

ATTITUDES OF SERBIAN PRODUCERS AND CONSUMERS OF TABLE EGGS ON THE BAN ON CONVENTIONAL BATTERIES AND THE TRANSITION TO ENRICHED CAGES AND ALTERNATIVE PRODUCTION SYSTEMS

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Abstract: The aim of the survey was to determine how the egg production sector is complying with animal welfare legislation, which requires a ban on conventional cages and the transition to permitted systems for rearing laying hens - enriched cages and alternative systems, as well as the attitudes of egg producers and consumers on the impact of permitted systems of egg production/purchase and hen welfare. The survey included producers (50), with 1000 and more hens, where in the sample, the percentage share of producers was according to the capacity - the size of the farm, i.e. similar to the share in the total egg production in Serbia. A consumer survey (261) established their views on the impact of the welfare of layers and the rearing system when buying eggs. According to the test results, it can be stated that: when switching to permitted rearing systems, enriched cages were the choice of all surveyed producers (100%) and that in the transition period from 2014 to autumn 2020, 16.3% of respondents switched from conventional cages to enriched ones (2.04% in full and 14.29% in part). According to the results obtained, 80.49% of them are planning to switch from a conventional cage system to another rearing system, of which 60.98% said they would do so if they had the financial means, while about 19% of producers believe they will be forced to leave production. All producers expect that the transition to enriched cages will lead to a reduction in their production, and 83.33% of them believe that it will be from 20 to 40%. Surveyed producers (87.18%) expect that the transition from conventional cages will increase production costs, and 65.11% believe that this will not affect

the welfare of layers. A survey of consumer attitudes found that when buying eggs, the production system was very important for 19.91% of consumers, and for 19.41% of consumers it was not important at all, while the welfare of layers was very important for 26.84% and not at all important for 10.32% of consumers. The conclusion of the research is that in Serbia the transition to permitted rearing systems is slow, that harmonization with legal regulations is a great challenge and that changes are expected in the coming period that may have far-reaching consequences for the sector of table egg production.

Key words: laying hens, welfare, rearing systems, consumer, eggs, survey, Serbia

Introduction

In recent decades, the egg production sector in Serbia has recorded a decline, i.e. a decrease in the number of laying hens, which according to data from 2019 is less by 11.11% compared to the 2008-2017 average, which can be related to the inability of producers to meet the new high requirements of regulations in Serbia, which are harmonized with EU regulations (Krnjajić, 2019). Adaptation to European standards (*Directive 1999/74/EC*) in Serbia is related to the Law on Animal Welfare which entered into force in Serbia in 2009 (*Official Gazette of the Republic of Serbia No. 41/2009*) and in 2010 the Rulebook on rearing conditions that must be met by breeders was adopted (hereinafter the Rulebook), which was amended in 2014 (*Official Gazette of the Republic of Serbia No. 6/10; Official Gazette of the Republic of Serbia No. 57/2014-27*). The legislation requires abandoning the conventional battery system and switching to permitted systems - enriched cages and alternative production systems, which requires high costs and large changes, and can be considered a danger to the egg production sector in Serbia. Research indicates that the implementation of legislation in Europe has been influenced by producers, traders, consumers, lawmakers, the media and general pressure by the public (Appleby, 2003; Frewer, 2005). Observed by country, waiting strategies and producer requirements for delay, in some countries, proved to be a poorer choice in relation to acceptance and faster adaptation to new conditions (*as cited in Rodić et al., 2014*). Taking into account how the process took place in EU countries and considering the persistence of decision makers, Rodić et al. (2014) indicate that it is not realistic that the rules for Serbia could be different.

In Serbia, the first deadline for the transition to permitted systems for rearing laying hens was in 2012, but it turned out that the given transitional period of two years was insufficient for the period of adaptation of producers, which led to amendments to the Rulebook, i.e. extension to 31st of December, 2020. The results of the survey of the attitudes of producers of table eggs in Serbia on the regulations

for ensuring the welfare of laying hens presented by *Rodić et al. (2014)* indicate that producers are not aware of the seriousness of the problem, that the belief dominates among producers that welfare regulations in the EU are motivated by preventing imports from countries outside the EU, and in our country by copying European practices. Also, some producers expect that the ban will be implemented in practice only when we become a member of the EU. Six years from the extension of the deadline, it turned out that the extended transition period was not enough, which can be related to the previously stated attitudes of producers, however this situation is a consequence of difficult economic conditions in the egg production sector in the transition period, small and limited incentives at the national level, inability to use funds under the IPARD II program until 2019, as well as particularly difficult conditions in 2020 caused by the Covid 19 pandemic. Given the situation that a very small number of producers managed to use the transitional period to harmonize production with the Rulebook, in 2020, producers sent a request to the authorities for a new extension (personal contact of the author).

