Large fish farms	3	85 000	255 000
3.2.2 Equipping of fish farms with fish transport equipment			0		0	Set of transporting tanks, diffusers, reductors and cool boxes for fish	65	325 000	SMS fish farms	65	5 000	325 000
3.2.3 Equipping of fish farms with a fish processing and preserving unit			0		0	Set of gutter, cleaner, packing cum balance machine and freezer/deep freezer	65	1 950 000	SMS fish farms	65	30 000	1 950 000

Source: Study Team, 2014

9.2 Pre-accession Assistance to the sector

As it is clearly defined by the EU Rural Development Component of the Instrument for Pre-accession Assistance (IPA) that candidate countries are to be assisted through a particular instrument called IPARD - Instrument for Pre-Accession Assistance in Rural Development. Objectives of IPARD are twofold (European Commission, 2014 A):

1. To provide assistance for the implementation of the *acquis* concerning the Common Agricultural Policy.
2. To contribute to the adaptation of a sustainable development of the agricultural sector and rural areas in the candidate country.

These objectives are to be met by the implementation of nine different measures under three priority axes listed in Box 8.2.

In view of the objectives and their implementation through set measures all recommended programs are eligible for IPARD support (Review Team, 2014). As detailed in Table 9.1 and 9.2, this would come to a total of BAM 11 533 500 (about EUR 5 897 000).

Box 8.2: Implementation of the objectives of IPARD

There are nine different measures under three priority axes:

Axis 1 – Improving Market Efficiency and Implementing Community Standards

Measures:

1. Investments in agricultural holdings to restructure and upgrade to EU standards
2. Investments in processing and marketing of agriculture and fishery products to restructure and upgrade to EU standards
3. Assistance in setting up producer groups

Axis 2 – Preparatory Actions for the Implementation of Agri-environmental Measures and Leader

Measures:

4. Preparation for implementation of actions relating to the environment and the countryside
5. Preparation and implementation of local rural development strategies

Axis 3 – Development of the Rural Economy

Measures:

6. Improvement and development of rural infrastructure
7. Development and diversification of rural economic activities
8. Training
9. Technical assistance

Source: European Commission, 2014 A

Table 9.2: Recommended actions eligible for assistance through IPARD

Issues and their description	Total of needed assistance (KM)	Total of needed assistance eligible for IPARD		
		Axis	Measures	Amount (BAM)
Grand total	**11 533 500**			**11 533 500**
1. Upgrading the status of the sector	**2 085 000**			**2 085 000**
1.1 Upgrading the status of the sector	295 000			295 000
1.1.1 Preparation of relevant study	295 000	Axis 3	Measure 9	295 000
1.2 Sector administration	**1 680 000**			1 680 000
1.2.1 Preparation of a feasible proposal	1 680 000	Axis 3	Measure 9	1 680 000
1.3 Licensing of existing and new fish farms	**110 000**			110 000
1.3.1 Revision of existing process of licensing	110 000	Axis 3	Measure 9	110 000

Issues and their description	Total of needed assistance (KM)	Total of needed assistance eligible for IPARD		
		Axis	Measures	Amount (BAM)
2. Technical assistance and training	**4 020 000**			4 020 000
2.1 Technical assistance and training to government organizations	**935 000**			935 000
2.1.1 Elaboration of water cadasters	935 000	Axis 3	Measure 9	935 000
2.1.2 Training to government officers	60 000	Axis 3	Measure 8	60 000
National workshops	10 000			10 000
International workshops	50 000			50 000
2.2 Technical assistance to statistical services	**275 000**			275 000
2.2.1 Elaboration of statistical monitoring of marine fisheries	55 000	Axis 3	Measure 9	55 000
2.2.2 Elaboration of statistical monitoring of inland fisheries	80 000	Axis 3	Measure 9	80 000
2.2.3 Enforcement of the use of statistical regulations on aquaculture	90 000	Axis 3	Measure 9	90 000
2.2.4 Study tour of statisticians to an EU member state	50 000	Axis 3	Measure 8	50 000
2.3 Assistance to police services	**1 000 000**			1 000 000
2.3.1 Training of police force	1 000 000	Axis 3	Measure 8	1 000 000
2.4 Technical assistance and training to fisheries/angling organizations and fish farmers	**1 750 000**			1 750 000
2.4.1 Technical assistance to upgrading of the MSc courses at state universities	1 350 000	Axis 3	Measure 9	1 350 000
2.4.2 Technical assistance and training to angling organizations	250 000	Axis 3	Measure 8	250 000
2.4.3 Technical assistance and training to fish farmers	150 000	Axis 3	Measure 8	150 000
3. Investments	**5 428 500**			5 428 500
3.1 Inland fisheries	**2 876 500**			2 876 500
3.1.1 Equipping angling associations of the entities	226 500	Auxis 3	Measure 7	226 500
3.1.2 Equipping fish guards	2 650 000	Auxis 3	Measure 6	2 650 000
3.2 Aquaculture	**2 552 000**			2 552 000
3.2.1 Installation of mechanical filters at land based trout farms	277 000	Axis 2	Measure 4	277 000
for fish farms below 5 t/yr. production	135 000			135 000
for fish farms between 5 - 10 t/yr. production	52 000			52 000
for fish farms between 10 - 25 t/yr. production	40 000			40 000

Issues and their description	Total of needed assistance (KM)	Total of needed assistance eligible for IPARD		
		Axis	Measures	Amount (BAM)
for fish farms between 25 - 50 t/yr. production	20 000			20 000
for fish farms between 50 - 100 t/yr. production	30 000			30 000
for fish farms above 100 t/yr. production	255 000			255 000
3.2.2 Equipping of fish farms with fish transport equipment	325 000	Axis 1	Measure 1	325 000
3.2.3 Equipping of fish farms with a fish processing and preserving unit	1 950 000	Axis 1	Measure 2	1 950 000

Source: Study Team, 2014

Annex 1

STAKEHOLDERS' SWOT WORKSHOPS OF THE FISHERY AND AQUACULTURE SECTOR

To have a full range of information and feedback, the opinion of stakeholders about the strengths, weaknesses, opportunities and threats of the sector were also received in the frame of six workshops:

1. Workshops in the FBiH
1.1. Workshop on the aquaculture subsector of the FBiH (12 May 2014, Sarajevo, BiH)
1.2. Workshop on the fishery subsector of the FBiH (13 May 2014, Sarajevo, BiH)
2. Workshops in RS
2.1. Workshop on the aquaculture subsector of RS (14 May 2014, Banja Luka, BiH)
2.2. Workshop on the fishery subsector of RS (15 May 2014, Banja Luka, BiH)
3. Workshop on the fishery and aquaculture sector of BD (7 July 2014, Brèko)
4. Technical workshop with Project Steering Committee members on the Forest and Fisheries sectors (8-10 July 2014 in Tesliæ, BiH)

On the basis of the workshops Chapter 7. "Identification of SWOT of the sector".

1. Constraints identified by the SWOT workshops in the Federation of Bosnia and Herzegovina

1.1 Constraints identified by the SWOT Workshop on the aquaculture subsector of the Federation of Bosnia and Herzegovina

Fish feed – produced in BiH versus imported from EU member states

Fish producers need to import fish feed, which is expensive. At present there are three fish feed importers in BiH, which cover the whole country.

There is only one feed producing company in the country. Over the past three and a half years it has invested in its business and it now states it is able to produce good quality feed on special request as well. As a huge amount of feed is needed for fish production and when it comes from abroad, transportation and tax costs that need to be paid mean it is cheaper to buy fish feed produced in the country. However, as cheaper feed does not necessarily result in cheaper fish, this may not help fish farmers. Considering that raw materials for fish feed come from the EU and feed production is based on fish meal since no blood or any other components of fish origin are allowed to be used, fish feed producers in BiH are hindered, especially as they also have problems with licenses and permits because these issues are not specifically regulated, which hence creates uncertainties. Though some farmers produce their own feed, usually the quality of this feed is not up to the mark.

Fish transport

For buyers it is cheaper if farmers are responsible for transport, although it is more expensive for farmers to transport small amounts of fish individually[39].

Training

Trainings are not regularly and/or systematically organized. Sometimes the FBiH Ministry of Agriculture organizes trainings for farmers, though not necessarily for fish farmers. Presentations of scientists, university teachers and foreign experts on various subjects (e.g. fish diseases, rearing technologies of different species etc.) are required in such trainings and seminars. Study tours are also considered to be important. A brief structure of an extension system was also introduced to participants of the workshop as a possible solution for such problems. They welcomed the idea though the responsibility of financing was a crucial issue for them.

Legislation

Legislation is a top priority for participants. The first step should be the development of a strategy at state level. The fact that no law about fish production exists at state level and that different pieces of legislation at entity and cantonal levels are not harmonized is considered a huge problem. It is not clear what laws or regulations should be followed in which areas and also the implementation of already existing laws is unclear. This causes a lot of confusion, financial losses, the

39 Cooperation on purchasing and transportation with neighboring farmers could be a solution.

appearance of unregistered fish farms, problems with concessions and so on.

Credit, interest rates and taxes

Participants have concerns regarding the crediting system of banks and would support the reduction of taxes and interest rates.

Marketing fish, importing fish seed and exporting fish and fishery products

Marketing is done individually and no assistance is received from the state or any marketing institutions. For individual farmers it is very difficult to find a market for small amounts of fish, there is no possibility to export their fish and it is more expensive to appear on the market[40].

Import of fish seed should also be reduced since most of the fish species could be reproduced within the country as well.

Aquaculture producers are of the opinion that export quotas to the EU should be raised. Another problem is that too many different permissions/documents are required for exporting fish but there are no systematic guidelines/ arrangements on how to receive them – the process should be simplified. No records of production, no export of fish food, no negotiator for export interests of fish producers, no fair play from the EU part. They are aware that producers need to fulfill certain regulations to be able to export fish into the EU. It is possible that with already existing capacities 5 000 MT of fish could be produced annually in BiH if EU market opportunities are increased.

Administration

In theory it is useful to be registered, because only registered farmers have access to subsidies. In reality, many costly permits are required for legal operation. This results in a high number of unregistered fish farms as many farmers get stuck without being able to finish the process. The lack of harmonization of laws and regulations, the lack of communication and coordination between different Ministries at different levels, the lack of proper monitoring and proper investigations all result in a slow and inefficient administration and provide opportunities for corruption.

Incentives

It is not well developed and clearly organized. There are no regulations to guide and control the process, thus it is unclear from where and how to receive funding. There is a huge bureaucracy with a lot of administration[41] and in many cases positive outcomes depend on personal connections.

1.2 Constraints identified by the SWOT Workshop on the fishery subsector of the Federation of Bosnia and Herzegovina

The most significant problems in the subsector identified by workshop participants are listed below, from which some are similar all over the country and some are specific to certain regions.

Legislation and legal framework

There is no fishery law at state level and there are loopholes in the law at the FBIH level. At present there are two levels of legislation in the FBiH: the FBIH and the cantonal level. It requires between five and six years to get a law at state level. Current laws do not distinguish between specific problems of different environments.

Lack of coordination among ministries (at different levels and departments)

Coordination of laws and working procedures need to be harmonized between different ministries and different levels.

Lack of cooperation with local authorities and the police

Policemen are not very supportive when poaching is reported. Fish guards only have authorization to make reports but not to actively protect fish. It takes a very long time to bring poachers to court. If poachers are convicted, the fines they have to pay are rather low. The fine goes to the Federation and not to fishers who have expenses in such cases. Poaching with dynamite is also a huge problem.

Financial resources

Revenues of sport fishing societies are based on membership fees which are insufficient to cover all costs requested by law (e.g. hygiene, employment of guards).

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40 Cooperation would be required. Export of live fish and fish seed should also be started into the EU.

41 It was mentioned in all of the workshops and both in the areas of fishery and aquaculture. In FBiH the amount is higher, though it is impossible to receive it due to the huge amount of permits and documentation. In RS, the amount is lower, so more people have access to it. The procedure itself is also much more simple. However, they claimed that once it is granted a long time can pass until they really receive it. In BD it was mentioned that they have no incentives at all.

Inspections and monitoring of fishery management

There is a lack of proper inspection and monitoring regarding fishing. Restocking (species of fish, time and location of restocking, size of fingerlings, number of restocked fish etc.) should be specified in the legislation.

The reporting system should be clarified and information collection about catches (volume, species etc.) should be centralized.

Dams and hydroelectric power stations

Dams and hydroelectric power stations are built all over the country and they usually receive permission without any environmental control. These stations block the free movement of fish, destroy a number of spawning areas and cause dramatic changes in the water level within a short period of time. Cooperation with them is not legally controlled so usually it depends on personal relations and communication.

By law, these stations should pay charges to fishing organizations though the amount is not defined and they are not forced to complete due payments.

Pests

Pests (cormorants, otters, beavers) cause a lot of problems for fish stocks in natural waters. To prevent these, joint actions are needed with neighboring countries and within the country as well. Government support (e.g. legislative support and centralized management) is also demanded by sport fishers.

Excavation of stone and sand from river beds

Excavation of stone and sand from river beds causes similar problems to hydroelectric power stations; namely, they destroy habitats and spawning grounds. Due to the lack of proper legislation and monitoring this problem is exacerbated. It often happens that after a company applies for and receives a mining concession for a certain segment of a river they remove sand or rock from a wider segment of the river bottom.

Equipment for fish guards

Sport fishing organizations and/or associations do not receive any additional funds from the government; they have to cover all their expenses from license fees. As many people have left the area and most of the remaining people are war invalids, juveniles or unemployed, they pay a reduced fishing fee which results in a relatively small income for the organization/association. According to the law, ensuring guarding of the fishing area is the duty of sport fishing societies. Therefore, all such organizations should have at least one fish guard who can be employed and equipped from fishing fees. On the other hand, no proper equipment is available for the fish guards to fulfill their duties. No boats, uniforms, binoculars, cell phones and other required tools are available to increase their work efficiency.

Waste water and solid waste

Free release of waste water and plastic bottles[42] into rivers causes huge problems for the environment and fish fauna. Waste water release should be better controlled and polluting companies should pay a pollution fee.

2. Constraints identified by the SWOT workshops in Republika Srpska

In RS essentially the same problems were identified as in the FBiH though some differences were identified when problems were specified and detailed.

2.1 Constraints identified by the SWOT Workshop on the aquaculture subsector in Republika Srpska

Fish export quotas

Increasing fish export quotas would bring more opportunities for large fish production companies to appear in EU markets. They already have the capacity to satisfy greater international demands and it would open local markets to small scale producers.

Harmonization of laws

Horizontal and vertical harmonization of fisheries laws between the ministries of entities and BD and between departments within ministries is strongly required, as it seems to be a major problem all over the country which results in a lot of uncertainty and slows down all processes. The new law on fisheries and aquaculture has already been accepted in RS though due to the lack of secondary legislation they still have problems with implementation.

Harmonization of the work of different ministries

Not only is the lack of proper legislation and the harmonization of existing laws a problem but there

42 The problem is so huge that fishers need to collect them as voluntary work. A system similar to that of Croatia would be needed where a refund is paid for returned plastic bottles.

is also a gap in communication between different ministries and departments. As a result, farmers often need to prepare the same type of examinations or documentation for different purposes where results of previous investigations were not allowed to be used.

Harmonization of incentives

In aquaculture, mechanisms of incentives exist in both entities. However, they work in different ways. More support is available in FBiH, but due to unclear conditions and extremely slow processes it is very difficult to apply for it successfully. In RS it is not so difficult to prepare a successful application, though the amount of the support is lower and for receiving the granted support the process is also rather slow.

Recognition of the subsector

Aquaculture should be recognized as a strategic sector for the country, as BiH has extremely good potential for such activities. In contrast to many other sectors, aquaculture already has an export quota to the EU, although a rather small one.

Transparency

Due to the lack of proper and comprehensible regulations and reference for implementation it is difficult to obtain licenses. In addition, there is no central control and/or supervision, no proper data collection and no proper publishing of information about the sector.

Simplification of bureaucracy

Bureaucratic burdens are considered to be too high which creates obstacles in the implementation processes.

Fish feed

Fish feed makes up a significant part of production costs. Most farmers are of the same opinion as in the FBiH that national feed production would be beneficial and much cheaper.

However, one opinion was also heard that it might not be so beneficial to use fish feed produced in the country and the new feed production company will face problems if it plans to appear on international markets. This was justified by the long and thorough experience and surveys of some well-known foreign companies. It was concluded that huge quantities of high quality feed are offered by leading international companies who are thus able to satisfy all specific requirements of consumers. The volume of feed produced by such a company also allows it to purchase raw materials much more cheaply than smaller companies.

Supportive treatment of fish producers

Simpler and easier to follow rules and regulations could help fish producers get the same support as foreign producers or producers and entrepreneurs in other sectors. Financial burdens on fish producers (fees and taxes) and support to fish farmers also needs to be revised.

The problem of water permission requests with reduced predicted water use[43] is another issue which should be addressed.

Unregistered fish farms

Around 70 percent of fish farms in the country are unregistered. Most of these farms would like to be registered but they got stuck at a certain stage of registration or do not even know how to start the process. However, some of these farms overuse water, some are competing for resources with neighboring farms and many other problems can appear which result in difficulties in the decision process.

