



CONSUMER KNOWLEDGE AND PERCEPTION ABOUT FRESH FISH FROM ORGANIC FARMING IN CROATIA

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ARTICLE INFO

Received: 12 July 2021

Accepted: 8 November 2021

Keywords:

fresh fish
organic fish farming
consumers
survey

ABSTRACT

Along with growing consumer awareness about the impact of food on health, there is a trend towards increasing fresh fish consumption. At the same time, the demand for organic food is increasing in the modern market. Although fruits, vegetables and nuts have the biggest share in the organic food market in Europe, the aquaculture production of organic fish is also growing. Therefore, the main aim of this study is to explore the knowledge and perception of Croatian consumers about fresh fish from organic farming. An online and face-to-face survey was conducted on a sample of 303 respondents. Data analysis (univariate and bivariate) was performed using SPSS Statistics for Windows. Most consumers have medium and low subjective knowledge about fresh fish from organic farming, and objective knowledge about fresh fish from organic farming is low. Only half of the consumers are aware that they can buy fresh fish from organic farming in the domestic market. Half of the consumers have already consumed fresh organic fish, and half are willing to pay a higher price for fresh fish from organic farming. Compared to fresh fish from conventional farming, respondents consider fresh organic fish to be healthier, tastier and to have less fat, but also more expensive and less available.

How to Cite

Ferfolja, M., Cerjak, M., Matulić, D., Tomić Maksan, M. (2022). Consumer knowledge and perception about fresh fish from organic farming in Croatia. *Croatian Journal of Fisheries*, 80, 7-16. 1. DOI: 10.2478/cjf-2022-0002.

INTRODUCTION

The massive promotion of physical activity and the increase in the consumption of fresh and varied foods are evidence of the population's shift towards a healthier lifestyle. In recent years, consumers have begun to understand that food choices have an important impact on their health (Franz and Nowak, 2010; Faletar et al., 2016) and, accordingly, are increasingly interested in the foods they eat (Franz and Nowak, 2010; Lalor et al., 2011).

Many previous studies have shown that consuming fish at least twice a week has a beneficial effect on human health (Pieniak et al., 2007; Eurofish, 2017). Particular emphasis should be placed on the consumption of fresh fish, as it contains the most minerals and omega-3 fatty acids (Oken et al., 2012). The term "fresh fish" refers to fish that has not been frozen and has only been in a refrigerated state from the time it was caught until it was released to the market and the consumer (Tomić et al., 2016).

As reported by FAO (2020), the total consumption of edible fish has increased substantially over the past 60 years and is expected to continue to increase, but at a rate of growth that will slow over time. Although seafood consumption in Europe is relatively stable (around 26 kg per capita, EUMOFA, 2017), seafood consumption among Croatian consumers is not satisfactory and is far below the European average (Tomić et al., 2016).

However, according to the results of the survey conducted by Eurofish (2017) among 1 001 Croatian consumers, most of them eat fish (87%). A very high percentage of people consuming fish was recorded in Istria and coastal regions (97%), while this percentage was lower in the continental regions of northern and central Croatia (78% and 82%, respectively). A smaller proportion of consumers (13%) do not consume fish at all, mainly because they do not like the taste of fish or do not have the habit of eating fish. However, the research by Eurofish (2017) shows the frequency of consumption, but not the total amount of fish consumed in Croatia. According to the Eurofish (2017) survey, the price also prevents more frequent fish consumption among Croatian consumers. The same survey found that Croatian consumers consume mostly fresh fish, on average 0.4 kg per person per meal. They usually consume it once a week at home. When given a choice between the wild-caught and farmed fish, and marine and freshwater fish, most Croatian consumers prefer wild-caught marine fish. The most important factors that would motivate consumers to buy farmed fish are the lower price, better visibility of origin and better quality.

Although most consumers prefer wild-caught fish, research has shown that there are consumer groups who are more familiar with the differences between wild-caught and farmed fish, or who like wild-caught fish significantly more than other consumers. For example,

women, consumers with higher incomes and those who grew up on the coast of Croatia find it easier to identify the differences when eating wild-caught and farmed fish. Older consumers, the physically active and those who grew up on the coast prefer wild-caught fish. In addition, consumers who eat and prepare fish more frequently also prefer wild-caught fish over farmed fish (Tomić et al., 2017).