Within this issue, part of the survey related to consumer attitudes about domestic animal welfare, and it was found that there were differences between countries - in northern Europe, greater importance is attached to welfare than in the south and the newly acceded EU member states, which may be due to different levels of knowledge about rearing and different willingness to allocate more funds for products obtained according to the principles of welfare (*European Commission, 2005*). In Europe, consumers in 2019 go a step further in demand and in September 2019, a European citizens' initiative called "End the Cage Age", which called for the abolition of cage systems for laying hens and for which over a million signatures were collected, was given for public debate in the European Parliament (*European Parliament, 2019*). In Serbia, there is little research on consumer attitudes (*Rodić et al., 2010; Rodić et al., 2012; Pavlovski et al., 2011*), which indicate a tendency to increase awareness of welfare over the last decade, and *Tolimir et al. (2019)* indicate that consumers need to be educated in this area.

The aim of this paper is to determine the representation of different systems for rearing of laying hens, i.e. how many producers have switched from conventional cages to permitted rearing systems - enriched cages and alternative systems, as well as to determine producers' views on the impact of permitted systems on production and welfare of laying hens. The paper also aims to examine the attitudes of consumers about the impact of production systems and welfare conditions for laying hens on their decisions when buying eggs.

Material and Methods

In accordance with the aim of the research, a basic method was used in the paper - a survey method - producers of table eggs (in telephone communication) and consumers (by filling out a written questionnaire). Data on producers were obtained using the databases of the Republic Bureau of Statistics, based on the 2012 census (on the number of farms with a capacity of 1000 to 5,000), and the structure of farms with over 5,000 hens was taken from the document *Sectorial analysis of egg production and processing in Serbia (2019)*, (Krnjajić, 2019) in which the data of the Veterinary Directorate of the Ministry of Agriculture of the Republic of Serbia from 2019 were used. The structure of the sample in relation to the total number of farms is given in Table 1.

Table 1. Structure of the sample

Farm size	1000- 5000	5000- 10000	10000 , 25000	25000 , 50000	Over 50000	Total
Number of farms*	339	89	30	17	17	492
Share of respondents in the total sample (%)**	5.6	11.2	26.6	35.3	41.2	10.2

*Number of farms according to the data of the Veterinary Directorate of the Ministry of Agriculture of the Republic of Serbia in 2019 (Krnjajić, 2019)

**Share of the surveyed producers within the each group registered farms, split by size

Producers of table eggs from the entire territory of the Republic of Serbia were surveyed during the fall of 2020, using data (contacts) from the records of the Serbian Chamber of Commerce. The sample, share (%) of surveyed producers was formed on the basis of their capacity, according to the size of the farm, i.e. the share in the total egg production in Serbia. The total number of surveyed producers (50) was 10.2% of the total number of farms with 1000 and more layers. The total number of layers on these farms was 1,311,700, which is about 15% of the total number of laying hens in Serbia (8,426,673). The survey covered 31 farms with 5,000 and more laying hens, with 1,264,500 layers, which is about 40% of the total number of laying hens located on all farms with a capacity of over 5,000 in Serbia (3,217,510), according to the data by Krnjajić (2019).

The survey used a structured survey questionnaire of closed type - questions that are with the offered answers, and related to:

a) Switching to permitted rearing systems - questions 1) Have you left the conventional production system (Answers: Yes and No), 2) Do you plan to switch from the conventional to another production system (Answers: Yes, Yes if I have financial means and No), 3) Which production system do you plan to switch to? (answers: Enriched cage system, Floor system, Aviary system, Free range system and Organic production);

b) The assessment of the impact of the transition on permitted rearing systems - questions: 1) By how many % do you expect the number of layers in your production to decrease? (Answers; by 0-20%, 20-40% and 40 and more %), 2) In your opinion, will the transition to a new rearing system have impact on the increase in production costs (answers: Yes and No) and the quality of eggs answers: Yes and No);

c) the welfare of laying hens - question 1) In your opinion, will the transition to enriched cages have impact on the welfare of chickens? (Yes or No);

d) to questions about the awareness of producers about consumer initiatives in Europe - question 1) Are you familiar with the initiative in Europe to abolish all cage systems? (Yes and No).