Sharing information with farmers

Sharing information with farmers regarding proposed new laws and regulations should be developed. At present farmers are not properly informed and they often receive irrelevant or incorrect information. This results in incorrect implementation of laws and regulations and in a lot of confusion.

Planned construction and expansions

Farmers consider planning before constructing or expanding fish farms to be an important element of their activities. Through proper planning, the majority of mistakes can be avoided and a lot of energy, time and money can be saved. Farmers expect to have central support for and a reasonable control over planning.

Country wide strategy for aquaculture

Farmers strongly support the idea of having a country wide strategy for fish production which clarifies the present status of the subsector, the main goals that should be reached and the way to achieve these goals.

43 Less water use is indicated in the reqiuest than the predictable actual use.

2.2 Constraints identified by the SWOT Workshop on the fishery subsector of Republika Srpska

Law on fishery

Though the new law has already been accepted in RS, there are still problems with its implementation. Though everyone is grateful for the new law they still think that some parts of it should be modified and a secondary legislation would also be needed on the basis of the law. For example there is an obligation to restock fish, though it is not clarified what type of fish, when, where and how restocking should be done. A detailed rule book would also be required clarifying exact venues and times of fishing bans.

Some concerns that were mentioned in connection with the new law:

- No obligations are set by law.
- Different laws should be harmonized, among others fishery law with the labor law[44].
- Communication between different ministries should be strengthened.
- Ministries often do not have the legal competence to protect fishermen due to loopholes in the law.

Water management

There are problems with water management as there is no systematic management and protection of river banks and river beds.

Poaching

There is a lack of proper rules and regulations for actions and sanctions against poachers. The border service should also control border-rivers against poachers and the degradation of the environment.

Guards are official but they are not authorized so they cannot impose any sanctions. As a result, only a very few cases end up in court and even fewer poachers are sentenced. Due to financial problems the police are not able to support fish guards. As in FBiH, equipment for fish guards is missing together with financial resources to purchase them.

Concessions of sport fishing societies

In FBiH, associations are official users of waters while in RS they are concessionaires. The problem with concessions is that they last for a relatively short period of time, usually for five years. This period is too short to consider serious investments.

Excavations of river beds

Excavation of stone and sand from river beds results in similar problems to those caused by hydroelectric power stations; it destroys habitats and spawning grounds. Usually old machinery is used, meaning that oil leakages often occur. It is not possible to prohibit such activities as they are implemented by mining concessionaires.

Support expected from the Ministry of Sports

Sport fishing organizations do not receive any kind of support from the Ministry of Sports and their interests and requirements are not taken into consideration in the decisions of the Ministry.

3. Findings of the SWOT workshop on the fishery and aquaculture sector in Brèko District

Key strengths of the sector identified by participants of the workshop are:

- Excellent water quality and natural resources
- Knowledge and human resources
- Quality of produced fish

The most important problems identified are:

- Legislation and implementation of the law
- Absence of the Ministry of Agriculture at state level
- Small hydroelectric power plants
- Commercial/economic fishing (see details below)
- Local communities and regulations
- Marketing of fish – price, transportation, fish eating habits (see details below)
- Inspection services
- Lack of commitment from sport fishermen
- Pollution
- Lack of incentives
- Insufficient utilization of natural resources (see details below)
- Proper microcredit system

Most of the problems mentioned during the Workshop has already appeared in other entities as

44 Application of guards: on the basis of the fishery law only full time guards can be employed while labor law allows part time or voluntary work as well.

well. For this reason only the differences are listed below.

Commercial/economic fishing: In Brèko District fishers and companies have the opportunity to buy fishing licenses in natural waters (referred to in connection with Sava River). With this license fishermen are entitled to catch a certain amount of fish which leads to the overfishing of these waters for the following reasons:

- As fishing is not monitored or controlled usually a much greater amount of fish is captured than allowed or needed. In this second case the unnecessary part of catch might be left behind as garbage.
- No fishing or restocking plans are needed to receive a commercial/economic fishing license.
- Fishing methods and equipment are not controlled either, so often illegal fishing methods are used.

For the listed problems there are tensions with sport fishermen because sport fishing associations are obliged by law to restock fish each year which they consider as an unequal treatment.

Marketing of fish (price, transportation and consumption of fish): Among Muslims eating fish is not a common habit so farmers in such regions need to transport their fish to more distant markets.

Lack of incentives: Unlike in the other two entities there are no incentives for fish farmers in Brèko District.

4. Summary on the discussions of the technical workshop for consultation with stakeholders of the fishery and aquaculture sector in BiH

The discussions were conducted in line with the following five sections:

- Collection of sector related information
- Key facts of the sector
- Results of the analysis of the sector from stakeholders' perspectives
- Compatibility with EU rules and regulations
- Recommendations for measures by all stakeholders to increase the efficiency of the sector.

Each section was followed by a discussion during which questions could be asked and concerns, recommendations or requests expressed.

On the basis of findings of the Fishery Sector Team scope for improvements have been identified in the field of:

- Secondary legislation, as well as monitoring and implementation of already existing laws;
- Providing incentives and streamlining processes for unregistered fish farms to be registered;
- Administration;
- Coordination and cooperation;
- Incentives for fish farmers;
- Marketing;
- Transparency.

These issues were discussed in detail and are further elaborated in relevant chapters and sections the present document.

The Ministries in Bosnia and Herzegovina agree that further improvements of the sector are possible. It was emphasized that, in addition to the sector study, a report about fish species in the country and water parameters of their habitats is required, a request which was duly detailed in Chapters 7, 8 and 10.

The effects of recent floods were also discussed with PSC members as they have had a great impact on fish production and fish producers also suffered serious losses. Although investigations about damage have not been completed, some major problems have already appeared in connection with this damage, like the problem of unregistered fish farms, construction of fish farms in insecure environments or the policy of insurance companies for not providing insurance for floods. It was also highlighted that the floods will have long term effects which is difficult to access at the moment (e.g. genetic pollution of natural waters by escaped farmed fish).

Participants of the Technical Workshop were satisfied with shared information, discussed topics and results of the meeting. They expressed their gratitude for the thorough review, accepted findings and agreed with recommendations, and considered the Technical Workshop beneficial for their future work/activities.

Annex 2

UNIVERSITY EDUCATION IN FISHERIES, AQUACULTURE AND RELATED SUBJECTS[45]

Location:	**Banja Luka**
Name of the university:	University of Banja Luka
Name of faculty:	Faculty of Agriculture (Poljoprivredni fakultet)
Name of course:	Animal production (Animalna proizvodnja)
Name of course:	Agricultural Economics and Rural Development
Level of course:	First, second and third cycle
Main subjects:	Aquaculture, Hydrobiology, Nutrition, Genetics, Physiology, Biology of natural resources

Location:	**Banja Luka**
Name of the university:	University of Banja Luka
Name of faculty:	Faculty of Natural sciences and Mathematics (including Chemical engineering, Process engineering and Biotechnology) (Prirodno-matematički fakultet)
Name of course:	Biology
Name of course:	Ecology and environmental protection
Level of course:	First, second and third cycle
Main subjects:	Aquaculture, Hydrobiology, Nutrition, Genetics, Physiology, Biology of natural resources

Location:	**Istočno Sarajevo**
Name of the university:	University of East Sarajevo (Univerzitet u Isto~nom Sarajevu)
Name of faculty:	Faculty of Agriculture (Poljoprivredni fakultet)
Name of course:	Animal production
Name of course:	Agricultural Economics and Rural Development
Level of course:	First, second and third cycle
Main subjects:	Aquaculture, Hydrobiology, Nutrition, Genetics, Physiology, Biology of natural resources

45 Source: Study Team, 2014

Location:	**Sarajevo**
Name of the university:	University of Sarajevo
Name of faculty:	Faculty of Natural Sciences and Mathematic (Prirodno-matematički fakultet)
Name of course:	
Level of course:	First, second and third cycle
Main subjects:	Aquaculture, Salmon culture, , Hydrobiology, Nutrition, Genetics, Physiology, Biology Cyprinocultura of natural resources, Zoonosis, Virology,

Location:	**Sarajevo**
Name of the university:	University of Sarajevo
Name of faculty:	Faculty of Agriculture and Food Science (Poljoprivredno-prehrambeni fakultet)
Name of course:	Aquacultura, Salmoniculture, Cyprinocultura, marine aquaculture
Level of course:	First, second and third cycle
Main subjects:	Aquacultura, Salmoniculture, Cyprinocultura, Marine aquaculture

Location:	**Sarajevo**
Name of the university:	University of Sarajevo
Name of faculty:	Faculty of Veterinary Medicine (Veterinarski fakultet)
Name of course:	Department of Epizootics: Department of breeding and diseases of fish, bees and wildlife
Level of course:	First, second and third cycle
Main subjects:	Fish diseases

Location:	**Sarajevo**
Name of the university:	University of Sarajevo
Name of faculty:	Joined Members: Institute for Genetic Engineering and Biotechnology (Institut za genetičko inženjerstvo i biotehnologiju)
Name of course:	
Level of course:	First, second and third cycle
Main subjects:	Fish genetics

Location:	**Mostar**
Name of the university:	University Džemal Bijedić of Mostar
Name of faculty:	Agro-Mediterranean Faculty
Name of course:	
Level of course:	First, second and third cycle
Main subjects:	Ecology water

Location:	**Mostar**
Name of the university:	University of Mostar (Sveučilište u Mostaru)
Name of faculty:	Faculty of Agriculture and Food technology (Agronomski fakultet)
Name of course:	
Level of course:	First, second and third cycle
Main subjects:	Aquacultura, Salmoniculture, Cyprinocultura, Marine aquaculture,

Location:	**Mostar**
Name of the university:	University of Mostar (Sveučilište u Mostaru)
Name of faculty:	Faculty of Natural Sciences, Mathematics and Education (Fakultet prirodno-matematièkih i odgojnih nauka)
Name of course:	
Level of course:	First, second and third cycle
Main subjects:	Aquacultura, Salmoniculture, Cyprinocultura, Marine aquaculture, Biology of natural resources

Location:	**Tuzla**
Name of the university:	
Name of faculty:	Faculty of Natural Sciences and Mathematic (Prirodno-matematièki fakultet)
Name of course:	Biology
Level of course:	First, second and third cycle
Main subjects:	Aquaculture, Salmoniculture, Cyprinocultura, Hydrobiology, Nutrology, Genetics, Physiology, Biology of natural resources

Location:	**Bihać**
Name of the university:	University of Bihać (Univerzitet u Bihaæu)
Name of faculty:	Faculty of Biotechnology (Biotehnički fakultet)
Name of course:	Agricultural and food
Level of course:	First, second and third cycle
Main subjects:	Aquaculture, Hydrobiology, Nutrology, Genetics, Physiology, Biology of natural resources

Annex 3

LIST OF COMMERCIAL BANKS, MICRO CREDIT INSTITUTIONS AND LEASING COMPANIES IN BOSNIA AND HERZEGOVINA

Table A3-1: Commercial banks in BiH

Name of bank	Address	Phone	Fax	Area code	Web	Email
Bank list - Federation of Bosnia and Herzegovina						
BOR banka dd Sarajevo	Obala Kulina Bana 18 71000 Sarajevo	278 520	278 550	033; +387 33	http://www.borbanka.ba	info@borbanka.ba
Bosna bank international d.d. Sarajevo	Trg djece Sarajeva bb 71 000 Sarajevo	275 100	203 122	033; +387 33	http://www.bbi.ba	info@bbi.ba
Hypo Hypo Alpe-Adria-Bank d.d. Mostar	Kneza Branimira 2b 88 000 Mostar	444 444	444 235	036; +387 36	http://www.hypo-alpe-adria.ba	bank.bih@hypo-alpe-adria.com
Intesa Sanpaolo Banka d.d. Bosna i Hercegovina	Obala Kulina bana 9a 71 000 Sarajevo	497 555	497 589	033; +387 33	http://www.intesasanpaolobanka.ba	info@intesasanpaolobanka.ba
Investiciono-komercijalna banka dd Zenica	Trg BiH 1 72 000 Zenica	448 400	448 501	032; +387 32	http://www.ikbze.com.ba/	ikbzenica@ikbze.com.ba
Komercijalno-investiciona banka dd V.Kladuša	Ibrahima Mržljaka 3 77 000 Velika Kladuša	771 253	772 416	037; +387 37	http://www.kib-banka.com.ba	kibbanka@bih.net.ba
MOJA BANKA dd Sarajevo	Trg me\unarodnog prijateljstva 25 71 000 Sarajevo	586 870	586 880	033; +387 33	http://www.moja-banka.ba	info@moja-banka.ba
NLB Banka d.d., Tuzla	Maršala Tita 34 75 000 Tuzla	259 259	250 596	035; +387 35	http://www.nlb.ba	info@nlb.ba
Privredna banka Sarajevo d.d. Sarajevo	Alipašina 6, 71 000 Sarajevo	277 700	664 175	033; +387 33	http://www.pbs.ba	info@pbs.ba
ProCredit Bank Sarajevo	Franca Lehara bb 71 000 Sarajevo	250 950	250 971	033; +387 33	http://www.procreditbank.ba	info@procreditbank.ba
Raiffeisen Bank dd BiH	Zmaja od Bosne bb 71000 Sarajevo	755 010	213 851	033; +387 33	http://www.raiffeisenbank.ba	info.rbbh@rbb-sarajevo.raiffeisen.at
Razvojna banka Federacije BiH	Igmanska 1, 71 000 Sarajevo	277 900	668 952	033; +387 33	http://www.rbfbih.ba/	info@rbfbih.ba
Sberbank BH dd	Fra Anđela Zvizdovića 1 71 000 Sarajevo	295 601	263 832	033; +387 33	http://www.sberbank.ba	info@sberbank.ba
Sparkasse Bank d.d.	Zmaja od Bosne 7, Sarajevo	280 300	280 230	033; +387 33	http://www.sparkasse.ba	info@sparkasse.ba
UniCredit Bank d.d.	Kardinala Stepinca b.b., 88 000 Mostar	312 112	312 121	036; +387 36	http://www.unicreditbank.ba	info@unicreditgroup.ba
Union banka d.d. Sarajevo	Dubrovačka 6 71 000 Sarajevo	561 000	201 567	033; +387 33	http://www.unionbank.ba	info@unionbank.ba
Vakufska banka d.d. Sarajevo	Maršala Tita 13 71 000 Sarajevo	280 100	663 399	033; +387 33	http://www.vakuba.ba	vakufska@vakuba.ba
ZiraatBank BH d.d.	Dženetića Čikma 2, 71 000 Sarajevo	252 230	252 245	033; +387 33	http://www.ziraatbosnia.com	info@ziraatbosnia.com

Name of bank	Address	Phone	Fax	Area code	Web	Email
Bank list - Republika Srpska						
Banka Srpske AD Banja Luka	Aleja Svetog Save 61 78 000 Banja Luka	245 111	245 145	051; +387 51	http://www.bib.ba	contact@bib.ba
Bobar banka ad Bijeljina	Njegoševa 1 76 300 Bijeljina	233 300	233 301	055; +387 55	http://www.bobarbanka.com	office@bobarbanka.com
Hypo Alpe-Adria-Bank a.d. Banja Luka	Aleja Svetog Save 13 78 000 Banja Luka	336 500	336 518	051; +387 51	http://www.hypo-alpe-adria.rs.ba	info@hypo-alpe-adria.rs.ba
Komercijalna banka AD Banja Luka	Veselina Masleše 6 78 000 Banja Luka	244 701	244 710	051; +387 51	http://www.kombank-bl.com	office@kombank-bl.com
MF Bank, a.d. Banja Luka	Vase Pelagića 22, 78 000 Banja Luka	221 400	232 091	051; +387 51	http://www.mfbanka.com	office@mfbanka.com
NLB Razvojna banka	Milana Tepiæa 4 78 000 Banja Luka	221 610	221 623	051; +387 51	http://www.nlbrazvojnabanka.com	helpdesk@nlbrazvojnabanka.com
Nova banka ad Banja Luka	Kralja Alfonsa XIII 37a, 78000 Banja Luka	333 398	217 256	051; +387 51	http://www.novabanka.com	office@novabanka.com
Pavloviæ International Bank a.d.	Karađorđeva 1, 76300 Slobomir Bijeljina	232 300	232 301	055; +387 55	http://www.pavlovic-banka.com	office@pavlovic-banka.com
Sberbank a.d. Banja Luka	Jevrejska 71, 78 000 Banja Luka	241 100	215 771	051; +387 51	http://www.volksbank-bl.ba	office@volksbank-bl.ba
Unicredit Bank a.d. Banja Luka	M. Bursać 7 78 000 Banja Luka	243 200	212 830	051; +387 51	http://www.unicreditbank-bl.ba	info-bl@unicreditgroup.ba

