

## Article

# Free Range, Organic? Polish Consumers Preferences Regarding Information on Farming System and Nutritional Enhancement of Eggs: A Discrete Choice Based Experiment

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**Abstract:** The main purpose of this study was to determine the structure of consumer preferences regarding information on farming system and nutritional enhancement of eggs to verify if consumers are willing to accept products combining sustainability and nutrition related claims. The data was collected within a CAPI (Computer Assisted Personal Interviews) survey on a representative sample of 935 consumers responsible for food shopping. A discrete choice-based conjoint method was selected in eliciting consumer preferences among different product profiles with varying levels of attributes. A hierarchical cluster analysis was used to identify four distinct clusters that differed significantly in terms of importance attached to production system attributes and socio-demographic profiles. The results of the experiment showed that price and farming system had the most significant mean relative importance in shaping consumers' preferences, while other attributes such as nutrition and health claims, egg size, package size and hen breed were far less important. Free range eggs had the highest relative importance for consumers despite the fact that organic egg production systems are governed by much stricter animal welfare standards. Our segmentation revealed that two of our four clusters may be more easily reached by information on animal welfare related attributes in egg production than the others. The results of our study provide the policy makers and marketing practitioners with insights applicable for communication and pricing strategies for eggs with sustainability claims.

**Keywords:** consumer; farming systems; eggs; preferences; free range; organic; animal welfare; nutrition claims; discrete choice-based experiment

## 1. Introduction

The egg is considered as a valuable source of high quality protein and contains many essential vitamins and minerals. Consumption of eggs is rising globally and in 2015, 6.4 million tonnes of eggs were produced in the EU for consumption purposes, with Germany, France, Spain, Italy, Poland, the Netherlands and the United Kingdom as the biggest producers [1].

Following the growth of public concern for the welfare of battery egg-laying hens since the 1960s as well as the emergence of other issues such as dietary health, there has been, in recent years, a significant increase in segmentation of the once fairly standardised egg market [2]. Consumers in all markets demand healthy and enjoyable food, but their ethical concerns are important drivers of food buying decisions [3–9]. Therefore, parallel to the trend towards healthier food, a trend towards more environmentally friendly or “green” food products has emerged [10]. As a result, producers and

particularly farmers are more inclined to invest in production systems that provide benefits in terms of environment and animal welfare.

### 1.1. Animal Welfare Related Attributes of Eggs

While the legislative and regulatory base for farm animal welfare has grown significantly in many countries within Europe and elsewhere over the last 20 years, the most dramatic developments have arguably been in the expanding role and place of farm animal welfare as a component of food marketing and product, range or brand segmentation strategies [2]. Animal welfare related claims belong to credence attributes that can only be taken into account by consumers, if the attributes are properly communicated at the point-of-sale, e.g., by means of claims [11]. Currently, consumers tend to rely more and more on extrinsic cues and credence characteristics, including process characteristics (e.g., the way animals are raised), to form their expectations about animal-based food products [7,12,13]. As Zander and Hamm [3] suggest the potential for communicating specific information about ethical attributes of food is substantial, but presenting consumers with a wide range of sustainability claims might create an information overload [14]. Responding to misleading labelling of free-range systems and to their perception of consumer preference for farm system information, the European Commission introduced in 2001 the mandatory labelling identifying “organic”, “free-range”, “barn” and “caged eggs” [15]. A number of studies showed that consumers indicate a higher willingness-to-pay for improved animal welfare [11,13,16]. Nevertheless, there are considerable differences observed in the importance attached to animal welfare issues among European consumers [6], with Polish, Hungarian and Croatian being the most reluctant to pay more for food with such claims. There is no research available to determine whether consumers in these countries are more receptive to certain aspects of animal welfare and whether their willingness to pay more for food with such attributes varies per product category. Another issue is the interpretation of animal welfare and other sustainability related claims and proper understanding of the benefits associated with such credence attributes.

### 1.2. Organic Eggs

The most common sustainability claims on the food market are organic food labels that guarantee fulfilment of requirements related to animal feed, foodstuffs, disease prevention, veterinary treatments, animal welfare, housing, fresh air, pasture and livestock breeding [11]. Therefore, organic production systems provide consumers with many extra benefits over the free range. The organic market in the EU increased by 7.4% to €24 billion (€26.2 billion in Europe, 7.6%) in 2014 and the greatest increase between 2007 and 2014 was for poultry, which must partly be attributed to the high demand for eggs [17]. In the egg market, the introduction of the mandatory labelling scheme correlated with a distinct change in hen husbandry systems, in that free-range and organic systems gained significant market shares [18]. When comparing the market shares of organic products within the total food market, one of prevailing categories in many European countries are eggs with a market share in 2014 of 11–22% in Austria, Belgium, Finland, France, Germany and The Netherlands. The organic farming sector in Poland, like in many other Central and Eastern European countries, experienced a tremendous growth in the last decade in the production area. In 2016, the number of farms reached 22,369 and 536,579ha were under organic production (approx. 4.0% of AUL) [19]. The organic market development is lagging behind, but Polish consumers perceive organic food extremely positively [20], which generates prospects for further expansion. The share of laying hens in organic production system recorded in Poland in 2015 was 0.28%, as compared to 88.9% of hens in battery cages [21], but the demand for organically produced eggs increases and 65% of Polish consumers declare to buy organic eggs [22]. In 2016, the number of organic laying hens reached 179,787 and the production of organic eggs for consumption exceeded 19,937,000 [23]. Similar trends are observed in other Central and Eastern European countries. The highest production of organic eggs for consumption was recorded in 2016 in countries like Romania (12,327,853) and the Czech Republic (3,346,860) while in other Central and Eastern European countries the number of organic eggs produced for consumption was much