Survey research of 261 consumers of table eggs from the Belgrade region, as the largest in Serbia was conducted. The structured questionnaire consisted of closed-ended questions, based on the principle of a nine-point Likert scale - where 1 was marked as not important to me at all, and 9 - very important to me, applied to the questions "How important is the welfare of laying hens when buying eggs?" and "How important is the layer rearing system to you when buying eggs?", and where 1 was marked as not at all and 9 - I completely agree in regard to the question, "The price of eggs from the new systems is higher (%)".

Standard data analysis methods in Microsoft Excel program was used in data processing.

Results and Discussion

Table 2. Attitudes of producers of table eggs about the transition to permitted rearing systems

Survey questions							
Have you abandoned the conventional production system?			Are you planning to switch from conventional to another production system?			Which production system are you planning to switch to?	
Yes	No	Partially	Yes	Yes, if I can	No, I will abandon the production	Enriched cage system	All other systems*
%							
2.04	83.67	14.29	19.51	60.98	19.51	100	0

* All other production systems (floor system, aviary, free rearing systems – free range, organic production)

Table 2 shows the results related to monitoring of the implementation of welfare legislation, i.e. the extent to which manufacturers have abandoned the system with conventional batteries during the transition period, their intention to switch/abandon with the production and to which system of those that are allowed

will they switch - enriched cages or some of the alternative systems: floor system, aviary, free-range and organic production.

According to the obtained results, it can be stated that in Serbia, by the fall of 2020, only 16.3% of producers switched to permitted systems, of which 2% in full and 14.3% in part. All surveyed producers had a conventional cage system, which is in line with a study conducted in 2019, which stated that in Serbia the conventional cage rearing system was dominant and that it was estimated that only about 15% of this equipment has been replaced (*Krnjajić, 2019*). The obtained results indicate that the process of transition to permitted systems is slow, although a transition period is close to expiration. In Europe, compliance with legislation is the obligation of all countries, with some members deciding to go beyond EU standards by introducing stricter national or regional laws (*Van Horne and Bondt, 2017*), but some countries, such as Belgium, with transition deadline 2012, was slow in accepting alternative layer farming systems (*Tuytens et al., 2011*). The same author states that Belgian producers, in 2010, in examining their plans to switch to one of the alternative systems showed the following commitments: 55.3% opted for the aviary system, 39.4% for the enriched and colony cages which are the type of enriched cages and 5.3 % for non-cage systems. However, according to the results of this research, all producers in Serbia choose enriched cages (100%), and the authors got the impression during the survey that they would not switch from the classic cage system, if they were not forced by law. The obtained results can be related to the research of *Stadig et al. (2016)*, according to which only 8.2% of the surveyed egg producers would switch from the battery system to one of the alternative systems for farming laying hens if it was not stipulated by law. A part of the surveyed producers (19.5%) believe that they will be forced to abandon production, mainly due to high initial costs for the purchase of equipment, which was also the case in European countries. *Tuytens et al. (2011)* indicates that the problem was more pronounced in older farmers. In Serbia, according to the obtained results, the age structure of the surveyed producers is as follows: 50% is aged 56 to 65, 26.09% 46 to 55, 15.22% 36 to 45 and at least in the youngest category 8.7%, with about 50% of producers stating that they have a successor in their business.

In the sector of egg production in the coming period, major changes are to be expected, with a far-reaching impact on primary production, which will be reflected in the market. Producers are aware that the transition to permitted systems will lead to a reduction in production. A reduction should also be taken into account due to the inability of a certain number of producers to adapt and abandon the production. For these reasons, the self-sufficiency of production may be called into question, that is, there may be dangers of deficits in Serbia. The shortage of eggs on the market is a threat to consumers in Serbia, who said that when buying eggs, the choice of all respondents (100%) was for eggs from domestic production, compared to imported eggs.

