

CARP PRODUCTION IN SERVICE OF REINFORCEMENT OF SERBIAN AGRICULTURE

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ŠARANSKA PROIZVODNJA – U FUNKCIJI RAZVOJA (POLJO)PRIVREDE U SRBIJI

Apstrakt

Šaranska proizvodnja u svetu poslednjih 60 godina ima trend rasta. U prvoj deceniji 21. veka kreće se između 2,8 i 3,4 miliona tona. Proizvodnja u Srbiji se u poslednjoj deceniji kretala od 5 500 tona do preko 12 000 tona (mađi i konzuma). Sa proizvodnjom konzumnog šarana od blizu 1,3 kg (Marković et al. 2012) Srbija zauzima treću poziciju u proizvodnji šarana po glavi stanovnika u svetu, iza Češke Republike i Kine, odnosno na nivou Myanmara (Varadi 2010). Proizvodnja šarana sa pratećim vrstama (belim i sivim tolstolobikom, belim amurom i grabljivicama: somom, smuđom i štukom) se obavlja na oko 11 000 hektara, od ukupne površine od 14 000 hektara. Broj šaranskih ribnjaka je oko 85, od kojih 25 ribnjaka čine 85% ukupnih površina koje su u eksploataciji. Proizvodnja se obavlja u poluintenzivnom sistemu (preko 95% ukupno porizvedenog šarana), zasnovanom na kombinaciji prirodne i dodatne hrane: žitarica i koncentrovane hrane (ekstrudirane i peletirane). Nivo proizvodnje poslednjih 3 godine je dvostruko veći od proizvodnje od pre deset godina. Povećanje proizvodnje je najpre usledilo sa privatizacijom ribnjaka (2003. godine) i unapređenjem upravljanja ribnjacima, a potom, od 2005. godine sve češćom zamenom žitarica sa kompletnom – pre svega ekstrudiranom hranom.

Iako akvakultura u Srbiji, sa apsolutnom dominacijom proizvodnje šarana u njoj, danas predstavlja mali segment srpske (poljo)privrede, gde u prodaji i otkupu proizvoda poljoprivrede, šumarstva i akvakulture promet ribom u poslednjoj deceniji čini svega 1 – 1,5% (podaci RZS) potencijal za znatno veći doprinos šaranske proizvodnje u razvoju srpske (poljo)privrede je jako veliki.

Resursi kojima Srbija raspolaze u šaranskoj proizvodnji su:

- Tradicija duža od 100 godina u proizvodnji, a a što podrazumeva nasleđivanje ribarskog zanata radnika kroz generacije zaposlenih na ribnjacima.

-Proizvodne površine (oko 3 000 ha) koji su van funkcije, a čijom rekonstrukcijom bi se proizvodnja šarana mogla povećati za preko 25% (3 000 tona).

-Više desetina hiljada hektara (po nekim procenama i preko 100 000 ha) zaslanjenih, zamočvarenih, pašnjačkih i drugih površina slabe plodnosti koje se ne koriste za druge namene, na kojima bi se mogle izgraditi nove površine pod šaranskim ribnjacima, a čija bi se plodnost značajno unapredila nakon 2 do 3 decenija ribnjačkog korišćenja.

- Raspoloživa građevinska operativa i ljudska radna snaga za izgradnju, a potom za rad na ribnjaku i njegovo održavanje.

- Postojanje domaćih sirovina, prerađivačkih kapaciteta (nekoliko puta većih od trenutno korišćenih) za proizvodnju ekstrudirane hrane za šarana, kao i resursa za unapređivanje kvaliteta hrane za ribe, čime bi sadašnji izvoz žitarica mogao biti delom zamenjen hranom za ribe ili samom ribom.

- Mogućnost proizvodnje daleko veće količine kvalitetne mladi (larvi) šarana od sadašnje.

- Šaranski ribnjak predstavlja stanište ugroženih i retkih vrsta ptica i sisara, kao i resurs za: proizvodnju zooplanktona, gajenje ukrasnih i korisnih vodenih biljaka, lov, ribolov, ispašu ovaca i goveda, ugostiteljstvo i turizam...

- Ribnjak baziran na iskorišćavanju prirodne produkcije (zooplanktona i faune dna), predstavlja racionalni oblik korišćenja obnovljivih prirodnih resursa u procesu proizvodnje usklađene sa dobrobiti životinja, a čime se stvara ekološki „bio”ili „eko”proizvod - šaran, visoke hranljive vrednosti.

