

Author's summary of scientific achievements

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Warsaw, 2018

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1. Personal data

1.1. Name and Surname

Sylvia Elżbieta Żakowska-Biemans

1.2. Diplomas and scientific degrees

- **Doctor of Philosophy degree in agricultural sciences** (2002), discipline: Food Technology and Nutrition; Faculty of Human Nutrition and Consumer Sciences, Warsaw University of Life Sciences - SGGW.
Title of Ph.D.: Factors affecting development of organic food market in Poland and other EU countries
Supervisor: prof. dr hab. Krystyna Gutkowska
Reviewers: prof. dr hab. Teresa Pałaszewska-Reindl,
prof. dr hab. Barbara Kowrygo.
- **Master of Science degree in agricultural sciences** (1991), specialization: Horticulture, Warsaw University of Life Sciences - SGGW.
M.Sc. thesis title: Comparison of nitrate and nitrite content in organic and conventional vegetables.
Supervisor: dr hab. Mieczysław Górny, prof. SGGW.

1.3. Information about employment in research units

- od 2002 **adjunct**, Consumption Research Unit, Department of Organization and Consumption Economics, Faculty of Human Nutrition and Consumer Sciences. Warsaw University of Life Sciences.
- od 2001 **Research assistant**, Consumption Research Unit, Department of Organization and Consumption Economics, Faculty of Human Nutrition and Consumer Sciences. Warsaw University of Life Sciences.
- od 2000 **Research assistant**, Organic Food Chair, Department of Dietetics and Functional Food, Faculty of Human Nutrition and Consumer Sciences.
do 2001 Warsaw University of Life Sciences.
- od 1992 **Research assistant**, Organic Food production Unit (from 1993 Organic Food Production Methods Unit), Department of Home Economics, (from 1995 Department of Food Commodities), Faculty of Human Nutrition and Home Economics (at present Faculty of Human Nutrition and Consumer Sciences). Warsaw University of Life Sciences.
do 2000

2. Scientific achievement being the basis of the habilitation procedure

2.1. Title of the scientific achievement

The scientific achievement, in accordance with Article 16, Paragraph 2 of the Act of 14 March 2003 concerning the scientific degrees and titles (Journal of Laws No. 65, item 595, as amended), is the series of 6 publications entitled:

“Determinants of consumer behaviour towards food with selected quality attributes”

2.2. The list of publications which constitute scientific accomplishment

1. **Żakowska-Biemans S.** (2011). *Polish consumer food choices and beliefs about organic food*. British Food Journal, 113 (1), 122-137.
<https://doi.org/10.1108/00070701111097385>
(IF₂₀₁₁= 0,703; pts MSaHE: 25)
2. **Żakowska-Biemans S.** (2015). *Troska o środowisko i jej implikacje dla zachowań konsumentów w sferze żywności i żywienia (Environmental care and its implications for the consumer behaviour in the domain of food and nutrition)*. Journal of Agribusiness and Rural Development, 3, 589-598.
(IF=0; pts MSaHE₂₀₁₅:13).
3. **Żakowska-Biemans S.** (2012). *Żywność tradycyjna z perspektywy konsumentów (Traditional food from the consumer perspective)*. Żywność Nauka Technologia. Jakość, 3 (82), 5-18.
(IF₂₀₁₂=0,190 pts MSaHE:15).
4. **Żakowska-Biemans S., Sajdakowska M., Issanchou S.** (2016). *Impact of innovation on consumers liking and willingness to pay for traditional sausages*. Polish Journal of Food and Nutrition Sciences, 66, 2, 119-127. <https://doi.org/10.1515/pjfn-2016-0004>¹.
(IF₂₀₁₆ =1,276; pts MSaHE: 15).
5. **Żakowska-Biemans S., Tekień A.** (2017). *Free range, organic? Polish consumers preferences regarding information on farming system and nutritional enhancement of eggs: A discrete choice based experiment*. Sustainability, 9 (11). Article number 1999, <http://doi.org/10.3390/su9111999>.²
(IF₂₀₁₇ =2,075; pts MSaHE: 20).
6. **Żakowska-Biemans S., Pieniak Z., Gutkowska K., Wierzbicki J., Cieszyńska K., Sajdakowska M., Kosicka-Gębska M.** (2017). *Beef consumer segment profiles based on information source usage in Poland*. Meat Science, 124, 105-113.
<http://doi.org/10.1016/j.meatsci.2016.11.001>.³
(IF₂₀₁₇ = 2,821; pts MSaHE: 35).

¹Publication within Traditional Food in United Europe -TRUEFOOD” 6 PR RTD UE project.

²Publication within “Biofood– innovative and functional products of animal origin” (POIG.01.01.02-14-090/09-00).

³Publication within PROOPTIBEEF – optimisation of beef production in Poland with the strategy from farm to fork” (POIG.01.03.01-00-204/09-00).

The total score of all publications constituting the Main Scientific Achievements is **123** points according to MSaHE journals' rank and total **IF** is **7.065** (IF from the year of publishing). Copies of manuscripts constituting the Main Scientific Achievement together with declarations of co-authors concerning their contribution to each of these manuscripts are enclosed in appendix 4.

2.3. Presentation of research objective and results obtained within the Main Scientific Achievement

2.3.1. Introduction

Understanding and predicting consumer behavior in the food market requires a multidisciplinary approach and the ability to combine theoretical knowledge in the fields of psychology, sociology, economics, human nutrition and food technology with practical knowledge. Behaviors in the sphere of food and nutrition are a distinct type of consumer behavior, because on the one hand they are implied by hunger and internalized dietary patterns, and on the other hand are related to the impact of individual elements of food marketing (food product, its price, availability, way of communicating its attributes) and conditions of the natural, socio-cultural and economic environment [Żakowska-Biemans and Gutkowska, 2003]. Although economic factors are included among the important determinants of food selection, the quality has become the main determinant of global changes in the food offer.

Food quality is a multidimensional concept and covers food safety, nutritional value and sensory quality [Baryłko-Pikielna, 1995]. The perception of quality of food by consumers differs significantly from the perception and understanding of it by specialists in the field of food sciences and producers. This fact is more and more often acknowledged by them and as a result a shift in the approach to the assessment of food quality from technological-normative to "consumer led" is observed, i.e. taking into account consumer perception and its determinants. The observed changes in the approach to the way of assessing food quality, as well as the fact that quality is a set of various components, varying to the extent important for individual consumers and depending on the type of product, encouraged me to undertake research on the significance of selected quality attributes in consumer decision-making processes.

The theoretical foundation of the research I have undertaken lies in the notion of food quality as conceptualized in the Total Food Quality Model [Grunert, 2005]. The TFQ model analyses "food quality" from the consumer's perspective, taking into account the factors that make up food expectations (expected quality) and the assessment of their fulfillment by a given product (experienced quality). Food quality according to TFQM can be analyzed vertically and horizontally. The horizontal approach takes into account the consumer's perception of the quality of food both before and after the purchase, and includes the expected quality and its verification (experienced quality). Proposed by Grunert, [2005] horizontal approach refers to the division of goods proposed by Nelson [1970] into goods whose properties can be assessed before a purchase (search goods), goods whose properties can only be assessed after their

acquisition (experience goods) and goods whose properties cannot be verified both before and after the purchase (credence goods), Oude Ophuis and Van Trijp [1995] in reference to the quoted theory of the distribution of goods, categorized the attributes of food quality into experience quality attributes, and the so-called credence quality attributes, e.g. "safety", "positive impact on the environment", "care for the welfare of farm animals", "organic production methods" [Grunert i in., 2014]. In the interpretation of the vertical structure of the model Grunert, [2005] refers to the means end theory of Olson's and Reynolds' [2001] and expose the meaning of cues defined as information used in creating quality expectations [Steenkamp, 1990]. These cues are divided into intrinsic quality cues and extrinsic quality cues. Among the intrinsic quality cues, the product's properties are distinguished by its technical specification, which can be the subject of measurement, e.g. color, content of minerals or vitamins. Extrinsic quality cues refer to the specific properties of products both in terms of information, e.g. product brand, quality marks, but also other factors such as price, place of sale. The cues can be identified and verified by the consumer to varying degrees, at different time and place, which refers to the division into search, experience and credence attributes. Consumers in the decision making processes related to the purchase and consumption of food combine in the cognitive structures specific attributes of the product with the desired consequences that reflect their values [Grunert et al., 1993].

Contemporary consumers are becoming addressees and creators of changes in the food market following global trends determined by health, wellness and environmental care, which causes constant redefinition of the quality attributes of food. The exemplification of these changes is the growing importance in the decision-making processes the aspects related to maintain physical and intellectual health for as long as possible, which contributes to the development of the offer of food with pro-health attributes. At the same time, consumers increasingly stress the care for the environment as a determinant of their consumption choices, which is reflected in the growing demand for food produced and distributed in an environmentally friendly way. A manifestation of global trends is also the pursuit of preserving and displaying values resulting from cultural heritage, which was reflected in the development of the traditional food market.

The observed changes on the food market imply to explore perception of food quality attributes and to search for new methods in consumer behavior testing that take into account the predominance of sensory attributes as determinants of food selection and the complexity of food quality assessment processes by consumers and food-related decision-making processes. Knowledge in this field is necessary both for the purpose of developing new food products and

improving the quality of already existing ones, as well as promoting the consumption of food that is responsible for the individual and social dimension.

2.3.2. The aims and study hypothesis

The exploratory aim of the presented scientific achievement was to identify the determinants of consumer behavior towards food with selected quality attributes and to propose the way to research them.

The methodological goal was to demonstrate the possibility of using a research approach based on the combination of consumer sensory research with behavioral experiments in the development of new food products and food quality improvement.

The research results, discounted in the presented scientific achievements, also have utilitarian goals because they provide indications and tools that can be used in creating strategies for communicating selected food quality attributes, formulating food policy and its evaluation.

The specific objectives included:

- identification, using research tools for multidimensional analysis of factors determining the choice of food, consumer segments with different propensity to purchase food with quality attributes resulting from the organic food production methods;
- defining the way of conceptualizing the attributes of the quality of traditional food and their impact on the tendency to accept innovation in this type of food;
- defining the structure of preferences and willingness to pay a specific price (WTP) for food products with quality attributes resulting from the use of production methods with different levels of animal welfare;
- determination of the significance in the decision processes related to the quality of food quality labels that constitute a synthetic representation of the attributes of food quality.

On the basis of the above-mentioned goals, the following research hypotheses have been formulated:

1. The origin of food from environmentally friendly production systems is an important determinant of consumers' buying decisions, but its importance depends on selected sociodemographic and socio-psychological variables that can be synthesized in the segmentation of consumers interested in the purchase of organic food.

2. Consumers represent a diverse level of awareness about the relationship between food handling and the level of sensitivity to environmental issues, with the criteria for this differentiation being determined by both sociodemographic and axiological variables.
3. The willingness to pay a higher price for food with certain quality attributes varies depending on how they are perceived by consumers as well as on the type of the product itself.
4. Traditional food is one of the types of food distinguished by special attributes, and the most important consumers recognize its unique sensory qualities, which implies specific directions of creating innovation in the traditional food market, which should include changes accepted by consumers that do not affect the authenticity of traditional food.
5. Introducing innovations in the food market requires the triangulation of research methods in the field of consumer sensory research with methods applied in experimental economics, so as to provide unique information on the relationship between sensory perception of quality attributes of food products and the willingness to pay (WTP).
6. The quality label is a guarantee that a food product possesses specific intrinsic and extrinsic attributes, the importance of which is of different value in the assessment of various consumer segments, initiating a different propensity to buy the product to which such labelling is applied.

2.3.3 Results

2.3.1.A Organic way of food production as a quality attribute that encourages consumers to make specific purchasing decisions

Publications

I.B.1. Żakowska-Biemans S. (2011). *Polish consumer food choices and beliefs about organic food*. British Food Journal, 113 (1). 122-137. <https://doi.org/10.1108/00070701111097385> (IF₂₀₁₁= 0,703; pts MSaHE 2011: 25)

I.B.2. Żakowska-Biemans S. (2015). *Care for the environment and its implications for consumer behavior in the sphere of food and nutrition*. Journal of Agribusiness and Rural Development, 3, 589-598. (IF = 0, pts MSaHE 2015: 13).

Organic farming concepts have emerged independently in different regions of the world in the 1920's in response to growing problems related to the quality and fertility of soils, but consumer interest in food from organic farming intensified in the 1960s in the result of socio-cultural and economic changes. Organic food production is most often identified with resignation in agricultural production from chemicals, care for the environment and food quality

[Hill and Lynchhaun, 2002; Aarset et al., 2004; Tsakiridou et al., 2008]. The literature on the subject shows that care for health and the environment, sensory attributes and socio-ethical aspects are among the most important determinants of the organic food choices [Tregear et al., 1994; Magnusson et al., 2001; Zanolli and Naspetti, 2002; Lockie et al., 2004; Hughner et al., 2007; Aertsens et al., 2009].

Consumers describe organic foods referring to attributes such as 'taste', 'safety', 'positive effects on health', 'care for the environment' and 'animal welfare' [Magnusson et al., 2001; Zanolli and Naspetti, 2002; Thøgersen, 2006]. The research by Padel and Foster, [2005] and Janssen and Hamm, 2011] shows that consumers do not have reliable knowledge about organic food and as a result are not able to assess the real benefits of buying this type of food. This is confirmed in research by Pieniak et al. [2010], which showed that the subjective knowledge about organic food was a better predictor of behavior than objective knowledge.

Consumers of organic food are very diverse in terms of socio-demographic profile and incomes. More often, organic food is bought by people with higher education and declaring having children [Hughner et al., 2007].

The organic food market has been one of the most dynamically developing segments of the European food market since the 1990s. Despite the existing purchase barriers, the number of consumers of organic food is increasing and the level of spending on this type of food is increasing. This entails to get more insights into of the factors influencing Polis consumer choices of organic food. For this purpose, a quantitative study was carried out on a representative nationwide sample of 1010 respondents using the CAPI (personal computer-assisted interviews) method.

The main objective of the research was to identify consumer segments with different propensity to purchase organic food using lifestyle as a segmentation criterion and to define attributes of organic food and barriers to buy (**publication I.B.1**)

In order to ensure the cross cultural comparisons of the results, the segmentation variables included selected statements from the research tool Food Related Lifestyle - FRL [Grunert et al., 1993] and Food Choice Questionnaire - FCQ [Steptoe et al., 1995]. Lifestyle within the meaning of the FRL concept has been defined as a mental construct that explains human behavior and includes aspects such as food purchase, the importance of food quality attributes in decision-making processes and meal preparation [Grunert et al., 1993; Brunsø et al., 2004]. FCQ includes a set of statements for determining factors influencing the choice of food, including sensory attributes, health care, convenience orientation, environmental and socio-ethical as well as economic aspects [Steptoe et al., 1995].

