Trends in eggs production and consumption

Tomić Maksan, Marina; Mesić, Željka; Šakić Bobić, Branka; Kovačić, Damir

REVIEW ARTICLE

Trends in eggs production and consumption

Marina Tomić Maksan, Željka Mesić, Branka Šakić Bobić, Damir Kovačić

Faculty of Agriculture, University of Zagreb, Svetošimunska cesta 25, Zagreb, Croatia (matomic@agr.hr)

Abstract
The objective of this study was to identify the main trends in the production and consumption of eggs and omega-3 fatty acid-enriched eggs. Egg producers are turning to the production of eggs with different intrinsic and extrinsic characteristics to meet the growing demands of consumers. Consumers are showing a growing interest in eggs from alternative production systems, but price, egg size and origin are also very important to them. There will be an increase in the share of alternative eggs production systems, as well as a greater emphasis on animal welfare. The obtained results are useful for egg producers for production planning, for consumers who will be additionally informed about egg market trends and the benefits of consuming omega-3 enriched eggs, and for marketing experts to develop strategies to increase eggs demand.

Key words: eggs, omega-3 enriched eggs, trends

Global trends in eggs production and consumption

Eggs are a very important source of protein, fat, and microelements (Kralik and Lovreković, 2018) and represent a food that is affordable and frequently consumed all over the world (Lesnierowski and Stangierski, 2018). According to Martinez-Michel et et al. (2011) consumers prefer eggs because they are safe to eat, easy to prepare, versatile, and cheap comparee with other sources of animal protein.

However, in the last 10 years, egg production has experienced a number of challenges that have had a major impact on the cost-effectiveness of egg production. Consumer demand for healthier, more environmentally friendly, and animal welfare-friendly foods is steadily increasing (Rahmani et al., 2019), which has also led to increased demand for alternative production systems (organic eggs, free-range eggs, and floor rearing eggs). Organic eggs come from free range laying hens raised according to organic production standards. Free-range eggs are produced in a rearing system where the laying hens have constant access to outdoor run during the day. Eggs from floor-raised hens are produced in a rearing system where the laying hens are housed in a barn on the floor (litter). It is worth mentioning the growing world population, which points to the challenge of increasing egg production while respecting the principles of sustainability (FAO, 2017). Moreover, egg production generates high greenhouse gas emissions (Abín et al., 2018) because it relies on a large number of natural resources, such as land, water, and energy, as well as cereals for animal feed, while modern consumers show a growing interest in sustainable products. In addition, in the last 10 years, we have frequently witnessed food scandals related to salmonella or the contamination of eggs with pesticides (Li et al., 2017, Li et al., 2019), which negatively affects the demand for eggs. It is also worth mentioning numerous diseases of modern society related to the nutritional properties of eggs, such as allergies (Loh and Tang, 2018) and high cholesterol (Zhu et al., 2018), which also affects consumer preferences. For these reasons, egg producers are forced to turn to egg production with different improved intrinsic and extrinsic characteristics (organic eggs, free-range eggs, eggs enriched with functional

ingredients such as omega-3 fatty acids, lutein, vitamins A and E, etc.). Knowing egg consumers' preferences is critical to market success. According to the authors Rondoni et al. (2020.), the most important characteristics for consumers when buying eggs are the so-called sensory characteristics (size, eggshell color, yolk appearance and color) and nutritional characteristics (omega-3 enriched), while for Baba et al. (2017) the most important characteristics are price, egg size, origin and production method. Consumers prefer larger eggs (Baba et al., 2017) and eggs of local origin (Gracia et al., 2014). Berkhoff et al. (2020) noted that consumers prefer to consume farm eggs rather than industrial eggs. The proportion of white and brown shell eggs consumed is about 50:50 worldwide, but significant differences have been found between continents. In Europe, Africa, and the Far East, consumers prefer eggs with brown shells, while in the Americas and the Middle East, they prefer eggs with white shells (Cavero et al., 2012). Consumers prefer deep yellow color of the egg yolk (Ayim-Akonor and Akonor, 2014). According to previous research, price is the most important determinant in eggs purchase (Baba et al., 2017) and consumers are not willing to pay a higher price for enriched eggs (Güney and Giraldo, 2019). However, consumers are willing to pay a higher price for cage-free eggs because they associate such production with greater animal welfare (Doyon et al., 2016) and higher food safety standards (Yang, 2018). Moreover, modern consumers demand sustainable products. Nevertheless, Rahmani et al. (2019) concluded that consumers in Spain are not willing to pay a premium price for eggs produced with lower greenhouse gas emissions and reduced water consumption.