Consumer attitudes about the impact of enriched cage systems on production are shown in Table 3 and relate to expectations regarding the reduction in the number of laying hens on the farm, as well as the impact on production costs and egg quality.

Table 3. Assessment of the impact of the transition to permitted farming systems on the production of table eggs

Survey questions						
By what % do you expect that the number of layers in your production will decrease?			In your opinion, will the transition to the new farming system affect:			
			Increase of production costs		Egg quality	
0-20%	20-40%	40 and over	Yes	No	No	Yes
%						
2.78	83.33	13.89	87.18	12.82	73.18	26.82

The analysis of the obtained test results shows that the largest number of producers (83.33%) believe that the transition to a system with enriched cages will result in a reduction of production by 20 to 40% compared to their current production in conventional cages. They also believe that it will have a negative impact on the increase of costs, to more difficult maintenance of hygienic conditions and greater possibility of injuring layers.

The increase in production costs in systems with enriched cages, compared to conventional ones, according to the research of *Van Horne and Bondt (2017)* are higher by 6%, and according to *Rodić et al (2010)* the increase in costs is up to 15%. The results can also be related to the research of *Stadig et al. (2016)* which shows that producers in Europe rated battery systems as better than alternatives, in terms of layer health, profitability, production results, operating costs, type and amount of work, egg prices, but in their opinion, animal welfare is better in alternative then in battery systems. According to the data from this research, producers who were of the opinion that the change in the system would affect the quality of eggs, mostly stated an increase in breakage and lower purity of eggs, i.e. poorer physical properties of egg quality. In the available literature, research indicates differences in egg quality depending on the production system, but mainly referring to comparisons of enriched cages and alternative systems, in which eggs from enriched cages have a higher grade for purity (*Denli et al., 2016*), and according to research by *Englmaierová et al. (2014)*, from the point of view of egg quality, suitable systems for transition are enriched cages and aviary in relation to the floor system, stating that the lowest values for the total number of bacteria are recorded in eggs from conventional production and from systems with enriched cages.

Table 4 shows the results of consumer attitudes about the welfare of laying hens in permitted systems - enriched cages, as well as indicators of awareness of producers in Serbia on consumer initiatives in Europe on the ban of all cage systems for farming laying hens.

Table 4. Attitudes of producers about the welfare of laying hens in permitted farming systems

Survey questions			
In your opinion, will switching to enriched cages affect the welfare of layers?		Are you aware of the initiative in Europe to ban all cage systems?	
Yes	No	Yes	No
%			
34.89	65.11	61.70	38.30

In Serbia, 65.11% of producers are of the opinion that the transition to enriched cages will not affect the welfare of layers. Some scientists are not convinced that the welfare of laying hens is better in alternative systems than battery systems (*Duncan, 2001; Savory, 2004*), but the fact is that both systems have advantages and disadvantages. Hens in non-cage systems have a greater ability to exhibit their natural behaviour, but also an increased risk of injury, parasites, disease, and predators compared to cage systems (*Laing, 1988; Häne et al., 2000*). Information from egg producers, according to *Tyttens et al. (2011)*, are very important, because they can be used to determine whether legally imposed changes in the breeding environment really result in improved welfare of laying hens in practice. The same author points out that the attitudes of producers who have already implemented legislation and have some of the allowed systems in production are especially important, since research indicates that their opinions about a system are better than those producers who do not have that experience.

A survey of producers' awareness of the initiative to ban all cage systems in Europe showed that 61.7% of producers had this knowledge, while the awareness of producers of smaller farm capacity was lower.

Producers in Serbia have expressed concern about the transition to farming in enriched cages, while initiatives are being launched in Europe to eliminate them (*European Parliament, 2019*).

Table 5 presents the results related to the attitude of consumers of table eggs towards farming systems and the welfare of layers, in terms of their impact when buying eggs.