lower e.g., 2,808,039 in Estonia, 1,489,761 in Latvia and 159,318 in Slovakia [23]. The consumption of organic food in these countries is much lower than in Western European countries, but the demand for organically produced is likely to increase [20,22,24].

### 1.3. Nutritional Enhancement of Eggs

The farming system for laying hens might provide both ethical and nutritional benefits. As revealed by Kühn et al. [25], the free-range farming system could be an appropriate method to fortify eggs with vitamin D, provided free-range farming conditions are sufficiently attractive for the hens to range outside.

Polish consumers express interest in innovative food of animal origin and particularly eggs, which is a promising trend [26]. Thus, exploring consumer reactions to farming system and nutrition related claims can contribute to a better understanding of the value that consumers attach to both types of information provided. In general, there is little data on consumer reactions to a combination of sustainability related and functional food attributes [10,27] and none of the studies involved Polish consumers. Therefore, the main aim of this research was threefold: (1) to analyse the importance of the free range and organic production method and nutrition related attributes of eggs to Polish consumers, thus determining the overall utility that each of these attributes provides, (2) to identify segments of consumers that react differently to production method and nutrition related claims on eggs, and (3) to gain insight into prospects for combining sustainability and nutrition related claims on eggs.

## 2. Methodology

### 2.1. Design of the Experiment

In the current research, a discrete choice conjoint experiment was conducted to elicit consumer preferences among different product profiles with varying levels of attributes [28]. The participants of our experiment made a discrete choice from a set of presented alternatives that contained a number of attributes with different levels, combined within choice sets. Briefly stated, a discrete choice model resembles a real shopping situation, where consumers choose the most beneficial product from a restricted set of attributes. The models of discrete choice assume that decision maker  $n$  chooses the alternative that maximizes utility when facing choices among  $j$  alternatives. According to random utility theory, the assumption is made that a given alternative is selected if the perceived utility provided by such alternative is the highest among the different choices [29]. Conjoint choice-based methods have been widely used to simulate the purchasing process [30–32]. Choice-based conjoint has an advantage over rating-based conjoint due to its greater similarity to market behaviour [33]—namely to what a consumer really does when buying food since consumers must choose one alternative within each choice set by simultaneously evaluating the presented product attributes and, as a result, they are less inclined to overestimate some attributes over others.

### 2.2. Consumer Attributes

The first step in the choice based research design concerns the identification of appropriate attributes, and subsequently the specification of feasible attribute levels [28]. Several studies have investigated consumer preferences for egg attributes [27,34,35]. Freshness, visual characteristics, origin and price are commonly among the most important information consumer take into account in the decision making process to buy eggs, but production methods and origin of eggs gain more and more attention [9,27,34,35]. The selection of attributes for our experiment was preceded by a thorough analysis of egg market trends and consumer literature on animal welfare [2,4,7,9,13,36–38], organic [8,10,20,34,39–46] and functional food [27,47,48] to identify the appropriate eggs attributes and dimensions that are valuable for the consumer. As a result, we decided to select for the experiment attributes such as: farming system (four levels),

breed (two levels), health benefits claim (five levels), egg size (four levels), package size (two levels), price (seven levels) (Table 1). The decision to take a production method as a main product attribute was driven by the growing concern for food products respecting environmental and animal welfare principles [36]. The production method attributes reflected four labels for eggs (used in European Union): eggs from caged hens, barn eggs, free-range eggs and organic eggs as laid down in the Commission Regulation (EC) No. 598/2008 of 24 June 2008 specifying detailed rules for implementing Council Regulation (EC) No. 1234/2007 regarding the marketing standards for eggs [49]. To get more insight into the relevance of the origin of laying hens, an attribute “Traditional local hen breed” was included.

**Table 1.** Attributes and levels used in the choice-based conjoint survey design.

Attribute	Attribute Level
Farming method	Organic
	Free range
	Barn eggs
	From caged hens
Breed	Traditional local hen breed
Nutrition claims	No claim
	No health benefits claim
	Contains Omega 3 fatty acids
	Contains Omega 3 fatty acids with a positive influence on the cardiovascular system
	Higher level of A+E vitamins
Size	Higher level of A+E vitamins with a positive influence on the cardiovascular system
	S
	M
	L
Package	XL
	6 eggs
Price (per unit)	10 eggs
	0.50 PLN <sup>1</sup>
	0.60 PLN
	0.73 PLN
	0.89 PLN
	1.07 PLN
	1.29 PLN
	1.60 PLN

<sup>1</sup> PLN = Polish new zloty (approx. 1 PLN = EUR 0.23).