Global trends in production and consumption of omega-3-enriched eggs

Functional foods are foods that have been shown to have a beneficial effect on human health in addition to their basic nutritional function (Alongi and Anese, 2021). One of the functional products for which there is a growing demand are eggs enriched with essential nutrients such as omega-3 fatty acids, vitamins or selenium. Omega-3 enriched eggs help reduce the risk of heart disease and maintain normal blood cholesterol levels (Baba et al., 2017) and consumers associated omega-3 enriched eggs with health benefits (Sass et al., 2021). To produce omega-3 enriched eggs, producers need to modify the hens diet. Typically, they feed laying hens with fish and/or flaxseed oil and flaxseed, but they also use antioxidants in the animal feed. According to Transparency Market Research's 2017-2025 forecasts, demand for omega-3 products, including omega-3 enriched eggs, will increase in developed economies, especially among consumers who care about health and believe that food has a significant impact on health. One potential problem for the omega-3-enriched egg market is the perception that consumers are unwilling to pay a higher price for omega-3 enriched eggs. The main reason for this is limited knowledge about the benefits of consuming such eggs (Sass et al., 2018). This is supported by the results of a study conducted in Croatia, which showed that only half of the study participants were aware of omega-3 enriched eggs (Kralik et al., 2020). However, research in Italy shows that unmarried women and consumers with higher economic status are more willing to pay a higher price for omega-3 enriched eggs, but also that willingness to pay a higher price for omega-3 enriched eggs is higher among consumers who place more value on the size of the eggs, the rearing conditions and feeding of the hens, the origin and brand of the eggs (Palmieri et al., 2022). According to Sass et al. (2021) omega-3 eggs are categorized as expensive, so their buyer is described as a “person with high purchasing power”.

Conclusion

According to previous research ,it can be concluded that several factors influence the demand for eggs, which producers should consider when planning their production policies.

In addition to intrinsic characteristics such as the appearance and color of the yolk, extrinsic characteristics such as price, egg size, origin, and production method are also extremely important when purchasing eggs. Socioeconomic characteristics of consumers and cultural factors play an important role in egg consumption behavior, which is reflected in different preferences for brown and white eggshells, egg size, and willingness to pay. It is therefore important to consider different segmentation variables (e.g., place of residence, lifestyle, income level) to help producers find their target consumer group.

Previous research results can help marketers to develop better communication policies to final consumers, for example, by highlighting the production method or egg size in promotions. Since consumers are not willing to pay a higher price for enriched eggs or eggs with lower GHG emissions, primarily due to their limited knowledge, it is necessary to educate consumers about the benefits of purchasing and consuming such eggs.

Ackowledgement
This paper is based on research undertaken as part of European Union's Horizon 2020 project AgriFoodBoost (No. 952303).

References

Abín R., Laca A., Laca A., Díaz M. (2018). Environmental assesment of intensive egg production: A Spanish case study. Journal of Cleaner Production. 179: 160–168.

Alongi M., Anese M. (2021). Re-thinking functional food development through a holistic approach. Journal of Functional Foods. 81: 104466.

Ayim-Akonor M., Akonor P. T. (2014). Egg consumption: Patterns, preferences and perceptions among consumers in Accra metropolitan area. International Food Research Journal. 21 (4): 1457-1463.

Baba Y., Kallas Z., Realini C. (2017). Application of the analytical hierarchy process to evaluate consumer acceptance and preferences for omega-3 enriched eggs. British Food Journal. 119 (7): 1459-1472.

Berkhoff J., Alvarado-Gilis C., Keim J. P., Alcalde J. A., Vargas-Bello-Pérez E., Gandarillas M. (2020). Consumer preferences and sensory characteristics of eggs from family farms. Poultry Science. 99 (11): 6239-6246.

Cavero D., Schmutz M., Icken W., Preisinger R. (2012). Attractive eggshell color as a breeding goal. Lohmann Information. 47 (2): 15-21.