Table 5. Attitudes of consumers of table eggs in Belgrade towards farming systems and welfare of laying hens

When buying eggs, evaluate the importance of the following for you									
Respondents' answers *	1	2	3	4	5	6	7	8	9
System for production of eggs (%)	19.41	6.21	6.27	9.16	11.32	11.41	10.10	6.21	19.91
Welfare of layers (%)	10.32	6.47	7.32	4.86	14.30	10.88	9.30	9.71	26.84

* Not important at all - 1; It is very important to me - 9

According to the results of the research, when buying eggs, the farming system is very important for about 19% of consumers and not important at all also for 19%, while the welfare of laying hens is very important for a larger number of consumers (26.84%) and not important at all for only 10.32%. consumer. The study by *Tolimir et al. (2019)*, which included a survey of the attitudes of consumers of table eggs on farming systems and the welfare of laying hens, indicates that there are no major differences between the regions in Serbia. Also, comparing the data with research in previous periods in Serbia (*Pavlovski et al., 2011*) relating to the acceptability of the battery system shows a decrease in the share of consumers for whom the battery system is acceptable for farming of laying hens and egg production, from 70.6% to 35, 6%, in the period from 1981 to 2001. *Stadig et al. (2016)* indicates a significant influence of consumers in the selection of farming systems by the producers, while in Serbia this influence is much less significant.

The results of consumer attitudes regarding the price of eggs from permitted systems are shown in Table 6 and show the willingness of consumers to allocate more money for eggs from “new farming systems”.

Table 6. Attitudes of consumers in Belgrade about the price of eggs from non-battery systems

Respondents' answers*	1	2	3	4	5	6	7	8	9
The price of eggs from new systems should be higher (%)	10.39	2.60	4.76	8.23	18.18	7.79	14.29	9.09	24.68

*I do not agree at all -1; I totally agree - 9

According to the obtained results, 10.39% of consumers do not agree that eggs from the new systems should have a higher price, while 24.68% of consumers completely agree. Also, 17.6% of surveyed consumers believe that they are always ready to pay a higher price for eggs from permitted systems, while 18.25% of respondents believe that they never have such an option (data not presented in table). Research by *Pavlovski et al. (2011)* indicates that the share of consumers willing to pay a higher price for eggs from non-battery systems has increased from

46 to 71.5%. However, producers surveyed in this survey, when asked: "How much are consumers willing to pay more for eggs from non-battery systems, expressed scepticism on this issue and stated that for Serbian consumers the most important when buying eggs is the lowest possible price, except for a very small number consumers, mainly in the area of the city of Belgrade, and that in addition to the price, the freshness and size of the eggs are very important to them, while they are not sufficiently informed about the farming systems. Research by some authors suggests the need for consumers to be better informed and educated about the importance of domestic animal welfare (*Autio et al., 2017*), which would include farming systems. Also, in the coming period, more attention should be paid to the research of the attitudes of consumers in Serbia, whose choice of eggs from a certain system can influence producers when choosing a system to transition to. Certain differences between producers and consumers in terms of consumer willingness to pay more for eggs from alternative systems impose the need that in the coming period attention should be focused to communication between them, as well as to consumer education.

Conclusion

Based on the research, conducted with the aim of monitoring the implementation of the Law on Animal Welfare and the related Rulebook, which require the transition from conventional to permitted systems - enriched cages and alternative systems, which significantly changes the egg production sector in Serbia, it can be concluded that the process is slow and that in the transitional period (2014-2020) about 85% of producers failed to harmonize their production with regulations. Manufacturers who have not converted production feel uncertain and hope for a new extension of the transition period, with all surveyed producers (100%) stating that they would transition to enriched cage systems. They have a negative opinion about the transition and believe that the transition will increase production costs and make it more complicated, and according to the opinion, about 65% of producers it will not have an impact on the welfare of laying hens. Further research should focus on examining the attitudes of producers who have switched to a production system with enriched cages, in order to more realistically assess the impact of this system on the production of table eggs in Serbia, which may be important for producers who have yet to convert production. Also, certain differences between producers and consumers regarding the willingness of consumers to pay more for eggs from alternative systems impose the need that in the coming period attention is focused to communication between them, as well as to consumer education.