The risk associated with cholesterol intake has prompted developments in production of eggs with reduced cholesterol and enhanced levels of desirable nutrients including omega-3 fatty acids, vitamin E, and vitamin D [50]. Enhancement of staple product such eggs with beneficial nutrients provides opportunities to counteract nutrition related deficiencies.

Therefore, these attributes providing functional benefits were also selected for the study. The claims that provided information about functional ingredients were formulated as nutritional claims referring to omega 3 or vitamin E content in eggs. These claims were supported with information about the health outcomes, since a lack of knowledge about the benefits related to the consumption of a functional ingredient might discourage the consumption of functional foods [51].

When one of the attributes included in the study is “price”, it is possible to use the generated part-worths in order to estimate the monetary value that consumers assign to the presence of other attributes [52]. Consequently, the attribute price was added to provide some managerial implication for the market actors.

### 2.3. Data Collection and Statistical Analyses

#### 2.3.1. The Survey

Quantitative data was collected within a project “BIOFOOD—Innovative, Functional Products of Animal Origin” aimed to increase the innovativeness of Polish agro-food sector through development

of animal origin food products providing functional and nutritional benefits. This paper presents some of the findings from a larger consumer study. The sample ( $n = 935$ ) were drawn from the Social Security addresses database and is representative in terms of age, gender and region that the respondents lived in. The basic sample design applied was a multi-stage, random one. A number of sampling points were drawn with probability proportional to population size for a total coverage of the country and to population density. In order to do so, the sampling points were drawn systematically from each of the “administrative regional units”, after stratification by individual unit and type of area. They thus represent the whole territory of Poland as well as the distribution of the resident population. In each of the selected sampling points, a starting address was drawn at random. Further addresses (every Nth address) were selected by standard “random route” procedures, from the initial address. In each household, a respondent was drawn, at random (following the “closest birthday rule”). The interviews were conducted face-to-face in respondents’ homes by the professional market research agency respecting ESOMAR (European Society for Opinion and Marketing Research) code of conduct using CAPI (Computer Assisted Personal Interview) technique. All respondents were aged 21+ and responsible for food purchasing within their household. The detailed characteristics of the sample are provided in Table 3.

The script for this discrete choice-based conjoint was prepared in the Sawtooth SMRT software v. 4.22 (Sawtooth Software, Orem, UT, USA). “Full profile” option was used as a rotation scheme of used product variants. This means that all of the attributes of each product were always shown on the screen. The profiles were generated using the method of complete enumeration, where each presented product profile differed from adjacent product on each of the presented attributes. When considering attributes that have only two levels (such as “breed” or “package size”), duplication of variant in such attribute was inevitable.

During testing, the respondents were presented with screens displaying full characteristics of each product (every product is described on each of the attributes). As it is shown in Table 2, three product configurations were presented on the screen and the respondent had to indicate the preferred alternative. In this study, a “no-choice” option was not included, although it has been pointed out that sometimes this option may give a better market penetration prediction [53]. As a result, it was a situation of forced choice, where the respondent had to opt for one configuration to choose the preferred product (out of three) to buy. Each respondent had to choose one out of three products. The task was repeated 19 times for each respondent.

**Table 2.** Example of the conjoint choice-based screen used in the study.

Attribute	Option 1	Option 2	Option 3
Farming method	Free range	Barn eggs	Organic
Breed	Traditional local hen breed	No information	Traditional local hen breed
Nutrition&health claims	Contains Omega 3 fatty acids	No information	Higher level of A+E vitamins that have a positive influence on the cardiovascular system
Size	M	S	XL
Package	10 eggs	10 eggs	6 eggs
Price (per unit)	0.79 PLN	0.88 PLN	0.50 PLN

At the end of the discrete choice-based conjoint task consumers filled in a questionnaire containing questions sub-divided in three sections concerning: questions on socio-demographic profile including subjective evaluation of income, perception of organic and functional food and subjective knowledge of organic and functional food products. In this part of the questionnaire, participants had to evaluate items on importance they attached to product information included on the labels, and prices of food, attitudes to advertising, attitudes to organic products and the importance of taste. The items were selected from the validated in cross cultural studies Food Related Lifestyle

measurement instrument developed by Grunert et al. [54]. Additionally, items on subjective knowledge and perception of prices for organic and nutritionally enhanced food namely functional food were added following the recommendation of Pieniak et al. [55]. All of the questions were formulated using a 7-point frequency scale anchored with ‘I completely disagree’ on the left and ‘I completely agree’ on the right.