The results of research have shown that the perception of organic food is dominated by attributes such as "health", "safety", "lack of chemicals", "quality", "trust", which places organic food among the credence goods [Hill and Lynchhaun, , 2002; Aarset et al., 2004; Tsakiridou et al., 2008; Fernquist and Ekelund, 2014].

The respondents considered the low ability to recognize organic food as the most important barrier to buy, which in turn indicates a weak consumer position in the organic food market and suggests the need for information and promotion activities on labeling this type of food, to reduce uncertainty in decision-making processes and to prevent loss of confidence in organic food.

To a lesser extent, the low level of interest in the purchase of organic food resulted from the lack of information on places of sale, high prices and the lack of organic products in preferred places of purchase.

As a result of the cluster analysis, 5 segments have been distinguished that differ significantly in terms of lifestyle and factors determining the choice of food identified as "Conscious", "Traditionalists", "Pragmatists", "Uninvolved" and "Careless".

The highest share of consumers declaring organic food purchases was recorded in the "Conscious", "Traditionalist" and "Pragmatists" segments. The "Conscious" segment comprised mainly of respondents under 45 years of age, with higher education and with a good income situation. Representatives of this segment were distinguished by a decidedly higher openness to new food products, interest and use of the information included on the food label and were willing to pay higher price for food products supporting the domestic economy. "Conscious" scored the highest on the statements indicating that they prefer to do shopping at specialist stores.

In the "Traditionalists" segment, the share of professionally inactive people aged over 55 with a worse income situation, representing a lower level of education and uninterested in new food products, was definitely higher. Their purchasing decisions were determined to the greatest extent by sensory attributes (taste), but similarly to "Conscious", they scored high on the statements regarding the importance of health quality as determinants of their food choices. "Traditionalists" valued the "naturalness" to the greatest extent and attached great importance to the choice of food products that "resemble food as they ate in childhood". It should be emphasized that consumers in the "Conscious" and "Traditionalist" segments to the greatest extent were guided in their food-related choices by environmental and socio-ethical aspects, while at the same time they were making pragmatic choices and looking for a good relationship between quality and price.

Representatives of both segments were paying particular attention to the freshness of food and preferred unprocessed food, which resulted in much lower scores on using ready to eat products. The consumers in “Pragmatist” segment made different declarations regarding the use of convenience food. “Pragmatists” were also less interested in information on the food label and the purchase of food in specialist stores. Like "Traditionalists," they highly rated the statement pointing to the importance attributed to the elimination of undesirable ingredients in food and they were skeptical about genetically modified foods. Their choices related to food to a lesser extent than in the case of "Conscious" and "Traditionalists" were determined by the country of origin.

As a result of the segmentation analysis, the consumer segments, whose representatives paid less attention to the qualitative attributes of food were also identified i.e. “Uninvolved” and “Careless”. In both of these segments, younger consumers under 25 had a much higher share. In the "Careless" segment, the majority were respondents for whom the sensory values of food were definitely more important than its impact on health. The respondents least agreed with the statements regarding weight control. At the same time, it was a segment with higher share of consumers who least used the information on the product's label to assess the nutritional value of food. In addition, consumers in this segment did not show interest in purchasing organic food, environmentally friendly packaging, as well as they were less interested to support domestic food products, if it would be associated with an increase in food expenses. They also showed little interest in new products.

In turn "Uninvolved" paid less attention to food prices and the convenience in shopping for food. In a similar way as "Careless", they evaluated statements regarding socio-ethical issues and quantifying ethnocentric attitudes. On the other hand, "Uninvolved” were less skeptical about buying organic food and they were more ready to pay a higher price for it.

I continued my research on the perception of quality attributes of food by exploring the relationship between the concern for the environment declared by consumers and the tendency to undertake behavior conducive to environmental protection and their lifestyle (**publication I.B.2**). The increase in the importance of values related to caring for the environment in the choices made by contemporary consumers noted in the literature [Fraj and Martinez 2007; MacMillan et al., 2012; Zhu et al., 2013] and the growing demand for organic food [Magnusson et al., 2001], encouraged me to undertake research on this issue.

In order to better understand the relationship between the declared care for the environment reflected by the interest in purchasing food from organic production and food related lifestyle,

research was carried out using the CAPI quantitative approach on a 1,000-nation nationwide representative sample of consumers.

The segmentation criterion comprised of selected statements from the FRL concerning decision-making processes related to the purchase of food, respecting the principles of healthy nutrition, meal preparation and willingness to purchase organic food. The importance of care for the environment and readiness for pro-environmental changes in the sphere of food consumption was diagnosed with statements illustrating a different degree of involvement in environmental issues and the significance of this aspect in purchasing decisions.

As a result of the cluster analysis, 4 consumer segments were identified, i.e. "Gourmets", "Pro-health", "Modern", "Uninvolved".

The "Gourmets" segment mainly comprised of women, respondents over 50, professionally inactive persons who assessed their financial situation more often than others as bad. Respondents belonging to this segment paid more attention to sensory attributes, product freshness and food prices, than to the nutritional value of food or the convenience in preparing meals. Representatives of this segment less frequently than others agreed with the statement that "they follow a very healthy diet", as well as did not tend to buy organic food.

The "Pro-healthy" segment was distinguished by a slightly higher share of men, people over 60 years of age, residents of cities from 100 to 500 thousand inhabitants, with higher education and a good social and professional position and declaring a satisfactory assessment of the income situation. For "Pro-health", the food prices were less important, and therefore they were more willing to pay more for more expensive, high-quality products, more often also declaring their willingness to buy organic food.

On the other hand, they were less interested to buy new products, which may result from the fact that in this segment the share of older people, displaying less willingness to accept market novelties, was high. "Pro-healthy" paid more attention than the other respondents to the content of additives in food and the degree of its processing, as well as were less interested in convenience food. "Pro-healthy" in contrast to "Gourmets", assessed their way of eating as healthy and were willing to make sacrifices to implement the principles of healthy nutrition. The factor differentiating both segments was the interest in information on the labels of food products to which "Pro-healthy" paid more attention.

In the "Modern" segment, the share of the youngest consumers as well as employed people and residents of big cities was statistically higher. Consumers belonging to this segment paid less attention to the content of additives in food and the degree of its processing as well as "naturalness" was not an important attribute of food for them. However, they more often

declared that they were looking for "new and diverse products" and to a greater extent agreed with the statement that "buying expensive and luxury food makes them happy". "Moderns" valued eating in expensive and exclusive restaurants and shopping in specialist stores, which testifies both to the desire to emphasize their status, and to look for exceptional sensory experiences. Among the representatives of this segment, there was a tendency to minimize time and effort associated with preparing meals. At the same time, these consumers scored high on the statements referring to meal planning, which points to the importance attributed to the reduction of time for these activities. "Modern" to a lesser extent agreed with statements expressing concern about environmental issues, although relatively often they admitted that their purchasing decisions are determined by care for the environment.

The "Uninvolved" segment comprised of consumers who were least in agreement with all the statements included in the study. In this segment, a statistically significantly higher share of people aged 30 to 39 and men was recorded. Consumers belonging to this segment were less interested in information on food labels and product prices and were more oriented on fast shopping. It can be assumed that purchases are made on a routine basis, because they did not attach importance to the shopping lists, as well as they were not looking for new food products. "Uninvolved" as well as representing the "Gourmets" segment, were not willing to sacrifice themselves in order to apply the principles of healthy nutrition, nor did they think that they eat healthy. Observed among the "Uninvolved" orientation on the convenience with regard to making purchases was not reflected in the way of preparing and eating meals. To a lesser extent, than the "Modern" they used ready-made meals and semi-finished products, and with the statement that "meals should be quick" they agreed to a similar degree as "Gourmets" and "Pro-healthy".

"Uninvolved" turned out to be the least sensitive to environmental issues, they did not show concern about the state of the environment, nor were they willing to take any actions that could contribute to its improvement. Their level of compliance with the statement diagnosing willingness to purchase organic food was the lowest as compared with the other segments.

Summary and the possibility of using the results

The planned methodological approach and the results obtained contributed to the achievement of exploratory aims of the scientific achievement, because the application of segmentation analysis using tools validated in intercultural studies provided unique information about the diversity of determinants associated with the choice of food characterized by selected quality attributes depending on the lifestyle of Polish consumers.

The research hypothesis 1 was positively verified and it was confirmed that the origin of food from organic production is an important determinant of choices made by consumers, and consumer segmentation using FRL allows for a more in depth exploration of complex determinants of food products with credence quality attributes. Segmentation analyzes carried out highlighted the most important differences between consumers exhibiting different propensity to buy organic food and showed a relationship between the valuation of specific food attributes, behaviors and lifestyle. The highest propensity to buy organic food was recorded among the segments comprising of respondents whose choices were determined by health aspects, skeptical to convenience food, as well as oriented on socio-ethical criteria in food production.

At the same time, there differences recorded between the segments distinguished by the highest share of consumers of organic food in the use of information contained in the labels, openness to new products and the inclination to incur higher costs for purchasing products of Polish origin. These issues should be used in creating marketing communication strategies. The criterion differentiating these segments was also making purchases in specialized stores and readiness to pay higher prices for organic food, which in turn should be used in the positioning of organic food. The identified segments corresponded to the ones highlighted in the study by Wycherley et al. [2008] and Nie i Zapeda [2011]. Thus, the applicability of the FRL was confirmed as a criterion for segmentation in research carried out in various socio-cultural and economic realities.

It was also shown that involvement in the sphere of food and nutrition promotes consideration of care for the environment as determinants of food choices. It was found that representatives of selected segments to a different extent declared that they were concerned about the environment when making decisions about food purchase, as well as showed a different tendency to buy organic food.

The differences between the individual segments also related to interest in buying new products, more expensive and exclusive products, as well as shopping in specialist stores and reading information contained on food labels. It can also be concluded that the representatives of particular segments had different possibilities of identifying food products with attributes resulting from respecting environmental criteria, which may have an impact on their purchasing behavior. In this context, it should be noted that both communication strategies addressed to these segments should emphasize the diagnosed behavioral tendencies of their representatives. The conducted research confirmed the hypothesis No. 2 and proved that consumers represent a diversified level of awareness on the relationship between food handling and the level of

sensitivity to environmental issues, depending both on sociodemographic and psychographic variables, and especially on recognized values.

In summary, it should be emphasized that the choice of organic food is an exemplification of a specific lifestyle and care for the environment becomes an important factor differentiating the behavior of contemporary food consumers. Polish consumers more and more often show a tendency to undertake such behaviors, which should be strengthened by carefully planned communication strategies that show concern for the environment in the context of individual benefits, as well as general societal benefits related to the implementation of sustainable consumption of food.

Conducted research is also considerably utilitarian for creating operators' strategies on the organic food market, because they provide a more complex and concise explanation of attitudes and behaviors and provide suggestions not only on creating products and communication strategies, but also precisely indicate what attributes and related values determine the choice of food from organic production.

The utilitarian dimension of the conducted research also results from the possibility of using the obtained results not only in marketing activities, but also in food policy in order to create adequate strategies for communicating organic food or, more broadly, food from sustainable agriculture.

Use as a criterion for segmentation of tools validated in intercultural research has provided opportunities to compare the findings with those obtained by other researchers. The I.B.1 publication met with interest from researchers from different countries and was cited 57 times according to the Web of Science database.

2.3.1.B. Attributes of traditional food as a factor differentiating the willingness to accept innovation

Publications

I.B.3. Żakowska-Biemans S. (2012). *Traditional food from the consumers' perspective*. Food Science Technology. Quality, 3 (82), 5-18.
(IF2012 = 0.190 pts MSaHE: 15).

I.B.4. Żakowska-Biemans S., Sajdakowska M., Issanchou S. (2016). *Impact of innovation on consumers liking and willingness to pay for traditional sausages*. Polish Journal of Food and Nutrition Sciences, 66, 2, 119-127.
<https://doi.org/10.1515/pjfn-2016-0004>
(IF₂₀₁₆=1,276; pts MSaHE: 15).

The contemporary consumer is becoming multicultural, on the one hand he displays a tendency to follow global trends, on the other hand, he strives to preserve cultural identity and

demonstrate individuality, which is manifested by the growing interest in traditional food distinguished by quality attributes resulting from the specific characteristics of raw materials, processing methods and place of origin. The legal regulations of the European Union specify the scope of protection of traditional products on the EU market, but they do not define the term "traditional food" directly. In the regard of the growing demand for this type of food in EU countries, it became necessary to identify how consumers conceptualize "traditional food" and what attributes associate with it, as well as the factors determining the choice of this category of food (**publication I.B.3**). For this purpose, research was carried out on a representative nationwide sample (n = 1005) using the CAPI method (computer-assisted personal interviews) preceded by a cross-section analysis of results obtained under the research project "Traditional Food in a United Europe" (TRUEFOOD) financed from the 6th Research Framework Program.

The data obtained as a result of triangulation of qualitative and quantitative research methods in the TRUEFOOD project allowed to identify how consumers conceptualize the term "traditional food" and to formulate a pan-European definition of traditional food. It was shown that consumers from the countries covered by the study (Belgium, France, Spain, Norway, Poland, Italy) most often identified the term "traditional food" with products often consumed, reflecting culinary traditions, as well as products whose consumption was associated with special situations (e.g. family celebrations, religious holidays), products transmitted from generation to generation, produced by traditional methods, less processed and possessing distinctive sensory values [Guerrero et al., 2010].

It was found that Polish consumers, to a greater extent than consumers from the other countries covered by the study in the conceptualization of traditional food, referred to culinary traditions than to specific products offered as traditional. At the same time, the identification of traditional food with traditional Polish cuisine often referred to as "fat" [Jeżewska-Zychowicz, 2009] resulted in consumers having an ambivalent attitude towards the influence of traditional food on maintaining normal body weight [Almli et al., 2011], which in turn may negatively affect its image among segments of Polish consumers that pay particular attention to these issues.