Another growing trend in science and among the public is organic farming, as increased environmental awareness and health concerns have led to the increasing demand for organic foods. In the European Union (EU), organically produced food must meet predefined standards in order to be labelled and sold as 'organic'. Council Regulation (EC) No 834/2007 (EU, 2007a) provides the legal framework for the production, processing, labelling and control of organic products. According to the EU definition (2007b), organic production is an overall system of farm management and food production that includes best environmental practices, a high level of biodiversity, the conservation of natural resources, the application of high animal welfare standards, and a production method that meets consumer preference for products made using natural substances and processes.

Organic aquaculture products are relatively new to the food market compared to other organic foods (Feucht and Zander, 2014), but they are experiencing remarkable growth. Organic aquaculture production has nearly doubled since 2014, although it is still small in volume at the global level. Organic aquaculture still accounts for about 0.5% of the total volume of global aquaculture (Gambelli et al., 2019).

Organic aquaculture is a holistic method of rearing fish and other marine animals according to ecological principles. The initial legislative framework for organic aquaculture in the European Union (EU) was established by Directive (EEC) 2092/91, which has recently been replaced by Directives (EC) 834/07, (EC) 889/08 and (EC) 710/2009 (EU 1991, 2007a, 2007b, 2008, 2009). At the same time, the 'FAO Guidelines for the Production, Processing, Labelling and Marketing of Organically Grown Food' and the Codex Alimentarius guidelines (FAO/WHO 2001) were formulated, as well as general principles for organic production and processing by IFOAM (IFOAM 2007). In addition, Nicolae et al. (2018) reviewed the literature and legal resources related to organic aquaculture production and the legislation applicable to organic aquaculture food. Fish nutrition is considered the most important aspect that distinguishes organic aquaculture from conventional aquaculture (Sicuro, 2019). A summary of the main concerns arising from nutrition in organic aquaculture was presented by Mente et al. (2011).

Organic aquaculture is the answer to the urgent consumer demand for better quality seafood and sustainable use of marine resources (Subasinghe et al., 2009; Turchini et al., 2009; Tusche et al., 2011). Previous studies have shown

that consumers have a preference for eco-labelled fish and seafood (e.g. Brécard et al., 2009; Uchida et al., 2013) and are willing to pay a price premium for eco-labelled fish products (Asche et al., 2013; Sogn-Grundvåg et al., 2014). Positive consumer behaviour towards organic aquaculture products can also have a very positive impact on the cultivation of such seafood (Richter, 2017). In the major EU countries - Germany, Spain, France, Italy and the UK - 46,500 tonnes of unprocessed fishery and aquaculture products consumed in 2019 were organically produced (EUMOFA, 2020).

Although consumer perceptions are “the key factor that policymakers should consider when setting the regulatory framework for organic aquaculture” (Lembo et al., 2018), little attention has been paid to consumer knowledge and perceptions of organic aquaculture (Schlag and Ystgaard 2013). Furthermore, a recent study by Gambelli et al., (2019) found that consumer knowledge about sustainability in aquaculture production was low and that lack of knowledge about organic aquaculture (27%) and unavailability of organic aquaculture feed (24%) were reported as the main reasons preventing the purchase of organic aquaculture products.

Another, commonly reported issue is the lack of adequate consumer knowledge about organic aquaculture standards and confusion between organic and environmental/sustainable standards in general (Schlag and Ystgaard, 2013). Few studies have been conducted with the aim of investigating consumer preferences and willingness to pay for eco-labels for farmed fish (Ankamah-Yeboah et al., 2019).

To date, several studies have been conducted in Croatia on consumer behaviour regarding fish consumption (Tomić et al., 2016; Eurofish, 2017; Tomić et al., 2017). However, consumer knowledge and perceptions of fresh organic fish have been mostly studied in developed countries, while studies on organic fish in developing countries are still in their infancy. Therefore, Croatia as a developing European country (International Monetary Fund, 2018) is an ideal choice for the topic of organic aquaculture.

The main objective of this study is to investigate objective knowledge (how much a person actually knows about a product), subjective knowledge (how much a person believes he/she knows about a product) and the perception of Croatian consumers about fresh fish from organic farming, and to determine their willingness to pay more for fresh fish from organic farming.