Stavovi proizvođača i potrošača konzumnih jaja u Srbiji o zabrani konvencionalnih baterija i prelasku na obogaćene kaveze i alternativne sisteme proizvodnje

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Rezime

Cilj anketnog istraživanja je da se utvrdi kako u sektoru proizvodnje jaja teče usaglašavanje sa zakonskom regulativom o dobrobiti životinja, koja nalaže zabranu konvencionalnih kaveza i prelazak na dozvoljene sisteme gajenja kokoši - obogaćene kaveze i alternativne sisteme, kao i kakavi su stavovi proizvođača i potrošača po pitanju uticaja dozvoljenih sistema na proizvodnju/kupovinu jaja i dobrobit kokoši. Ispitivanjem su obuhvaćeni proizvođači (50), koji gaje 1000 i više kokoši, pri čemu je u uzorku, procentualno učešće proizvođača bilo prema kapacitetu - veličini farme, odnosno shodno učešću u ukupnoj proizvodnji jaja u Srbiji. Anketnim ispitivanje potrošača (261) utvrđeni su njihovi stavovi o uticaju dobrobiti kokoši i sistema gajenja pri kupovini jaja. Prema rezultatima ispitivanja može se konstatovati da: pri prelasku na dozvoljene sisteme gajenja izbor svih anketiranih proizvođača (100%) su obogaćeni kavezi i da je prelaznom periodu od 2014. do jeseni 2020. godine sa konvencionalnih kaveza na obogaćene prešlo 16,3% anketiranih (2% u potpunosti i 14,3 delimično). U planu da pređu sa konvencionalnog kaveznog sistema na neki drugi sistem gajenja ima 80,49% od kojih je 60,98% izjavilo da će to učiniti ako budu imali finansijske mogućnosti, dok oko 19% proizvođača smatra da će biti prinuđeni da napuste proizvodnju. Svi proizvođači očekuju da će prelazak na obogaćene kaveze dovesti do smanjenje njihove proizvodnje, a njih 83,33% smatra da će to biti od 20 do 40%. Anketirani proizvođači (87,18%) očekuju da će prelazak sa konvencionalnih kaveza povećanje troškova proizvodnje, a 65,11% smatra da to neće uticati na dobrobit kokoši. Ispitivanjem stavova potrošača utvrđeno je da je pri kupovini jaja sistem proizvodnje za 19,91% potrošača je veoma važan, a za 19,41% potrošača nije uopšte važan, dok je dobrobit kokoši veoma važna za 26,84% i nije uopšte važna za 10,32% potrošača. Zaključak istraživanja je da u Srbiji prelazak na dozvoljene sisteme gajenja odvija sporo, da je usaglašavanje sa zakonskom regulativom veliki izazov i da se u narednom periodu očekuju promene koje mogu imati dalekosežne posledice po sektor proizvodnje konzumnih jaja.

Ključne reči: kokoši, dobrobit, sistemi gajenja, potrošač, jaja, anketa, Srbija

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References

- APPLEBY M. C. (2003): The European Union ban on conventional cages for laying hens: History and prospects. *Journal of Applied Animal Welfare Science*, 6, 2, 103-121.
- AUTIO M., AUTIO A., KUISMIN A., RAMSINGH B., KYLKILAHTI E., VALROS A. (2017): Bringing Farm Animal Welfare to the Consumer's Plate – The Quest for Food Business to Enhance Transparency, Labelling and Consumer Education. In: *The Business of Farm Animal Welfare*. Nicky Amos & Rory Sullivan (eds.) Greenleaf Publishing.
- DIRECTIVE 1999/74/EC of 19 July 1999 laying down minimum standards for the protection of laying hens. European Union. Retrieved from <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:31999L0074&from=EN>, on 05.09.2020.
- DENLI M., BUKUN B., TUTKUN M. (2016): Comparative performance and egg quality of laying hens in enriched cages and free-range systems. *Scientific papers : Series D, Animal Science*, Vol. LIX, 29-32.
- DUNCAN I. J. H. (2001): The pros and cons of cages. *World's Poultry Science Journal*, 57, 4, 381-390.
- ENGLMAIEROVÁ M., TŮMOVÁ E., CHARVÁTOVÁ V., SKŘIVAN M. (2014): Effects of laying hens housing system on laying performance, egg quality characteristics, and egg microbial contamination. *Czech Journal of Animal Science*, 59, 345-352.
- EUROPEAN COMMISSION (2005): Attitudes of Consumers towards the Welfare of Farmed Animals. *Special Eurobarometer*, 229, 1-138.
- EUROPEAN PARLIAMENT (2019): Eggs from caged hens. Retrieved https://www.europarl.europa.eu/doceo/document/E-9-2019-002939_EN.pdf.
- FREWER L. J., KOLE A., VAN DE KROON S. M. A., DE LAUWERE C. (2005): *Journal of Agricultural and Environmental Ethics*, 18, 345-367.
- HÄNE. M., HUBER-EICHER B., FROHLICH E. (2000): Survey of laying hen husbandry in Switzerland. *World's Poultry Science Journal*, 56, 21-31.
- KRNJAIC S. (2019): Sektorska analiza proizvodnje i prerade jaja u Republici Srbiji / Egg production and processing sector analysis in the Republic of Serbia. Retrieved from <http://www.minpolj.gov.rs/wp->