Source Central Bank of Bosnia and Hezegovina, 2014

Table A3-2: Micro Funding Institutions in BiH

Name of institution	Address		Phone and fax	Email	Website
EKI	Džemala Bijediæa 30	71 000 Sarajevo	033/ 651-112; 651-113; 714-200	wvimikro@bih.net	www.worldvision.ba
LIDER	Turhanija 2	71 000 Sarajevo	033/250-580; 250-593	dzavids@lider.ba	www.lider.ba
LOK	Skenderija 13	71 000 Sarajevo	033/ 564; 200 ; 564-250	info@lok.ba	www.lok.ba
MIKRA	Marka Maruliæa 2/VI	71 000 Sarajevo	033/ 616-162; 714-140; 717-141 fax	mikra@mikra.ba	www.mikra.ba
MIKROFIN	Vase Pelagiæa 22	78 000 Banja Luka	051/ 230 - 330	mikrofin@mikrofin.com	www.mikrofin.com
PARTNER MIKROKREDITNA FONDACIJA	15. maja	75 000 Tuzla	035/ 245-780; 245-781; 245-782	partner@partner.ba	www.partner.ba
PRIZMA	Bistrik medresa 43	71000 Sarajevo	033/ 573-320; 446-583; 552-002; 209-179 fax	hq@prizma.ba	www.prizma.ba
SUNRISE	Zagrebaèka 30	71 000 Sarajevo	033/ 727-350; 655-467	sunrise@microsunrise.ba	www.microsunrise.ba

Source: Association of Leasing Companies in BiH, 2014

Table A3-3: Leasing organizations in BiH

Name of institution	Address		Telephone	Fax	Email	Website
VB Leasing	Ul. Fra An|ela Zvizdovi}a 1	71000 Sarajevo	033/276 280	033/276 286	info@vbleasing.ba	www.vbleasing.ba
Hypo Group Alpe Adria Leasing d.o.o. Banja Luka	Aleja Svetog Save 13	78000 Banja Luka	051/340 301	051/340 310		www.hypo-alpe-adria.rs.ba
NLB Leasing	Ul. Trg solidarnosti 2a	71000 Sarajevo	033/789 345	033/789 346	info@nlbleasing.ba	www.nlbleasing.ba
UniCredit Leasing	Ul. Džemala Bijedića 2	71000 Sarajevo	033/ 721 750	033/ 721 777		
S-Leasing	Ul. Zmaja od Bosne 7	71000 Sarajevo	033/565 850	033/208 863		www.s-leasing.ba
ASA Aleasing d.o.o.	Bulevar M. Selimovića 16	71000 Sarajevo	033/771 222	033/771 225	info@aal.ba	www.asa-aleasing.ba
Raiffeisen Leasing	Ul. Danijela Ozme 3	71000 Sarajevo	033/254 354	033/212 273	info@rbb-sarajevo.raiffeisen.at	www.rlbh.ba

Source: Association of Leasing Companies in BiH, 2014

Annex 4

BILINGUAL QUESTIONNAIRES USED FOR SURVEYING FISH FARMS[46]

Survey sheet of fish farms in Bosnia and Herzegovina[47]

Tabelarni pregled ribljih farmi u Bosni i Hercegovini [48]

	Type of information Tip informacije	*Pond culture Bazenska kultura*	*Tank culture Rezervoarskakultura*	*Cage culture Kaveska kultura*
0.1	**Name of farm/organization/enterprise: Naziv farme/organizacije/preduzeća:**	Txt:		
0.2	**Name of responsible leader: Ime odgovorne osobe:**	Txt:		
0.3	**Position of responsible leader Pozicija odgovorne osobe:**	Txt:		
0.4	**Address Adresa:**	Txt:		
0.5	**Phone: Telefon:**	Txt:		
0.6	**Fax: Fax:**	Txt:		
0.7	**E-mail: E-mail:**	Txt:		
0.8	**Website: Web stranica:**	Txt:		
	1. PARTICULARS AND CONTACT DATA – POJEDINOSTI I KONTAKT PODACI			
1.1	**Culture System**	Pond – Cage – Tank		
1.2	**Code of survey (yymmdd-# XY): Kod pregleda(ggmmdd#XY):**	Txt:		
1.3	**Ownership of farm or organization or enterprise: Vlasnik farme ili organizacije ili preduzeća:**	National – Foreign – Joint venture		
1.4	**Type of organization/enterprise: Tip organizacije/preduzeća:**	Family enterprise – Limited company – Association – Cooperative – NGO – GO enterprise – Local GO enterprise – Non-profit organization		
1.5	**Year of establishment of organization/enterprise: Godina osnivanja organizacije/preduzeća:**	No.		
1.6	**Aquaculture licence: Licenca za akvakulturu:**	Yes – No – In progress		
	2. LOCATION – LOKACIJA			
2.1	**GPS: GPS coordinate:**			

46 Designed by Study Review Team in 2013

47 **Disclaimer** - Data collected will be used and processed fairly and lawfully, only for the purpose of this study and contact details will not be shared.

48 **Napomena** - Podaci prikupljeni æe se koristiti i obraditi pravedno i zakonito, samo za potrebe ovog istraživanja i podaci se neće dijeliti.

	Type of information Tip informacije	Pond culture Bazenska kultura	Tank culture Rezervoarskakultura	Cage culture Kaveska kultura
2.2	**Location above sea level (m):** **Nadmosrka visina (m):**			m
2.3	**Location – Entity:** **Lokacija – Enditet:**	Txt:		
2.4	**Location – Canton:** **Lokacija – Kanton:**	Txt:		
2.5	**Location – Municipality:** **Lokacija – Opština:**	Txt:		
2.6	**Location – Town/village/place:** **Lokacija – Grad/selo/mjesto:**	Txt:		
2.7	**Name of water body where cages are located:** **Naziv vodenog tijela gdje je kaveska farma locirana:**	NR	NR	Txt:
	3. GROUP OF PRODUCED SPECIES – Grupa vrsta koje se proizvode			
3.1	**Group of produced fishes:** **Grupa vrsta koje se proizvode:**	Salmonids – Cyprinids – Freshwater predators – Marine species		
3.2	**Specific observation to the section:** **Specifični zaključci:**	Txt:		
	4. WATER SUPPLY AND DRAINAGE – OPSKRBA VODOM			
4.1	**Name of water source:** **Naziv vode kojom se opskrbljuje:**	Txt:		
4.2	**Type of water source:** **Naziv vode kojom se opskrbljuje**	Underground – Surface water		NR
		Spring – Stream – Rive – Lake – Reservoir – Canal – Rain		NR
4.3	**Quality of supplied water:** **Kvalitet vode kojom se opskrbljuje:**	Excellent – Good – Medium – Poor – Not useable – Changes by season		NR
4.4	**Min and max. water temperature (°C):** **Min. i max. Temperature vode (°C):**	NR	….. °C –	…..°C
4.5	**Water temperature problems:** **Problemi u vezi temperature vode:**	Txt:		
4.6	**Mode of water supply:** **Način snabdjevanja vodom:**	By gravity – By pump – Mixed		NR
4.7	**Excess to water:** **Višak vode**:	No limit – limited in Winter – Spring – Summer – Autumn – Flood effected		NR
4.8	**Volume of water used (m^3/yr.):** **Kubatura vode koja se upotrebljava (m^3/god.):**	m^3/yr.		NR
4.9	**Name of recipient water body:** **Naziv vodenog tijela sa kojim se vrši snabdjevanje:**	Txt:		NR
4.10	**Mode of drainage:** **Način drenaže:**	By gravity – By pump – Mixed		NR
4.11	**Specific observation to the section:** **Specifični zaključci:**	Txt:		
	5. FISH HATCHERY UNIT – MRIJESTILIŠNA JEDINICA	Yes – No – Out of use		
5.1	**Year of construction:** **Godina izgradnje:**	No.		NR

	Type of information Tip informacije	Pond culture Bazenska kultura	Tank culture Rezervoarskakultura	Cage culture Kaveska kultura
5.2	**Water supply:** **Način snabdjevanja:**	By gravity – By pump – Mixed		NR
5.3	**Size of hatchery building (m^2):** **Kvadratura mrijestilišne zgrade (m^2):**	m^2		NR
5.4	**Hatchery trays (No.):** **Broj ležnica:**	No.		NR
5.5	**Total area of hatchery trays (m^2):** **Kvadratura ležnica (m^2):**	m^2		NR
5.6	**Hatchery/fry rearing troughs (No.):** **Mrijestilištna korita za izvalu mlađi (Br.):**	No.		NR
5.7	**Total volume of hatchery/fry rearing troughs (m^3):** **Kubatura mrijestilišnih korita za izvalu mlađi (m^3):**	m^3		NR
5.8	**Hatchery/fry rearing tanks (No.):** **Mrijestilištna korita za mlađd (Br.):**	No.		NR
5.9	**Total volume of hatchery/fry rearing tanks (m^3):** **Kubatura mrijestilišnih korita za mlađ (m^3):**	m^3		NR
5.10	**Zuger jars of 7 – 10 l (No.):** **Cugeri od 7 – 10 litara (Br.):**	No.		NR
5.11	**Hatchery jars of 50 l (No.):** **Mrijestilišne posude od 50 litara (Br.):**	No.		NR
5.12	**Hatchery jars of 150 – 200 l (No.):** **Mrijestilišne posude od 150 – 200 litara (Br.):**	No.		NR
5.13	**Brood fish tanks in the hatchery (No.):** **Bazeni za izvaljenu ribu u mrijestilištu (Br.):**	No.		NR
5.14	**Brood fish tanks in the hatchery (m^3):** **Bazeni za izvaljenu ribu u mrijestilištu (m^3):**	m^3		NR
5.15	**Specific observation to the section:** **Specifični zaključci:**	Txt:		NR
	6. TABLE FISH REARING UNIT – JEDINICA ZA UZGOJ RIBE	Yes – No – Out of use		
6.1	**Year of construction:** **Godina izgradnje:**			No.
6.2	**No. of ponds:** **Broj bazena:**	No.	NR	NR
6.3	**Total water surface of ponds (ha):** **Ukupna vodena površina bazena (ha):**	ha	NR	NR
6.4	**Avg. water depth of ponds, tanks or cages (m):** **Prosječna dubina bazena, rezervoara ili kaveza (m):**			m
6.5	**No. of tanks or cages:** **Broj rezervoara ili kafeza:**	NR		No.
6.6	**Total water volume of tanks or cages (m^3):** **Ukupna vodena kubatura rezervoara ili kaveza (m^3):**	NR		m^3
6.7	**Water depth at cages (m):** **Dubina vode u kavezima (m):**	NR	NR	m

	Type of information Tip informacije	Pond culture Bazenska kultura	Tank culture Rezervoarskakultura	Cage culture Kaveska kultura
6.8	**Status of production:** **Status proizvodnje:**	Yes – No – Increasing – Decreasing		
6.9	**Specific observation to the section:** **Specifični zaključci:**			
	7. MANURING AND CHEMICALS – ĐUBRIVO I KEMIKALIJE			
7.1	**Type of manure:** **Vrsta đubriva:**			
7.2	**Used manure (MT/yr.):** **Upotreba đubriva (tona/god.):**			MT/yr.
7.3	**Used nitrogen fertilizer (MT/yr.):** **Upotreba azotnog đubriva (tona/god.):**			MT/yr.
7.4	**Used phosphorous fertilizer (MT/yr.):** **Upotreba fosfatnog đubriva (tona/god.):**			MT/yr.
7.5	**List of used chemicals and drugs[51]:** **Popis upotrebljenih kemikalija i narkotika[52]:**	Txt:		
7.6	**Specific observation to the section:** **Specifični zaključci:**	Txt:		
	8. FEEDING – HRANJENJE			
8.1	**Use of supplementary feeds (MT/yr.):** **Upotreba dodatne hrane (tona/god.):**			MT/yr.
8.2	**Use of farm-made feed (MT/yr.):** **Upotreba hrane napravljene na farmi (tona/god.):**			MT/yr.
8.3	**Use of industrial fish feed (MT/yr.):** **Upotreba industrijske riblje hrane (tona/god.):**			MT/yr.
8.4	**Name of industrial feed producer:** **Naziv proizvođača industrijske hrane:**	Txt:		
8.5	**Total area of fish feed store (m^2):** **Skladište za riblju hranu(m^2):**			m^2
8.6	**Total volume of fish feed silo (m^3):** **Silos za riblju hranu (m^3):**			m^3
8.7	**Specific observation to the section:** **Specifični zaključci:**	Txt:		
	9. FISHING EQUIPMENT AND FARM MACHINERY – OPREMA I MAŠINE ZA RIBARSTVO			
9.1	**Boats without engine (No.):** **Čamac bez motora (Br.):**			No.
9.2	**Boats with engine (No.):** **Čamac sa motorom (Br.):**			No.
9.3	**Type and quality of nets:** **Vrsta i kvalitet mreža:**	Txt:		
9.4	**Bird nets (m^2):** **Mreže za zaštitu od ptica (m^2):**			m^2
9.5	**Water pumps (No.):** **Vodene pumpe (Br.):**			No.

[51] **Observation** - If YES list product names and estimated quantities/year.

[52] **Primjedba -** Ukoliko DA lista proizvoda i procenjenim količinama/godine

	Type of information Tip informacije	*Pond culture Bazenska kultura*	*Tank culture Rezervoarskakultura*	*Cage culture Kaveska kultura*
9.6	**Total capacity of water pumps (m^3/sec): Vodene pumpe (ukupni kapacitet m^3/sec):**			m^3/sec
9.7	**Egg counter: Brojač ikre:**	Yes – No		
9.8	**Aerators: Aeratori:**	Yes – No – Not enough capacity		
9.9	**Oxygen diffusers: Rasprskivači (difuzori) za kiseonik:**	Yes – No – Not enough capacity		
9.10	**Grinding machine (total capacity MT/hour): Mašina za mljevenje (tona/sat):**			MT/hour
9.11	**Pelleting machine (total MT/hour): Mašina za paletiranje:**			MT/hour
9.12	**Mechanical feeder: Mehaničkа hranilica:**	Yes – No – Not enough capacity		
9.13	**Automatic feeder: Automatska hranilica (Br.):**	Yes – No – Not enough capacity		
9.14	**Fish grading machine: Sortir mašina (tona/sat):**	Yes – No – Not enough capacity		
9.15	**Microscope: Mikroskop (uvećanje):**	Yes – No		
9.16	**Oxygen meter: Oksimetar:**	Yes – No		
9.17	**Water quality measuring set[53]: Set za mjerenje kvaliteta vode set:**	Txt:		
9.18	**Automatic water quality alarm system: Automatski alarm system za kvalitet vode:**	Yes – No		
9.19	**Specific observation to the section: Specifični zaključci:**	Txt:		
10.	**EMPLOYED STAFF AND THE LEVEL OF THEIR EDUCATION – UPOSLENICI I NJIHOVO OBRAZOVANJE**			
10.1	**Administrative staff ♂ (No.): Administrativno osoblje ♂ (Br.):**			No.
10.2	**Administrative staff ♀ (No.): Administrativno osoblje ♀ (Br.):**			No.
10.3	**Technical management ♂ (No.): Tehničko osoblje ♂ (Br.):**			No.
10.4	**Technical management ♀ (No.): Tehničko osoblje ♀ (Br.):**			No.
10.5	**Veterinarian ♂ (No.): Veterinar ♂ (Br.):**			No.
10.6	**Veterinarian ♀ (No.): Veterinar ♀ (Br.):**			No.
10.7	**Full-time worker ♂ (No.): Puno radon vrijeme radnika ♂ (Br.):**			No.
10.8	**Full-time worker ♀ (No.): Puno radon vrijeme radnika ♀ (Br.):**			No.