MATERIALS AND METHODS

Survey

The survey was conducted with a sample of 303 respondents using a mixed-mode approach. Namely, 203 respondents (70%) participated in an online survey and 100 respondents (30%) were interviewed in person.

The link to the online survey was posted on a social networking site (Facebook) and was also provided to the sample of respondents via email. The Google Forms tool was used to create the online survey. An in-person survey was conducted in the capital (Zagreb) at three fish markets (convenience sample). The survey was conducted between January 2019 and May 2019.

The survey consisted of the following parts: (1) fresh fish consumption and purchasing behaviour; (2) knowledge (subjective and objective) about fresh fish from organic farming; (3) consumption and purchasing behaviour of fresh fish from organic farming; (4) perception of fresh fish from organic farming and fresh fish from conventional farming; and (5) sociodemographic characteristics (gender, age, education, employment status, individual monthly income, place of residence).

Data analysis

All data analyses were performed using SPSS Statistics for Windows, version 21. Univariate statistics (frequencies and descriptive statistics) were used to describe the sample and analyse fish consumption and purchasing behaviour, consumer subjective and objective knowledge about fresh fish from organic farming, and perceptions of fresh fish from organic and fresh fish from conventional farming. Bivariate statistics (ANOVA test) were used to test the influence of sociodemographic characteristics on consumer perception of fresh fish from organic farming.

RESULTS AND DISCUSSION

Sample description

Sociodemographic characteristics of the sample are shown in Table 1.

Most of the respondents (42.9%) like to consume fresh fish and 37.3% even like it very much (Figure 1). Only 4.60% of the respondents do not like to eat fresh fish at all. These results are in line with the Eurofish (2017) survey of Croatian consumers.

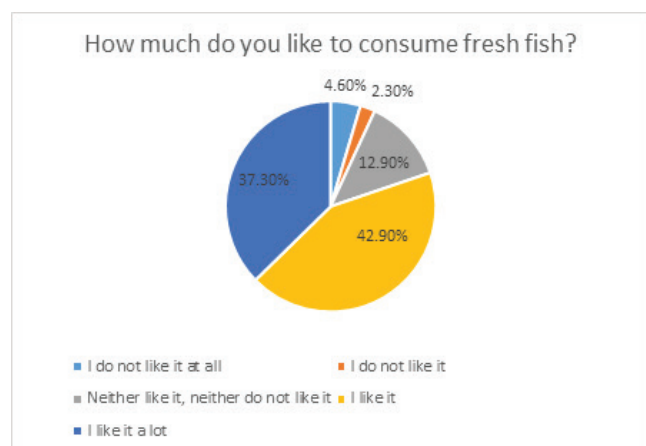


Fig 1. Fresh fish consumption

Table 1. Sociodemographic characteristics of the sample (n=303)

		N	%			N	%
Gender	Male	91	30.4	Residence	Continental Croatia	277	91.4
	Female	211	69.6		Coastal Croatia	26	8.6
Age	<20	6	2.0	Employment status	Unemployed	12	4
	20-25	88	29.0		Employed	175	57.8
	26-35	73	24.1		Student	87	28.7
	36-45	43	14.2		Housewife	2	0.7
	46-55	56	18.5		Entrepreneur	9	3
	56-65	24	7.9		Retired	18	5.9
	>65	13	4.3		HRK <4 000	117	38.6
	Elementary school	8	2.6		HRK 4 001-6 000	90	29.7
Education	High school	107	35.3	Individual monthly income*	HRK 6 001-8 000	18	15.8
	University	140	46.2		HRK 8001-10 000	28	9.2
	Master's Degree	48	15.8		HRK >10 000	20	6.6