Cultural differences were observed in the evaluation of traditional food attributes between Polish consumers and those representing other countries. Polish consumers, as the positive features of traditional food, most often indicated "taste" and "quality", but decidedly lower the attributes referring to "convenience" in the sense of convenience in doing food shopping and time devoted to the preparation of traditional food. However, this does not mean that consumers perceive these attributes as negative features of traditional food. The time devoted to the

preparation of traditional products or dishes can be interpreted as an expression of care for the loved ones and foster the implementation of related values. The limited availability of traditional food can be an element of "exclusiveness" enhancing the image of traditional food among consumers treating food consumption as a way to manifest a particular lifestyle and social status. The intercultural studies carried out also showed that Polish consumers to a lesser extent agreed with the statement that traditional food is characterized by reproducible quality.

Attributes associated to traditional food by Polish consumers indicated their positive emotional attitude to this category of food, which was reflected in the declarations regarding its purchase. The research carried out among Polish consumers showed that among respondents declaring the purchase of traditional food, women and people over 40 were prevalent. Indeed, people who were retired and living in households with more than 4 people were more likely to buy traditional food. However, no relationship was found between the level of education, subjective assessment of the income situation of respondents and the declared frequency of traditional food purchase. The analysis of the socio-demographic profile of consumers of traditional food has shown that traditional food is a product best accepted by respondents at a mature age, who at the same time more often exhibit conservative attitudes and are characterized by a greater attachment to traditional values.

The most important motive for the choice of traditional food by Polish consumers was the conviction of its high quality and exceptional taste properties. Consumers buying traditional food most often referred to the need to experience sensory pleasure and seek new culinary experiences, [Żakowska-Biemans and Kuc, 2009].

Based on data collected in the TRUEFOOD project, the segmentation analysis of traditional food consumers, taking into account their lifestyle, showed that consumers of traditional food were more concerned about health and more involved in the planning and preparation of meals [Vanhonacker et al., 2010]. They perceived cooking as a sign of care for loved ones and valued culinary skills. A relation was also found between the ethnocentric tendencies and the interest in traditional food. Consumers for whom important information was the country of origin of the product more often indicated that they are consumers of traditional food. The segmentation analysis carried out showed, moreover, that Polish and Italian consumers, more than representatives of the other countries covered by the study, appreciated making traditional food purchases in specialized stores and marketplaces, and paid more attention to quality marks for traditional food. The preference to purchase traditional food in specialist stores and direct distribution, and the importance attributed to labeling indicates that they expect certain guarantees of the authenticity and uniqueness of traditional food. These

issues should be taken into account in marketing communication so as to support the recognition of quality labels and provide consumers with knowledge allowing for the interpretation of multiple benefits resulting from the purchase and consumption of traditional food in the socio-cultural environmental and economic dimension.

Despite the fact that traditional food is perceived by consumers very positively, they see various barriers to its purchase, mainly related to its availability, price level and lack of information on places of sale [Żakowska-Biemans and Kuc, 2009].

The cross-sectional analysis of the results of international research carried out as part of the TRUEFOOD project has shown that consumers are interested in traditional food since they are looking for new taste sensations and implementation of values relating to the care for the environment and the local economy, which has specific consequences for producers of traditional food seeking possible sources of competitive advantage. Despite the fact that the research results showed that consumers of traditional food are not oriented on convenience, it can be expected that they will look for products combining the attributes of traditional and convenience food, which will require searching for innovative methods of processing and extending the shelf life of traditional food products, but also guaranteeing preservation of their exceptional sensory properties.

These issues have become an inspiration for further research combining consumer sensory research with experimental research on the willingness to accept innovation in traditional food. Qualitative research carried out as part of the TRUEFOOD project showed that "innovative" and "traditional" are terms that, in the opinion of consumers, were mutually exclusive [Guerrero et al., 2012]. As a result, consumers can treat innovations in traditional food as a kind of breach of the authenticity and integrity of this food category.

It should be noted that the further development of the traditional food market requires searching for the possibility of diversifying the offer of this food, taking into account the impact on health, environment, functionality and convenience, thus creating innovative products and developing new forms of their distribution [Cayot, 2007]. At the same time, the development of a new product is a huge investment for the company and is associated with high responsibility and risk. In order to ensure effective commercialization of food products understood as a process in which identified consumer values are used to achieve defined and verified goals [Sojkin et al., 2012], methods derived from behavioral economics are increasingly used [Wertenbroch and Skiera, 2002]. The combination of experimental methods with sensory evaluation of products seems to be the most desirable combination in food-related research due to the dominant importance of taste as determinants of food choice [Combris et al., 2009; Asioli

et al., 2016]. Research using such an approach was conducted in different countries in relation to food and beverages of various attributes, e.g. pork and poultry preserved with irradiation, luxury products such as champagne [Lange et al., 2002], cookies containing genetically modified ingredients [Noussair in 2004], as well as to determine the impact of nutrition information on the willingness to pay a specific price (Willingness to Pay - WTP) for baguette with an increased content of fiber [Ginon et al., 2009].

It is particularly interesting to use such an approach in research on products that consumer buy due to taste and whose uniqueness results from the combination of traditional ingredients and production methods. The basic goal of the experimental research carried out as part of the TRUEFOOD project was to determine the degree of liking and WTP for Kabanos with modified intrinsic and extrinsic quality cues under different evaluation conditions, i.e. without providing information about the assessed sample (so-called blind condition), evaluation of the product solely on the basis of the information on the packaging (so-called expectancy condition), which corresponds to the expected quality and research in full information condition simulating the condition of experienced quality (**publication I.B.4**).

The research procedure was developed in cooperation with a team of researchers from the INRA Dijon Institute in France, led by Dr. Sylvie Issanchou, an expert in the field of sensory analysis of recognized international reputation. In order to determine WTP, the method of experimental auctions was used using the BDM procedure [Becker et al., 1964; Ginon et al., 2014]. Five variants of Kabanos were evaluated, four of them were modified in a way reflecting trends in food consumption and issues important from the point of view of public health. Two of the reviewed variants concerned modifications in the Kabanos recipe and concerned reduction in the level of sodium and the addition of a mixture of natural spices to obtain spicy sausage. These changes reflected two trends, because, on the one hand, the need to reduce sodium (table salt) consumption is becoming more and more emphasized due to the prevention of cardiovascular diseases [Newson et al., 2013]. On the other hand, it is noted that consumers are more and more focused on searching for new sensory experiences, which justifies modifying the taste attributes of traditional Kabanos and developing a variant that could favor new applications of Kabanos, e.g. snacks. Subsequent changes reflected the growing environmental concerns among Polish consumers. Hence, it was proposed as one of the variants Kabanos in a package labelled as "biodegradable". Kabanos produced from organic meat was also included in the experiment, in order to assess how the combination of organic and traditional food attributes will affect the liking and WTP. In the case of "organic" Kabanos, no changes were made to the recipe, while non-organic ingredients were replaced with organic ones, so that the

obtained product would meet the EU criteria of organic food production. The control sample consisted of Kabanos with unchanged quality attributes defined as "traditional".

The experiment was carried out in two locations, i.e. Warsaw and Krakow with the participation of 221 respondents recruited by a professional marketing research agency. It was assumed that participants of the study may only be persons who purchase Kabanos and describe themselves as consumers of traditional food.

In the so-called blind test (stage 1), the participants of the experiment were given Kabanos samples in random order, without providing any information about them. The assessment was made on a linear 10 cm hedonic scale, taking into account the degree of liking of the product and at the same time giving the maximum price that consumers would be willing to pay for 300g of the tested product. In the next stage of the study (stage 2), the participants received Kabanos in the packaging with information on the variant and analogously as in the blind condition, the degree of liking and the indication of the maximum price were requested. In turn, in step 3, the consumers made a hedonic assessment of the samples, read the information on the packaging and at the same time gave the maximum price they would be willing to pay for the packaging with the indicated weight. Steps 2 and 3 corresponded to the expected and experienced quality assessment according to the TFQ model [Deliza et al., 1996]. Immediately after the end of stage 3, an experimental auction was conducted, during which at first randomly one "price" was selected. Then, each participant drew one "price" from a pre-determined set of prices (the prices in the collection were close to the average market prices of Kabanos). If the price indicated by the participant referred to as the "offer to buy" was at least equal to or higher than the "market price" (bid) from the set price, the transaction was carried out at the "market price", which was a source of satisfaction for the participants [Grunert et al. 2009]. According to the literature on the subject, the mechanism of the BDM experimental auction triggers a tendency to follow the actual WTP [Becker et al., 1964; Ginon et al., 2009].

The obtained results of hedonic and WTP evaluations were subjected to a two-factor analysis of variance ANOVA with the post hoc Dunnett test in order to compare the assessment and WTP of the control sample against Kabanos with altered quality indicators. The conducted analyzes showed the impact of the assessment stage on its result and statistically significant differences in the assessment of individual variants.

In stage 1, consumers participating in the experiment carried out in Warsaw rated the variant in the "biodegradable" package the most, but the differences between the assessment of this variant and the traditional one were not statistically significant. Lower than the traditional variant, they rated Kabanos "with reduced sodium content" and "organic". Lowering the sodium

content (table salt) in food products is considered to be particularly difficult because the salty taste in food is perceived positively [Almli and Hersleth, 2013]. In the case of traditional food, whose inherent characteristic is the taste often referred to as "known from childhood", consumers may reject the change in sensory values treating it as a violation the authenticity of traditional food [Guerrero et al., 2012].

The change in evaluation conditions in stage 2 resulted in statistically significantly higher rating of Kabanos in the "biodegradable" packaging compared to the variant offered as "traditional" but no significant differences in the evaluation of this variant in relation to "spicy" Kabanos, "with reduced sodium content" and "organic".

It should be emphasized, however, that in the stage of expected quality, the average "liking" scores of the modified variants were higher than in step 1. The effect of the assimilation effect and / or contrast occurring in the operational memory during the assessment of qualitative attributes of the tested products is noticeable here, which resulted in higher scores at the stage corresponding to the expected quality [Bayarri et al., 2009; Tarancón et al., 2014]. Therefore, it is emphasized in the literature that there is a need to verify the impact of evaluation stages and the accompanying psychological processes on the degree of liking and WTP of new food products due to their impact on product perception, consumer preferences and, as a result, its effective commercialization [Tarancón et al., 2014 Asioli and in., 2016].

The last stage of the assessment reflecting the assessment of the experienced quality confirmed the highest degree of liking of Kabanos in the "biodegradable" packaging, despite the lack of differences in the recipe in relation to the "traditional" variant. This indicates the existence of the positive disconfirmation process and confirmation of the participants' expectations regarding the sensory attributes of Kabanos at the stage of the quality experienced [Ares et al., 2010]. Kabanos "with reduced sodium content" was rated the lowest in contrast to the stage of assessing expected quality, which in turn indicates the occurrence of negative disconfirmation [Deliza and MacFie, 1996].

With regard to the results of research in Krakow, analogical relations and statistically significant impact of the evaluation stage on the product assessments were observed, but the individual variants were assessed differently than by Warsaw consumers. In the first stage, the "organic" variant was scored higher than in Warsaw. On the other hand, Kraków's consumers were skeptical about changing their taste to spicy, which resulted in a decidedly lower hedonic scores of this variant at this stage. In stage 1, none of the proposed changes received a higher grade than the "traditional" option.

The variant in the biodegradable packaging obtained the highest grade in the study phase corresponding to the expected quality assessment and the average for this variant was statistically higher than the average for traditional "Kabanos". The other options were assessed in a similar way as the "traditional" variant. As in the case of research carried out in Warsaw in stage 3 reflecting the assessment of the quality of the tested, Kabanos in the biodegradable packaging was rated the highest. In contrast to the research carried out in Warsaw, Kraków's consumers rated "organic" Kabanos higher at each stage of the assessment.

The observed relation between WTP of individual variants reflect the tendencies observed in the case of the hedonic evaluation both in relation to the research carried out in Warsaw and Kraków. The WTP ranged from PLN 5.59 to PLN 7.59 for a package with a weight of 300g. In stage 1 of the evaluation carried out in Warsaw, none of the variants obtained a higher price than the "traditional" variant, and the lowest price was given for the "organic" variant. However, contrary to the hedonic evaluation, the maximum price of the variant "with reduced sodium content" did not differ significantly from the price of the "traditional" variant. In the expected quality assessment, consumers were willing to pay the highest price for the variant in the "biodegradable" packaging. There was a statistically significant difference between the WTP of this variant and the Kabanos "with reduced sodium content" and "spicy". In turn, in the stage of assessing the experienced quality, Kabanos in the "biodegradable" packaging obtained analogically as in stage 2 the highest price, but no differences were noted in relation to the "traditional" variant. The lowest price was indicated for the variant "with reduced sodium content" and "organic".

In studies carried out in Krakow, the impact of the WTP assessment stage was recorded only in stage 1. This was also true for Kabanos in the "biodegradable" package, which at the stage of assessing expected quality was rated the highest, but consumers were not willing to pay more for such changes than for Kabanos "traditional".

The results of the analysis of the answers to the questions included in the survey completed by the participants immediately after the auction, confirmed that they were the most inclined to accept changes regarding extrinsic quality cues, including the "biodegradable" packaging. The changes affecting the perception of sensory attributes related to the reduction of sodium content in Kabanos and the addition of new ingredients to modify the taste were much lower. In turn, the analysis of the answers to questions regarding the perception of traditional food showed that Warsaw consumers associated more traditional food with animal welfare, which indicates that displaying this type of attributes may positively affect the perception of traditional food and its tendency to purchase. In addition, it was noted that despite the higher hedonic evaluation of

“organic” Kabanos by the participants of the experiment carried out in Krakow, they did not differ in assessing the quality of this type of food from the participants of the study carried out in Warsaw. On the other hand, the respondents participating in the research carried out in Krakow decidedly rated the sensory attributes of organic food, i.e. taste and appearance, which could have influenced the higher assessments of this variant observed at the stage of assessing expected quality.

Summary and the possibility of using the results

The differences observed in the assessment of the Kabanos variants confirmed the results of the analysis of the relationship between quality attributes and the image of traditional food that Polish consumers in the analyzed international surveys.

Experimental studies carried out showed that the liking and the WTP of Kabanos was conditioned by the factors related to the consumer, including his sensory preferences, but also the impact of the evaluation condition on the hedonic assessment and WTP was noted. There was a discrepancy between the quality assessed at the stage corresponding to the expected and experienced quality. Kabanos "with reduced sodium content" and "spicy" generated higher hedonic scores in conditions of quality assessment expected in relation to the quality experienced, which was also related to the nature of the introduced changes affecting the sensory values of traditional food. The influence of factors not directly related to the product on the result of the assessment was also observed, which was indicated by the significantly lower evaluation of the "spicy" variant in the research carried out in Kraków.