content/uploads/datoteke/IPARD/01%2004%202019%20Sektorska%20analiza%20proizvodnje%20i%20prerade%20jaja%20u%20Srbiji.pdf, on 28.08.2020.

LAING P. M. (1988): Diseases of free range birds. *World's Poultry Science Journal*, 44, 72-75.

OFFICIAL GAZETTE OF THE REPUBLIC OF SERBIA NO. 41/2009. (2009): Law on animal welfare.

OFFICIAL GAZETTE OF THE REPUBLIC OF SERBIA NO. 6/10; OFFICIAL GAZETTE OF THE REPUBLIC OF SERBIA NO. 57/2014-27 (2010, 2014): Rulebook on conditions for animal welfare in terms of animal housing, rooms and equipment in facilities where animals for production purposes are kept, reared and placed on the market, the manner of keeping, breeding and trade of certain species and categories of animals, as well as the content and management of animal records' keeping / Pravilnik o uslovima za dobrobit životinja u pogledu prostora za životinje, prostorija i opreme u objektima u kojima se drže, uzgajaju i stavljaju u promet životinje u proizvodne svrhe, načinu držanja, uzgajanja i prometa pojedinih vrsta i kategorija životinja, kao i sadržini i načinu vođenja evidencije o životinjama (in Serbian)

PAVLOVSKI L., ŠKRBIĆ Z., LUKIĆ M. (2011): Free systems of laying of chickens and layer hens: quality of meat and eggs. *Tehnologija mesa* 52, 1, 160-166.

RODIĆ V., PERIĆ L., DJUKIĆ STOJČIĆ M., VUKELIĆ N., ŠKRBIĆ Z. (2012): Socio-economic implications of adopting the EU laying hen welfare regulation in Serbia. *World's Poultry Science Journal*, 68, 229-238.

RODIĆ V., PERIĆ L., PAVLOVSKI, Z. (2014): Stavovi proizvođača konzumnih jaja prema regulativi za obezbeđenje dobrobiti nosilja (in Serbian) / Attitudes of table eggs producers towards regulations for ensuring the welfare of laying hens. *Agroekonomika*, 43, 63-64, 125-135.

RODIĆ, V., PERIĆ, L., PAVLOVSKI, Z., MILOŠEVIĆ, N. (2010): Competitiveness of table eggs from non-cage housing systems. *Biotechnology in Animal Husbandry* 26, 1-2, 117-128.

SAVORY C. J. (2004): Laying hen welfare standards: A classic case of "power to the people". *Animal Welfare*, 13, S153-S158.

STADIG L. M., AMPE B. A., VAN GANSBEKE S., VAN DEN BOGAERT T., D'HAENENS E., HEERKENS J. L. T., TUYTTENS F. A. M. (2016): Survey of egg farmers regarding the ban on conventional cages in the EU and their opinion of alternative layer housing systems in Flanders, Belgium. *Poultry Science*, 95, 3, 715-725.

TOLIMIR N., MASLOVARIĆ M., ŠKRBIĆ Z., RADIŠIĆ R., LUKIĆ M., RAJKOVIĆ B. (2019): The attitudes of table egg consumers in Serbia on the welfare of laying hens. *Biotechnology in Animal Husbandry* 35, 4, 387-398.

TUYTTENS F. A. M., SONCK B., STAES M., VAN GANSBEKE S., VAN DEN BOGAERT T., AMPE B. (2011): Survey of egg producers on the introduction of

alternative housing systems for laying hens in Flanders, Belgium. *Poultry Science* 90, 941-950.

VAN HORNE P.L.M., BONDT N. (2017): Competitiveness of the EU egg sector. base year 2015. Wageningen Economic Research. Wageningen, Netherlands, pp 46.

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