*1 HRK = ca. 0.13 EUR

Table 2. Fresh fish consumption and purchasing behaviour

		N	%
How often do you buy fresh fish?	Several times a week	7	2.3
	Once a week	69	22.8
	2-3 times per month	64	21.1
	Once a month	36	11.9
	Once in two months	18	5.9
	Few times a year	59	19.5
	Less than a few times a year	22	7.3
	I do not buy fresh fish	28	9.20
How often do you consume fresh fish?	Few times a week	7	2.5
	Once a week	82	29.8
	2-3 times per month	78	28.4
	Once a month	31	11.3
	Once in two months	17	6.2
	Few times a year	44	16.0
Where do you buy fresh fish?	Less than a few times a year	15	5.5
	I do not consume fresh fish	1	0.4
	At fish market	107	59.8
	At the store/in the supermarket	58	32.4
	Directly from fishermen	10	5.6
	I catch fish	2	1.1
How much fresh fish did you eat during childhood compared to today?	Someone else catches fish	2	1.1
	More than today	90	32.8
	Same as today	70	25.5
	Less than today	94	34.3
	I do not know	9	3.3
	I didn't eat fresh fish during childhood	11	4.0

Moreover, most of the respondents buy fresh fish once a week (22.8%) or 2-3 times a month (21.1%), and only 2.3% of the respondents buy fresh fish several times a week. Most respondents consume fresh fish once a week (29.8%), which is consistent with their frequency of purchase. These results are consistent with the data from Eurofish (2017), according to which Croatian consumers mostly eat fish once a week. Most respondents buy fresh fish at the fish market (59.8%), while 32.4% of respondents buy fresh fish at the market and supermarkets. This is in line with a previous study by Eurofish (2017) that 65% of consumers buy fishery products from fish markets.

Comparing the amount of fresh fish that respondents consumed in their childhood with the amount of fresh fish they consume today, most respondents (34.3%) answered that they consumed less fresh fish in their childhood than they do today (Table 2).

Consumer knowledge about fresh fish from organic farming

Respondents rated their knowledge of fresh organic fish as low (37%) and very low (19%). 39% of the respondents rated their knowledge as medium (39%), while only 5% of the respondents thought they had high or very high knowledge about fresh fish from organic farming (Figure 2). Previous studies have found that consumers were mostly unfamiliar with aquaculture in general (Gutierrez and Thornton, 2014; Feucht and Zander, 2015; Zander et al., 2018).

When asked if they knew what fresh fish from organic farming was, only 37% of respondents answered positively. In an open-ended question, these respondents explained their interpretation of fresh fish from organic farming. The responses were classified into seven categories (Table 3). Most respondents indicated that organic fresh fish is fish that has been farmed in compliance with environmental standards (48.1%). One-fifth of the respondents (19.5%) indicated that the diet of the fish is different from conventionally farmed fresh fish, indicating that organic farming does not use GMO feeds and the fish is fed

with organic feed. In addition, 20.8% of respondents indicated that organic fresh fish is raised under controlled conditions that closely resemble their natural habitat and diet. The answers, divided into categories, describe certain elements of organic fish farming, but the actual definition of organic aquaculture is much more complex and includes a whole range of the regulations and laws already mentioned.

The objective knowledge of the respondents was measured by four statements, of which only one was correct (*"The use of hormones is not allowed in organic fish production"*). Only half of the respondents stated that the statement *"Fish from organic and fish from conventional farming do not need to be physically separated"* is false. Only 68.3% of the respondents believe that the claim *"The use of hormones is not allowed in organic fish farming"* is true (Table 4).

The results obtained indicate a low level of objective knowledge about fresh fish from organic farming. Similarly, a recent study by Ankamah-Yeboah et al. (2019) found that the majority of German consumers have low knowledge about European organic aquaculture production. The low level of knowledge could be due to insufficient consumer education and promotion of organic fish. In addition, the relatively limited supply on the domestic market did not encourage consumers to become curious and learn more about fresh organic fish.

Consumer behaviour in consumption and purchase of fresh fish from organic farming

The survey results show that 55.1% of the respondents know that they can buy fresh fish from organic farming at the local market, and 44.9% are not aware of the offer. Fresh fish from organic farming in Croatia can be found only in specialized fish markets and in larger supermarkets. Most of the respondents are not sure if they have ever tried fresh fish from organic farming (49.2%). Almost 30% of respondents have tried fresh fish from organic farming before, and 22.1% have never consumed fresh fish from organic farming (Figure 2).