The obtained results confirm the necessity to conduct research on new food products at the stage of consumer formation of quality expectations in relation to sensory attributes and their verification in a situation corresponding to the experienced quality. It is also worthwhile to take into account in the process of introducing new food products to the market, especially possessing the attributes referring to the cultural heritage the diversity resulting from geographical and cultural factors.

The recorded positive impact of care for the environment on the perception of traditional food could have influenced the relatively high hedonic assessment of Kabanos in biodegradable packaging. At the same time, the high rating of the product in an environmentally friendly packaging could be influenced by the social expectations (social desirability bias) and the willingness to present themselves as person who care about the environment. Therefore, despite the positive attitude towards this variant, it did not significantly induce a higher WTP.

The conducted research also confirmed the validity of hypothesis 4, assuming that traditional food is one of the types of food distinguished by special attributes, and as the most

important consumers consider unique sensory attributes, which implies specific directions in creating innovation on the traditional food market, which should take into account accepted by consumers changes that do not affect the authenticity and integrity of traditional food. The research results positively verify hypothesis 5 and prove that triangulation of research methods allows to recognize consumer behavior towards food products with various qualitative attributes with particular emphasis on the creation and marketing of new food products and prove the validity of hypothesis 3 that the tendency to pay a higher price for food varies depending on the type of product and the quality attributes of the consumers, indicating both the exploratory, methodological and utilitarian importance.

At the exploratory level, it has been shown that in the conceptualization of traditional food, Polish consumers refer to sensory values, displaying "quality" as the most important attribute, but definitely lower than consumers from other countries rated the attributes referring to "convenience." In defining traditional food more often referred to culinary traditions rather than to specific products offered as traditional, which may affect the perception of this type of food among consumers who are skeptical about traditional Polish cuisine in the context of its impact on maintaining a healthy body weight.

At the **methodological** level, it was shown that the proposed research approach combining consumer sensory research with methods taken from behavioral economics allows to more accurately determine the impact of food quality attributes on the liking and determine WTP, and consequently increase the chances of successful commercialization of new food products.

The results obtained are also of **utilitarian** importance for enterprises seeking sources of competitive advantage in the traditional food market, indicating optimal research methods in the development of new products and providing indications regarding the directions of offer development and the positioning of traditional food.

2.3.1.C. Socio-ethical and pro-health attributes as factors influencing consumer preferences for products of animal origin

Publication

I.B.5. Żakowska-Biemans S., Tekień A. (2017). *Free range, organic? Polish consumers preferences regarding information on farming system and nutritional enhancement of eggs: A discrete choice based experiment.* Sustainability, 9 (11). Article number 1999, <http://doi.org/10.3390/su9111999>. (IF2017 =2,075; pts MSaHE: 20).

Contemporary consumers manifest increasingly complex expectations towards food of animal origin, which are implied by care for health, care for the environment and animal welfare. As a result, in the quality assessment of these products they rely to a large extent on

external quality cues and credence quality attributes [De Graaf et al., 2016; Honkanen et al., 2009; Napolitano et al., 2010].

Food producers and distributors in response to changing consumer expectations are increasingly inclined to put health and nutrition claims on the packaging, as well as verbal information and / or signs of compliance with socio-ethical and environmental criteria related to the sphere of food production and distribution [Meise et al ., 2014].

Communicating these issues may affect the structure of consumer preferences and their purchasing decisions [Van Loo et al., 2014], and as a result, become a source of competitive advantage for producers of the animal production sector.

According to Napolitano et al., [2010], Nocella et al., [2012], Van Loo et al., [2014], consumers are willing to pay a higher price for products from systems with high animal welfare standards, but their preferences depend on both the type of product and perceived benefits. The question of animal welfare as one of the attributes of food quality and its impact on the decision-making processes of Polish consumers has not yet been sufficiently recognized. Therefore, as part of the project "BIOFOOD - innovative, functional products of animal origin", research was initiated on the impact of information on animal husbandry systems and potential nutritional and health benefits on the structure of consumer preferences.

Chicken eggs were selected for the study, which belong to a particular category of food products, because they have high nutritional values and are widely used in the food industry [Kijowski et al., 2013], although there are common opinions on the need to limit egg consumption and unethical practices used in laying hens [Buller and Roe, 2014; Kijowski et al., 2013; Sosnówka-Czajka et al., 2014].

The basic aims of the research included determination of consumer preferences in relation to eggs from cage, free-range, barn and organic production system; identification of consumer segments differing in terms of the importance attributed to information on the method of production and the nutritional and health benefits of eggs; determining the validity of combining in egg labelling health and nutrition claims with information referring to the rearing conditions (**publication I.B.5**).

The study uses the Choice Based Conjoint - CBC method based on "discrete choice analysis", in which the respondent are presented with various combinations of attributes the so-called profiles and examine his preferences for specific variants. The purpose of the CBC analysis is to perform the process of decomposing preferences, resulting in the calculation of the so-called part-worth utility, that is the share of a given attribute level in the total usability of the product [Walesiak and Bąk, 2000]. The CBC method is one of the most frequently used

methods of measuring consumer preferences, because it allows accurate simulation of real market situations [Asioli et al., 2016] thanks to determining the share of a given attribute in the total utility of the product [Walesiak and Bąk, 2000].

Based on the literature analysis [Gerini et al., 2016; Gracia et al., 2014; et al., 2011] and prior to the CBC exploratory research, a set of six attributes was selected, which included the breeding method, information on breed of hens (traditional vs. no information), packing size (6 or 10 eggs), class egg weight (S, M, L, XL) and price (from 0.50 to 1.60 PLN per item).

In order to determine the impact on consumer preferences of nutrition and health information, four claims were formulated, i.e. "contains omega 3 fatty acids"; "Omega 3 acids have a beneficial effect on the functioning of the cardiovascular system"; "High content of vitamin A + E" and "vitamin A + E has a positive effect on the functioning of the cardiovascular system", which were presented to the participants of the study individually or in logical combinations.

Obtained CBC results showed that the price and information on rearing conditions had the highest relative importance, which means that this attribute was of the greatest importance to the consumer's final purchasing decision. Free range eggs generated the highest partial usability, and this value was higher than for organic eggs, where more stringent animal welfare criteria apply. In turn, barn eggs from, despite potential benefits in relation to animal welfare, resulted in a decrease in partial usability. To a lesser extent, consumer preferences were determined by the size of eggs, the size of the packaging, nutrition and health claims, and information about the breed of hens. It was observed that consumers preferred eggs in size X and XL in a package containing six eggs.

The highest partial utility of eggs from free-range production confirmed by previous research of Martinez et al., 2011 and Van Loo et al., [2014]. The decrease in partial usability recorded in organic eggs may be related to the perception of organic food as an expensive and difficult to access [Rödiger and Hamm, 2015] and a poor knowledge of welfare criteria in organic livestock production [Janssen and Hamm, 2012].

Grandin [2014] emphasizes that the biggest concern with regard to the welfare of laying hens is raised by cage breeding, especially the size of cages. As a result, consumers prefer rearing systems where free range access is provided to chickens [Janssen et al., 2016].

Obtained results of research have shown that nutrition and health claims have little effect on consumer preferences regarding the purchase of eggs. At the same time, the analysis of the data shows that the method of providing this type of information is important, i.e. the structure of a claim in which three elements stand out: information on the active ingredient, its function

and impact on health [Lähteenmäki, 2011]. A higher partial usability was obtained when three elements of the statement were given, which is consistent with the results of the studies of Van Kleef et al., [2005] and Lähteenmäki et al. [2010]. Krutylute et al. [2011] stated that apart from the structure of the claim, it is also important to what extent the given ingredient is known to the participants of the study, which may explain the lower usefulness of claims referring to omega 3 content than vitamins A and E.

The relationships found have practical implications for egg producers because they justify the use of claims that, apart from the name of the ingredient, contain information about its impact on health. However, these issues require further deepening with regard to the assessment of claims in terms of their credibility, because Lähteenmäki et al., [2010] stress that a health claim that contains both information about a constituent and its function is perceived as more reliable only in case of little known ingredients.

The hypothetical product that generates the highest utility for consumers is XL egg in a pack containing six pieces from free range system, bearing a claim consisting of an indication of the active ingredient and its function with a maximum price of PLN 0.89 per piece.

In order to get more insights into factors affecting consumer preferences, a cluster analysis was carried out using as a criterion statements related to the use of information on food products, perception of organic eggs and those containing omega 3 as well as selected determinants of food choices (price vs. sensory values).

The analyzes carried out led to the identification of four segments, i.e. "Enthusiasts", "Conservative", "Uninvolved", and "Skeptics", "Skeptics" were the least diversified in relation to all respondents in terms of socio-demographic characteristics. Respondents in this segment attributed the highest importance to the price in food-related decision-making processes, relied more on information from advertisements and more often used promotional leaflets. In addition, the participants of this segment were convinced that eggs from organic farming are better than not organic, but they did not tend to incur higher costs for environmentally friendly products.

Among the "Uninvolved", there was a higher proportion of people representing vocational and secondary education, not interested in the information contained on the label, poorly assessing their knowledge of both eggs with pro-health and ecological attributes. Their purchase decisions were determined to a large extent by price. As a result, "Uninvolved" were less inclined to buy organic food.

In turn, in the "Enthusiasts" segment, the price was definitely less important in the decision-making processes of buying egg. "Enthusiasts" rated the statements regarding the use of information on the labels of food products the highest, as well as they scored the highest on

the assessment of their knowledge about organic food. This segment was also distinguished by a higher share of people with higher education and a good financial situation. In addition, the representatives of this segment were most convinced that organic eggs are better than not organic and were willing to pay more for organic food.

“Conservatives”, like “Enthusiasts”, were most likely to pay more for environmentally friendly products, to a lesser extent than others perceived organic eggs as expensive. The importance of price in the decision-making processes related to the purchase of eggs was similar in this segment to those recorded among the “Enthusiasts”. This segment has a higher share of women and people over 60 years of age, who are less willing to accept new products and more often rely on information from advertisements to make purchasing decisions.

Summary and the possibility of using the results

The research and the results obtained have both exploratory and utilitarian significance referring to the main aim of the habilitation achievement and the context of accepted research hypotheses. At the exploratory level, the results obtained confirm that communication of food quality attributes may influence the structure of consumer preferences and, as a result, the purchasing decisions they make, thus confirming the results of international research.

Exploratory significance is also proven by the results indicating that, although nutrition and health claims have little effect on consumer preferences regarding the purchase of eggs, the appropriate way to provide this type of information can change these skepticism. Therefore, taking into account the three-element structure of the claims, i.e. information on the active ingredient, its function and impact on health [Lähtenmäki, 2011], the impact on health should be emphasized, which results from global trends accentuating “health and well-being” and attachment of Polish consumers' special importance to health as an autotelic and instrumental value.

In creating the message, it should be remembered that the terms indicating the potential impact on health of a given ingredient should be formulated in such a way as to indicate the positive effects of the use or to emphasize what health consequences can be avoided by consuming food bearing such a claim.

The relationships found have practical implications for egg producers because they confirm the legitimacy of using claims that, apart from the name of the active ingredient, contain information on its impact on the health of consumers. In addition, the obtained results indicate what combination of quality attributes generates the highest utility for the consumer. At the same time, the lower level of usefulness of eggs bearing information about organic farming indicates the necessity of undertaking marketing communication activities exposing the

benefits resulting from this breeding system for animal welfare, so as to provide consumers with reliable information on organic breeding criteria and benefits in the socio-ethical dimension.

Once again it has been proved that consumer behavior towards products characterized by specific quality attributes differ significantly, depending on their sociodemographic characteristics, as demonstrated by the segmentation analysis carried out. The results of this analysis can be used both in the creation of marketing communication and the positioning of eggs with quality attributes resulting from the compilation of farming methods with nutrition and health claims.

2.3.1.D. Systems and quality labels as the preferred means of communicating quality attributes of beef

Publication

I.B.6. Żakowska-Biemans S., Pieniak Z., Gutkowska K., Wierzbicki J., Cieszyńska K., Sajdakowska M., Kosicka-Gębska M. (2017). *Beef consumer segment profiles based on information source usage in Poland*. Meat Science, 124. 105-113, <http://doi.org/10.1016/j.meatsci.2016.11.001>. (IF₂₀₁₇ = 2,821; pts MSaHE: 35)

Since the 1990s, there has been a significant drop in beef consumption from 8.8 kg per capita in 1995 to just 1.6 kg 2015 in a year. Among the main reasons for this phenomenon, apart from economic factors resulting from the significant increase and high prices of beef [Wojnar and Kasprzyk, 2014; Świetlik, 2005], we should mention the changing expectations of consumers in relation to meat resulting from global consumer trends [Font-i-Furnols and Guerrero, 2014; Henchion et al., 2014] and unsatisfactory quality of beef [Pisula, 2007; Gutkowska et al., 2012].

The importance of meat quality attributes in decision-making processes is subject to transformations resulting from socio-cultural, economic and environmental changes, which has a direct impact on the functioning of producers and distributors and encourages them to seek new sources of competitive advantage on an increasingly globalized meat market [Grunert, 2006; Troy and Kerry, 2010; Hocquette et al., 2012; Font-i-Furnols and Guerrero, 2014]. According to Conceição Pereira et al., [2008] and Verbeke et al., [2010] on the importance of factors affecting consumers' decision-making processes, they lose concerns about the safety of meat and the importance of health and nutritional aspects. Font-i-Furnols and Guerrero, [2014] and [Verbeke et al., 2010] also emphasize that meat production systems are subject to transformations implied by an increased demand for meat produced in a way that respects the environment and contributes to the improvement of animal welfare.

A huge challenge for producers and other market participants is not only to adapt the product offer to the changing expectations of consumers, but above all to effectively communicate the quality attributes of beef.

These issues have become the subject of research under the project "ProOptiBeef" - optimization of beef production in Poland, in accordance with the strategy "from fork to farm".

Their main purpose was to identify consumer segments with different preferences regarding beef quality attributes and ways of communicating them. The detailed objectives included segmentation of consumers using based on the usage of information sources on beef, identification of factors determining decisions related to purchase of beef and interest in the information on the beef package with particular reference to quality marks, identification of factors affecting the increase in beef consumption (**publication I.B.6**).