Doyon M., Bergeron S., Cranfield J., Tamini L., Criner G. (2016). Consumer Preferences for Improved Hen Housing: Is a Cage a Cage? Canadian Journal of Agricultural Economics. 64 (4): 739-751.

FAO (2017). Gateway to poultry production and products. Available from: http://www.fao.org/poultry-production-products/production/en/

Gracia A., Barreiro-Hurlé J., López-Galán B. (2014). Are Local and Organic Claims Complements or Substitutes? A Consumer Preferences Study for Eggs. Journal of Agricultural Economics. 65 (1): 49-67.

Güney O. I., Giraldo L. (2019). Consumers' attitudes and willingness to pay for organic eggs: A discrete choice experiment study in Turkey. British Food Journal. 122 (2): 678-692.

Kralik Z., Lovreković M. (2018). Utjecaj hranidbe na kvalitetu i obogaćivanje jaja funkcionalnim sastojcima. Meso, 20 (1): 58-65.

Kralik Z., Kralik G., Hanžek D. (2020). Mišljenje potrošača u Hrvatskoj o konzumaciji omega-3 obogaćenih jaja. In Zbornik radova 55. hrvatskog i 15. međunarodnog simpozija agronoma. Mioč B., Širić, I. (ed.). 440–443. Zagreb, Hrvatska: Sveučilište u Zagrebu, Agronomski fakultet.

Lesnierowski G., Stangierski J. (2018). What's new in chicken egg research and technology for human health promotion? - A review. Trends in Food Science and Technology. 71: 46-51.

Li T., Bernard J. C., Johnston Z. A., Messer K. D., Kaiser H. M. (2017). Consumer preferences before and after a food safety scare: An experimental analysis of the egg recall. Food Policy. 66: 25-34.

Li X., Li H., Ma W., Guo Z., Li X., Song S., Tang, H., Li X., Zhang Q. (2019). Development of precise GC-EI-MS method to determine the residual fipronil and its metabolites in chicken egg. Food Chemistry. 281: 85-90.

Loh W., Tang M. L. K. (2018). The epidemiology of food allergy in the global context. International Journal of Environmental Research and Public Health. 2043 (15): 1-8.

Martinez-Michel L., Punter P., Wismer W (2011). Perceptual attributes of poultry and other meat products: a repertory grid application. Meat Science. 87 (4): 349-355.

Palmieri N., Stefanoni W., Latterini F., Pari L. (2022). Factors Influencing Italian Consumers' Willingness to Pay for Eggs Enriched with Omega-3-Fatty Acids. Foods. 11: 545.

Rahmani D., Kallas Z., Pappa M., Gil J. M. (2019). Are Consumers' Egg Preferences Influenced by Animal-Welfare Conditions and Environmental Impacts? Sustainability. 11 (22): 6218

Rondoni A., Asioli D., Millan E. (2020). Consumer behaviour, perceptions, and preferences towards eggs: A review of the literature and discussion of industry implications. Trends in Food Science & Technology. 106: 391-401.

Sass C. A. B., Kuriya S., Da Silva G. V., Silva H. L. A., Da Cruz A. G., Esmerino E. A., Freitas M. Q. (2018). Completion task to uncover consumer's perception: A case study using distinct types of hen's eggs. Poultry Science. 97 (5): 2591-2598.

Sass C. A., Pimentel T. C., Guimarães J. T., Silva R., Pagani M. M., Silva M. C., Queiroz M. F., Cruz A. G., Esmerino, E. A. (2021). How buyer-focused projective techniques can help to gain insights into consumer perceptions about different types of eggs. Food Research International. 144, 110320.

Transparency Market Research. Omega-3 Eggs Market - Global Industry Analysis, Size, Share, Growth, Trends and Forecast 2017-2025. Available from: Omega-3 Eggs Market | Global Industry Report, 2025 (transparencymarketresearch.com)

Yang Y. C. (2018). Factors affecting consumers' willingness to pay for animal welfare eggs in Taiwan. International Food and Agribusiness Management Review. 21 (6): 741-754.

Zhu Y., Vanga S. K., Wang J., Raghavan V. (2018). Impact of food processing on the structural and allergenic properties of egg white. Trends in Food Science and Technology. 78: 188-196.