Table 3. Respondents' definition of fresh fish from organic farming (subjective knowledge)

Definition	N	%
Fish farmed according to environmental standards	37	48.1
Fish farmed under controlled conditions that most closely resemble their natural habitat and diet in all segments	16	20.8
Fish fed with organic/non-GMO feed	15	19.5
Fish farmed in ponds	3	3.9
Fish reared in sea cages	3	3.9
Wild-caught fish that lived in their natural environment	2	2.6
Fish raised without the use of pesticides	1	1.3

Table 4. The objective knowledge about fresh fish from organic farming

Claim	True/false	% of correct answers
Fish from organic and fish from conventional farming do not need to be physically separated	False	54.5
Genetically modified food may be used to feed organically farmed fish	False	77.2
The use of hormones is not allowed in organic fish production	True	68.3
In organic aquaculture, 100% of non-organic, conventional fish feed and fish oil can be used	False	64.0

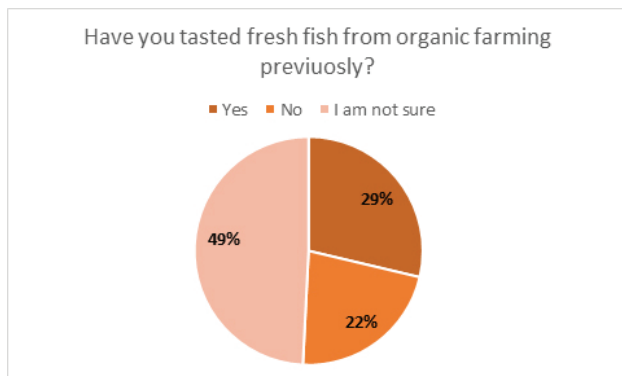


Fig 2. Previous experience with consumption of fresh fish from organic farming

As many as 45.9% of respondents were willing to pay a higher price for fresh organic fish than for conventionally farmed fish. Another 38% were not sure and 16.2% of respondents said they were not willing to pay a higher price (Figure 3). Although the highest proportion of respondents were willing to pay a higher price, these results are far below those of previous studies where more than 90% of respondents were willing to pay a higher price for organically farmed fish (Budak et al., 2006). Emphasizing the benefits of producing and eating organically farmed fresh fish could help to increase willingness to pay a higher price for organically farmed fish.

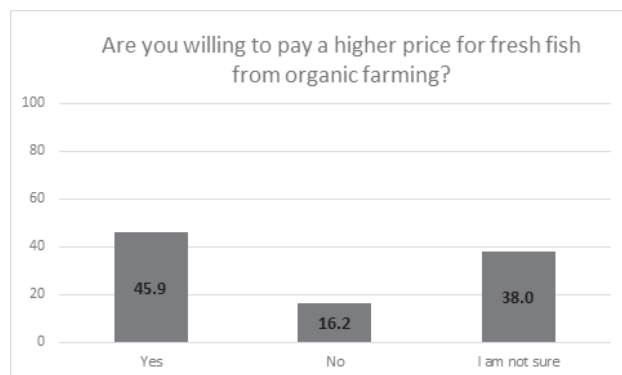


Fig 3. Willingness to pay a higher price for fresh fish from organic farming %

The price of organically produced fish on the Croatian market is about 30% higher than the price of conventionally farmed fish. However, most of the respondents who are willing to pay a higher price are willing to pay between 11-20% more for organically farmed fresh fish (44.6%), followed by those who would pay up to 10% more (31.7%) and those who would pay between 21-30% more (15.8%). Only 7.9% of the respondents are willing to pay a premium of more than 30% for fresh fish from organic farms (Table 5). These results are consistent with the study published by Ankamah-Yeboah et al. (2016) who found that consumers are willing to pay a price premium of about 20% for organic salmon in Denmark, and with the study by Asche et al. (2015) who found an acceptable premium of about 25% for organic salmon in the UK, while Norwegian consumers are willing to pay a 15% higher price for organic salmon (Olesen et al., 2010). The proportion of consumers willing to pay for healthy and environmentally friendly organic fresh fish shows the market potential of organic fresh fish. However, in order to exploit this potential, it is necessary to diversify the supply, but also to improve the accessibility of the products.