[53] Thermometer, pH paper, plankton net, hand magnifier – Termometar, pH metar, planktonska mrežica, lupa

	Type of information Tip informacije	*Pond culture Bazenska kultura*	*Tank culture Rezervoarskakultura*	*Cage culture Kaveska kultura*
10.9	**Full time fisher (No.):** **Puno radon vrijeme ribara (Br.):**			No.
10.10	**Part-time worker ♂ (No.):** **Dijelemično radon vrijeme radnika ♂ (Br.):**			No.
10.11	**Part-time worker ♀ (No.):** **Dijelemično radon vrijeme radnika ♀ (Br.):**			No.
10.12	**Part-time fisher (No.):** **Dijelemično radon vrijeme ribara (Br.):**			No.
10.13	**Seasonal workers ♂ (No.):** **Sezonski radnici ♂ (Br.):**			No.
10.14	**Seasonal workers ♀ (No.):** **Sezonski radnici ♀ (Br.):**			No.
10.15	**Seasonal fisher (No.):** **Sezonski ribari (Br.):**			No.
10.16	**General, technical educational background of employees:** **Opšta i tehnička edukacija uposlenih:**	Txt:		
10.17	**Specific observation to the section:** **Specifični zaključci:**	Txt:		
	11. ENVIRONMENT AND FISH HEALTH – OKOLIŠ I ZDRAVLJE RIBE			
11.1	**Environmental permit:** **Okolinska dozvola:**	Yes – No – In progress		
11.2	**Veterinarian permit licence:** **Veterinarska dozvola licenca:**	Regularly obtained – Occasionally obtained – Not obtained		
11.3	**Environment monitoring – frequency:** **Praćenje životne sredine – frekvencija:**	Txt:		
11.4	**Environment monitoring – items:** **Praćenje životne sredine pojedinost:**	Txt:		
11.5	**Fish health:** **Zdravlje ribe:**	No problem – Occasional problem – Frequent problem – Seasonal problem		
11.6	**Cooperation with veterinary station:** **Suradnja sa veterinarskom stanicom:**	Regular – Occasional – No		
11.7	**Dead fish disposal place:** **Mjesto za odstranjivanje mrtvih riba:**	Yes – No – Not enough		
11.8	**Cleaning system of arriving water:** **Sistem za prečišćavanje vode prije ribnjaka:**	Yes – No – Not enough capacity		
11.9	**Cleaning system of discharged water:** **Sistem za prečišćavanje vode nakon ribnjaka:**	Yes – No – Not enough capacity		
11.10	**Specific observation to the section:** **Specifični zaključci:**	Txt:		
	12. FISH TRANSPORT – TRANSPORT RIBE			
12.1	**No. of vehicles:** **Broj vozila:**			No.
12.2	**Total carrying capacity of vehicles (MT):** **Ukupan kapacitet za transport žive ribe (tona):**			MT
12.3	**Total of live fish transporting tank capacity (m^3):** **Kapaciteti cisterna za transport žive ribe (m^3):**			m^3

	Type of information Tip informacije	*Pond culture Bazenska kultura*	*Tank culture Rezervoarskakultura*	*Cage culture Kaveska kultura*
12.4	**Total of iced fish transporting capacity (MT):** **Kapacitet transporta za sleđenu ribu (m^3):**			MT
12.5	**Total of frozen fish transporting capacity (MT):** **Kapacitet transporta za zamrznutu ribu (m^3):**			MT
12.6	**Specific observation to the section:** **Specifični zaključci:**	Txt:		
13. FISH PROCESSING, FISH SHOP AND RESTAURANT – PRERADA RIBE, RIBARNICA I RESTORAN				
13.1	**Ice making capacity (kg/hour):** **Ledomat – kapacitet (kg/sat):**			kg/hour
13.2	**Fish stunning capacity (kg/hour):** **Kapacitet za ošamućivanje riba (kg/sat):**			kg/hour
13.3	**Fish gutting capacity (fish/hour):** **Kapaciteti za uklanjanje utrobe (fish/sat):**			fish/hour
13.4	**Fish scaling capacity (kg/hour):** **Kapaciteti za dimenzioniranje ribe (kg/sat):**			kg/hour
13.5	**Fish filleting capacity (kg/hours):** **Kapaciteti za filetiranje ribe (kg/dan):**			kg/hour
13.6	**Fish smoking capacity (kg/day):** **Kapaciteti za dimljenje ribe (kg/dan):**			kg/day
13.7	**Fish packing capacity (kg/hour):** **Kapaciteti za pakovanje ribe (kg/dan):**			kg/hour
13.8	**Cold store capacity (m^3):** **Hladnjača kapaciteti (m^3):**			m^3
13.9	**Deep-freezing capacity (m^3):** **Komore za duboko zamrzavanje ribe (m^3):**			m^3
13.10	**Live fish storing capacity – aquarium (m^3):** **Kapaciteti za živu ribu – akvarijum (m^3):**			m^3
13.11	**Own fish processing unit (m2):**			m^2
13.12	**Own fish shop – total area (m^2):** **Vlastita ribarnica – ukupna kvadratura (m^2):**			m^2
13.13	**Own fish restaurant – total area (m^2):** **Vlastiti restoran – ukupna kvadratura (m^2):**			m^2
13.14	**Specific observation to the section:** **Specifični zaključci:**	Txt:		
14. COOPERATION AND EXPECTATIONS FROM GOVERNMENT AND POSSIBLE IPARD SUPPORT – SARADNJA I OČEKIVANJA OD VLADE I MOGUĆA IPARD PODRŠKA				
14.1	**Problems:** **Problemi:**	Txt:		
14.2	**Need for training:** **Potreba za obukom:**	Txt:		
14.3	**Need for investment:** **Potreba za investicije:**	Txt:		
14.4	**Fields of cooperation with other farmers:** **Kooperacija sa drugim farmerima:**	Txt:		
14.5	**Expectations from government, authorities:** **Očekivanja od vlade, vlasti:**	Txt:		

Type of information Tip informacije		Pond culture Bazenska kultura	Tank culture Rezervoarskakultura	Cage culture Kaveska kultura
14.6	**Possible IPARD support:** **Moguća IPARD podrška:**	Txt:		
14.7	**Observations of surveyor:** **Zapažanja anketara:**	Txt:		

Table 1: Produced or purchased age groups and species in 2012 – PROIZVEDENE ILI KUPLJENE STAROSNE GRUPE I VRSTE U 2012.

	Type of information/Name of fish => Vrsta informacije/naziv ribe								
	1. PRODUCED – Split total figure and underline export – PROIZVODNJA – Raspodjela ukupnog broja sa naglašenim izvozom	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**
1.1	**Produced eggs (No/yr.): Proizvodnja jaja – ikra (Br./god.):**								
1.2	**Produced feeding larvae (No/yr.): Proizvodnja ribljih larvi (Br./god.):**								
1.3	**Produced advanced fry (No/yr.): Proizvodnja plivajuće mlađi (Br./god.):**								
1.4	**Produced fingerling (No/yr.): Proizvodnja mlađi (Br./god.):**								
1.5	**Produced fingerling (MT/yr.): Proizvodnja mlađi (tona/god.):**								
1.6	**Produced larger fish (No/yr.): Proizvodnja konzumne ribe (Br./god.):**								
1.7	**Produced larger fish (MT/yr.): Proizvodnja konzumne rib (tona/god.):**								
1.8	**Produced/kept future brood fish (No/yr.): Proizvodnja predmatične ribe (Br./god.):**								
1.9	**Produced/kept brood fish (No/yr.): Proizvodnja matične ribe (Br./god.):**								
1.10	**Produced/kept brood fish (MT/yr.): Proizvodnja matične ribe (tona/god.):**								

	Type of information/Name of fish => Vrsta informacije/naziv ribe								
	2. PURCHASED – Split total figure and underline import – NABAVKA – Raspodjela ukupnog broja sa naglašenim uvozom	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**
2.11	**Purchased eggs (No/yr.): Nabavljeno jaja – ikre (Br./god.):**								
2.12	**Purchased feeding larvae (No/yr.): Nabavljeno ribljih larvi (Br./god.):**								
2.13	**Purchased advanced fry (No/yr.): Nabavka plivajuće mlađi (Br./god.):**								
2.14	**Purchased fingerling (No/yr.): Nabavka mlađi (Br./god.):**								
2.15	**Purchased fingerling (MT/yr.): Nabavka plivajuće mlađi (tona/god.):**								
2.16	**Purchased larger fish (No/yr.): Nabavka konzumne ribe (Br./god.):**								
2.17	**Purchased larger fish (MT/yr.): Nabavka konzumne ribe (tona/god.):**								
2.18	**Purchased brood fish (No/yr.): Nabavka matične ribe (Br./god.):**								
2.19	**Purchased brood fish (MT/yr.): Nabavka matične ribe (tona/god.):**								
2.20	**Observations: Zapažanja:**								

Annex 5

STATISTICAL EVALUATION OF FISH FAUNA AND COMPLETED SURVEY SHEETS AND QUESTIONNAIRES OF FISH FARMS

Table A5-1: Natural and artificial lakes in BiH

Name of lake	FBiH			RS				Grand total
	Natural lakes	Water reservoirs	Total	Natural lakes	Water reservoirs	Fish ponds	Total	
Bistarac		2.5	2.5					2.5
Brestica	3.7		3.7					3.7
Hutovo blato	2 040.2		2 040.2					2040.2
Mali ol	0.4		0.4					0.4
Modrac		1 710.0	1 710.0					1710.0
Sjekovac (at Ukrina)						398.0	398.0	398.0
Velika Mrtvica	0.5		0.5					0.5
Bosna - total	**2 044.8**	**1 712.5**	**3 757.3**			**398.0**	**398.0**	**4 155.3**
Balkana				5.6			5.6	5.6
Drenova (at Vijaka)		34.8	34.8					34.8
Prokoško	4.1		4.1					4.1
Una - total	**4.1**	**34.8**	**38.9**	**5.6**			**5.6**	**44.5**
Bočac					233.0		233.0	233.0
Glamočko	15.9		15.9					15.9
Kukavičko	1.9		1.9					1.9
Malo Plivsko	18.5		18.5					18.5
Rastičevsko	1.6		1.6					1.6
Veliko Plivsko	117.0		117.0					117.0
Vrbas - total	154.9		154.9		233.0		233.0	387.9
Bardača (at Matura)						747.2	747.2	747.2
Han	0.4		0.4					0.4
Hazna		6.4	6.4					6.4
Pećenačko	0.9		0.9					0.9
Prnjavor (at Vijaka)						666.4	666.4	666.4
Saničani (at Gomjenica)						1 117.9	1 117.9	1 117.9
Snježnica		20.6	20.6					20.6
Vidara		39.9	39.9					39.9
Sava - total	**1.3**	**66.9**	**68.2**			**2 531.5**	**2 531.5**	**2 599.7**
Bijelo (Zeleno)				0.6			0.6	0.6
Crno				1.2			1.2	1.2
Donje Bare (at Zelengora)				2.1			2.1	2.1
Gornje Bare (at Zelengora)				0.8			0.8	0.8
Jugovo				1.4			1.4	1.4
Kladopoljsko (at Zelengora)				1.6			1.6	1.6
Kotlaničko (at Zelengora)				4.4			4.4	4.4

Name of lake	FBiH			RS				Grand total
	Natural lakes	Water reservoirs	Total	Natural lakes	Water reservoirs	Fish ponds	Total	
Orlovačko (at Zelengora)				2.1			2.1	2.1
Perućačko (at Drina)					1 240.1		1 240.1	1 240.1
Štirinsko (at Zelengora)				12.9			12.9	12.9
Veliko				0.3			0.3	0.3
Višegradsko (at Drina)					890.0		890.0	890.0
Zvorničko (at Drina)					887.6		887.6	887.6
Drina - total				27.4	3 017.7		3 045.1	3 045.1
Black Sea - total	**2 205.1**	**1 814.2**	**4 019.3**	**33.0**	**3 250.7**	**2 929.5**	**6 213.2**	**10 232.5**
Bazen Lipa		64.9	64.9					64.9
Blindsko	351.7		351.7					351.7
Buško Blato		5580.0	5 580.0					5580.0
Mandek	17.6		17.6					17.6
Šatorsko	3.5		3.5					3.5
Željeznica		2.0	2.0					2.0
Krka-Cetina - total	**372.8**	**5 646.9**	**6 019.7**					**6 019.7**
Bijelo	0.5		0.5					0.5
Blatačko	4.3		4.3					4.3
Boračko	30.0		30.0					30.0
Crno	0.8		0.8					0.8
Deransko	310.6		310.6					310.6
Jablaničko		1 330.0	1 330.0					1 330.0
Jelim	28.0		28.0					28.0
Nevesinjsko		37.1	37.1					37.1
Platno	0.3		0.3					0.3
Plivsko (Veliko)	110.0		110.0					110.0
Rama		487.0	487.0					487.0
Ramsko		1 530.0	1 530.0					1 530.0
Salakovac		68.0	68.0					68.0
Škrka	11.1		11.1					11.1
Neretva - total	**495.6**	**3 452.1**	**3 947.7**					**3 947.7**
Bilećko					2 706.4		2706.4	2 706.4
Gorica (at Trebišnjica)					108.2		108.2	108.2
Grančarevo					1 280.0		1280.0	1 280.0
Klinje (at Mušnica)					25.2		25.2	25.2
Trebinjsko					53.5		53.5	53.5
Uloško (at Crvanj)				4.3			4.3	4.3
Trebisnjica - total				**4.3**	**4 173.3**		**4 177.6**	**4 177.6**
Adriatic Sea - total	**868.4**	**9 099.0**	**9 967.4**	**4.3**	**4 173.3**		**4 177.6**	**14 145.0**
Grand total	**3 073.5**	**10 913.2**	**13 986.7**	**37.3**	**7 424.0**	**2 929.5**	**10 390.8**	**24 377.5**

Source: Study Team, 2014

Table A5-2: Fish species in BiH[49]

Environment, origin, status and name of fish species	Water/river basins									
	Adriatic Sea	Korana and Glina	Bosna	Una	Vrbas	Save direct basin	Krka-Cetina	Neretva	Drina	Trebišnjica
Total - marine	**76**									
Subtotal - endangered - marine	**3**									
Mola mola (Linnaeus, 1758)	1									
Sciaena umbra Linnaeus, 1758	1									
Zeus faber (Linnaeus, 1758)	1									
Subtotal - vulnerable - marine	70									
Aphia minuta (Risso, 1810)	1									
Arnoglossus kessleri Schmidt, 1915	1									
Arnoglossus thori Kyle, 1913	1									
Belone belone (Linnaeus, 1761)	1									
Blennius ocellaris Linnaeus, 1758	1									
Boops boops (Linnaeus, 1758)	1									
Callionymus maculatus Rafinesque, 1810	1									
Cepola macrophthalma (Linnaeus, 1758)	1									
Chelidonichthys lastoviza (Bonnaterre, 1788)	1									
Chromis chromis (Linnaeus, 1758)	1									
Citharus linguatula (Linnaeus, 1758)	1									
Conger conger (Linnaeus, 1758)	1									
Coris julis (Linnaeus, 1758)	1									
Coryphoblennius galerita (Linnaeus, 1758)	1									
Dentex dentex (Linnaeus, 1758)	1									
Dentex gibbosus (Rafinesque, 1810)	1									
Diplodus annularis Linnaeus, 1758	1									
Diplodus puntazzo (Cetti, 1777)	1									
Diplodus sargus (Linnaeus, 1758)	1									

49 Compiled by Review Team on the bases of information received from Adem Hamzić.

Environment, origin, status and name of fish species	Water/river basins									
	Adriatic Sea	Korana and Glina	Bosna	Una	Vrbas	Save direct basin	Krka-Cetina	Neretva	Drina	Trebišnjica
Diplodus vulgaris (Geofroy Saint-Hilaire, 1817)	1									
Engraulis encrasicolus (Linnaeus, 1758)	1									
Eutrigla gurnardus (Linnaeus, 1758)	1									
Gobius bucchichii Steindachner, 1870	1									
Gobius cobitis Pallas, 1814	1									
Gobius cruentatus Gmelin, 1789	1									
Gobius geniporus Valenciennes, 1837	1									
Gobius niger Linnaeus, 1758	1									
Hippocampus hippocampus (Linnaeus, 1758)	1									
Hippocampus ramulosus Leach in Leach i Nodder, 1814	1									
Labrus merula Linnaeus, 1758	1									
Lepidotrigla cavillone (Lacepéde, 1801)	1									
Lesueurigobius suerii (Risso, 1810)	1									
Lipophrys dalmatinus (Steindachner i Kolombatovic, 1883)	1									
Merluccius merluccius (Linnaeus, 1758)	1									
Monochirus hispidus Rafinesque, 1814	1									
Mulus barbatus (Linnaeus, 1758)	1									
Oblada melanura (Linnaeus, 1758)	1									
Ophidion barbatum Linnaeus, 1758	1									
Pagellus acarne (Risso, 1827)	1									
Pagellus bogaraveo (Brünnich, 1768)	1									
Pagellus erythrinus (Linnaeus, 1758)	1									
Parablennius gattorugine Linnaeus, 1758	1									
Parablennius sanguinolentus (Pallas, 1814)	1									
Salaria pavo (Risso, 1810)	1									
Sardina pilchardus (Walbaum, 1792)	1									

Environment, origin, status and name of fish species	Water/river basins									
	Adriatic Sea	Korana and Glina	Bosna	Una	Vrbas	Save direct basin	Krka-Cetina	Neretva	Drina	Trebišnjica
Scomber scombrus Linnaeus, 1758	1									
Scorpaena notata Rafinesque, 1810	1									
Scorpaena porcus Linnaeus, 1758	1									
Scorpaena scrofa Linnaeus, 1758	1									
Serranus hepatus (Linnaeus, 1758)	1									
Serranus scriba (Linnaeus, 1758)	1									
Solea solea (Linnaeus, 1758)	1									
Sphyraena sphyraena (Linnaeus, 1758)	1									
Spicara maena (Linnaeus, 1758)	1									
Spondyliosoma cantharus (Linnaeus, 1758)	1									
Symphodus cinereus (Bonnaterre, 1788)	1									
Symphodus mediterraneus (Linnaeus, 1758)	1									
Symphodus ocellatus (Forsskål, 1775)	1									
Symphodus roissali (Risso, 1810)	1									
Symphodus tinca (Linnaeus, 1758)	1									
Synapturichthys kleini (Risso, 1827)	1									
Syngnathus tenuirostris Rathke, 1837	1									
Trachinus draco Linnaeus, 1758	1									
Trachinus radiatus Cuvier, 1829	1									
Trachurus mediterraneus (Steindachner, 1868)	1									
Trachurus trachurus (Linnaeus, 1758)	1									
Tripterygon melanurus Guichenot, 1845	1									
Tripterygon tripteronotus (Risso, 1810)	1									
Zeugopterus regius (Bonnaterre, 1788)	1									
Aidablennius sphinx (Valenciennes, 1836)	1									
Subtotal - steady - marine	**3**									