### 2.3.2. Data Analysis

Choice data are routinely analysed within a random utility framework by so-called discrete choice models [53]. The approach is based on modelling “utility”, that is to say the net benefit a consumer obtains from selecting a specific product in a choice situation [30]. In our study, the Hierarchical Bayesian (HB) network model in Sawtooth SMRT (Sawtooth Software Market Research Tools) discrete choice based conjoint dedicated software was used to estimate coefficients for the individual utilities of each attribute level/to estimate individual-level part-worth values. The Hierarchical Bayes model used by the HB System is called “hierarchical” because it has two levels namely at the higher level, and the assumption is made that individuals’ part-worths are described by a multivariate normal distribution. Such a distribution is characterized by a vector of means and a matrix of covariances. At the lower level, the assumption is made that, given an individual’s part-worths, his/her probabilities of choosing particular alternatives are governed by a multinomial logit model [56]. HB algorithm ability to borrow information from other respondents to stabilize part-worth estimation for each individual is valuable for this method [57]. After the hierarchical modelling, part-worth utilities for all product attributes and levels were obtained and used for subsequent analysis in IBM SPSS Statistics version 23PL (IBM Corp. in Armonk, NY, USA).

Having determined the preferences from the utilities estimated in the choice based conjoint, Ward’s hierarchical clustering method was used to identify distinctive, homogenous segments based on items from the attitudinal questionnaire, namely perception of organic eggs, buying behaviour, and the importance of information on the packaging.

Once the clusters were identified, the mean part-worths for each level of the attributes considered and their relative importance were calculated. To profile consumers’ segments, socio-demographic variables and items on perception of farming system, buying behaviour, and importance of information on packaging were used. The segments were tested for significant differences one way ANOVA, with cluster analysis serving as a fixed source of variation. The results, together with the size of each cluster, are reported in Table 3.

**Table 3.** Socio-demographic profile of the total sample and the clusters identified [%].

Variable	Total Sample ( <i>n</i> = 935)	Sceptics ( <i>n</i> = 323, 35%)	Uninvolved ( <i>n</i> = 251, 26%)	Enthusiasts ( <i>n</i> = 244, 26%)	Conservatives ( <i>n</i> = 117, 13%)	Sig.
Gender						0.007
Female	50	46	57	45	56	
Male	50	54	43	55	44	
Education						0.000
Primary school	10	11	12	8	9	
Gymnasium	1	0	2	0	1	
Basic vocational school	36	35	47	25	35	
Secondary education	37	38	31	41	44	
Higher education	15	13	9	25	9	
No response	1	2	0	1	2	
Age						0.380 *
<34	24	26	27	24	17	
35–54	40	39	39	41	44	
55–64	20	17	20	23	19	
>65	16	18	14	12	21	

\* Differences between groups not significant (*p*-value > 0.05).



Table 3. Cont.

Variable	Total Sample ( <i>n</i> = 935)	Sceptics ( <i>n</i> = 323, 35%)	Uninvolved ( <i>n</i> = 251, 26%)	Enthusiasts ( <i>n</i> = 244, 26%)	Conservatives ( <i>n</i> = 117, 13%)	Sig.
Place of residence						0.978 *
Village	36	35	37	39	32	
Small town (up to 20,000 residents)	15	16	12	15	17	
Town (above 20,000 residents)	17	18	17	13	22	
City (above 100,000 residents)	20	21	19	20	22	
Big city (above 500,000 residents)	11	10	14	14	6	
Children						0.116 *
Yes	43	41	46	48	34	
No	38	41	37	34	44	
No response	18	18	17	18	21	
Financial status						0.022
We can afford all we need	9	6	9	14	12	
We live frugally and satisfy all our needs	36	39	30	38	33	
We live very frugally to save for bigger needs	32	32	32	32	31	
We have money only for the cheapest food and clothes	16	15	17	9	16	
We do not have enough money, even for the cheapest food and clothes	1	1	1	0	0	

\* Differences between groups not significant (*p*-value > 0.05).

### 3. Results

#### 3.1. Socio-Demographic Profile of the Total Sample and the Clusters Identified

Regarding the socio-economic characteristics of the respondents, the sample consisted of an equal share of female and male participants (Table 3). In addition, 24% of the respondents were aged below 34 years old, while 40% were aged from 35 to 54 years. Respondents above 55 years old comprised 36% of the total sample. More than 1/3 of the respondents lived in rural areas, and 11% proclaimed to be residents of cities with over 500,000 inhabitants. The majority of participants had a secondary or higher level education, and 47% had completed a vocational and/or lower education. A prevailing number of respondents assessed their health as “good” or “very good”. Respondents’ financial status was relatively good, since 9% declared to be able to “afford all we need” and 36% agreed that “we live frugally and we have enough to satisfy all our needs, while only 1% stated that they “do not have enough money, even for the cheapest food and clothes”.