The empirical material was collected using a questionnaire distributed in butcher shops on a sample of 501 respondents recruited taking into account the criterion of responsibility for decisions related to the purchase of food and consuming beef at least once a week. The segmentation criterion was the frequency of using selected sources of information, including traditional media (TV advertising, press, leaflets), new media (websites of producers and distributors and dedicated to food issues), food labels, culinary programs and books, and personal sources represented by family, friends, dietitians, doctors and sales staff.

As a result of factor analysis by the principal component method, the variables were reduced and four factors were identified, including sources of information defined as "advertising", "personal sources and food labels", "internet" and "culinary".

The respondents were classified according to cluster analysis using the two-step clustering method [Wedel and Kamakura, 2000]. As a result, three segments were distinguished statistically significantly due to the information sources used for beef, referred to as "Enthusiasts", "Conservative" and "Ultraconservative".

In the "Enthusiasts" segment, respondents were the most frequent users of the sources of information included in the study, in which they attached particular importance to information from friends and family and placed on beef labels. Consumers classified in this segment most often indicated that they are looking for information about the expiration date, quality class, health benefits and nutritional value. They also showed the greatest interest in information on how to prepare beef.

"Conservative" distinguished themselves by the high frequency of using sources of information such as culinary programs and books and portals on this subject. To a lesser extent,

than the "Enthusiasts" were interested in finding information about beef, first of all they paid attention to the expiration date and were looking for information about quality class and price.

"Ultra-conservative" were the least likely to use all the sources of information studied, including the least interest in using Internet sources. They were most often looking for information about the expiration date and price and were least interested in information on the methods of cooking beef.

The obtained results are confirmed by literature reports indicating that the decision about the purchase of meat is most often verified with information on the origin and expiration date [Bernués et al., 2003]. A high level of interest in information about the quality class, in turn, indicates that consumers expect synthetic information about the attributes of beef quality, which should be reflected in creating a competitive advantage in the beef market.

Among the determinants of beef choice, the highest importance among participants of all segments were assigned to intrinsic quality cues (general appearance, color), which confirms the findings noted in the literature on the subject [Davidson, 2003; Realini et al., 2014; Acebron and Dopico, 2000; Grunert et al., 2004]. In the least extent, purchasing decisions of consumers representing the identified segments were determined by culinary skills and eating habits.

It was noted that decisions of "Enthusiasts" were determined to a greater extent by information about the country of origin and its impact on health rather than the price. In turn, "Conservative" and "Ultraconservative" positioned the price as the most important, after extrinsic quality cues, the determinant of beef selection.

In the sequence of factors influencing the decision-making processes, the quality signs informing about the special attributes of beef also took an important place. Apaolaza et al., [2018] and Sans et al., [2008] emphasize that certificates and quality marks function as cognitive heuristics, facilitating decision-making processes related to the choice of food. The obtained research results indicate that the quality mark, which is a guarantee that a food product possesses a certain combination of attributes, may be desirable information on the beef label, allowing to reduce the sense of uncertainty in decision-making processes.

In the hierarchy of motives of purchasing beef, the most important among participants of all segments were its sensory values and the positive impact on health as well as the possibilities of using them to prepare various dishes. Respondents also highly appreciated the juiciness and tenderness of beef as factors influencing their beef choices, which indicates high expectations in relation to sensory attributes of beef and justifies the creation of quality systems to predict culinary usefulness and increase consumer satisfaction from the selection at the stage of assessing the experienced quality.

"Conservative" and "Ultraconservative", which is identified with higher health value of beef [Verbeke et al., 2010]. Thus, in the communication addressed to this segment, it seems justified to refer to potential health benefits resulting from eating beef and emphasizing its nutritional value. Research on markets with higher beef consumption suggests that such information is sought after by consumers, but the communication of nutritional information to a small extent has been used for meat and meat products [Barreiro-Hurle et al., 2009; Van Wezemael et al. 2014].

Among the factors that could prompt respondents to increase their consumption of beef, the most frequently indicated were the lower price, higher quality of beef and better income situation of consumers. Therefore, it was proved that above all economic factors and lack of satisfaction with beef quality make up the most important barriers to beef consumption.

"Enthusiasts" among the factors conducive to increasing the consumption of beef higher than the representatives of other segments assessed the quality class and the introduction of the quality label. This indicates that consumers representing the segment with the highest level of involvement in seeking information about beef, expect the introduction of beef quality prediction systems, which will favor the reduction of dissonance between expected and experienced beef quality and reduce the level of uncertainty in decision-making processes [Henchion et al., 2014; Wezemael et al., 2010].

This is the function of the Meat Standards Australia - MSA, system based on the taste evaluation of individual carcass muscles, which serves primarily to predict consumer satisfaction with beef meat [Polkinghorne et al., 2008]. On the meat label there is information about the suggested methods of treatment and the recommended period of meat maturing in order to obtain a specific standardized quality of consumed beef [Watson et al., 2008]. The Quality Meat Program (QMP) system is the answer to the expectations of Polish consumers in the field of beef quality prediction, which defines the standards for the whole beef production process, thanks to which beef, which is QMP-certified, has an appropriate overall quality, including tenderness, juiciness and the right taste and the source of its origin is traceable [Wierzbicki, 2016].

As emphasized by Henchion et al., [2014], there are two important sources of building competitive advantage and increasing meat consumption, which are related to the attributes of the experienced quality (sensory values, convenience) and credence quality attributes, which include information on methods production. "Enthusiasts" more than the "Conservative" and "Ultraconservative" were willing to increase the consumption of beef, if it comes from environmentally friendly production systems. Consumers concentrated in the "Conservative"

segment to a greater extent, increased their consumption depending on the widening of the range and increased availability of beef. The assessment of factors affecting the possibilities of increasing consumption of beef by consumers representing "Ultraconservative" are definitely lower, but also in this group information on the origin of beef from environmentally friendly production systems and information about the quality class have been rated above the average on a scale.

Thus, the readiness of Polish consumers to increase beef consumption also depends on the expansion and diversification of beef offer, which requires the creation of new products that take into account high consumer expectations of sensory values of beef, its impact on health and the environment, but also convenience of use.

Summary and the possibility of using the results

The results showed that the applied segmentation approach makes it possible to prepare a multidimensional characteristic of beef consumers, with an indication of the used and preferred sources of food information. The research confirmed that the development of beef quality prediction systems is in line with the expectations of Polish consumers regarding the quality attributes of beef and may contribute to an increase in the consumption of this type of meat, because it helps to reduce uncertainty at the stage of assessing the quality of experience.

The obtained results confirmed the **hypothesis no. 6** that the quality mark is a guarantee that the food product possesses specific attributes of internal and external nature, the importance of which is of different value in the assessment of individual consumer segments, initiating also a different propensity to buy the product it concerns.

The obtained results also fulfill a utilitarian purpose, because the segmentation of beef consumers based on the preferred sources of information combined with profiling of identified segments due to factors determining decision-making processes and conducive to increasing beef consumption, provides valuable indications for beef industry participants regarding the possibility of differentiating quality attributes of beef and strategies for communicating them. The conducted research has shown that beef market participants should pay particular attention to the attributes of sensory quality, strive to diversify the assortment and adequately shape the range of information contained on the beef package, including information on the impact of beef on health, its origin and possible culinary use. The empirical data obtained can be used to determine the basic elements of the marketing mix in the field of beef, and thus: the product, in particular its quality and promotion determinants, taking into account both the scope of information that should be addressed to consumers and their preferred sources and method of communication.

2.4. Summary of the publication cycle

Global trends in the sphere of food and nutrition determined by "quality", "health" and "well-being" have triggered, both in the individual and social dimension, interest in foods with quality attributes that consumers are unable to verify at the stage of both the quality assessment as expected and experienced. My research has served to better understand the perception of quality attributes resulting from the methods used in food production (organic food, varied animal husbandry conditions) and attributes related to the cultural heritage and values (traditional food) including both their impact on decision-making processes and willingness to pay.

The research tools applied by me in the segmentation of consumers, by means of multidimensional analysis of factors determining the choice of food and lifestyle of consumers, allowed to attain unique information on the importance of selected quality attributes in the processes related to the selection of food from organic production. Using research tools that takes into account different dimensions of lifestyle allowed for a more in depth understanding of the perception and categorization of food quality attributes, motivation related to the purchase of food products, the importance of information on the food label in decision-making processes and the way of shopping and meal preparation. The methodological approach provides new opportunities for categorizing food consumers, developing food products and services tailor made to consumers' needs, as well as support development of marketing communication to stimulate sustainable food consumption.

My research on food with quality attributes resulting from the reference to tradition and place of origin provided both indications regarding the perception of this type of food, and also served to verify the methodological approach inspired by the research methods applied in behavioral economics. Experiments in the field of behavioral economics provide the opportunity to recognize the complex sequence of determinants of consumer reactions to changes in prices, income, advertising messages, packaging or used. New knowledge about the determinants of consumer behavior may also have practical implication, because it can be used in marketing strategies of food producers, in all operational elements, from the product, through price, distribution and ending with promotion.

The experimental studies carried out confirmed the validity of combining the methods and showed the influence of the conditions of the assessment stage of the expected and experienced quality on the hedonic and WTP scores.

In view of the fact that the most important medium for communicating symbolic quality attributes is the packaging and the food label, the scope of my research also included the use of information sources, including labels in relation to the importance attributed to certain beef quality cues. The research has shown that quality labels resulting from beef quality prediction systems constitute desirable information on the food packaging and / or label and may limit uncertainty in the decision-making processes at the stage of expected quality assessment.

Presented considerations in the cycle of publications being the scientific achievement, proved the achievement of the main goals, both exploratory, methodological and utilitarian. I determined the factors that influence consumer behavior towards food with selected quality attributes and the optimal way to study them, noting that the determinants related to the purchase of food show a different character, taking both the form of "simple" socio-demographic variables, as well as synthetic variables about of axiological and sociopsychological character, which also in various ways affect the importance of individual components of food quality in the process of its acquisition, trigger a different tendency to pay a higher price for individual quality attributes, depending also on their share in the total utility of the product.

I proved that the adequate research approach in the field of development and improvement of food products quality is the triangulation of research methods in the field of consumer sensory research with methods used in experimental economics, so as to provide unique information on the relations between sensory perception of quality attributes of food products at various stages of the quality evaluation process and the WTP including consumers' receptiveness to specific marketing messages.

An important exploratory result of my research was the recognition of traditional food cognitive correlates, which allowed me to determine that traditional food is distinguished by special attributes, among which the most important is its unique sensory qualities, which should be considered as particularly important in the implementation of any innovation to traditional food not to violate the authenticity of traditional food.

I have shown that the quality label is a guarantee that the food product possesses specific attributes of an internal and external nature, the importance of which is of different value in the assessment of various consumer segments, initiating a different propensity to buy the product it is labeling.

The research results discounted in the presented scientific achievements also comply with utilitarian goals because they provide substantive indications and operational tools that can be used in creating marketing strategy for food with specific quality attributes, including message

content addressed to different consumer segments with varying degrees of importance attached to quality components in food.

2.5. Conclusions

Summing up, the considerations regarding the importance of various quality attributes in the decision processes of consumers the conclusions can be formulated as follows:

1. Segmentation of food consumers on the basis of traditional criteria, which are sociodemographic variables, is not a sufficient tool for consumer profiling due to their shopping preferences and sensitivity to various attributes of food quality, therefore it is necessary to take into account more complex variables synthesizing behaviors and their axiological context what a lifestyle is;
2. The complexity of determinants of consumer behavior in the food market, especially food with specific quality attributes, stimulates the use of triangulation approaches and research methods, so that it is possible to obtain more reliable answers to questions about them.
3. Creating a communication strategy on food with quality credence attributes should include quality labels that constitute their synthetic representation and serve as specific "cues", making consumers sure about their purchasing decisions and minimizing the risk of inappropriate choices.

Summing up the obtained results reflected in the scientific achievement and conclusions drawn on their basis, the thesis may be made that the attributes of food quality becoming increasingly important determinants of consumer behavior will change their configuration and hierarchy of importance, giving the priority to the attributes guaranteeing sustainable development and thus sustainable consumption, which will create a need for effective education of consumers sensitizing them to moral responsibility for the well-being of subsequent generations.

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3. Presentation of other scientific and research achievements

I have been associated with the Faculty of Human Nutrition and Consumption Sciences, WULS-SGGW since October 1, 1992, when I was employed as an assistant in the Unit of Ecological Food Production. From the beginning of the work at WULS-SGGW, I have been gaining knowledge and valuable experience in international cooperation and management of research projects, participating in the implementation of research on socio-economic determinants of organic farming development in environmentally sensitive areas, financed by the World Bank (Global Environmental Facility) (II.I- 1.8). In addition, I upgraded my teaching skills following the Postgraduate Study of Pedagogical Excellence at the Faculty of Economics and Agriculture of the Warsaw University of Life Sciences in Warsaw, from which I graduated in 1993.

In 1995 I obtained a scholarship from the Ministry of Science and NUFFIC (Dutch Organization for Internationalization in Higher Education) and I completed a five-month scientific scholarship at Wageningen University in the Netherlands, which was one of the first European academic centers to combine knowledge in the field of human nutrition science with research on consumer behavior. This stay enabled me to acquire knowledge and practical skills in the field of advanced methods of consumer behavior and data analysis, and was an inspiration to undertake further research on consumer behavior towards food and socio-economic aspects determining the development of organic food production methods.

In 2001, I was employed at the Unit of Consumption Research led by Prof. dr hab. Krystyna Gutkowska, under whom supervision I have prepared a doctoral dissertation on the factors determining the development of the organic food market in Poland and other European Union countries.

During the preparation of the doctoral thesis, I established cooperation with the Institute for Research in Organic Agriculture in Switzerland (FiBL), which conducted pioneer research on the environmental and socio-economic aspects of organic farming. The contacts established as a result of the academic scholarship and cooperation with FiBL resulted in an invitation to participate in developing research consortia and resulted in obtaining grants financed from the 5/6/7 Framework Program of the European Union, in which I was a manager and / or main contractor and coordinator or co-coordinator of research tasks. Cooperation with researchers from prominent academic centers has contributed to strengthening my scientific and didactic competences and enabled me to implement in my research an innovative approach that takes

into account the specific aspects of consumers behavior towards food, combining exploratory, quantitative and experimental methods.

My scientific and research interests after obtaining the doctoral degree have focused on issues related to the research of consumer behavior on the food market, in particular the organic food market, among which five main areas can be distinguished:

1. Determinants of the development of organic farming and organic food market
2. Determinants of acceptance of innovation in the food market
3. Consumer behavior towards products of animal origin
4. Factors determining food safety in the opinion of consumers
5. Determinants of sustainable food consumption.