Environment, origin, status and name of fish species	Water/river basins									
	Adriatic Sea	Korana and Glina	Bosna	Una	Vrbas	Save direct basin	Krka-Cetina	Neretva	Drina	Trebišnjica
Arnoglossus laterna (Walbaum, 1792)	1									
Uranoscopus scaber (Linnaeus, 1758)	1									
Xiphias gladius Linnaeus, 1758	1									
Total - diadromous	16					5		21		1
Subtotal - critically endangered - diadromous						4		2		
Acipenser gueldenstaedtii Brandt & Ratzberg, 1833						1				
Acipenser naccarii Bonaparte, 1836								1		
Acipenser nudiventris Lovetzky, 1828						1				
Acipenser stellatus Pallas, 1771						1				
Acipenser sturio Linnaeus, 1758								1		
Huso huso (Linnaeus, 1758)						1				
Subtotal - endangered - diadromous								2		1
Alosa fallax (Geoffroy Saint, Hilaire18)								1		
Anguilla anguilla Linnaeus, 1758								1		1
Subtotal - vulnerable - diadromous	1					1		1		
Alosa immaculata Bennet, 1835						1				
Sygnatus abaster Risso, 1827	1							1		
Suntotal - steady - diadromous	15							16		
Aphanius fasciatus (Humboldt & Velenciennes, 1821)								1		
Atherina boyeri Cuvier, 1829	1							1		
Atherina hepsetus Linnaeus, 1758	1							1		
Chelon labrosus Risso, 1827	1							1		
Dicentrarchus labrax (Linnaeus, 1758)	1							1		
Knipowitschia panizzae (Verga, 1841)	1							1		
Liza aurata Risso, 1810	1							1		
Liza ramado Risso, 1810	1							1		
Liza saliens Risso, 1810	1							1		
Mugil cephalus Linnaeus, 1758	1							1		

Environment, origin, status and name of fish species	Water/river basins									
	Adriatic Sea	Korana and Glina	Bosna	Una	Vrbas	Save direct basin	Krka-Cetina	Neretva	Drina	Trebišnjica
Oedalechilus labeo Cuvier, 1829	1							1		
Platichthys flesus Linnaeus, 1758	1							1		
Pomatoschistus canestrinii (Ninni, 1883)	1							1		
Salaria fluviatilis Asso, 1801	1							1		
Sparus aurata Linnaeus, 1758	1							1		
Zosterisessor ophiocephalus Pallas, 1811	1							1		
Total freshwater		**8**	**50**	**38**	**48**	**60**	**12**	**57**	**40**	**32**
Subtotal - endemic - freshwater								3		
Subtotal - critically endangered - endemic - freshwater								3		
Salmo dentex (Heckel, 1851)								1		
Salmo marmoratus Cuvier, 1829								1		
Salmo obtusirostris Heckel, 1851								1		
Subtotal - native - freshwater		**7**	**37**	**29**	**33**	**49**	**9**	**35**	**29**	**19**
Critically endangered										3
Salmo taleri (Karaman, 1933)										1
Telestes dabar (Bogutskaya, Zupancic, Bogut & Naseka, 2012)										1
Telestes metohiensis (Steindacher, 1901)										1
Subtotal - endangered - native - freshwater		**1**	**5**	**4**	**5**	**5**	**5**	**9**	**5**	**3**
Aspius aspius (Linnaeus, 1758)			1	1	1	1			1	
Aulopyge hugelii Heckel, 1843							1	1		
Chondrostoma phoxinus Heckel, 1843							1			
Cobitis nerentana Karaman, 1928								1		
Cottus ferrugineus Heckel & Kner, 1858								1		
Delminichthys ghetaldii (Steindacher, 1882)										1
Lampetra zanandreai (Vladykov, 1955)								1		
Misgurnus fossilis Linnaeus, 1758			1			1				

Environment, origin, status and name of fish species	Water/river basins									
	Adriatic Sea	Korana and Glina	Bosna	Una	Vrbas	Save direct basin	Krka-Cetina	Neretva	Drina	Trebišnjica
Petromyzon marinus Linnaeus, 1758								1		
Phoxinellus alepidotus Heckel, 1843							1	1		
Sabanejewia balcanica (Karaman, 1922)					1	1				
Salmo faroides Karaman, 1938								1		1
Squalius cephalus (Linnaeus, 1758)		1	1	1	1	1	1	1	1	1
Squalius microlepis (Bonaparte, 1838)							1			
Telestes souffia (Risso, 1826)									1	
Thymallus thymallus Linnaeus, 1758			1	1	1			1	1	
Vimba vimba (Linnaeus, 1758)			1	1	1	1			1	
Vulnerable - native - freshwater			3	2	2	3	1	6	1	2
Acipenser ruthenus Linnaeus, 1758			1	1	1	1				
Chondrostoma knerii Heckel, 1843								1		
Cyprinus carpio Linnaeus, 1758			1	1	1	1		1	1	1
Delminichthys adspersus (Heckel, 1843)								1		
Knipowitschia croatica Mrakovčić, Kerovec, Mišetić, Schneider, 1996								1		
Phoxinellus pseudoalepidotus Bogutskaya et Zupancic, 2003								1		
Squalius svallize Heckel i Kner, 1858								1		1
Squalius tenellus Heckel, 1843							1			
Umbra krameri Walbaum, 1792			1			1				
Subtotal - steady - native - freshwater		6	29	23	26	41	3	20	23	11
Alburnoides bipunctatus (Bloch, 1782)			1	1	1	1				
Alburnus alborella (De Filippi, 1844)								1		
Alburnus alburnus (Linnaeus, 1758)								1	1	
Albutnus neretvae (Buj,Šanda, 2010)								1		1

Environment, origin, status and name of fish species	Water/river basins									
	Adriatic Sea	Korana and Glina	Bosna	Una	Vrbas	Save direct basin	Krka-Cetina	Neretva	Drina	Trebišnjica
Ballerus ballerus Linnaeus, 1758			1			1				
Ballerus sapa (Pallas, 1814)			1							
Barbatula barbatula Linnaeus, 1758						1				
Barbus balcanicus Kotlik,Tsigenopoulos,Rab,Berrebi, 2002		1	1	1	1	1		1	1	
Barbus barbus (Linnaeus, 1758)			1	1	1	1			1	1
Barbus plebejus Bonaparte 1839								1		
Blicca bjoerkna (Linnaeus, 1758)			1			1				
Carassius carassius Linnaeus, 1758			1	1		1		1	1	1
Chondrostoma nasus (Linnaeus, 1758)			1	1	1	1		1	1	1
Cobitis elongata Heckel i Kner, 1858			1	1	1	1			1	
Cobitis elongatoides Bacescu i Maier, 1969		1	1	1	1	1			1	
Cottus gobio Linnaeus, 1758				1		1		1		
Esox lucius Linnaeus, 1758			1	1	1	1			1	
Eudontomyzon danfordi Rega, 1991						1				
Eudontomyzon mariae (Berg, 1931)						1				
Eudontomyzon vladykovi Oliva & Zanandrea, 1959			1		1	1			1	
Gasterosteus aculeatus Cuvier, 1829								1		
Gasterosteus gymnurus Cuvier, 1829						1				
Gobio obtusirostris Valencinnes, 1864			1	1	1	1			1	
Gymnocephalus baloni Hol?ik i Hensel, 1974				1		1			1	
Gymnocephalus schraetzer (Linnaeus, 1758)				1		1			1	
Knipowitschia radovici Kovacic, 2005								1		
Leucaspius delineatus (Heckel, 1843)						1				
Leuciscus leuciscus (Linnaeus, 1758)					1	1				
Lota lota (Linnaeus, 1758)			1	1	1	1			1	
Neogobius fluviatilis Pallas, 1811						1				

Environment, origin, status and name of fish species	Water/river basins									
	Adriatic Sea	Korana and Glina	Bosna	Una	Vrbas	Save direct basin	Krka-Cetina	Neretva	Drina	Trebišnjica
Pelecus cultratus (Linnaeus, 1758)						1				
Perca fluviatilis Linnaeus, 1758			1	1		1			1	
Phoxinus lumaireul Schinz, 1840								1		1
Phoxinus phoxinus (Linnaeus, 1758)			1		1			1	1	
Ponticola kessleri (Gunther, 1861)						1				
Proterorhinus semilunaris Heckel 1837						1				
Pungitius platygaster (Kessler, 1859)						1				
Romanogobio albipinnatus Lukash, 1933						1				
Romanogobio kesslerii Dybowski, 1862			1		1	1				
Romanogobio uranoscopus Agassiz, 1828			1		1	1				
Romanogobio vladykovi Fang, 1943			1	1	1	1			1	
Rutilus basak (Heckel, 1843)								1		
Rutilus rutilus (Linnaeus, 1758)		1	1	1	1	1			1	
Rutilus virgo (Heckel, 1852)			1		1	1		1	1	
Salmo labrax Pallas, 1814			1	1	1					
Salmo montenegrinus (Karaman, 1933)										1
Salmo trutta Linnaeus, 1758		1	1	1	1		1	1	1	1
Sander lucioperca (Linnaeus, 1758)			1	1	1	1		1		1
Sander volgensis (Gmelin, 1789)			1		1	1				
Scardinius dergle Heckel i Kner, 1858							1			
Scardinius erythrophtalmus (Linnaeus, 1758)					1	1	1	1		1
Scardinius plotizza Heckel i Kner, 1858								1		
Squalius squalus (Bonaparte, 1837)								1		1
Tinca tinca (Linnaeus, 1758)			1	1	1	1		1	1	1
Zingel streber Siebold, 1863		1	1	1	1	1			1	
Zingel zingel (Linnaeus, 1766)		1	1	1	1	1			1	
Leuciscus idus (Linnaeus, 1758)			1	1	1	1			1	

Environment, origin, status and name of fish species	Water/river basins									
	Adriatic Sea	Korana and Glina	Bosna	Una	Vrbas	Save direct basin	Krka-Cetina	Neretva	Drina	Trebišnjica
Subtotal - introduced - freshwater			8	4	10	8	2	15	6	9
Subtotal - steady - introduced - freshwater			4	2	7	5	2	10	3	6
Carassius gibelio Bloch, 1783			1		1	1		1		1
Carassius langsdorfii Temminck & Schlegel 1846								1		
Ctenopharygodon idella (Valenciennes, 1844)			1	1	1	1		1	1	1
Gambusia holbrooki Girard, 1859								1		
Hypophtalmichthys molitrix Valenciennes, 1844					1		1	1		1
Hypophtalmichthys nobilis (Richardson, 1844)						1		1		
Ictalurus punctatus (Rafinesque, 1818)						1				
Micropterus salmonides (Lacepéde, 1802)						1				
Oncorhynchus mykiss (Walbaum, 1792)			1	1	1		1	1	1	1
Salmo letnica (Karamas, 1924)					1			1		
Salvelinus alpinus (Linnaeus, 1758)					1			1	1	1
Salvelinus fontinalis (Mitchill, 1814)			1		1			1		1
Subtotal - invasive - introduced - freshwater			4	2	3	3		5	3	3
Ameiurus nebulosus (Lesueur, 1819)			1	1	1	1		1	1	1
Carassius auratus (Linnaeus, 1758)			1					1	1	
Coregonus peled Linnaeus, 1758								1		
Lepomis gibbosus (Linnaeus, 1758)			1	1	1	1		1		1
Pseudorasbora parva Temminck & Schlegel, 1846			1		1	1		1	1	1
Subtotal - native/intoduced - freshwater		1	5	5	5	3	1	4	5	4
Subtotal - endangered - native/introduced - freshwater			1	1	1				1	1
Hucho hucho (Linnaeus, 1758)			1	1	1				1	1
Subtotal - steady - native/introduced - freshwater		1	4	4	4	3	1	4	4	3
Abramis brama Linnaeus, 1758			1	1	1	1		1	1	1

Environment, origin, status and name of fish species	Water/river basins									
	Adriatic Sea	Korana and Glina	Bosna	Una	Vrbas	Save direct basin	Krka-Cetina	Neretva	Drina	Trebišnjica
Gymnocephalus cernua (Linnaeus, 1758)			1	1	1			1	1	1
Rhodeus amaurus (Bloch, 1782)		1	1	1	1	1	1	1	1	
Silurus glanis Linnaeus, 1758			1	1	1	1		1	1	1
Grand total	**92**	**8**	**50**	**38**	**48**	**65**	**12**	**78**	**40**	**33**

Table A5-3: Geographical distribution of angling societies in BiH in 2013[50]

River basins and entities	Number of angling societies and their member (No.)						Proportion of angling societies and their members (%)					
	Black Sea		Adriatic Sea		Total		Black Sea		Adriatic Sea		Total	
	Societies	Members	Societies	Members	Societies	Members	Societies	Members	Societies	Members	Societies	Members
Korona and Glina	**5**	**381**			**5**	**381**	**3**	**2**	**0**	**0**	**3**	**2**
FBiH	5	381			5	381	3	2	0	0	3	2
Bosna	50	2012			50	2012	32	12	0	0	32	12
FBiH	45	1083			45	1083	28	6	0	0	28	6
RS	5	929			5	929	3	5	0	0	3	5
Una	**15**	**2583**			**15**	**2583**	**9**	**15**	**0**	**0**	**9**	**15**
FBiH	9	1963			9	1963	6	11	0	0	6	11
RS	6	620			6	620	4	4	0	0	4	4
Vrbas	**15**	**2769**			**15**	**2769**	**9**	**16**	**0**	**0**	**9**	**16**
FBiH	7	516			7	516	4	3	0	0	4	3
RS	8	2253			8	2253	5	13	0	0	5	13
Sava	**22**	**3591**			**22**	**3591**	**14**	**21**	**0**	**0**	**14**	**21**
BD	1				1		1	0	0	0	1	0
FBiH	8	831			8	831	5	5	0	0	5	5
RS	13	2760			13	2760	8	16	0	0	8	16
Krka-Cetina			**6**	**234**	**6**	**234**	**0**	**0**	**4**	**1**	**4**	**1**
FBiH			6	234	6	234	0	0	4	1	4	1
Neretva			**16**	**2907**	**16**	**2907**	**0**	**0**	**10**	**17**	**10**	**17**
FBiH			14	2877	14	2877	0	0	9	17	9	17
RS			2	30	2	30	0	0	1	0	1	0
Drina	**25**	**2443**			**25**	**2443**	**16**	**14**	**0**	**0**	**16**	**14**
FBiH	5	435			5	435	3	3	0	0	3	3
RS	20	2008			20	2008	13	12	0	0	13	12
Trebišnjica			**4**	**434**	**4**	**434**	**0**	**0**	**3**	**3**	**3**	**3**
RS			4	434	4	434	0	0	3	3	3	3
Total	**132**	**13779**	**26**	**3575**	**158**	**17354**	**84**	**79**	**16**	**21**	**100**	**100**

50 Source: Study Team, 2014

Table A5-4.1: Geographical distribution of surveyed fish farms in BiH in 2013[51]

Water and river basins	BD				FBiH				RS				BiH			
	Farms (No.)	Total ponds (ha)	Total tanks & cages (m3)	Fish (MT)	Farms (No.)	Total ponds (ha)	Total tanks & cages (m3)	Fish (MT)	Farms (No.)	Total ponds (ha)	Total tanks & cages (m3)	Fish (MT)	Farms (No.)	Total ponds (ha)	Total tanks & cages (m3)	Fish (MT)
Black Sea	**4**	**1**	**700**	**1**	**58**	**17**	**43 012**	**1 131**	**44**	**2 868**	**83 310**	**3 914**	**106**	**2 886**	**127 022**	**5 046**
Korona/ Glina					**1**	**0**	**131**	**3**					**1**	**0**	**131**	**3**
Tank					1	0	131	3					1	0	131	3
Bosna					**39**	**6**	**22 575**	**386**	**13**	**1 152**	**2 412**	**375**	**52**	**1 158**	**24 986**	**761**
Pond					2	1	0	2	3	1 152	0	345	5	1 152	0	347
Tank					20	0	20 601	358	9	0	2 382	31	29	0	22 982	389
Trading					13	6	1 974	25	1	0	30	0	14	6	2 004	25
No prod./info					4	0	0	0					4	0	0	0
Una					**7**	**3**	**11 900**	**636**	**2**	**0**	**12 107**	**842**	**9**	**3**	**24 007**	**1 478**
Pond					1	3	0	3					1	3	0	3
Tank					6	0	11 900	633	2	0	12 107	842	8	0	24 007	1 475
Vrbas					**2**	**0**	**7 441**	**88**	**16**	**645**	**14 910**	**1 593**	**18**	**645**	**22 351**	**1 681**
Pond									4	645	0	664	4	645	0	664
Tank					1	0	7 021	84	12	0	14 910	929	13	0	21 931	1 013
Cage					1	0	420	4					1	0	420	4
Sava	**4**	**1**	**700**	**1**	**8**	**7**	**495**	**17**	**8**	**1 069**	**250**	**233**	**20**	**1 077**	**1 445**	**251**
Pond	2	1	0	1	7	7	0	12	7	1 069	0	231	16	1 077	0	244
Tank					1	0	495	5	1	0	250	2	2	0	745	7
Trading	2	0	700	0									2	0	700	0
Drina					**1**	**0**	**470**	**1**	**5**	**2**	**53 632**	**871**	**6**	**2**	**54 102**	**872**
Pond									1	2	0	5	1	2	0	5
Tank					1	0	470	1	2	0	7 272	86	3	0	7 742	87
Cage									2	0	46 360	780	2	0	46 360	780
Adriatic Sea					**42**	**2**	**151 211**	**2 066**	**3**	**0**	**32 619**	**548**	**45**	**2**	**183 830**	**2 614**
Neretva					**42**	**2**	**151 211**	**2 066**	**1**	**0**	**296**	**5**	**43**	**2**	**151 507**	**2 071**
Pond					1	2	0	1					1	2	0	1
Tank					22	0	35 442	874	1	0	296	5	23	0	35 738	879
Cage					14	0	102 961	1 062					14	0	102 961	1 062
Trading					4	0	1 148	0					4	0	1 148	0
Mollusk					1	0	11 660	130					1	0	11 660	130
Trebišnjica									**2**	**0**	**32 323**	**543**	**2**	**0**	**32 323**	**543**
Tank									1	0	950	33	1	0	950	33
Cage									1	0	31 373	510	1	0	31 373	510
Total of water basins	**4**	**1**	**700**	**1**	**100**	**19**	**194 222**	**3 197**	**47**	**2 868**	**115 929**	**4 462**	**151**	**2 888**	**310 852**	**7 660**
Pond	2	1	0	1	11	14	0	17	15	2 868	0	1 244	28	2 883	0	1 263
Tank					52	0	76 060	1 959	28	0	38 166	1 928	80	0	114 226	3 886
Cage					15	0	103 381	1 066	3	0	77 733	1 290	18	0	181 114	2 356