The clusters identified differ significantly in terms of gender and education (Table 3). We named the clusters according to their socio-demographic profile, relative importance of the free range and organic farming system and the results of attitudinal questions. Sceptics comprise the largest segment (35%) and the least differentiated group as compared to the total sample. They derived low utility from the free range and organic farming system and tend to rely more on advertisements. Uninvolved accounts for 27% of the sample and individuals belonging to Uninvolved are lower educated and with more female respondents. Consumers in this segment do not differ in terms of age from the total sample, but more often have secondary education. Enthusiasts accounts for 26% of the sample and consists mainly of respondents with higher education. They derived the highest utility from free range and organic farming systems. Conservatives are the smallest segment (13%) with a higher share of female respondents and the highest share of respondents aged above 65. Like Sceptics, Conservatives have more confidence in advertisements. We called this segment Conservatives because elderly consumers in Poland tend to be more inclined to hold socially conservative views, reject novelties and rely on advertisements [58].

Consumers belonging to the four clusters identified differ significantly in their subjective assessment of their income situation. The highest share of respondents who can afford all they need was identified among Enthusiasts (14%) and Conservatives (12%), but Conservatives differ in terms of their subjective income assessment since 16% of them claim to have money only for the cheapest food and clothes. Sceptics have the lowest financial status and 32% of respondents in this cluster live frugally and 15% have money only for the cheapest food and clothes. Uninvolved have similar material status as Sceptics, but the share of respondents who can afford all that they need is higher.

### 3.2. The Relative Importance of Attributes

Table 4 presents estimated part-worth utilities of each level and the relative importance of the attributes averaged across all the respondents from the study and four clusters identified in the choice-based conjoint study.

**Table 4.** The part-worth utilities and relative importance of attributes for total sample and four identified clusters.

Attribute	Attribute Level	Total Sample (n = 935)	Sceptics (n = 323, 35%)	Uninvolved (n = 251, 26%)	Enthusiasts (n = 244, 26%)	Conservatives (n = 117, 13%)	Sig.
Farming system	Relative importance (%)	23	18	17	35	28	
	Caged	−1.604	−1.393	−1.182	−2.301	−1.633	0.000
	Organic	0.639	0.437	0.297	1.221	0.711	0.000
	Free range	1.271	1.048	0.973	1.852	1.312	0.000
	Barn system	−0.306	−0.091	−0.087	−0.773	−0.390	0.000
Breed	Relative importance (%)	2	2	1	2	2	
	No claim	−0.097	−0.108	−0.067	−0.115	−0.092	0.553 *
	Traditional local hen breed	0.097	0.108	0.067	0.115	0.092	0.553 *
Health benefits claim	Relative importance (%)	5	5	4	7	9	
	No health benefits claim	−0.392	−0.365	−0.298	−0.444	−0.561	0.054 *
	Contains Omega 3 fatty acids	−0.169	−0.145	−0.163	−0.275	−0.027	0.024
	Contains Omega 3 fatty acids with a positive influence on the cardiovascular system	0.224	0.151	0.206	0.325	0.253	0.072 *
	Higher level of A+E vitamins	0.055	0.096	0.045	0.038	0.002	0.471 *
	Higher level of A+E vitamins with a positive influence on the cardiovascular system	0.282	0.263	0.211	0.356	0.332	0.214 *
Size	Relative importance (%)	14	15	14	14	15	
	S	−1.004	−1.123	−1.001	−0.915	−0.870	0.089 *
	M	−0.160	−0.234	−0.186	−0.073	−0.082	0.016
	L	0.330	0.407	0.321	0.289	0.224	0.038
	XL	0.834	0.950	0.866	0.699	0.728	0.023
Package	Relative importance (%)	6	7	7	4	4	
	6 eggs	0.373	0.477	0.442	0.231	0.237	0.000
	10 eggs	−0.373	−0.477	−0.442	−0.231	−0.237	0.000
Price (per unit)	Relative importance (%)	50	54	57	39	42	
	0.50	2.850	3.414	3.426	1.994	1.846	0.000
	0.60	2.173	2.674	2.569	1.508	1.333	0.000
	0.73	1.225	1.444	1.399	0.904	0.918	0.000
	0.89	0.303	0.315	0.251	0.352	0.281	0.541 *
	1.07	−0.901	−1.137	−1.135	−0.547	−0.486	0.000
	1.29	−2.132	−2.589	−2.463	−1.556	−1.367	0.000
	1.60	−3.518	−4.122	−4.048	−2.654	−2.525	0.000

\* Differences between groups not significant ( $p$ -value > 0.05).

Upon analysing the results with reference to the mean relative importance of each attribute, it can be concluded that consumers consider ‘price per item’ and ‘production method’ to be the most relevant attributes. These attributes are followed by ‘egg size’, ‘package size’ and ‘nutrition and health claims’. ‘Breed’ turns out to be the attribute that least affects the choice of eggs.



The value of the part-worth of each level indicates whether the presence of that level of the attribute adds (positive sign) or subtracts (negative sign) that amount of utility to or from the product or reference level [52].