3.1. Determinants of the development of organic farming and organic food market

The organic food market has been one of the most dynamically growing sectors of the food market in Europe for over two decades. However, there is a significant variation in the level of its development between individual countries of the European Union, despite the institutional and financial support for the development of the organic food production sector under the Common Agricultural Policy (CAP) of the EU. The reasons for the existing disproportions in the level of development of organic farming and organic food market are very complex and include factors of individual, social and cultural nature as well as historical and political conditions for agricultural development, and more broadly macro and microeconomic and environmental determinants.

Analysis of the conditions for the development of organic food production became the subject of my research within grants financed from the European Union funds in 5/6/7 EU Framework Program for Research and Development (II.I-1.1; II.I-1.2; II.I- 1.3, II.I-1.5), the Committee for Scientific Research, the Ministry of Science and Higher Education (II.I-2.1, II.I-2.2, II.I-2.3) and the Ministry of Agriculture and Rural Development (II.I-2.5 II.I-2.8).

The most important issues in this area of interest include:

- analysis of factors determining the development of organic farming, in Poland and other EU member states from Central and Eastern Europe (publications II.2.D-1.9, II.D-1.11, II.D-1.12, II.D-1.34, II. D-5.8, II.D-5.17, II.D-1.39, II.D-5.18, II.D-5.19, projects II I-1.1, II-I-1.8, II. I.2.1, II. .2.2);
- analysis of the possibilities of development of the market information system for the organic food market (publications II.D-1.16, III.B-3.7, III.B-3.8, project II. I-1.2);

- determination of the coexistence of the production of genetically modified and organic food in distribution chains, consumer preferences and the inclination to bear higher costs for non GMO food (publications III.B-3.5; III.B-3.12; III.B-3.13, project II.I-1.3);
- analysis of consumer attitudes and behavior on the organic food market (publications II.D-1.1, II.D-1.2, II.D-1.6, II.D-1.14, II.D.1; II.D-1.19; II D-1.33, II.D-1.38, II.D-1.42, II.D-2.1, II.D-2.2, II.D-4.1, II.D-5.4, II.D-5.5, II. D-5.13, II.D-5.14, II.D-5.16, II.D-5.23, II.D-5.29, III.E.16, III.E.17, II.I-1.1, II.I projects -1.3; II.I-1.5; II.I-2.1; II.I-2.3; II.I-2.5; II.I-2.8).
- determining the impact of sensory attributes of organic food on consumer perception and the possibilities of using sensory marketing in stimulating the consumption of organic food (publications II.E. 13, II.E.14, II.E. 15, project II.I-1.5);
- determination of factors determining the development of the organic food market in Poland in relation to changes in the sphere of production, consumption and distribution of food (II.A.10, II.D-1.5, II.D-1.7, II.D-1.8, II. D-1.13; II.D-1.15; II.D-1.23; II.D-1.32; II.D-1.55, II.D-2.1; II.D-2.2; II.D-5.6; II.D- 5.7, II.D-5.12, II.D-5.15, II.D-5.20, II.D-5.21, II.D-5.28, II.D-5.30, II.D-5.31, II.E.16; II.E.17, projects II.I-1.1, II.I-1.2, II.I-1.5, II.I-2.1, II-2.3, II.I-2.5, II.I-2.8).

The analysis of factors motivating producers to convert to organic farming, with particular emphasis on environmentally sensitive areas, I conducted from the beginning of my employment at the Warsaw University of Life Sciences within the grant " Development of organic farming in the outskirts of Bialowieza Primeval Forest" (project II.I-1.8) financed by the World Bank. I continued work on the determinants of the development of organic farming under two national projects financed from the funds of the Scientific Research Committee (draft II.I-2.1; II.I-2.3) and a project financed from the 5th EU Framework Program " Further development of Organic Farming Policy in Europe, with Particular Emphasis on EU Enlargement" (EUCLEOFP) (project II.I-1.1).

The research carried out in the period before and after the accession showed that organic farmers display the characteristics of innovators, but with the diffusion of organic farming and its institutionalization, their choices related to the conversion of the farm into organic production are increasingly determined by economic aspects, namely the prospect to obtain financial support from funds for agri-environmental measures under the Common Agricultural Policy. So while among the surveyed organic farmers in the pre-accession period, when they were quite an elite group, in the first place among the reasons for switching to organic, there was concern for their own health and family, quality of crops and the natural environment,

including striving for living in harmony with nature, care for the condition of the soil and the beauty of the countryside landscape, then in the phase of wider dissemination of these farming methods in the farmers' environment, these determinants gave way to strictly economic aspects (II.D-1.1; II.D-1.10; II.D -1.11; II.D-2.1).

These issues have been further explored within the research task coordinated by me on the analysis of the state of development and implementation of regulations regarding organic farming and the development of the organic markets in the EU candidate countries. I conducted a comparative analysis of the state of development of organic farming and the regulatory sphere in Poland and other accession countries (II.E.3), analysis of domestic and export markets in new EU countries from Central and Eastern Europe (II.E.4 II.E.5) and I participated in the analysis of the impact of regulations in the field of organic farming, Agenda 2000 and the process of expanding the EU with the countries of Central and Eastern Europe on economic indicators of organic farms in Poland, taking into account the specific features of Polish organic farming.

I showed, among others, that the new member states differ significantly in terms of both the level of development of organic farming, its institutionalization and the organic food market, which resulted from political and economic conditions, agrarian structure and demand for food from organic production methods. I also defined the stimulus factors and supply-demand barriers for the development of the organic food market in the new EU member states. The project were to identify factors that could stimulate further development of the policy on organic farming after the enlargement of the European Union, so as to ensure its sustainable development in all EU countries. The results of the first interdisciplinary research on the factors determining the development of organic farming in the countries candidate for the European Union allowed not only to determine the most important determinants of its development, but above all to create recommendations for institutional support of the development of the organic agricultural sector after the enlargement of the European Union. The results of the project used to formulate the policy recommendation. The measurable results of the research were publications of the series "Organic Farming in Europe: Economics and Policy" published by the University of Hohenheim in Germany (III.G.1) and dissemination activities on the national and international forum (II.K-1.7; II.K-1.8 II.K-1.10, II.K-1.11, II.K-2.12, II.K-2.13, II.K-2.14, II.K-1.15).

The weaknesses in the institutional development of organic farming identified within the project, including access to information on organic farming and data quality on the organic

production and market of organic food, have been the subject of further research carried out within the project "European Information System for Organic Markets" (EISFOM) financed from the funds of the 5th EU Research and Development Program (project II.I-1.2). As part of the project, I was responsible for evaluating existing systems for collecting and processing organic market data in the new EU member states, developing proposals for harmonization of existing data collection and processing systems, defining tools for improving the quality of production, processing, import and organic food prices, development and evaluation of pilot studies in the field of data collection and processing (II.E.6). The conducted exploratory research and analysis of information needs on the part of institutions and other participants in the organic farming sector and data sources, their quality and usability has led to the development of the market information system in organic farming and the creation of guidelines for collecting statistical and administrative data on organic farming and the food market organic by the member states of the European Union and the European Statistical Office EUROSTAT (III.B-1.1). As part of the project, I established cooperation with the Central Statistical Office and the Trade Quality Inspection of Agricultural and Food Products, in order to jointly develop optimal solutions on the collection and dissemination of data from the field of organic agricultural production at the national level, which contributed to the application dimension of the project.

As a result of the cooperation with the Central Statistical Office, a complementary study on the conditions for ecological management in the Świętokrzyskie Voivodeship was carried out on the factors that stimulate farmers to convert into organic farming in the post-accession period, which confirmed that although economic aspects are the main drivers to convert but also other factors are of high importance:

- Environmental aspects: (organic farming is perceived as more environmentally friendly, unwillingness to use artificial fertilizers and pesticides, protection of nature, willingness to conduct sustainable agricultural production, etc.);
- Perceived health benefits for the farmer and his family resulting from the belief that organic food production guarantees its safety and prevents the emergence of various scandals that result in loss of confidence in food.

In the structure of motives that determine conversion to organic farming, prosocial factors related to aspects such as concern for the quality of food produced, the environment, including the agricultural landscape, as well as rural development emerged (II.D-5.17; II.D-5.18; II.D-5.19).

The results of the EISFOM project and complementary studies on factors motivating producers to convert to organic farming were presented at national and international conferences (II.K-2.2; III.B-3.7; III.B-3.8) and within the framework of two international seminars organized by the consortium, the results of which appeared in the form of peer-reviewed publications (III.C.1, III.C.2).

Among environmental factors that are considered particularly important from the point of view of consumer expectations and the perception of the quality of organic food, it is important to ensure the co-existence of organic farming with genetically modified crops. These issues were covered in the research conducted within the project "GM and non-GM supply chains: their coexistence and traceability" (COEXTRA) (project II.I-1.3), financed from the 6th EU framework program, aimed at providing integrated tools, methods, models and guidelines needed to solve the problem of the coexistence of genetically modified organisms and non GMO and control their flow in distribution channels. The project was aimed at supporting decision-making processes concerning the coexistence between genetically modified and non GMO crops, traceability in food and feed distribution chains and defining the future expansion of GMO's taking into account the quantitative and qualitative aspect (III.B-1.2; III.B -1.6, III.B-3.5, III.B-3.13). In addition to participating in the analysis of selected food and feed distribution channels and their modeling to propose coexistence structures, I was also responsible for carrying out consumer surveys diagnosing consumers' attitudes towards genetically modified and organic food and their inclination to bear higher costs for food free from genetic modification (II.E.9). In the research I used the choice experiment method based on the declared preferences. The results indicated that consumers are skeptical towards genetically modified food, which was also reflected in the results of experimental research and the lack of readiness to accept such products, despite the indicated benefits in the health and environmental dimension (III.B-1.5; III.B -1.12).

Research on factors determining the development of organic farming and organic food market with particular emphasis on the demand side, which I started as part of the projects of the Scientific Research Committee (II.I-2.1; II.I-2.3) I continued as part of research projects financed by the Ministry. Agriculture and Rural Development in 2011 and 2017 (II.I-2.5, II.I-2.8).

The main objectives of the projects included an analysis of the factors determining the development of the organic food market in Poland, including the determination of:

- development trends of the organic food market in selected European countries and their implications for the development of the domestic organic food market;
- factors influencing consumer behavior in the food market in the context of observed changes in the sphere of food production and distribution;
- factors influencing the diversification of the organic food offer, including the increase in the market share of processed food of domestic origin;
- ways of distributing organic food and the possibility of improving it in accordance with the changing consumers' expectations.

The questionnaire developed in 2001 was used in research carried out on nationwide representative samples over several years, which allowed me to identify changes in consumer attitudes and behaviors in relation to the hierarchy of motives to buy organic food, preferred products and sale channels as well as barriers to buy organic food.

Research carried out in the initial phase of development of the organic food market in Poland confirmed findings of the international surveys and indicated that the primary motive to buy organic food among Polish consumers was health concern, sensory values of organic food and care for the environment (II.D-1.5; II.D-1.12; II.D-5.18; II.D-2.1; II.D-3.1). Organic food was more often bought by women, people over 40 years of age, with secondary and higher education and good incomes, living in households from 3 to 5 persons (II.D-1.13). The hierarchy of motives to buy organic food does not change and health aspects are the most important determinant of organic food choices (II.D-5.29; II.E.16; II.E.17), but the importance environmental and socio-ethical aspects as a stimulant of sustainable food consumption is of growing importance (II.D-1.34; II.D-5.29).

Polish consumers perceive organic food in a very positive way, which they most often describe as "healthy", "safe" and "trustful" (II.D-1.20, II.D-1.23, II.D-2.1; II.D-3.1; II.D-5.29).

In the initial stage of development of the organic food market, the most frequently mentioned sale channels for organic food were specialist stores, supermarkets and farmers markets (II.D-1.7, II.D-2.1, II.D-2.1). The most frequently purchased products from the organic food assortment include products of vegetable origin, i.e. vegetables and fruits (II.D-1.7, II.D-5.29, II.E.16, II.E.17). On the other hand, consumers perceive shortages of meat and meat products in the offer of organic food (II.D-5.29, II.E.16, II.E.17). With the development of the supply of organic food and as a result of changes in the structure of retail trade, the importance of large-format is growing, and above all, discount formats (II.D-5.29, II.E.16, II.E.17). The sequence of factors influencing the resignation from the purchase of organic food has also

changed from factors related to the availability of organic food and information related barriers (II.D-1.36) to factors related to the level of organic food prices (II.D -5.29; II.E.16; II.E-17). The research also showed that despite the promotional activities, Polish consumers do not have sufficient knowledge about the labeling of organic food, which may cause a loss in confidence in this food category (II.D-1.54). Difficulties in identifying organic food observed among Polish consumers clearly indicated the need to undertake promotional activities introducing not only the rules for labeling organic food, but also the criteria of organic food production using a segmentation approach and adequate means of communication. The results of segmentation analyzes and observed demographic trends indicate also the need to diversify the offer of organic food in line with expectations of both younger consumers looking for convenience products and a growing group of seniors who are looking for organic products processed in a traditional way and produced from raw materials from domestic origin, but also of high quality sensory properties identified with "flavors of childhood" (II.E.17).

The analysis of development trends in the organic food market in selected European countries and their implications for the development of the domestic organic food market has shown that organic production in Poland is developing dynamically, but despite the favorable EU policy and support, the number of organic producers has been decreasing since 2015. It was also found that organic farms are still very spatially dispersed, which in relation with the increasing share of farms with small size have implications for the development of processing and distribution of organic food, because it limits the possibility of introducing organic food to wide distribution, that could contribute to the dynamic development of the domestic organic food market (II.E.16). The small scale of production and the dispersion of producers as well as the concentration of demand in larger cities force that companies predisposed to operate in local food supply systems to distribute their products over long distances, which is neither environmentally nor economically justified and affects the level of organic food prices and its image (II.E.17). The conducted research also showed that in international trade of organic food Poland is still primarily a supplier of raw materials and semi-finished products. Currently, Polish organic food processors most often function as subcontractors for foreign enterprises, which is not conducive to promoting the Polish origin of organic food and the development of Polish brands, which could be positioned on international markets. As a result of the analyzes, risk factors in the organic food production sector were also identified. The highest risk in the opinion of the representatives of the production and distribution sector results from the complexity and ambiguity of the applicable legal regulations, their frequent changes as well as

unclear and ambiguous interpretations. Operation in the organic food sector is additionally endowed with a significant risk of maintaining a stable raw material base. Despite the systematic increase in support for organic agricultural producers, the supply of organic food was assessed as insufficient and not satisfying the needs of domestic companies. Dependence on foreign suppliers, in turn, increases the financial risk in the context of currency risk. The small scale of production and the high share of imported products as well as relatively high commercial margins result in a high level of organic food prices, which in turn result in low consumption of organic food.