51 Source: Farm surveys of Review Team, 2014

Water and river basins	BD				FBiH				RS				BiH			
	Farms (No.)	Total ponds (ha)	Total tanks & cages (m3)	Fish (MT)	Farms (No.)	Total ponds (ha)	Total tanks & cages (m3)	Fish (MT)	Farms (No.)	Total ponds (ha)	Total tanks & cages (m3)	Fish (MT)	Farms (No.)	Total ponds (ha)	Total tanks & cages (m3)	Fish (MT)
Trading	2	0	700	0	17	6	3 122	25	1	0	30	0	20	6	3 852	25
No prod./info					4	0	0	0					4	0	0	0
Mollusk					1	0	11 660	130					1	0	11 660	130
Total of culture systems	**4**	**1**	**700**	**1**	**100**	**19**	**194 222**	**3 197**	**47**	**2 868**	**115 929**	**4 462**	**151**	**2 888**	**310 852**	**7 660**

Table A5-4.2: Proportional geographical distribution of surveyed fish farms in BiH in 2013[52]

Water and river basins	BD				FBiH				RS				BiH			
	% of farms	Area of ponds (%)	Volume of tanks & cages (%)	Prod. (%)	% of farms	Area of ponds (%)	Volume of tanks & cages (%)	Prod. (%)	% of farms	Area of ponds (%)	Volume of tanks & cages (%)	Prod. (%)	% of farms	Area of ponds (%)	Volume of tanks & cages (%)	Prod. (%)
Black Sea	**100**	**100**	**100**	**100**	**58**	**87**	**22**	**35**	**94**	**100**	**72**	**88**	**70**	**100**	**41**	**66**
Korona/Glina					**1**								**1**			
Tank					1								1			
Bosna					**39**	**33**	**12**	**12**	**28**	**40**	**2**	**8**	**34**	**40**	**8**	**10**
Pond					2	4			6	40		8	3	40		5
Tank					20		11	11	19		2	1	19		7	5
Trading					13	29	1	1	2				9		1	
No prod./info					4								3			
Una					**7**	**16**	**6**	**20**	**4**		**10**	**19**	**6**		**8**	**19**
Pond					1	16							1			
Tank					6		6	20	4		10	19	5		8	19
Vrbas					**2**		**4**	**3**	**34**	**22**	**13**	**36**	**12**	**22**	**7**	**22**
Pond									9	22		15	3	22		9
Tank					1		4	3	26		13	21	9		7	13
Cage					1								1			
Sava	**100**	**100**	**100**	**100**	**8**	**38**		**1**	**17**	**37**		**5**	**13**	**37**		**3**
Pond	50	100		100	7	38			15	37		5	11	37		3
Tank					1				2				1			
Trading	50		100										1			
Drina					**1**				**11**		**46**	**20**	**4**		**17**	**11**
Pond									2				1			
Tank					1				4		6	2	2		2	1
Cage									4		40	17	1		15	10
Adriatic Sea					**42**	**13**	**78**	**65**	**6**		**28**	**12**	**30**		**59**	**34**
Neretva					**42**	**13**	**78**	**65**	**2**				**28**		**49**	**27**
Pond					1	13							1			
Tank					22		18	27	2				15		11	11
Cage					14		53	33					9		33	14
Trading					4		1						3			
Mollusk					1		6	4					1		4	2
Trebišnjica									**4**		**28**	**12**	**1**		**10**	**7**
Tank									2		1	1	1			
Cage									2		27	11	1		10	7
Total of water basins	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
Pond	50	100		100	11	71		1	32	100		28	19	100		16

52 Source: Farm surveys of Review Team, 2014

Water and river basins	BD				FBiH				RS				BiH			
	% of farms	Area of ponds (%)	Volume of tanks & cages (%)	Prod. (%)	% of farms	Area of ponds (%)	Volume of tanks & cages (%)	Prod. (%)	% of farms	Area of ponds (%)	Volume of tanks & cages (%)	Prod. (%)	% of farms	Area of ponds (%)	Volume of tanks & cages (%)	Prod. (%)
Tank					52		39	61	60		33	43	53		37	51
Cage					15		53	33	6		67	29	12		58	31
Trading	50		100		17	29	2	1	2				13		1	
No prod./info					4								3			
Mollusk					1		6	4					1		4	2
Total of culture systems	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Table A5-5: Geographical distribution of surveyed farms dealing with fish seed production in BiH in 2013[53]

Water and river basins	BD			FBiH			RS			BiH		
	Farms (No.)	Area of ponds (ha)	Volume of tank and cages (m^3)	Farms (No.)	Area of ponds (ha)	Volume of tank and cages (m^3)	Farms (No.)	Area of ponds (ha)	Volume of tank and cages (m^3)	Farms (No.)	Area of ponds (ha)	Volume of tank and cages (m^3)
Black Sea	**1**	**0**	**0**	**23**	**2**	**26 327**	**11**	**4**	**21 768**	**35**	**6**	**48 095**
Korona/Glina				**1**	**0**	**131**				**1**	**0**	**131**
Tank				1	0	131				1	0	131
Bosna				**13**	**0**	**16 510**	**3**	**0**	**570**	**16**	**0**	**17 079**
Tank				13	0	16 510	3	0	570	16	0	17 079
Una				5	0	1 700	1	0	11 547	6	0	13 247
Tank				5	0	1 700	1	0	11 547	6	0	13 247
Vrbas				**1**	**0**	**7 021**	**5**	**0**	**2 580**	**6**	**0**	**9 601**
Tank				1	0	7 021	5	0	2 580	6	0	9 601
Sava	1	0	0	2	2	495	1	4	0	4	6	495
Pond	1	0	0	1	2	0	1	4	0	3	6	0
Tank				1	0	495				1	0	495
Drina				**1**	**0**	**470**	**1**	**0**	**7 072**	**2**	**0**	**7 542**
Tank				1	0	470	1	0	7 072	2	0	7 542
Adriatic Sea				21	0	58 282	3	0	32 619	24	0	90 901
Neretva				**21**	**0**	**58 282**	**1**	**0**	**296**	**22**	**0**	**58 578**
Tank				16	0	34 426	1	0	296	17	0	34 722
Cage				4	0	23 176				4	0	23 176
Trading				1	0	680				1	0	680
Trebišnjica							**2**	**0**	**32 323**	**2**	**0**	**32 323**
Tank							1	0	950	1	0	950
Cage							1	0	31 373	1	0	31 373
Total of water basins	**1**	**0**	**0**	**44**	**2**	**84 609**	**14**	**4**	**54 387**	**59**	**6**	**138 996**
Pond	1	0	0	1	2	0	1	4	0	3	6	0

53 Source: Farm surveys of Review Team, 2014

Water and river basins	BD			FBiH			RS			BiH		
	Farms (No.)	Area of ponds (ha)	Volume of tank and cages (m^3)	Farms (No.)	Area of ponds (ha)	Volume of tank and cages (m^3)	Farms (No.)	Area of ponds (ha)	Volume of tank and cages (m^3)	Farms (No.)	Area of ponds (ha)	Volume of tank and cages (m^3)
Tank				38	0	60 753	12	0	23 014	50	0	83 767
Cage				4	0	23 176	1	0	31 373	5	0	54 549
Trading				1	0	680				1	0	680
Total of culture systems	**1**	**0**	**0**	**44**	**2**	**84 609**	**14**	**4**	**54 387**	**59**	**6**	**138 996**

Table A5-6: Geographical distribution of surveyed farm dealing with table fish production in BiH in 2013[54]

Water and river basins	BD			FBiH			RS			BiH		
	Farms (No.)	Area of ponds (ha)	Volume of tank and cages (m^3)	Farms (No.)	Area of ponds (ha)	Volume of tank and cages (m^3)	Farms (No.)	Area of ponds (ha)	Volume of tank and cages (m^3)	Farms (No.)	Area of ponds (ha)	Volume of tank and cages (m^3)
Black Sea	**2**	**1**	**0**	**41**	**11**	**41 038**	**42**	**2 868**	**82 680**	**85**	**2 880**	**123 718**
Korona/Glina				**1**	**0**	**131**				**1**	**0**	**131**
Tank				1	0	131				1	0	131
Bosna				**22**	**1**	**20 601**	**12**	**1 152**	**2 382**	**34**	**1 152**	**22 982**
Pond				2	1	0	3	1 152	0	5	1 152	0
Tank				20	0	20 601	9	0	2 382	29	0	22 982
Una				**7**	**3**	**11 900**	**2**	**0**	**12 107**	**9**	**3**	**24 007**
Pond				1	3	0				1	3	0
Tank				6	0	11 900	2	0	12 107	8	0	24 007
Vrbas				**2**	**0**	**7 441**	**15**	**645**	**14 310**	**17**	**645**	**21 751**
Pond							4	645	0	4	645	0
Tank				1	0	7 021	11	0	14 310	12	0	21 331
Cage				1	0	420				1	0	420
Sava	**2**	**1**	**0**	**8**	**7**	**495**	**8**	**1 069**	**250**	**18**	**1 077**	**745**
Pond	2	1	0	7	7	0	7	1 069	0	16	1 077	0
Tank				1	0	495	1	0	250	2	0	745
Drina				**1**	**0**	**470**	**5**	**2**	**53 632**	**6**	**2**	**54 102**
Pond							1	2	0	1	2	0
Tank				1	0	470	2	0	7 272	3	0	7 742
Cage							2	0	46 360	2	0	46 360
Adriatic Sea				**35**	**2**	**138 002**	**3**	**0**	**32 619**	**38**	**2**	**170 621**
Neretva				**35**	**2**	**138 002**	**1**	**0**	**296**	**36**	**2**	**138 298**
Pond				1	2	0				1	2	0
Tank				20	0	35 041	1	0	296	21	0	35 337
Cage				14	0	102 961				14	0	102 961
Trebišnjica							**2**	**0**	**32 323**	**2**	**0**	**32 323**
Tank							1	0	950	1	0	950

54 Source: Farm surveys of Review Team, 2014

Water and river basins	BD			FBiH			RS			BiH		
	Farms (No.)	Area of ponds (ha)	Volume of tank and cages (m^3)	Farms (No.)	Area of ponds (ha)	Volume of tank and cages (m^3)	Farms (No.)	Area of ponds (ha)	Volume of tank and cages (m^3)	Farms (No.)	Area of ponds (ha)	Volume of tank and cages (m^3)
Cage							1	0	31 373	1	0	31 373
Total of water basins	2	1	0	76	14	179 039	45	2 868	115 299	123	2 883	294 339
Pond	2	1	0	11	14	0	15	2 868	0	28	2 883	0
Tank				50	0	75 659	27	0	37 566	77	0	113 225
Cage				15	0	103 381	3	0	77 733	18	0	181 114
Total of culture systems	**2**	**1**	**0**	**76**	**14**	**179 039**	**45**	**2 868**	**115 299**	**123**	**2 883**	**294 339**

Table A5-7: Employees of surveyed fish farms in BiH in 2013[55]

Type of activity	BD			FBiH						RS					Grand total
	Pond	Trading	Total	Pond	Tank	Cage	Trading	Mollusk	Total	Pond	Tank	Cage	Trading	Total	
Number of employees															
Administrative staff (No.)				5	9	3		1	18	6	8	3		17	35
Administrative staff (No.)					7	5		1	13	6	4	1		11	24
Technical management (No.)				2	12	4			18	10	8	3		21	39
Technical management (No.)											4			4	4
Veterinarian (No.)					1	1			2						2
Veterinarian (No.)															
Full-time worker (No.)		3	3	11	103	46	14	5	179	101	55	21		177	359
Full-time worker (No.)					17	13	7		37	5	1			6	43
Full time fisher (No.)															
Part-time worker (No.)					1				1	6	3	17		26	27
Part-time worker (No.)											1	5		6	6
Part-time fisher (No.)															
Seasonal workers (No.)	2		2	5	20	5	4		34	25	6			31	67
Seasonal workers (No.)					4	2	10		16						16
Seasonal fisher (No.)															
Total of employees (No.)	**2**	**3**	**5**	**23**	**174**	**79**	**35**	**7**	**318**	**159**	**90**	**50**		**299**	**622**
Total of full time workers (No.)		3	3	18	149	72	21	7	267	128	80	28		236	506
Total of part time workers (No.)					1				1	6	4	22		32	33
Total of seasonal workers (No.)	2		2	5	24	7	14		50	25	6			31	83

55 Source: Farm surveys of Review Team, 2014

Type of activity	BD			FBiH						RS					Grand total
	Pond	Trading	Total	Pond	Tank	Cage	Trading	Mollusk	Total	Pond	Tank	Cage	Trading	Total	
Proportion of the different activities															
Administrative staff ? (%)				1	1	0		0	3	1	1	0		3	6
Administrative staff ? (%)					1	1		0	2	1	1	0		2	4
Technical management ? (%)				0	2	1			3	2	1	0		3	6
Technical management ? (%)											1			1	1
Veterinarian ? (%)					0	0			0						0
Veterinarian ? (%)															
Full-time worker ? (%)				2	17	7	2	1	29	16	9	3		28	58
Full-time worker ? (%)					3	2	1		6	1	0			1	7
Full time fisher (%)															
Part-time worker ? (%)					0				0	1	0	3		4	4
Part-time worker ? (%)											0	1		1	1
Part-time fisher (%)															
Seasonal workers ? (%)				1	3	1	1		5	4	1			5	11
Seasonal workers ? (%)					1	0	2		3						3
Seasonal fisher (%)															
Total of employees (%)			**1**	**4**	**28**	**13**	**6**	**1**	**51**	**26**	**14**	**8**		**48**	**100**
Total of full time workers (%)				3	24	12	3	1	43	21	13	5		38	81
Total of part time workers (%)					0				0	1	1	4		5	5
Total of seasonal workers (%)				1	4	1	2		8	4	1			5	13

Table A5-8-1: Vehicles and fish transport capacities of surveyed fish farms in BiH in 2013[56]

Entity and culture system	Vehicles (No.)	Total live fish carrying capacity of vehicles (MT)	Total live fish transporting tank capacity (m^3)	Total iced fish transporting capacity (m^3)	Total frozen fish transporting capacity (m^3)
Pond	2	0.3	0	0.3	0
Trading	5	0.5	0.3	0	0
BD total	**7**	**0.8**	**0.3**	**0.3**	**0**
Pond	9	0.1	0	1	0
Tank	42	18.3	124.9	8.5	30
Cage	20	5.17	35.5	11.1	10
Trading	6	0.6	7.5	1	0.5
Mollusk	3	0	0	6	0
FBiH total	**80**	**24.17**	**167.9**	**27.6**	**40.5**

56 Source: Farm surveys of Review Team, 2014

Entity and culture system	Vehicles (No.)	Total live fish carrying capacity of vehicles (MT)	Total live fish transporting tank capacity (m^3)	Total iced fish transporting capacity (m^3)	Total frozen fish transporting capacity (m^3)
1. Pond	15	84	147.7	0	0
2. Tank	22	21.7	48.5	31.5	6.5
3. Cage	11	9	75	143	15
4. Trading	1	0.1	0	0	0
RS total	**49**	**114.8**	**271.2**	**174.5**	**21.5**
Total	**136**	**139.77**	**439.4**	**202.4**	**62**
Pond	26	84.4	147.7	1.3	0
Tank	64	40	173.4	40	36.5
Cage	31	14.17	110.5	154.1	25
Trading	12	1.2	7.8	1	0.5
Mollusk	3	0	0	6	0

Table A5-8.2: Proportion of vehicles and fish transport capacities of surveyed fish farms in BiH in 2013[57]

Entity and culture system	Vehicles (%)	Total live fish carrying capacity of vehicles (%)	Total live fish transporting tank capacity (%)	Total iced fish transporting capacity (%)	Total frozen fish transporting capacity (%)
Pond	1	0	0	0	0
Trading	4	0	0	0	0
BD total	**5**	**1**	**0**	**0**	**0**
Pond	7	0	0	0	0
Tank	31	13	28	4	48
Cage	15	4	8	5	16
Trading	4	0	2	0	1
Mollusk	2	0	0	3	0
FBiH total	**59**	**17**	**38**	**14**	**65**
1. Pond	11	60	34	0	0
2. Tank	16	16	11	16	10
3. Cage	8	6	17	71	24
4. Trading	1	0	0	0	0
RS total	**36**	**82**	**62**	**86**	**35**
Total	**100**	**100**	**100**	**100**	**100**
Pond	19	60	34	1	0
Tank	47	29	39	20	59
Cage	23	10	25	76	40
Trading	9	1	2	0	1
Mollusk	2	0	0	3	0