Respondents in the total sample and each of the clusters perceive 'price per unit' in a similar way: they preferred the lowest price (0.50 PLN) per item. The higher the price per item, the lower the utility was. The importance of this attribute in clusters differed significantly. Uninvolved considered 'price per unit' as the most important product attribute and this was the most price-oriented segment, whereas Enthusiasts and Conservatives valued this attribute significantly less.

Regarding the next most important attribute, "production method", it can be noticed that free range and organic were the most preferred, with the utility decreasing as the production system provided less opportunities for hens to move freely and have access to an outside range. However, organic eggs were less preferred than eggs labelled as "free range" in all segments, nevertheless both production methods provided positive utilities. Although some preferences were similar across all clusters, the importance of "production method", which is related to animal welfare issues, is significantly higher among Enthusiasts and Conservatives. Differences in the perception of this attribute by the segments identified are substantial. Sceptics and Uninvolved attached much less importance to "production method" than "price", whereas relative importance of this attribute among Enthusiasts and Conservatives was higher. As far as the attribute "egg size" is concerned, the participants valued bigger sizes (XL or L). Nutrition and health claims were not important drivers of buying decisions in all clusters identified. However, when the claim was presented along with additional information on the functions of the ingredients (e.g., "*Higher level of A+E vitamins with a positive influence on the cardiovascular system*"), it was valued positively by the consumers in all clusters. It can be stated that Enthusiasts and Conservatives attached higher importance to "nutrition and health claims" than Sceptics and Uninvolved.

It is worth noticing that the nutrition claim '*Contains Omega 3 fatty acids*' without any further information on its potential benefits had a negative influence on consumer choices. Attribute 'breed' was not relevant for respondents and such claim did not influence significantly the overall utility.

### 3.3. Attitudinal Questionnaire

The data in Table 5 summarizes mean scores of the total sample and clusters identified on the items related to consumers' perception, self-assessed subjective knowledge of functional and organic eggs, role of sensory aspects in food choice, price orientation, interest in information included on the label and the role of external sources of information like advertisements in purchasing decisions.

Sceptics attached the greatest importance to prices of food and advertisements of all clusters. They have more confidence in food products that they have seen advertised and information from advertising helps them make better buying decisions. They are also more inclined to look for newspaper ads for store specials and plan to use them when they go shopping. They are also convinced that organic eggs are better than non organic, but they are not ready to pay a higher price for environment friendly products. Uninvolved assigned the least importance of all clusters to information on food and they were not much engaged in comparing the information on product labels before deciding which to choose. They self-assess their knowledge of functional food and organic foods as low. They also scored the lowest on the items related to purchasing of organic food and willingness to pay a premium for organic products. Enthusiasts placed the highest importance of all clusters on the information on food and particularly food labels. Moreover, Enthusiasts emphasised more than other clusters the importance of organic food and, in contrast to Uninvolved, scored the highest on items related to willingness to pay more for organic food. They also assessed as the highest their knowledge of organic food as compared with other clusters. Conservatives were the most convinced that organic eggs were not expensive, but their scores were slightly below the neutral point of the scale. Conservatives, like Enthusiasts, were more inclined to pay a higher price for environmental friendly

products and buy organic food. All four clusters scored high (mean score above 5.0) on the taste of food and only in these two questions differences between groups were not statistically significant.

**Table 5.** Clusters' profile on attitudinal questionnaire.

Statement	Total Sample (n = 935)	Sceptics (n = 323, 35%)	Uninvolved (n = 251, 26%)	Enthusiasts (n = 244, 26%)	Conservatives (n = 117, 13%)	Sig.
Eggs containing Omega 3 acids are expensive (1)–cheap (7)	3.26	3.29	3.00	3.35	3.59	0.001
Organic eggs are expensive (1)–cheap (7)	2.71	2.62	2.65	2.58	3.38	0.000
Organic eggs are better than non-organic	5.70	6.00	4.40	6.90	4.80	0.000
Self-assessment: knowledge of functional food (1) insufficient–(7) sufficient	2.82	2.68	2.42	3.21	3.26	0.000
Self-assessment: knowledge of organic food (1) insufficient–(7) sufficient	3.99	3.81	3.22	4.92	4.21	0.000
To me, product information is of high importance. I need to know what the product contains	4.64	5.34	3.20	5.59	3.83	0.000
I compare the information on the product labels before deciding which to choose	4.18	4.53	3.20	4.82	3.97	0.000
I have more confidence in food products that I have seen advertised than in unadvertised products	3.03	3.28	2.85	2.89	3.06	0.017
Information from advertising helps me make better buying decisions	3.43	3.70	3.10	3.38	3.49	0.003
I always check prices, even on the small items	4.68	4.92	4.34	4.82	4.42	0.000
I watch for ads in the newspaper for store specials and plan to make use of them when I go shopping.	3.62	3.89	3.15	3.69	3.71	0.000
I always buy organically grown food products if I have the opportunity	4.19	3.96	3.14	5.45	4.48	0.000
I do not mind paying higher price for environment friendly products.	3.98	3.76	3.03	5.04	4.39	0.000
I find the taste of the food is the most important	5.64	5.75	5.51	5.71	5.46	0.108*
My priority in preparing meals is their taste	5.59	5.71	5.49	5.63	5.39	0.145*

\* Differences between groups not significant ( $p$ -value > 0.05).