Access to data on the supply and demand of organic farming products is, in the opinion of market actors, still unsatisfactory, which hinders the possibility of assessing the risks related to the production and distribution of organic food, and is not conducive to proposing adequate tools to support the development of this sector. In the sale of organic food, the growing activity of large retail chains, including discount stores, is noticed. However, their offer is dominated by processed products of foreign origin, often introduced under the private labels of international retailers. These issues are discussed in more detail in the publication II.A.10. The results and analysis of global trends indicated that further changes in the organization of organic food sales may be implied by convenience, but also a trend conducive to sustainable consumption. As a result, one may expect the development of large-format stores dedicated exclusively to organic food and products that are environmental friendly and support the idea of responsible consumption.

The scope of my scientific and research interests related to the development of the organic food market and consumer behavior towards organic food has expanded in recent years to research on factors related to the impact of sensory attributes on consumer acceptance. The inspiration to get involved into consumer sensory research has come from the project "Traditional Food in United Europe", whose results pointed to the need to improve the sensory attributes of organic food so as to increase its acceptability and create opportunities for using organic raw materials in traditional food production. I continued this research under the project "European sensory information system for organic food markets" (ECROPOLIS) financed from the 7th EU Framework Program, of which I was the coordinator at SGGW (II.I-1.5). This project was a part of the "Capacities" instrument - Research for Small and Medium-sized Enterprises (SME's), which served to strengthen cooperation between science and business, to improve the technological capabilities and competitive position of SME's. The basic goal of the project was to create a European information system about the sensory quality of organic

food (Organic Sensory Information System - OSIS). The scope of research covered the identification of consumer expectations and preferences for selected groups of organic food products, determination of the specific sensory characteristics and the preferred sensory attributes of organic food from four assortment groups (fruits, processed fruit and vegetables, dairy products, meat products), identification of drivers of liking and the development of marketing strategies in line with the concept of sensory marketing (II.E.14; III.B-1.22). The data obtained has been integrated in the OSIS database available to entrepreneurs operating in the sector of organic food production in order to support their activities in the field of new product development in line with consumer expectations and effective marketing communication on the organic food market (III.B-1.26). The scope of research conducted by me as part of the ECROPOLIS project included both the analysis of companies operating in the organic food production sector (II.E.10, III.B-1.16, II.B-6.6), as well as analysis of attitudes and behaviors of Polish consumers using the exploratory method - focused group interviews (FGI) and quantitative research combined with consumer sensory evaluation of selected products, i.e. yoghurts and cookies with various quality attributes (II.E.12, II.E.15, III.B-1.17). The collected data from quantitative research were used in segmentation analysis to develop marketing strategies referring to sensory marketing (II.E.14). The respondents were very positive about placing information characterizing sensory attributes on product labels, which should be reflected in the labeling of organic food. The research also aimed to identify the differences between regular and occasional consumers of organic food (III.D-1.36, II.B-1.18). I found out that regular consumers of organic food prefer shopping in speciality stores, pay more attention to aspects such as low calorie content, taste and health properties of food, freshness of products and know how to recognize high quality products and have more knowledge on the ingredients that determine the high quality of meals. In terms of the importance they attach to sensory attributes of food products, regular consumers are very much concerned with taste, even if it is associated with the need to pay a higher price. At the same time, regular consumers are more pragmatic, they more often prepare shopping lists and pay more attention to the information on the food packaging and would like to obtain more information about the sensory attributes of food products.

An important aspect of the ECROPOLIS project implementation was knowledge transfer. As part of the project, training programs were developed and training sessions organized on sensory aspects of organic food and sensory marketing for entrepreneurs from the production and distribution sector of organic food (III.B-7.8).

My involvement in the implementation of national and international research projects in the field of organic farming and organic food as well as the acquired knowledge and experience has been discounted in preparation in co-authorship with dr hab. Józef Tyburski from the University of Warmia and Mazury in Olsztyn, the first national academic textbook in the field of organic farming, which met with favorable evaluation and received a distinction for the best academic textbook during the XI Poznań Scientific Book Days in 2007.

The results of the research carried out with my participation were used in economic practice and the area of political decisions. Data obtained as a result of research carried out as part of international projects, including the acronyms EUCLEOP EISFOM and COEXTRA served the European Commission for the development of organic farming policy after the EU enlargement to the countries of Central and Eastern Europe, development of data collection systems and support decision-making processes related to ensuring co-existence of crops GMO and organic. The results of international and national surveys were used to formulate the national action plan for organic farming and organic food. They were also used in business practice in order to improve sensory attributes and the assortment offer of organic food by enterprises participating in the implementation of the ECROPOLIS project.

3.2. Determinants of the acceptance of innovation in food

Technological progress and changes in consumer behavior force the food companies to increasingly deepen and engage their competences in the development and introduction of new food products. Creation of innovations has become a kind of imperative for the development of modern economy and entire societies, which is reflected in the priorities of long-term policy of individual countries, including Poland (II.D-1.37). Innovation and innovativeness are analysed in the literature in relation to the enterprise, product and consumer and its particular predispositions related to the willingness to accept innovation [Roehrich 2004]. In the 1990s, the term "consumer innovativeness" appeared, which is defined as the readiness to buy new and different products and brands, which is stronger than the tendency to follow well-established consumption patterns [Steenkamp et al., 1999]. In the analysis of consumer innovation, a particular role is attributed to the individual and his predispositions to accept innovations that are determined by variables representing the socio-demographic, personality and lifestyle characteristics of individuals.

The impulse to engage in the research on consumer innovativeness and factors determining the acceptance of innovation on the food market was my participation in the project "Traditional Food in United Europe" (TRUEFOOD), financed under the 6th EU Framework Program, whose

main goal was to introduce innovation to the traditional food sector ensuring microbiological safety, the low processing using traditional methods and high nutritional value and sensory values of traditional food. I was involved in research on consumer attitudes in relation to the safety and quality attributes of traditional food and identifying the innovations accepted by consumers in the production and distribution of traditional food (II.E.7; II.E.8; II.E.10). Exploratory research (focus group interviews, association tests) and quantitative research carried out as part of the project helped to define innovations accepted by consumers in traditional food (II.A.1, II.A.2, II.B-1.27). The results of exploratory research carried out among Polish consumers have confirmed that in the field of traditional food, innovations involving the use of new technologies to improve usability, including health quality and convenience, are accepted. The changes that were associated with interference with the traditional recipe were strongly rejected (II.D-1.27). It was shown that consumers from the countries studied (Belgium, France, Spain, Norway, Poland) differ in terms of the level of acceptance of the proposed innovation in traditional food. Poles and Norwegians were more skeptical about introducing innovations in traditional food than Belgians and the French. It was shown that innovations related to packaging, improvement of health and nutritional values as well as convenience related have gained a higher level of acceptance. However, French and Polish consumers showed less willingness to accept changes related to nutritional health values (II.A.3).

The results of the project were published in prestigious journals (II.A.1, II.A.2, II.A.3) and met with great interest from other researchers, which was reflected in the high number of citations and obtaining by the publication II.A.1 in the Web of Science the status of "highly cited paper" (publication with a high number of citations).

The results of the TRUEFOOD project were also systematically disseminated in order to promote knowledge about traditional products, the regulatory aspects, consumer attitudes and behavior, and the issues related to creating innovation in the traditional food market (III.B-1.4; III.B-1.7; III.B-1.8; III.B-1.13, III.B-3.15, III.B-3.17, III.B-3.18). As part of the transfer of knowledge and skills, I was responsible for preparing the program and organizing specialized seminars in this field addressed to experts, including decision-makers involved in the development and registration of traditional products (II.B-7.4; II.B-7.5).

I used the knowledge and experience gained in international research on innovations in the food market in the implementation of national projects, including two projects co-financed from the European Regional Development Fund, Innovative Economy Program, i.e. "BIOFOOD - innovative, functional products of animal origin" (project II .I-1.10) and "BIOPRODUCTS,

innovative technologies for the production of healthy bakery products and reduced calorie pasta" (II.I-1.12).

The research undertaken on consumer innovativeness within the BIOFOOD project was aimed at defining attitudes and behaviors of consumers towards food with pro-health attributes and the relationship between consumer characteristics and their tendency to accept innovations depending on the type of product and the changes introduced. Quantitative research has shown that the level of innovation of Polish consumers is relatively low and only 6.2% is categorized as "innovators", and the vast majority of consumers considerably slower accepts new food products or are reluctant to market novelties (II.D- 1.52). The reasons for the low level of innovation can be related to the fact that food products are often bought routinely, and the hedonistic aspects determine the purchasing decisions. Consumers who accept innovation the most quickly differ significantly from other respondents in terms of such socio-demographic variables as age, level of education, subjective assessment of the income situation and place of residence. The results confirmed the assumption about a low level of innovativeness of older people (retired) and retired as well disadvantaged (II.A.6). As a result of exploratory research, it was found that consumers by "innovative food products" most often understand food with new flavor variants, as well as food with improved quality and health values. However, consumers were the most familiar with the changes in the food market related to the increase in the product offer products characterized by a reduction in allergens and products with a reduced content of artificial ingredients, especially preservatives. The changes identified by the consumers in the food offer are accepted by them to a different degree with the vast majority of respondents negatively referring to the "improvement" of food by its enrichment with various ingredients (II.D-1.46). It was also found that the level of innovativeness varies from product to product and consumers are more prone to accept the innovation in dairy products than in milk, meat and meat products, and eggs (II.A.6). The results also revealed that Polish consumers accepted the most the changes in the content of some ingredients, e.g. salt or sugar, while the lowest level of acceptance was declared for the enrichment of milk and its products with vitamins and minerals. The results of the research also confirmed that the higher level of acceptance of most changes in food of animal origin was declared by younger consumers, with higher incomes, having higher education and coming from larger cities (II.A.5).

In order to deepen the conditions for the acceptance of innovation in relation to products of animal origin, segmentation analyzes were carried out, which allowed for a more in depth analysis of factors affecting the level of consumer innovativeness.

In publication II.D-1.43, a segment of “Enthusiasts of novelties” was identified, in which younger people with a higher level of education and good income situation prevailed, who positively referred to changes in the food market and innovations in animal products related to the reduction of cholesterol content and lowering the level of some ingredients, e.g. salt or sugar. However, they were less inclined to accept the enrichment of milk and its products with vitamins and minerals.

In turn, the results of segmentation analyzes published in II.D-1.52 showed that the highest level of innovativeness is demonstrated by consumers representing the "Ecological" segment, who attach particular importance to environmental aspects related to food production, but at the same time look for such food that is easily available, free from additives and has a favorable price-to-quality ratio, which confirmed the findings in the literature of the subject. The growing importance of environmental aspects and interest in organic food was also confirmed by comparing the level of innovation of Polish consumers in 2004-2011 (II.A.9).

The research carried out within the BIOPRODUCTS project was aimed at determining the factors affecting the acceptance of bread with an increased content of fiber (project I.1.12). Fiber belongs to one of the functional components of food that consumers are familiar with and can be used in health and nutrition claims [Bornkessel et al., 2014]. At the same time, fiber intake with diet is lower than recommended. Therefore, it is justifiable to enrich with fiber products that are often consumed and at the same time poor in this ingredient, such as white bread [Martin et al., 2013]. The results of the analysis of the factors determining the acceptance of bread with added fiber have shown that such products are perceived positively in the relation to the impact on health and naturalness usually associated with the exclusion of additives. However, even a product with high nutritional value will not be accepted if it does not have the appropriate sensory quality. In order to determine the key sensory attributes the so called “drivers of liking” expert sensory analysis was carried out using Quantitative Descriptive Analysis (QDA) followed by the consumer sensory assessment of experimental wheat-rye bread enriched with oat fiber at the level of 4%, 8%, 12%, 16%, 20%. The results of expert evaluations confirmed the findings from the literature, where it was emphasized that increasing the fiber content in bakery products may have negative consequences with respect to the volume of the bread loaf [Gomez et al., 2003], crumb color and elasticity [Wang et al., 2002] and taste [Martin et al., 2013]. The QDA results showed that the addition of fiber to the wheat-rye bread type "Baltonowski bread" caused changes mainly in relation to the taste, aroma and texture of bread and contributed to the deterioration of mechanical properties (III.B-1.30). In addition, the

addition of fiber significantly affected the perception of bread moisture and its adhesiveness. Consumers evaluating bread with an increased fiber content positively responded to the sensory attributes and showed readiness to pay a higher price for bread with an increased content of fiber. The results of consumer assessments showed that the addition of fiber to the level of 12% seems to be the most desirable direction of increasing the health value of bread type such as "Baltonowski bread". However, in assessing the market prospects of this product category, the results of analytical sensory assessments should be taken into account, in which it was found that the addition of fiber adversely affects the attributes associated primarily with the appearance and texture of the bread.

As a result of the analysis of data collected during the implementation of consumer surveys, three segments were distinguished with different preferences regarding selected attributes of bread and interest in new food products (II.D-1.56). The highest inclination to accept new food products was demonstrated by consumers who highly valued bread with beneficial health effects, significantly more often paid attention to the information contained on the food packaging, declared to follow the guidelines of proper nutrition and rated high the content of fiber bread in the context of a positive impact on health. The group comprised mainly with women, people over 40, with secondary and higher education. The research confirmed that the production of bread with added fiber may be an important direction of diversifying the product offer, in line with the expectations of modern consumers.

The results of the research are published in publications (II.D-1.57, II.D-1.58) and presented at national conferences (III.B-2.40, III.B-2.41), as well as at an international conference (III.B-1.32) .

Participation in the project BIOFOOD and BIOPRODUCTS allowed me not only to continue research on consumer innovativeness and determinants of acceptance of innovation in relation to food, taking into account the multi-attribute concept of food quality, but also contributed to further development of innovative research methods combining expert sensory assessments with consumer research. In addition, the implementation of these projects allowed me to gain experience in cooperation with the economic environment.