57 Source: Farm surveys of Review Team, 2014

Table A5-9.1: Number and proportion of surveyed fish farms equipped with fish processing and marketing facilities (in 2013) [58]

Entity and culture system	Ice making capacity	Fish stunning capacity	Fish gutting capacity	Fish filleting capacity	Fish smoking capacity	Fish packing capacity	Cold store capacity	Deep-freezing capacity	Live fish storing capacity - aquarium	Own fish processing unit - total area	Own fish shop - total area	Own fish restaurant - total area
Farms (No.)												
Pond											1	
Trading												1
BD total											1	1
Pond	1				1							1
Tank	7	1	2	2	4	1	3	2			6	15
Cage	3	1	1				1	1			5	1
Trading	1				1		1					7
No prod./info												
Mollusk	1											1
FBiH total	**13**	**2**	**3**	**2**	**6**	**1**	**5**	**3**			**11**	**25**
Pond			1				2		1		4	
Tank	1	2	10	1	2	2	2	1	2	4	1	8
Cage	2	2	2			2	2		1	1	2	
Trading												
RS total	**3**	**4**	**13**	**1**	**2**	**4**	**6**	**1**	**4**	**5**	**7**	**8**
Total	**16**	**6**	**16**	**3**	**8**	**5**	**11**	**4**	**4**	**5**	**19**	**34**
Pond	1		1		1		2		1		5	1
Tank	8	3	12	3	6	3	5	3	2	4	7	23
Cage	5	3	3			2	3	1	1	1	7	1
Trading	1				1		1					8
Mollusk	1											1
Farms (%)												
Pond											5	
Trading												3
BD total											**5**	**3**
Pond	6				13							3
Tank	44	17	13	67	50	20	27	50			32	44
Cage	19	17	6				9	25			26	3
Trading	6				13		9					21
No prod./info												
Mollusk	6											3
FBiH total	**81**	**33**	**19**	**67**	**75**	**20**	**45**	**75**			**58**	**74**
Pond			6				18		25		21	
Tank	6	33	63	33	25	40	18	25	50	80	5	24
Cage	13	33	13			40	18		25	20	11	
Trading												
RS total	**19**	**67**	**81**	**33**	**25**	**80**	**55**	**25**	**100**	**100**	**37**	**24**
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
Pond	6		6		13		18		25		26	3
Tank	50	50	75	100	75	60	45	75	50	80	37	68
Cage	31	50	19			40	27	25	25	20	37	3
Trading	6				13		9					24
Mollusk	6											3

58 Source: Farm surveys of Review Team, 2014

Table A5-9.2: Capacities of fish processing and marketing of surveyed fish farms in BiH in 2013[59]

Entity and culture system	Ice making capacity (kg/hour)	Fish stunning capacity (kg/hour)	Fish gutting capacity (fish/hour)	Fish filleting capacity (kg/day)	Fish smoking capacity (kg/day)	Fish packing capacity (kg/day)	Cold store capacity (m3)	Deep-freezing capacity (m3)	Live fish storing capacity - aquarium (m3)	Own fish processing unit - total area (m2)	Own fish shop - total area (m2)	Own fish restaurant - total area (m2)
Pond											2	
Trading											2	120
BD total											**4**	**120**
Pond	10				30						11	400
Tank	590	500	320	960	340	2 000	217	220			52	2 135
Cage	160	50	400				30	10			15	230
Trading	20				0		150				17	1 276
No prod./info											4	
Mollusk	50										1	60
FBiH total	**830**	**550**	**720**	**960**	**370**	**2 000**	**397**	**230**			**100**	**4 101**
Pond			40				68		5		15	
Tank	300	2 500	3 430	1 000	115	20 100	703	50	962	1 059	28	570
Cage	110	1 800	3 000			20 000	55		2	200	3	
Trading											1	
RS total	**410**	**4 300**	**6 470**	**1 000**	**115**	**40 100**	**826**	**50**	**969**	**1 259**	**47**	**570**
Total	**1 240**	**4 850**	**7 190**	**1 960**	**485**	**42 100**	**1 223**	**280**	**969**	**1 259**	**151**	**4 791**
Pond	10		40		30		68		5		235	400
Tank	890	3 000	3 750	1 960	455	22 100	920	270	962	1 059	407	2 705
Cage	270	1 850	3 400			20 000	85	10	2	200	418	230
Trading	20				0		150					1 396
Mollusk	50											60

59 Source: Farm surveys of Review Team, 2014

Annex 6

LIST OF REFERENCES, SOURCES AND FURTHER READINGS OF BACKGROUND INFORMATION

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WISE – Water Information System for Europe, 2014 – Waternote 10: *Climate change - Addressing floods, droughts and changing aquatic ecosystems,* http://ec.europa.eu/environment/water/participation/notes_en.htm

WISE – Water Information System for Europe, 2014 – Waternote 11: *From rivers to the sea - Linking with the new Marine Strategy Framework Directive,* http://ec.europa.eu/environment/water/participation/notes_en.htm

WISE – Water Information System for Europe, 2014 – Waternote 12: A Common Task - *Public Participation in River Basin Management Planning*, http://ec.europa.eu/environment/water/participation/notes_en.htm

WTO, 2014 – Tariff download facility http://tariffdata.wto.org/

Annex 7

Environmental effects of intensive culture systems of rainbow trout

1. Environmental effect of tank-based trout production

By the standards the water suitable for trout production should have the physical and chemical parameters as shown in Table A7-1.

Table A7-1: The water quality suitable for trout production

Parameters	Unit	Allowed value
Temperature	°C	<30
pH		6.5-9.0
Sediment (30 min)	ml/l	<0.5
Suspended material	g/m^3	<35
BOD5	gO_2/m^3	<25
COD (dichromat)	gO_2/m^3	<125
NH3-N	g/m^3N	<10
NO2-N	g/m^3N	<1
NO3-N	g/m^3N	<10
Total N	g/m^3N	<15
Total P	g/m^3 P	<3
Fe	mg/m^3	<2000
Mn	mg/m^3	<500

Source: Piper at.al., 1982

The summarized production data and the environmental loading caused by 41 tank based trout farms of different sizes are presented in Table A7-2. While the environmental loading which occurs in 1 m^3 (called specific environmental loading) of discharged water is presented in Table A7-3.

It should be assumed that about 1/10 of the total water quality transferred by different sources (rivers and streams) is used for supplying farms located nearby to the river. Consequently the materials discharged by the farms are diluted 10 times in the recipient water, so the environmental effect is negligible.

Based on the above data it can be concluded that tank based trout production does not have a significant negative environmental effect on the recipient river systems. Though there are some farms – as can be seen in Table A7-7 – where the parameters in the discharged water are above the acceptable limits. However, (accepting that only a part of the river water is used for farm supply) even in these cases there is no significant deterioration in water quality. It is because “the solution on pollution is the dilution”.

Table 7A-2: Production data of 41 fish farms and the environmental loading caused by the farms

Parameters	Units	Values
Water used	m^3/year	606 838 120
Tank volume total	m^3	85 642
Feed used total	T	3 661
Fish production	T	3 459
FQ		1.06
Fish production in unit tank volume	kg/m^3/year	40.4
Water used for fish production	m^3/kg	175
Calculated[60] quantity of feces produced	T	1098
Calculated[61] BOD 5	t O_2	659
Calculated[62] COD	t O_2	1647
Calculated[63] TAN loading	T	110
Calculated[64] P issued	T	18

Source: Ebeling, J.M. 2006, Eding at.al., 2006, Piedrahita, R.H. 2003, Piper at.al., 1982, Skjolstrup at.al., 1998 and Suzuki at.al., 2003

Table A7-3: The average environmental loading in 1 m^3 of discharged water[65]

Parameters	Units	Values
Water used	m^3/year	606 838 120
Feces=Total Suspended Solids	g/m^3	1.81
BOD	gO_2/m^3	1.09
COD	gO_2/m^3	2.71
TAN	g/m^3	0.18
P issued	g/m^3	0.03

Source: Ebeling, J.M. 2006, Eding at.al., 2006, Piedrahita, R.H. 2003, Piper at.al., 1982, Skjolstrup at.al., 1998 and Suzuki at.al., 2003

2. Environmental effect of cage fish farming

The cage fish farms are located in water reservoirs where the current is slow or negligible. Here the accumulation of sediment is unavoidable, and the diluted metabolite (as TAN and P) supports the primary production/eutrophication in the water. The main technical data of 17 cage fish farms are given in Table A7-5. The environmental loading after production of 1 MT of fish is given in Table A7-6. As can be seen, the

60 Feces: 0.3 kg/kg feed
61 BOD: Feces C content (50 %) x 1.2
62 COD: BOD x 2.5
63 TAN: 3 % of the consumed feed
64 P issued: 5 g/kg feed
65 Calculated by the data of Table A7-2

loading of the recipients is significant, and we can suppose in those regions where there are many cage farms the negative environmental effect of fish production is unavoidable.

Table A7-5: The main technical data of fish production in 17 cage farms

Technical categories	Units	Values
Number of cages in examined farms	Number	1 001
Total volume of cages	m^3	180 480
Average water depth under the cages	M	16
Fish production in cages	t/year	2 329
Fish feed used in cages	t/year	2 476
Average cage volume	m^3	180
Average production	kg/m^3/year	13
FQ		1.06
Calculated[66] quantity of feces produced	T	743
Calculated[67] BOD 5	t O_2	446
Calculated[68] COD	t O_2	1114
Calculated[69] TAN loading	T	74
Calculated[70] P issued	T	12.4

Source: Ebeling, J.M. 2006, Eding at.al., 2006, Piedrahita, R.H. 2003, Piper at.al., 1982, Skjolstrup at.al., 1998 and Suzuki at.al., 2003

Table A7-6: Calculated environmental loading after production of 1 t fish

Water quality parameter	Unit	Values	Visualization of the value
Suspended solids	Kg	319	By C content equivalent to 1.3 m3 wet pig manure
BOD5	kgO_2	191	
COD	kgO_2	478	
TAN	Kg	32	Equivalent to N content of 100 kg ammonium nitrate
P issued	Kg	5.3	Equivalent to P content of 66 kg superphosphate

Source: Ebeling, J.M. 2006, Eding at.al., 2006, Piedrahita, R.H. 2003, Piper at.al., 1982, Skjolstrup at.al., 1998 and Suzuki at.al., 2003

66 Feces: 0.3 kg/kg feed
67 BOD: Feces C content (50 %) x 1.2
68 COD: BOD x 2.5
69 TAN: 3 % of the consumed feed
70 P issued: 5 g/kg feed

Table A7-7: Some production data of examined tank based trout farms and the effect of production on the quality of discharged water[71]

ID #	Water used (1000 m3/year)	Volume of fish tanks (m3)	Total feed applied (yr./t)	Total fish production (t)	FQ	Production (kg/m3)	Water used for production (m3/ 1 kg)	Production of feces (kg)	Suspended solid in effluent (gr./m3)	Suspended solid in the river (gr./m3)	BOD5 (kg O2)	BOD5 (gr/m3)	BOD increment in the river (gr./m3)	TAN issued (gr./m3)	TAN increased in the river (g/m3)
84	6 940	2013	6	6	1.00	3	1	1800	259.4	25.9	1 080	155.6	15.6	25.9	2.6
11	3 154	202	3	3	1.00	15	1	900	285.4	28.5	540	171.2	17.1	28.5	2.9
61	1 577	77	1.5	2	0.79	25	1	450	285.4	28.5	270	171.2	17.1	28.5	2.9
94	4 700	210	4.5	6	0.82	26	1	1350	287.2	28.7	810	172.3	17.2	28.7	2.9
47	946	368	1	1	1.25	2	1	300	317.1	31.7	180	190.3	19.0	31.7	3.2
92	4 700	325	5	5	0.94	16	1	1500	319.1	31.9	900	191.5	19.1	31.9	3.2
31	4 415	296	5	5	1.00	17	1	1500	339.8	34.0	900	203.9	20.4	34.0	3.4
91	1 262	115	2	3	0.69	25	0	600	475.4	47.5	360	285.3	28.5	47.5	4.8
62	3 153	495	5	5	1.00	10	1	1500	475.7	47.6	900	285.4	28.5	47.6	4.8
34	3 150	330	6	6	0.96	19	1	1800	571.4	57.1	1 080	342.9	34.3	57.1	5.7
29	7 844	700	18	20	0.90	29	0	5400	688.4	68.8	3 240	413.1	41.3	68.8	6.9
28	1 600	22	4	3	1.33	138	1	1200	750.0	75.0	720	450.0	45.0	75.0	7.5
26	7 900	971	20	17	1.18	18	0	6000	759.5	75.9	3 600	455.7	45.6	75.9	7.6
95	7 900	900	20	20	1.00	22	0	6000	759.5	75.9	3 600	455.7	45.6	75.9	7.6
42	1 577	114	4	3	1.57	22	1	1200	760.9	76.1	720	456.6	45.7	76.1	7.6
86	4 700	406	12	12	1.00	30	0	3600	766.0	76.6	2 160	459.6	46.0	76.6	7.7
10	946	131	2.5	3	0.78	24	0	750	792.8	79.3	450	475.7	47.6	79.3	7.9
32	4 730	540	15	15	0.98	28	0	4500	951.4	95.1	2 700	570.8	57.1	95.1	9.5
51	9 460	520	30	24	1.27	45	0	9000	951.4	95.1	5 400	570.8	57.1	95.1	9.5
45	630	273	2	3	0.80	9	0	600	952.4	95.2	360	571.4	57.1	95.2	9.5
7	6 300	751	25	27	0.91	36	0	7500	1190.5	119.0	4 500	714.3	71.4	119.0	11.9
63	18 900	2936	80	56	1.43	20	0	24000	1269.8	127.0	14 400	761.9	76.2	127.0	12.7
27	2 300	534	10	12	0.84	26	0	3000	1304.3	130.4	1 800	782.6	78.3	130.4	13.0
13	158 000	10200	700	580	1.21	57	0	210000	1329.1	132.9	126 000	797.5	79.7	132.9	13.3
85	6 300	5000	35	35	1.00	7	0	10500	1666.7	166.7	6 300	1000.0	100.0	166.7	16.7
4	158 000	9100	900	750	1.20	82	0	270000	1708.9	170.9	162 000	1025.3	102.5	170.9	17.1
5	7 900	630	45	40	1.13	63	0	13500	1708.9	170.9	8 100	1025.3	102.5	170.9	17.1
57	15 768	3876	90	100	0.90	26	0	27000	1712.3	171.2	16 200	1027.4	102.7	171.2	17.1
35	17 000	7072	100	80	1.25	11	0	30000	1764.7	176.5	18 000	1058.8	105.9	176.5	17.6
6	6 500	650	40	35	1.14	54	0	12000	1846.2	184.6	7 200	1107.7	110.8	184.6	18.5
12	4 730	1022	30	30	1.00	29	0	9000	1902.7	190.3	5 400	1141.6	114.2	190.3	19.0
23	315	250	2	2	1.00	8	0	600	1904.8	190.5	360	1142.9	114.3	190.5	19.0
3	62 000	11547	650	796	0.82	69	0	195000	3145.2	314.5	117 000	1887.1	188.7	314.5	31.5
58	31 536	11016	370	402	0.92	36	0	111000	3519.8	352.0	66 600	2111.9	211.2	352.0	35.2
9	160	129	2	3	0.65	24	0	600	3750.0	375.0	360	2250.0	225.0	375.0	37.5
17	22 075	9499	320	246	1.30	26	0	96000	4348.8	434.9	57 600	2609.3	260.9	434.9	43.5
8	160	165	4	3	1.27	19	0	1200	7500.0	750.0	720	4500.0	450.0	750.0	75.0
60	1 198	912	30	36	0.83	40	0	9000	7512.5	751.3	5 400	4507.5	450.8	751.3	75.1
59	105	185	18	10	1.80	54	0	5400	51369.9	5137.0	3 240	30821.9	3082.2	5137.0	513.7

71 Source: Farm survey of Review Team, 2013 and 2014

Annex 8

CASE STUDIES[72]

Culture system of case study 1	Tank
Type of organization/enterprise	Family enterprise
Year of establishment	2002
River Basin	Una
Group of produced fishes	Salmonids
Type of water source 1	Underground
Type of water source 2	Spring
Quality of supplied water	Excellent
Mode of water supply	By gravity
Volume of water used (m^3/yr.)	160 000
Mode of drainage	By gravity
Fish hatchery unit	Yes
Table fish rearing unit	Yes
No. of tanks or cages	10
Total water volume of tanks/cages (m^3)	165
Status of production	Increasing
Use of industrial fish feed (MT/yr.)	4.0
Name of industrial feed producer	Skretting
Fish feed store (m^2)	10.0
Administrative staff ? (No.)	0
Administrative staff ? (No.)	0
Technical management ? (No.)	2
Technical management ? (No.)	0
Veterinarian ? (No.)	0
Veterinarian ? (No.)	0
Full-time worker ? (No.)	0
Full-time worker ? (No.)	0
Part-time worker ? (No.)	1
Seasonal workers ? (No.)	0

72 All photos used in this annex are part of the project archive and taken with consent of the interviews/visited parties during the field work of the FAO project team. Source: Farm survey of Review Team, 2013 and 2014.