## 4. Discussion

This study presents original findings from a consumer survey combined with a discrete choice-based conjoint experiment. This study aimed to investigate Polish consumers' preferences for production method and prices of eggs. Our results revealed that price and farming system were the most important attributes determining the structure of Polish consumer preferences for this product category. This confirms previous studies of Gerini et al. [35], highlighting the growing concerns and willingness to pay for animal welfare related attributes of laying hens husbandry.

According Jaeger [59], price could influence consumer purchase intention in two different ways: it could lower purchase intention due to a greater monetary sacrifice, or it could have a positive impact on purchase because of an increase in perceived product quality. In our study, an increase in price resulted in a decrease in part-worth utilities, suggesting that increasing price might decrease consumer probability of choosing eggs with animal welfare related attributes. This result is consistent with previous conjoint analyses of food products such as those of Mesias et al. [27] and Gerini et al. [35].

### 4.1. Eggs with Animal Welfare Related Attributes

Since the introduction of compulsory system labelling for shell eggs, consumer behaviour has revealed a strong preference for non-caged systems in the UK [2]. The results of our study showed that consumers preferred free range eggs over organic eggs, despite the fact that organic

production is strictly regulated and ensures high animal welfare standards in terms of housing, access to outdoor pasture and feeding. Similar results were obtained by Van Loo et al. [11] and Martinez et al. [60], who found out that free-range production was preferred over organic and it had the greatest influence on consumer choice. Barn systems where birds are loose-housed on litter but have no access to the outdoors provided negative part-worth utilities despite its potential benefits in terms of animal welfare. The results of the meta analysis of consumer studies on animal welfare labels confirm that the consumers have a positive attitude towards more animal welfare-friendly husbandry systems with outdoor access and are willing to pay a price premium for products from such systems [18]. Therefore, the barn system restricting access to the outdoors provided lower utilities for Polish consumers than free range and organic.

The results of Polish consumers' segmentation revealed that Enthusiasts, who were comprised of better educated and well off respondents with more focus on the information on food and particularly food labels and willingness to pay premium for environment friendly products, were more inclined to choose eggs coming from free range and organic production systems. In contrast, Uninvolved living frugally, less educated and less interested in information on food derived the lowest utility from free range and organically produced eggs. Our study confirmed that education has a significant positive impact on behavioural willingness, which shows that more educated people are more likely to be willing to enhance their animal welfare friendly behaviour [35,36]. Individual differences in perceptions of animal welfare and the production system attributes that contribute to it might be related to a variety of background variables, but also, importantly, moral beliefs [61]. Cognitive aspects of organic food consumption also seem to play a role in shaping consumers preferences, but the state of knowledge about organic certification schemes is generally unsatisfactory [62]. As a result, perception of organic labelling schemes tends to be mostly subjective. Limited knowledge on organic regulations and particularly production standards result in incapability to make informed choices and assess the benefits that consumers may derive from such production systems [63]. Therefore, the Conservatives cluster, who derived relatively high utility from free range and organic farming system but assessed their knowledge on organic food lower than Enthusiasts, scored also lower on the item *"I always buy organically grown food products if I have the opportunity"*. Our findings are supported by Toma et al. [36], who found out that the stronger the perceived ease to find information on welfare friendly products and perceived usefulness of welfare labelling, the stronger the willingness to change the usual place of shopping in order to be able to buy more animal welfare friendly food products. The information provision plays a crucial role in shifting consumer preferences since the the animal types generating the highest willingness to pay estimates are those that have received the greatest press attention in recent years [64].

#### 4.2. Organic versus Free Range Eggs

Organic food remains a niche product in many countries and a high number of consumers are not well acquainted with benefits of organic production but tend to perceive organic products as expensive [39]. The results of attitudinal questionnaires show that organic eggs were perceived as expensive by Polish people regardless of their willingness to pay a premium for organic products. Sales of organic eggs reflect the consumers' high concerns about animal welfare, but also their readiness to pay a relatively higher price. As demonstrated by Lee and You [41], the perceived price premiums of organic food negatively influenced consumers' perceived attitudes. As a result, consumers react adversely and tend to prefer free range eggs. In Germany, for example, organic eggs are at least twice as expensive as conventional eggs—becoming one of the highest price differentials to be found within organic product groups [65]. At the same time, the market share of organic eggs is high as compared with other product categories [17], and there are prospects for further expansion, since many consumers declare buying organic eggs more often than any other product categories [22]. The often-reported result that organic food prices are a major barrier to purchase is only conditionally useful for practitioners, since the market volume is in fact growing and results for the price–quality