Table 5. Willingness to pay a premium price for organically farmed fresh fish

Price premium	N	%
Up to 10%	44	31.7
11 to 20%	62	44.6
21 to 30%	22	15.8
More than 30%	11	7.9

Consumer perception of fresh fish from conventional farming vs. fresh fish from organic farming

Consumers were asked to rate organically farmed fish compared to conventionally farmed fish on various aspects using a semantic differential ranging from -3 (negative attributes) to 3 (positive attributes). As can be seen in Figure 4, respondents have a more positive perception of organically farmed fish than conventionally

farmed fish. Although fish from both types of production is perceived as healthy and tasty, this perception is stronger for fresh organic fish. It was also found that respondents value the healthier aspect of fresh organic fish more than the taste compared to conventional fish. Since the fat content of food is not appreciated by most of the contemporary consumers, the respondents rated fresh organic fish as less fat than conventional fresh fish, although they also did not perceive conventional fresh fish as fat. Colombo and Mazal (2020) studied six types of salmon and found that there was no difference in the fat content between organic and non-organic salmon and between sustainably certified and non-certified salmon. However, they also emphasized that the most important determinant of protein and fat content in salmon fillets is the type of salmon (basically the species), which can also be strongly influenced by diet. Respondents believe that fresh organic fish is more expensive and less available than conventionally farmed fish. The most significant difference is in the perception of the impact of fish farming on the environment. Respondents believe that fresh fish from organic farming has a positive impact on the environment, but they also believe that fresh fish from conventional farming has a negative impact on the environment.

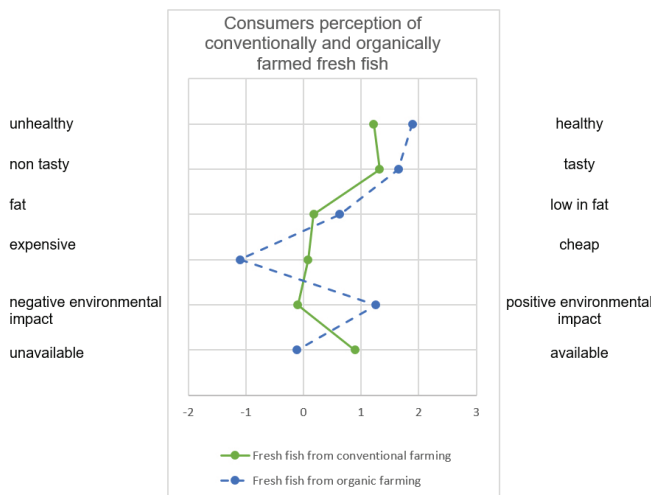


Fig 4. Consumer perception of conventionally and organically farmed fresh fish

The impact of sociodemographic characteristics on consumer perceptions of fresh fish from organic farming

The results of the ANOVA test showed that some sociodemographic characteristics of the respondents influence the perception of fresh organic fish. According to the results, the perception of fresh fish from organic farming is influenced by gender, education level and age of the respondents.

Knowing that positive perception of a product influences consumption behaviour, our results can be very important for aquaculture as a sector/system of food production.

Female respondents are more likely to agree that fresh fish from organic farming is low in fat compared to male respondents, and they are also more likely to agree that fresh fish from organic farming has a positive impact on the environment ($p < 0.05$).

Respondents with higher education (master's degree and/or doctorate) considered fresh fish from organic farming to be tastier than respondents with lower education ($p < 0.05$). In addition, respondents with higher education (master's degree and/or doctorate) were more likely to think that fresh fish from organic farming has a positive impact on the environment ($p < 0.05$).

Respondents younger than 25 and older than 45 were more likely to think that fresh fish from organic farming is healthier and less greasy than respondents aged 26-45 ($p < 0.05$). In addition, respondents aged 26-45 were more neutral towards the environmental impacts of fresh fish, while those aged under 25 and those aged over 45 were more likely to think that fresh fish from organic farming has positive environmental impacts ($p < 0.05$).

Level of monthly income and occupational status were not statistically significantly related to consumer perceptions of fresh fish from organic farming ($p > 0.05$).

CONCLUSIONS

Research results have shown that Croatian consumers like to eat fresh fish. They usually buy and eat fresh fish once a week or two to three times a month. Most consumers buy fresh fish at fish markets and less often in shops and supermarkets.