Seasonal workers ? (No.)	0
Educational background of employees	Secondary school; from literature
Total of employees (No.)	3
Total of full time workers (No.)	2
Total of part time workers (No.)	1
Total of seasonal workers (No.)	0
No. of vehicles	0
Total live fish carrying capacity of vehicles (MT)	0
Total live fish transporting tank capacity (m^3)	0
Total iced fish transporting capacity (m^3)	0
Total frozen fish transporting capacity (m^3)	0
spnum**Ice making capacity (kg/hour)**	0
Fish stunning capacity (kg/hour)	0
Fish gutting capacity (fish/hour)	0
Cold store capacity (m^3)	0
Deep-freezing capacity (m^3)	0
Own fish restaurant – total area (m^2)	50
Total produced eggs (No/yr.)	20 000.0
Total produced feeding larvae (No/yr.)	16 000.0
Total produced advanced fry (No/yr.)	15 000.0
Total produced fingerling (No/yr.)	15 000.0
Total produced fingerling (MT/yr.)	0.2
Total produced larger fish (MT/yr.)	3.0
Total produced/kept future brood fish (No/yr.)	30.0
Total produced/kept brood fish (No/yr.)	90.0
Total produced fish (MT/yr.)	**3.2**
Produced large fish (kg/m^3)	**18.2**
Produced all size of fish (kg/m^3)	**19.1**

Spring supplying the farm

Upper tanks used for nursing, the tanks below for fingerling production

The last tank used for table fish production

A simple hatchery

Removing bad eggs

A fish restaurant and a place for grilling fish

Culture system of case study 2	Tank
Type of organization/enterprise	LTD
Year of establishment	2010
Water basin	Black Sea
River Basin	Vrbas
Group of produced fishes	Salmonids
Type of water source 1	Underground
Type of water source 2	Spring
Quality of supplied water	Excellent
Mode of water supply	By gravity
Volume of water used (m^3/yr.)	7 844 000
Mode of drainage	By gravity
Fish hatchery unit	No
Table fish rearing unit	Yes
No. of tanks or cages	6
Total water volume of tanks/cages (m^3)	700
Status of production	Increasing
Use of industrial fish feed (MT/yr.)	18.0
Name of industrial feed producer	Skretting
Fish feed store (m^2)	15.0
Administrative staff ? (No.)	1
Administrative staff ? (No.)	0
Technical management ? (No.)	0
Technical management ? (No.)	1
Veterinarian ? (No.)	0
Veterinarian ? (No.)	0
Full-time worker ? (No.)	2
Full-time worker ? (No.)	0
Part-time worker ? (No.)	0
Seasonal workers ? (No.)	0
Seasonal workers ? (No.)	0

Educational background of employees	Secondary school
Total of employees (No.)	4
Total of full time workers (No.)	4
Total of part time workers (No.)	0
Total of seasonal workers (No.)	0
No. of vehicles	3
Total live fish carrying capacity of vehicles (MT)	1
Total live fish transporting tank capacity (m^3)	6
Total iced fish transporting capacity (m^3)	0
Total frozen fish transporting capacity (m^3)	0
Ice making capacity (kg/hour)	0
Fish stunning capacity (kg/hour)	0
Fish gutting capacity (fish/hour)	0
Cold store capacity (m^3)	0
Deep-freezing capacity (m^3)	0
Own fish restaurant – total area (m^2)	0
Observations	NI
Total produced eggs (No/yr.)	0.0
Total produced feeding larvae (No/yr.)	600 000.0
Total produced advanced fry (No/yr.)	550 000.0
Total produced fingerling (No/yr.)	500 000.0
Total produced fingerling (MT/yr.)	15.0
Total produced larger fish (MT/yr.)	5.0
Total produced/kept future brood fish (No/yr.)	0.0
Total produced/kept brood fish (No/yr.)	0.0
Total produced fish (MT/yr.)	**20.6**
Produced large fish (kg/m^3)	**7.1**
Produced all size of fish (kg/m^3)	**29.4**

Office and guard house

A net for removing leaves from the inlet water

Supply canal

Inlet screens of fish tank

A “U” and “D” form raceway

Monitor for day/night control

Fingerling tanks

A movable screen for condensing fish for harvest

Water outlet, screened for avoiding penetration of otters

Culture system of case study 3	Tank
Type of organization/enterprise	LTD
Year of establishment	2011
Water basin	Black Sea
River Basin	Vrbas
Group of produced fishes	Salmonids
Type of water source 1	Surface
Type of water source 2	River
Quality of supplied water	Medium
Mode of water supply	By gravity
Volume of water used (m^3/yr.)	158 000 000
Mode of drainage	By gravity
Fish hatchery unit	No
Table fish rearing unit	Yes
No. of tanks or cages	85
Total water volume of tanks/cages (m^3)	9 100
Status of production	Increasing
Use of industrial fish feed (MT/yr.)	900.0
Name of industrial feed producer	Skretting
Fish feed store (m^2)	250.0
Administrative staff ? (No.)	1
Administrative staff ? (No.)	0
Technical management ? (No.)	0
Technical management ? (No.)	0
Veterinarian ? (No.)	0
Veterinarian ? (No.)	0
Full-time worker ? (No.)	21
Full-time worker ? (No.)	0
Part-time worker ? (No.)	0
Seasonal workers ? (No.)	0
Seasonal workers ? (No.)	0
Educational background of employees	Primary and secondary school
Total of employees (No.)	22

Total of full time workers (No.)	22
Total of part time workers (No.)	0
Total of seasonal workers (No.)	0
No. of vehicles	0
Total live fish carrying capacity of vehicles (MT)	0
Total live fish transporting tank capacity (m^3)	0
Total iced fish transporting capacity (m^3)	0
Total frozen fish transporting capacity (m^3)	0
Ice making capacity (kg/hour)	0
Fish stunning capacity (kg/hour)	0
Fish gutting capacity (fish/hour)	0
Cold store capacity (m^3)	0
Deep-freezing capacity (m^3)	0
Own fish restaurant – total area (m^2)	0
Total produced eggs (No/yr.)	0.0
Total produced feeding larvae (No/yr.)	0.0
Total produced advanced fry (No/yr.)	0.0
Total produced fingerling (No/yr.)	0.0
Total produced fingerling (MT/yr.)	0.0
Total produced larger fish (MT/yr.)	750.0
Total produced/kept future brood fish (No/yr.)	0.0
Total produced/kept brood fish (No/yr.)	0.0
Total produced fish (MT/yr.)	**750.0**
Produced large fish (kg/m^3)	**82.4**
Produced all size of fish (kg/m^3)	**82.4**

A fish sorting machine

Disinfection of nets and brushes

Feed stored temporarily in open place

Culture system of case study 5	Tank
Type of organization/enterprise	LTD
Year of establishment	1982
Water basin	Black Sea
River basin	Una
Group of produced fishes	Salmonids
Type of water source 1	Surface
Type of water source 2	River
Quality of supplied water	Excellent
Mode of water supply	By gravity
Volume of water used (m^3/yr.)	158 000 000
Mode of drainage	By gravity
Fish hatchery unit	No
Table fish rearing unit	Yes
No. of tanks or cages	99
Total water volume of tanks/cages (m^3)	10 200
Status of production	Even
Use of industrial fish feed (MT/yr.)	700.0
Name of industrial feed producer	Skretting, Veronesi
Fish feed store (m^2)	600.0
Administrative staff ? (No.)	1
Administrative staff ? (No.)	2
Technical management ? (No.)	1
Technical management ? (No.)	0
Veterinarian ? (No.)	0
Veterinarian ? (No.)	0
Full-time worker ? (No.)	12
Full-time worker ? (No.)	0
Part-time worker ? (No.)	0
Seasonal workers ? (No.)	0
Seasonal workers ? (No.)	0
Educational background of employees	Technical staff: 1, veterinarian by his education. Staff-secondary school
Total of employees (No.)	16
Total of full time workers (No.)	16
Total of part time workers (No.)	0
Total of seasonal workers (No.)	0
No. of vehicles	7

Total live fish carrying capacity of vehicles (MT)	6
Total live fish transporting tank capacity (m^3)	41
Total iced fish transporting capacity (m^3)	0
Total frozen fish transporting capacity (m^3)	30
Ice making capacity (kg/hour)	25
Fish stunning capacity (kg/hour)	0
Fish gutting capacity (fish/hour)	0
Cold store capacity (m^3)	0
Deep-freezing capacity (m^3)	0
Own fish restaurant – total area (m^2)	0
Total produced eggs (No/yr.)	0.0
Total produced feeding larvae (No/yr.)	0.0
Total produced advanced fry (No/yr.)	0.0
Total produced fingerling (No/yr.)	0.0
59**Total produced fingerling (MT/yr.)**	0.0
Total produced larger fish (MT/yr.)	580.0
Total produced/kept future brood fish (No/yr.)	3 000.0
Total produced/kept brood fish (No/yr.)	20 300.0
Total produced fish (MT/yr.)	**580.0**
Produced large fish (kg/m^3)	**56.9**
Produced all size of fish (kg/m^3)	**56.9**


River Unac


Inlet canal with 4 m^3/sec water transferring capacity


Tanks with total volume of 10 000 m^3


Matured graylings


Outlet channel of tanks


Water outlet of the farm

Culture system of case study 6	Tank
Type of organization/enterprise	LTD
Year of establishment	1981
Water basin	Black Sea
River Basin	Una
Group of produced fishes	Salmonids
Type of water source 1	Underground
Type of water source 2	Spring
Quality of supplied water	Excellent
Mode of water supply	By gravity
Volume of water used (m^3/yr.)	10 900 000
Mode of drainage	By gravity
Fish hatchery unit	Yes
Table fish rearing unit	Yes
No. of tanks or cages	20
Total water volume of tanks/cages (m^3)	180
Status of production	Even
Use of industrial fish feed (MT/yr.)	2.0
Name of industrial feed producer	Skretting
Fish feed store (m^2)	30.0
Administrative staff ? (No.)	0
Administrative staff ? (No.)	0
Technical management ? (No.)	1
Technical management ? (No.)	0
Veterinarian ? (No.)	0
Veterinarian ? (No.)	0
Full-time worker ? (No.)	8
Full-time worker ? (No.)	0
Part-time worker ? (No.)	0
Seasonal workers ? (No.)	0

Seasonal workers ? (No.)	0
Educational background of employees	Primary and secondary school
Total of employees (No.)	9
Total of full time workers (No.)	9
Total of part time workers (No.)	0
Total of seasonal workers (No.)	0
No. of vehicles	0
Total live fish carrying capacity of vehicles (MT)	0
Total live fish transporting tank capacity (m^3)	0
Total iced fish transporting capacity (m^3)	0
Total frozen fish transporting capacity (m^3)	0
Ice making capacity (kg/hour)	0
Fish stunning capacity (kg/hour)	0
Fish gutting capacity (fish/hour)	0
Cold store capacity (m^3)	0
Deep-freezing capacity (m^3)	0
Own fish restaurant – total area (m^2)	0
Total produced eggs (No/yr.)	9 600 000.0
Total produced feeding larvae (No/yr.)	7 820 000.0
Total produced advanced fry (No/yr.)	7 370 000.0
Total produced fingerling (No/yr.)	7 200 000.0
Total produced fingerling (MT/yr.)	66.0
Total produced larger fish (MT/yr.)	0.0
Total produced/kept future brood fish (No/yr.)	0.0
Total produced/kept brood fish (No/yr.)	0.0
Total produced fish (MT/yr.)	**73.4**
3 **Produced large fish (kg/m^3)**	**0.0**
Produced all size of fish (kg/m^3)	**403.6**

Spring of Klokot

A traditional trout hatchery

Hatchery tray covered with eggs

A hatchery tray with wooden frame

A hatchery jar full with eggs

Hatched fry

Disinfection of the tools in formalin

Brown trout broodfish

Water outlet of the hatchery

Culture system of case study 7	Cage
Type of organization/enterprise	LTD
Year of establishment	2003
Water basin	Adriatic Sea
River Basin	Neretva
Group of produced fishes	Salmonids
Type of water source 1	NR
Type of water source 2	NR
Quality of supplied water	NR
Mode of water supply	NR
Volume of water used (m^3/yr.)	NR
Mode of drainage	NR
Fish hatchery unit	Yes
Table fish rearing unit	Yes
No. of tanks or cages	84
Total water volume of tanks/cages (m^3)	10 125
Status of production	Increasing
Use of industrial fish feed (MT/yr.)	150.0
Name of industrial feed producer	Les Guessant
Fish feed store (m^2)	30.0
Administrative staff ? (No.)	0
Administrative staff ? (No.)	2
Technical management ? (No.)	0
Technical management ? (No.)	0
Veterinarian ? (No.)	1
Veterinarian ? (No.)	0
Full-time worker ? (No.)	7
Full-time worker ? (No.)	3
Part-time worker ? (No.)	0
Seasonal workers ? (No.)	3
Seasonal workers ? (No.)	2

Educational background of employees	Secondary school
Total of employees (No.)	18
Total of full time workers (No.)	13
Total of part time workers (No.)	0
Total of seasonal workers (No.)	5
No. of vehicles	2
Total live fish carrying capacity of vehicles (MT)	0
Total live fish transporting tank capacity (m^3)	1
Total iced fish transporting capacity (m^3)	4
Total frozen fish transporting capacity (m^3)	3
Ice making capacity (kg/hour)	10
Fish stunning capacity (kg/hour)	50
Fish gutting capacity (fish/hour)	400
Cold store capacity (m^3)	30
Deep-freezing capacity (m^3)	10
Own fish restaurant – total area (m^2)	0
Observations	NI
Total produced eggs (No/yr.)	1 688 000.0
Total produced feeding larvae (No/yr.)	0.0
Total produced advanced fry (No/yr.)	0.0
Total produced fingerling (No/yr.)	1 460 000.0
Total produced fingerling (MT/yr.)	14.0
Total produced larger fish (MT/yr.)	125.0
Total produced/kept future brood fish (No/yr.)	0.0
Total produced/kept brood fish (No/yr.)	2 470.0
Total produced fish (MT/yr.)	**139.0**
Produced large fish (kg/m^3)	**12.3**
Produced all size of fish (kg/m^3)	**13.7**

Cages on a water reservoir

The hatchery for supplying cages

“Homemade” hatchery trays

Hatchery jars, locally called “Zoug” jars

Hatchery jar made of "PET" bottle

A very simple hatchery jar

Rainbow trout eggs in the jar

Feeding fry in a concrete tank

Common carp in the cage

Culture system of case study 8	Cage
Type of organization/enterprise	LTD
Year of establishment	2013
Water basin	Adriatic Sea
River Basin	Neretva
Group of produced fishes	Salmonids
Type of water source 1	NR
Type of water source 2	NR
Quality of supplied water	NR
Mode of water supply	NR
Volume of water used (m^3/yr.)	NR
Mode of drainage	NR
Fish hatchery unit	Yes
Table fish rearing unit	Yes
No. of tanks or cages	30
Total water volume of tanks/cages (m3)	3 750
Status of production	Increasing
Use of industrial fish feed (MT/yr.)	10.0
Name of industrial feed producer	Skretting, Coppens
Fish feed store (m^2)	8.0
Administrative staff ? (No.)	0
Administrative staff ? (No.)	0
Technical management ? (No.)	0
Technical management ? (No.)	0
Veterinarian ? (No.)	0
Veterinarian ? (No.)	0
Full-time worker ? (No.)	2
Full-time worker ? (No.)	0
Part-time worker ? (No.)	0
Seasonal workers ? (No.)	0
Seasonal workers ? (No.)	0
Educational background of employees	Secondary school
Total of employees (No.)	2
Total of full time workers (No.)	2
Total of part time workers (No.)	0

Total of seasonal workers (No.)	0
No. of vehicles	1
Total live fish carrying capacity of vehicles (MT)	0
Total live fish transporting tank capacity (m^3)	0
Total iced fish transporting capacity (m^3)	1
Total frozen fish transporting capacity (m^3)	0
Ice making capacity (kg/hour)	0
Fish stunning capacity (kg/hour)	0
Fish gutting capacity (fish/hour)	0
Cold store capacity (m^3)	0
Deep-freezing capacity (m^3)	0
Own fish restaurant – total area (m^2)	0
Total produced eggs (No/yr.)	100 000.0
Total produced feeding larvae (No/yr.)	0.0
Total produced advanced fry (No/yr.)	0.0
Total produced fingerling (No/yr.)	85 000.0
Total produced fingerling (MT/yr.)	0.4
Total produced larger fish (MT/yr.)	20.0
Total produced/kept future brood fish (No/yr.)	0.0
Total produced/kept brood fish (No/yr.)	200.0
Total produced fish (MT/yr.)	**20.4**
Produced large fish (kg/m^3)	**5.3**
Produced all size of fish (kg/m^3)	**5.4**

Cages for fingerling and table fish production

The house of the owner and the staff with a hatchery at the left end of the building

Newly hatched fry in the hatchery

Feeding fry

Poultry houses at the farm

Rear varieties of hens and a fish transport tank behind