- Šaran je pogodan za unapređenje kvaliteta mesa, sa mogućnošću povećanja nivoa proteina, smanjenja nivoa masti, unapređenja kvaliteta masti u smislu povećanja sadržaja omega 3 masnih kiselina i poboljšavanja odnosa omega 3 i omega 6 masnih kiselina.

- Šaran se tradicionalno koristi u ishrani stanovništva u Srbiji, ali i više evropskih zemalja.

Da bi se navedeni resursi aktivirali neophodno je:

- Informisanje političara i ekonomista o značaju šaranskih ribnjaka za poboljšanje kvaliteta zemljišta slabe plodnosti i njihovog korišćenja za unapređenje kvaliteta zahvaćenih voda.

- Podsticanje relevantnih institucija za uvođenje stimulativnih i podsticajnih mera za izgradnju ribnjaka, gajenje šarana, njegovu preradu i konzumiranje.

- Izrada strategije razvoja ribarstva (akvakulture) za duži vremenski period.

-Stalno jačanje istraživačkih resursa (materijalnih i ljudskih) i podsticanje istraživačkih programa sa ciljem unapređivanja proizvodnje i kvaliteta ribljeg mesa.

- Podsticanje proizvodnje i izvoza ekstrudirane hrane za ribe, ribe i proizvoda od ribe (šarana) umesto sadašnjeg izvoza žitarica.

- Promovisanje značaja šaranskih ribnjaka kao staništa brojnih zaštićenih biljnih i životinjskih vrsta.

- Stalno unapređenje saradnje i stvaranje mreža između naučnih institucija i proizvođača šarana u zemlji i sa drugim institucijama u Evropi i svetu.

-Promocija šaranskih ribnjaka kao zanimljivih destinacija za odmor od svakodnevnog stresnog života savremenog čoveka nastanjenog u gradovima i rekreaciju (veslanje, ribolov, lov, šetnju, posmatranje ptica...) usklađenu sa prirodnim okruženjem.

- Stvaranje atraktivnih prehrambenih artikala, što bližih tanjiru (kroz jačanje prerađivačke industrije), uz isticanje nutritivnih vrednosti šarana.

- Unapređenje načina plasmana riba, umesto živog šarana ponuda čitavog spektra primamljivih polupreradjevina i preradjevina od šarana.
- Kontinuirana promocija i reklamiranje kvaliteta ribljeg mesa (sa težištem na domaći proizvod – šarana) i njegovog korišćenja u preventivnoj svrsi od niza bolesti (kardiovaskularnih, kancerogenih, dijabetisa) kao i u pravilnom razvoju dece i omladine.
- Organizovan nastup srpskih proizvođača šarana na sajmovima i u pregovorima sa potencijalnim kupcima (velikim trgovačkim lancima prodajnih objekata)
- Isticanje „bio” i „eko” prednosti mesa šarana u odnosu na brojne konkurentske proizvode

Ključne reči: proizvodnja šarana, akvakultura Srbija

Key words: carp production, aquaculture, Serbia

INTRODUCTION

In the past 60 years carp production in the world has an increasing trend. In the first decade of the 21st century carp production varied from 2.8 and 3.4 millions of tons. The share of European carp production in the total world production also varies: in 1990 it was 402 000 t and represented 35% of the total world production; 7 years later due to political changes in Eastern Europe, 125 274 t carp produced represented only 5% of the total world production (FAO, 2013).

In Serbia carp production in the past decade increased from 5 500 t to over 12 000 tons, 70 % of this production is consumable size carp (Markovic et al. 2012). With the production of 1.6 kg (fry and consumable size) per capita, i.e. 1.3 kg consumable size per capita in the last couple of years, Serbia occupies a relatively high position, after the Czech Republic, China, at the level of Myanmar (Varadi, 2010).

From the total surface area under warmwater fish farms of 14 000 hectares, carp and accompanying species (white bighead and gray bighead, white grass carp and predators: wells/catfish, pikeperch, and northern pike) production is practiced on 11 000 hectares. Biggest part of these farms, approx. 97% is located in the Northern Serbian province Vojvodina. Number of carp farms in Serbia is 85, but 25 of them occupy 85% of the total area under exploitation. Among the 25, 6 farms make use of over 500 ha each.

Serbian carp production technology is predominantly, over 95%, semi-intensive, based on combination of natural food and supplemental one: cereals and compound feed (extruded and pelleted). In the past three years the level of production has doubled compared to the level 10 years ago. Production increase started with farm privatization and farm management improvement in 2003, and after that from 2005 with increased replacement of cereals with compound feed, primarily extruded.