relationship indicate reasonable opportunities for future organic markets [39]. However, the biggest welfare concerns for laying hens are related to small battery cages [37] and therefore free range attributes referring to single animal welfare measure are better accepted than organic claims. Furthermore, free range and organic claims might serve in consumers' mind as competing concepts, like organic and local claims. The findings of Gracia et al. [34] demonstrate that local egg producers could ask for a higher price if the products are marketed with the locally produced claim rather than the organic ones. Our finding has some implications for the market actors involved in the organic sector, since they should strengthen efforts to communicate animal welfare related attributes of organic production methods. Adding animal welfare to production criteria has been an innovation driver for the egg sector, providing new performative economic practices [2] and supporting market expansion. Since organic production normally satisfies the same outdoor requirements as free-range eggs, these consumers' lower appreciation of the organic attribute can be straightforwardly solved with the appropriate information [27]. Nevertheless, the price of organic eggs remains a barrier, particularly in countries like Poland, where the expenditure on food is relatively high.

#### *4.3. Prospects for Combining Information on Farming Systems with Nutrition Related Claims*

Our results show that information on farming systems plays an important role in shaping consumers' preferences for eggs. The information on health and nutrition claims i.e., omega 3 and vitamin E did not contribute significantly to the structure of consumer preferences and had a minor impact on consumer choices of eggs. Claims can be basically constructed from three components: the active ingredient, effective function and health outcome. When only ingredient, function or outcome are included in the claim, there is less information to assess the credibility of the claim or what the health-related outcome may be [66]. The respondents were confronted with two types of claims consisting of either information on active ingredient or health outcome. Nutrition claim on Omega 3 fatty acids resulted in negative utilities in all clusters identified. In the study of Krutulyte et al. [67], it was found that combinations of carriers and functional ingredients like omega 3 acids that have been available on the market for some time, and for which respondents therefore are familiar with, lead to higher purchase intention. Overall, familiarity is a key factor in acceptance of functional food and using a component that is already widely marketed with health-related arguments seems to create a bigger benefit perception than a new component [68]. Our findings can possibly be explained by the fact that Polish consumers are less familiar with products communicated as containing omega 3 acids. In contrast, information on Vitamin A as an active ingredient yielded positive utilities since consumers are well acquainted with such components. Provision of information on health outcomes led to increased part-worth utilities. Consumers in our study revealed preference for claims with additional information on health outcomes that confirms previous studies of van Kleef [69]. It was also found that two of the consumer segments, namely Enthusiasts and Conservatives, may constitute interesting targets for these new products, while the other two are sceptical towards products with such attributes.

## **5. Conclusions**

Introduction of an European labelling system for shell eggs affected consumer behaviour and resulted in egg market proliferation. Therefore, understanding of Polish consumers preferences for labelling systems and prices of eggs is of paramount importance for producers and operators in the eggs market to better target the communication and to gain a competitive advantage. Our study revealed that the price of eggs is of primary importance for Polish consumers, but information on farming systems substantially differentiates consumers' preferences. Polish consumers preferred free range eggs over organic ones despite the legally guaranteed benefits of organic farming in terms of animal welfare. As a result, free range claims generate more market prospects than organic ones. Therefore, our results have some practical implication for food policy makers and operators in the Polish organic sector, who should effectively communicate the attributes of organic farming

related to animal welfare and particularly strict housing and feeding conditions of laying hens, required in the organic EU regulations. Barn eggs are less preferred, although they provide some benefits in terms of animal welfare. Consumers clearly differentiate between the free range and barn farming systems and tend to favour access to the outdoors. Claims related to nutritional enhancement of eggs were less relevant, but our results provide some insights into preferred claim structure. Understanding the ultimate reasons for choices helps us with regard to the search for suitable labelling initiatives and public intervention strategies. The empirical results and findings from this study could provide the marketers in the organic foods with some managerial suggestions to formulate effective marketing communication strategies. Our results also provide the marketing practitioners with insights applicable for pricing strategies. To encourage consumers to buy organic eggs, more information on credence attributes related to animal welfare should be provided. Our segmentation showed that two of our four clusters may be more easily reached by information on animal welfare related attributes in egg production than the others. Enthusiasts who derived the highest utility from free range and organic production system and Conservative consumers who were less convinced that organic eggs are expensive, and were more inclined to pay a premium for organic eggs, should be targeted with such information. While Conservative consumers could benefit from information about linkages between organic production systems and animal welfare, clearly, they are problematic in terms of receptivity. Therefore, more research is needed to effectively target this particular segment. The heterogeneity within the socio-demographic and socioeconomic characteristics confirms that niche markets for products produced with higher animal welfare standards do exist. Our study also has some limitations since the data is self-reported and therefore subject to discrepancy between actual and reported information. Using cluster analysis as a method for segmentation also has some weaknesses that should be mentioned. The method is not based on probabilistic statistics so it is the researcher's interpretation that is most relevant. Furthermore, we did not verify if Polish consumers properly interpret the claims on eggs.

In conclusion, it can be stated that a hypothetical product with the highest utility would be a package of six eggs, free range, XL size with nutrition claims that highlight the potential health benefits. The price per unit should not exceed 0.89 PLN (approx. EUR 0.20).

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