In their childhood, about one-third of consumers ate less fresh fish than they do today. The reason for this could be the increasing emphasis on the importance of fish consumption for health, so this has probably influenced the change in consumer eating habits. However, it is also noted that about one-third of the respondents have reduced their fish consumption compared to their childhood.

The results of this study confirm that consumer knowledge about fresh organic fish is low. Both subjective and especially objective knowledge was found to be very low. The reason for this lack of knowledge is a very limited supply of fresh organic fish. Combined with the relatively high price of such products (which consumers are also aware of), consumer interest in organic fish is still very limited and low. These results show that consumer education is very important, especially by emphasizing the qualities that consumers value in fish as healthy food and in organic food.

Most respondents are not sure if they have ever tasted fresh fish from organic farming suggesting that even if they have tasted it, they did not know they were eating organic fish. Only half of the respondents know that it is possible to buy fresh organic fish at the local market. This finding is an urgent call to retailers and marketers of fresh organic fish to make an effort to offer and promote such

fish.

Although most respondents are willing to pay a higher price for fresh organic fish (46%), there is a high percentage of respondents who are unsure if they are willing to pay more (38%). The most accepted price premium for fresh organic fish is between 11-20%.

Fresh organically farmed fish is considered healthier, tastier and less fat than conventionally farmed fresh fish, and respondents also claim that it has a positive impact on the environment. In addition, respondents believe that fresh fish from organic farming is expensive and less available.

The results show that the perception of fresh fish from organic farming is influenced by gender, education and age. Females and respondents with higher education have a more positive perception of fresh fish from organic farming than males and respondents with lower education. Regarding age, respondents younger than 25 and older than 45 have a more positive perception towards organic fish than respondents aged between 25 and 45.

The limitations of this study are mainly related to the sample selection and the mixed-mode of data collection. Despite these limitations, the survey results may serve as a guide for policymakers, public health professionals and fish producers. The results of this study may encourage policymakers to educate consumers about fresh organic fish and its positive health and environmental impacts. Educating consumers is a priority because their knowledge about organic fish is low. Consumers need to fully understand the importance of the concept of organic farming and they should be aware that sustainability is a priority.

In addition, the results of this research could be used by public health professionals to improve people's nutrition and therefore their quality of life.

The results of this research are useful for producers of fresh organic fish because, as this study shows, consumer knowledge about this is quite low, but due to the seemingly positive attitude towards organic products in general, they also perceive organic fish positively. It is therefore up to producers to offer such fish, but also to promote it as much as possible and bring it as close as possible to consumers.

ZNANJE I PERCEPCIJA POTROŠAČA REPUBLIKE HRVATSKE O SVJEŽOJ RIBI IZ EKOLOŠKOG UZGOJA

SAŽETAK

S rastom svijesti potrošača o utjecaju hrane na zdravlje javlja se trend porasta konzumacije svježije ribe. Istovremeno na suvremenom tržištu raste potražnja za ekološkom hranom. Iako se u ekološkoj proizvodnji u Europi najviše uzgajaju voće, povrće i orašasti plodovi,

raste i proizvodnja ribe iz ekološkog uzgoja. Stoga je glavni cilj rada ispitati znanje hrvatskih potrošača i njihovu percepciju o svježoj ribi iz ekološkog uzgoja. Online i osobno anketno ispitivanje provedeno je na uzorku od 303 ispitanika. Analiza podataka (jednovarijatna i dvovarijatna) provedena je u statističkom programu SPSS. Većina potrošača ima srednje i nisko subjektivno znanje o svježoj ribi iz ekološkog uzgoja, dok je objektivno znanje o svježoj ribi iz ekološkog uzgoja nisko. Samo je polovica potrošača svjesna da mogu kupiti svježiju ribu iz ekološkog uzgoja na domaćem tržištu. Polovica potrošača je kušala ranije svježiju ribu iz ekološkog uzgoja, a polovica njih je spremna platiti veću cijenu za svježiju ribu iz ekološkog uzgoja. U odnosu na svježiju ribu iz konvencionalnog uzgoja, ispitanici smatraju svježiju ribu iz ekološkog uzgoja zdravijom, ukusnijom i manje masnom, ali skupljom i manje dostupnom.

Ključne riječi: svježa riba, ekološki uzgoj ribe, potrošači, anketa

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