There is an absolute dominance of carp production in Serbian aquaculture, representing a small segment of Serbian agriculture today: in the total turnover (sale and purchase) of agricultural production, forestry and aquaculture, the income from fish culture in the last decade is only 1 – 1.5 % (data of the Statistical Office of the Republic of Serbia). Despite this fact there is a great potential for significantly higher contribution of carp production in Serbian agriculture.

RESOURCES FOR INCREASED CONTRIBUTION OF CARP PRODUCTION IN AGRICULTURE DEVELOPMENT IN SERBIA

Beginnings of carp culture in Serbia are related to White Lake regulation and the year 1894 when „Ečka” fish farm started operating, being, even today, the biggest farm in Serbia. This shows that there is a certain tradition in this species culture, including inheritance of the fishing craft through generations of workers on the farms.

From the total surface area under carp farms – approximately 14 000 ha, some 3 000 ha is out of function. By reconstructing these areas the actual carp and accompanying species production could be increased for over 25% (more than 3000 t).

Carp farms are mostly built on saline, swamp/wetland, grassland and other areas of low fertility. Today there are several tens of thousands hectares (some estimate over 100 000 ha) of such unexploited areas located in the vicinity of water currents: rivers and canals (primarily in Banat). There, new surface areas under carp farms could be built.

In the period of financial crisis lasting in Serbia already for 15 years and the lack of big investments and larger constructions, the existing construction machines (dredge, bulldozer, backhoe...) are mostly out of order. By reconstructing the existing ones and building new farms, the mentioned construction machinery could be put in function, and their operators employed.

According to the data from the National employment service in Serbia 765 000 people are unemployed. Different trade unions estimate this number is over 1 million. The level of unemployment in Banat that has a biggest potential in available space for farm building, according to the National Statistical Office, in 2007 was 78 509, pointing out that there is available work force in these areas. This could create conditions for population retention in rural areas.

Serbia is a big producer of crop cereals that are used directly as added feed for carp or as a component in feed mixtures. As an example in 2011, 6 480 thousand tons of corn, and 2 076 thousand tons of wheat were produced, from Serbia 1 500 thousand tons of corn and over 250 thousand tons of wheat were exported (data from the Statistical Office of the Republic of Serbia). Bearing in mind the fact that a big producer of soy concentrates (that could replace imported fish meal in carp feed) exists in Serbia, this is Sojaprotein from Bečej, its production capacity being about 70 thousand tons per year, as well as the fact that extruded carp feed is produced by 4 animal feed companies (Veterinarski zavod Subotica from Subotice, DTD Ribarstvo – Bački Jarak, Komponenta from Čuprija, and Eco Feed from Sečanj) with the total capacity of over 40 thousand tons, there is a clear potential in resources of processing industry for carp extruded feed production. To the mentioned production and resources in raw material another one – the research resource existing at the Faculty of Agriculture in Belgrade should be added. In the Laboratory for fish nutrition and in the center for Fishery and Applied Hydrobiology, CEFAH, research is carried out in order to improve feed quality for carp.

In Serbia there are 4 industrial hatcheries, as well as one experimental, with production capacity for carp fry, able to meet the needs of the major part of European cyprinid aquaculture. In addition it should be mentioned that from 6 years ago at the Experimental hatchery of the CEFAH of the University of Belgrade Faculty of Agriculture, a carp breeding program is established (Spasić et al. 2010), and an improved carp production based on quality fry is expected in 5 years.

An important segment of carp production is the fact that carp ponds are sedimentation units for water from surrounding canals and rivers that supply the ponds. By

sedimentation of particles (inorganic and bioeston) that are reaching the pond, as well as sedimentation of uneaten feed and feces of the fish that is decomposing, the barren land areas after a certain period of exploitation as carp farms, become fertile and usable for field crops cultivation.

Carp farms are not only objects for warmwater fish cultivation; they are also a habitat for many rare and endangered species of birds and mammals, thus representing a resource and wealth for the whole country.

Semiintensive carp production, based on natural food (zooplankton and bottom fauna) exploitation, supplemented with cereals or concentrated feed represents a rational form of use of the renewable resource and energy source for the production process. Thus an "eco" or "bio" product of high nutritional value is created.

Carp farms are additional production and service resources: for zooplankton production, for ornamental and useful macrophytes, for angling and hunting, for sheep and cow grazing, for catering and tourism.

Carp is a species cultured in its natural environment and both extensive and semiintensive production technologies are in agreement with the principles of animal welfare. As such this type of production represents an advantage compared to other fish species cultured in intensive systems with high stocking density and almost permanent stress conditions, which is reflected on fish flesh quality in human diet.

Carp meat quality can be additionally improved by the increase of protein level, decrease of lipids level, improvement of lipid quality such as increase of omega 3 content and better omega 3 : omega 6 ratio (Marković et al. 2012; Trbović et al. 2012).

Carp is traditionally used in human nutrition in Serbia. Actually Serbia is the unique country where carp is bought in important quantities for family celebrations. Carp is traditionally consumed in several European countries, especially for Christmas Eve, Good Friday or other holidays. European Union has a deficit of fish on its own market of about 1 550 000 tons (Varadi et al, 2010), therefore there is room for carp placement, primarily processed (such as smoked carp).

ACTIVATION OF RESOURCES IN ORDER TO INCREASE CONTRIBUTION TO DEVELOPMENT OF SERBIAN AGRICULTURE

In order to activate mentioned resources it is necessary to:

- Inform politicians and economists about the importance of carp farms for remediation of barren land and their use for improvement of quality of water resources used.
- Encourage relevant institutions to introduce stimulating measures and promote farm building, carp production, its processing and consumption
- Create the Strategy for aquaculture development for a longer period of time
- Permanently reinforce scientific resources (material and human) and encourage research programs aimed to production and fish meat quality improvement
- Incentive for production and export of extruded fish feed, fish and fish products instead of export of cereal crops
- Promote the importance of carp farms as habitat for various protected plant and animal species
- Permanently improve cooperation and networking between research institutions and carp producers in the country as well as with other institutions in Europe and the world.

- Promote carp farms as interesting destinations for retreat from everyday stress of the modern urban populations, and possibilities of recreation (rowing, angling, hunting, walking, bird watching etc...) in harmony with natural environment.
- Create attractive food products through reinforcement of the processing industry, with emphasis of the nutritive value of carp meat.
- Improve placement of fish, instead of live carp, offer attractive semi cooked and processed carp.
- Continuously promote and advertize fish meat quality with emphasis on carp as domestic product and its use in prevention of diseases (cardiovascular, cancer, diabetes) as well as child and youth development
- Organize appearance of Serbian carp producers on fairs and negotiations with potential customers (retail chains)
- Highlight "bio" and "eco" advantages of carp flesh compared to other products

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REFERENCES

FAO (2008-2009): National Aquaculture Sector Overview. Serbia. Text by Marković, Z.; Poleksić, V. In: *FAO Fisheries and Aquaculture Department* [online]. Rome. Updated 1 June 2008. http://www.fao.org/fishery/countrysector/naso_serbia/en.

FAO (2013): Cultured Aquatic Species Information Programme *Cyprinus carpio* (Linnaeus, 1758) - http://www.fao.org/fishery/culturedspecies/Cyprinus_carpio/en.

Marković, Z., Stanković, M., Živić, I., Trbojević, D., Dulić, Z., Rašković, B., Poleksić, V. (2012): Improvement of carp feeding technology – a reason for increase of carp (*Cyprinus carpio* L.) production and a chance for increase of carp consumption in Serbia. AQUA 2012, Prague, Czech Republic, Sep 1-5 2012, Abstracts p. 675.

Varadi L. (2010): Carp culture in the European Union – Why? International Carp Conference, 28 – 29 July, Berlin, Germany.

Varadi, L., Bekefi, E., Gyalog G., Harache Y., Lane, A., Lengyel, P. (2010): Regional Review on Aquaculture Development in Europe. Aquaculture 2010, Global Conference. Phuket, Thailand. Conference Handbook, 15 – 17;

Spasić, M., Poleksić, V., Stanković, M., Dulić, Z., Rašković, B., Živić, I., Vukojević, D., Bošković, D., Ćirić, M., Relić, R., Marković, Z. (2010): Selekcija familija - program unapređenja proizvodnih osobina kod šarana (*Cyprinus carpio* L.) u Srbiji. I Međunarodni simpozijum ribarstva i ribolovnog turizma "BH-FISH 2010". 23. – 24. jun 2010. godine, Centar za ribarstvo "Neretva" Konjic, Boračko jezero, Bosna i Hercegovina. Zbornik radova, str. 157 – 164.

Trbović, K. D., Vranić, V. D., Spirić, M. D., Petronijević B. R., Zivić, M.I. , Spirić, A. T., Marković Z. Z. (2012): Effect of diet on lipid content and fatty acid profile of common carp (*Cyprinus carpio* L.). 6th Central European Congress on Food, CEFood 2012., 1530-1534.