3.3 Consumer behavior towards products of animal origin

In Poland, since the 1990s, the structure and amount of meat consumption have changed. The main reasons for this phenomenon, apart from economic factors, include changes in consumer preferences reinforced by unfavorable reports of opinion-forming institutions, such

as the World Health Organization (WHO) on the impact of consumption of red meat and its products on health. Decision-making processes related to products of animal origin are influenced by factors directly related to the consumer, which include socio-economic variables, eating habits and attitudes, lifestyles, and related to the product, e.g. color, fat content, packaging, information on the label [Grunert, 2006; Troy and Kerry, 2010]. The trends observed in the consumption of food also have an impact on the consumption of meat, which is increasingly determined by both ethical and environmental issues, as well as the convenience trends in shopping and meal preparation [Grunert, 2006; Van Wezemael et al., 2010; Font-i-Furnols and Guerrero, 2014]. A more complete recognition of the decision-making processes related to animal products was made by research carried out under the project co-financed by the European Regional Development Fund under the Innovative Economy Operational Program "Optimization of beef production in Poland in accordance with the strategy" from farm to fork "PROOPTIBEEF. In the analysis of decision-making processes, both exploratory methods (qualitative research by focus group interviews) and quantitative research were used. Obtained results of qualitative research have shown that consumers are aware of the health values of beef, perceiving it as a special kind of meat, both due to its high nutritional value as well as specific taste values, but also question the level of beef prices and unsatisfactory quality of beef offer (II.D-1.39, III.B-1.20). Also analyzed decision-making processes related to the purchase of beef showed that beef is perceived as a difficult and time-consuming meat to prepare. Consumers emphasized that they do not have a guarantee of obtaining the desired culinary properties, which increased uncertainty in the decision-making processes related to the purchase of this type of meat (II.D-1.42; III.B-1.21) The results of exploratory research have been confirmed in quantitative studies carried out using the CATI method with 3136 consumers and the PAPI method on a sample of 501 beef consumers. The results showed that beef consumption is determined by the income of consumers, but economic factors are not the only predictor of the possibility of increasing and diversifying beef consumption. In order to identify the factors affecting the decision-making processes, segments with different frequency and amount of beef consumption were identified (II.D-1.33, III.B-1.19). It was shown that in the segment comprising of regular consumers, the lack of satisfaction with the quality of beef available on the domestic market was more pronounced than the economic reasons. High quality beef, with parameters enabling its various culinary uses, was consumed by consumers representing segments open to novelties and looking for new culinary experiences. The research has shown that consumer decision-making processes in relation to beef are subject to high uncertainty, which in turn justifies the introducing of the labeling to facilitate the assessment of the quality

and culinary purpose of beef elements in order to increase consumer satisfaction and propensity to re-purchase (II.D-1.48).

At the same time, it was found that consumers more and more often in decision-making processes related to products of animal origin refer to environmental and socio-ethical issues (II.A.9, II.D-1.49). The market for such products is attractive from an economic point of view, because it triggers a mechanism by which the value resulting from animal welfare is added to the product. The research carried out in 2016 shows that 94% of consumers from among all EU member states considered it very important to care for the welfare of farm animals [Eurobarometer ..., 2016]. The growing interest of consumers in food products of animal origin from production systems stressing the care for animal welfare has led me to undertake research on the impact of such attributes on the attitudes and behavior of consumers. The issue of animal welfare in pig farming is particularly interesting in this context due to the importance of Poland in pork production and the debate in the EU on stopping surgical castration of boars, which led to the development of a European declaration on alternative methods for surgical castration of pigs and signing by some Member States, a memorandum on the resignation from this type of practices since 2018. At the same time, such actions to improve animal welfare cause adverse changes in the sensory quality of meat, which has a direct impact on consumer acceptance. These issues became the inspiration for me to join the project "Acceptance by consumers in the European Union and third countries of meat from male pigs that were not surgical castrated" (CAMPIG) financed by the European Commission, Directorate General Health and Consumers (project II.1-1.9). As part of the project, sensory acceptance of meat products was conducted, including fragrance tests combined with direct interviews to determine sensory and psychological factors determining acceptance of this products. The research initiated as part of the CAMPIG project, established contacts with scientists from various academic centers and gained experience in assessing the sensory attributes of meat from various production systems with special regard to fragrance I apply since September 2017 in the implementation of the research project "Sustainability in the pork production with immunocastration" (SuSI)) financed from Horizon 2020 under ERA NET COFUND (project II.I-1.7).

3.4 Factors determining food safety in the opinion of consumers

Food safety is an integral part of food quality and ensuring food safety is a priority of the food policy implemented by European Union, which was reflected both in food law and establishment of the European Food Safety Administration (EFSA). Despite legislative and institutional actions, European consumers have a skeptical attitude towards food safety, which

motivated me to explore factors determining the perception of risk in the food chain. To achieve the previously specified goal, I undertook in cooperation with prof. dr hab. Krystyna Gutkowska and prof. dr hab. Irena Ozimek, research aimed at identifying Polish consumers level of knowledge on the factors determining the perception of food related risks at the stage of production, distribution and handling of food after its purchase. The questionnaire developed by the Authors has been used in two stages of research carried out directly before Poland's accession to the European Union and several months after gaining membership, in order to identify the possible implications of implementing the *acquis communautaire* with regard to the subjective perception of food-related risks.

The results of own research obtained in 2003 showed that the level of consumer awareness regarding the safety of food production and distribution, as well as hazards that may occur in connection with the consumption of food with inadequate health quality is insufficient (II.D-1.16). The greatest concerns among consumers at the stage of food production and processing aroused the use of bone meal in animal feeding and the use of food additives. To a lesser extent, respondents were concerned with the risks associated with the distribution of food. It was noted that consumers with a higher level of education and older people were more likely to demonstrate increased concerns about factors that could affect food safety. The 2005 study confirmed the findings of the pre-accession study, but the share of consumers expressing the highest concerns decreased significantly (II.D-1.24, II.D-1.28). The obtained research results indicated the necessity cover the issues regarding communication of food-related risks among Polish consumers. Appropriate communication of food risks is intended both to increase consumer awareness in the field of food safety, as well as to provide institutions responsible for food safety with information on consumers' needs and expectations. At the same time, the prerequisite for effective communication is to provide consumers with information in a manner adequate to their needs and with sources that are trusted [Verbeke, 2008]. Thus, the selection of effective communication tools related to food safety issues requires the identification of factors differentiating the perception of food-related risks taking into account different stages of the food chain and identifying sources of information on food safety and the trust assigned to them. These issues became the subject of research carried out by me in the years 2006-2008 as part of a research project for outstanding adjuncts, financed from the own resources of the Warsaw University of Life Sciences (project II.I-2.4). The surveys carried out on representative samples of Poles showed that consumers do not possess sufficient objective knowledge about potential threats to the safety of consumed food, and their perception is dominated by subjective

knowledge (II.D- 1.35; II.D-1.38). As a result, they overestimate the risks associated with the use of illegal substances in animal feed and food preservation by ionizing radiation. Lack of consumer knowledge about legal measures and practices allowed in food production weakens their market position and result in purchasing decisions that are not always economically justified.

Differences in respondents' opinions on food safety were observed, depending on the category of food being assessed. Positively connoted, in the context of ensuring the safety of consumed food, was the use of ingredients derived from the organic production method, despite the lack of unambiguous scientific evidence on the safety of this food category. Consumers were also very positive about the safety of traditional food. The criterion differentiating the perception of food safety was also the origin of food in the meaning of the country of origin. Consumers were less aware of the risks associated with food produced in Poland than those from abroad. The greatest concerns about safety were raised by fast food and genetically modified foods (II.D-1.35).

The results of the research also confirmed that consumers do not engage in the search for information on food safety and most often use formal sources, i.e. newspapers, magazines and television programs (II.D-1.38). The family and scientists were pointed out as the most reliable source of information. To a lesser extent, the respondents trusted institutions and organizations responsible for disseminating information related to food safety. In turn, the least credible sources were producers and traders. The respondents attributed the greatest importance in terms of improving the safety of consumed food to checking the information contained on the food label and were less convinced that promotional activities, dissemination of knowledge in the field of food safety and creation of stricter legal regulations in the field of food safety may increase food safety. I found out that consumers with a higher level of education considered as more reliable information from formal sources, whereas consumers with lower educational level relied more on information obtained from the family (II.D-1.38). The research revealed that there are discrepancies between the subjective assessment of food risk related to the consumption of selected types of food, and objective data of inspections on disqualified samples of various types of food. The importance of the so-called subjective knowledge, which may have a greater impact on consumer behavior in relation to identified food-related risks than objective data. The results of research among Polish consumers indicated that food safety gains importance as a factor influencing consumer decision processes. Polish consumers have determined the impact on food safety, both the method of its production and the handling of

food in distribution channels and after the purchase. The subjective assessment of hazards associated with selected types of food showed that consumers are concerned about a high degree of processing, which is reflected in the high share of answers indicating consumer risks related to "fast food", genetically modified food and food containing additives. The factor that differentiates consumers' opinions on the issue of safety attributed to various types of food is its subjective assessment in the "natural - unnatural" categories. Foods with "natural" attributes are categorized as "non-risky", while new technologies that are associated with a high degree of interference in "naturalness" are perceived by consumers as threatening. As a result, consumers are skeptical about potentially beneficial biotechnology products and genetically modified foods. The results indicate also the necessity to further explore the issues related to the search and processing of information on food safety by Polish consumers so as to create effective communication strategies in order to increase confidence in food safety. The conducted research also proved the legitimacy of monitoring consumers' knowledge on food safety and the food-related hazards they perceive, so as not only to effectively respond to the emergence of criminal activities of the so-called food crime, but also to verify the effectiveness of the activities carried out.

3.5 Determinants of the development of sustainable food consumption

In recent years, my research interests have expanded to include issues related to sustainable nutrition and modeling of consumer attitudes. I undertook research in this field in 2015 under the project "Attitudes and behavior of young consumers towards healthy and sustainable eating" financed by the National Science Center as part of the HARMONIA call, i.e. cooperation established directly with a partner from a foreign scientific institution (Prof. Monique Raats, University of Surrey, United Kingdom) (project II.I-2.7).

In line with the 2010 definition of Food and Agriculture Organization (FAO), sustainable diet means "diets with low environmental impacts which contribute to food and nutrition security and to healthy life for present and future generations. Sustainable diets are protective and respectful of biodiversity and ecosystems, culturally acceptable, accessible, economically fair and affordable; nutritionally adequate, safe and healthy; while optimizing natural and human resources". The main objective of the project was to determine the attitudes and behaviors of young consumers regarding sustainable and healthy nutrition, because young consumers more often than other age groups undertake unfavorable dietary behaviors, follow an unvaried diet with a high proportion of snacks, including fast food and eat less fruit and vegetables (II.A.7).

In the implementation of the project innovative research methods, including qualitative longitudinal research (QLR) were used to better understand consumer interpretation of the principles of sustainable and healthy diet (III.B-1.28; III .B-1.31). The quantitative research carried out among young consumers, in turn, served to determine the factors influencing their behavior as part of the implementation of the principles of balanced and healthy nutrition and the development and validation of the scale of "healthy sustainable diet" (III.B-1.32). The scope of the project also included intervention studies carried out in accordance with the principles of Randomised Controlled Trial (RCT), which made it possible to determine the impact of interactive and personalized according the results of segmentation analysis, messages on the six principles of healthy and sustainable diet developed with the social campaign "Livewell 2020", on the behavioral intention to follow a sustainable and healthy diet. The theoretical foundation of the experimental research was based on an integration model that combines behavioral theories regarding predicting changes in consumer behavior. Messages containing graphic materials, photos and videos were sent to the mobile devices of the study participants using the "FoodUP" application developed as part of the project every 2-3 days for four weeks. The results were integrated in a model in which the influence of particular factors on behavioral intentions was determined using the analysis of structural equations. It was found that properly structured messages, information sent via mobile devices may affect the tendency to take behaviors that are in line with the concept of sustainable and healthy diet.

My interests in the social aspects related to the broadly understood production and consumption of food were also reflected in the involvement in the analysis of data and the preparation of publications on research on the behavior on the food market of visually impaired and blind consumers (III.B-1.29). In the II.A.8 publication, not only the most important determinants of food selection by this group of consumers have been determined, but also practical recommendations regarding solutions which, in the opinion of representatives of this group, could facilitate decision-making processes related to the purchase of food and its preparation for consumption. The results provide valuable insights for decision-makers responsible for social and food policy, because they show the complexity of decision-making processes by people with different levels of disability and indicate areas requiring urgent action to provide this group access to information and support them in the selection of food adequate to their needs.

In conclusion, I would like to stress that my scientific activity, discounted both by the described achievement constituting the basis of the habilitation procedure and other achievements, was focused on the in depth exploration of consumer behavior towards food,

especially its quality in a multi-attribute context, and consequently on the identification of possible strategies to develop the market for food possessing the quality attributes resulting from specific production methods, respecting both environmental values and diverse consumer preferences and favoring the idea of sustainable consumption and a balanced diet.

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4. Summary of scientific publications

My scientific achievements include 167 publications, of which 17 in journals indexed by the Journal Citation Report base, and 55 are on the Ministry of Science and Higher Education, while 55 are chapters in national and foreign monographs as well as 20 popular science publications.

The number of citations of my works according to the ICI Web of Science database is 434, the Hirsh index is 5, the number of citations recorded in the Elsevier SCOPUS database is 525, and the Hirsch index is 6. The Google Scholar database identified 1545 citations of my publications, and the Hirsch index was 16 .

The total number of IF calculated by the year of publication of the work is 28,149, while the 5-year current total Impact Factor for these publications is 36,943.

The total number of points obtained according to the lists published by the Ministry of Science and Higher Education (formerly the Scientific Research Committee) in accordance with the year of publication is 906, with 865 points obtained after gaining the PhD degree.

The summary of scientific publications is included below in Table 1.

Table 1: Summary of scientific publications with regard to Polish Ministry of Science and Higher Education scoring and Impact Factor

Lp.	Publication	Number of publications		Polish Ministry scoring by year	IF (by year)	IF (5 year)	Sum of scoring based on Ministry scoring
		Before PhD.	After PhD.				
1	2	3	4	5	6	7	8
A. Publications published in scientific journals with the Impact Factor (IF), and indexed in the Journal Citation Reports (JCR)							
1.	Agribusiness	0	1	15	0,406	1,206	15
2.	Animal Science Papers and Reports	0	1	25	0,725	0,845	25
3.	Appetite	0	1	20	2,582	3,691	20
4.	Appetite	0	1	35	3,174	3,691	35
5.	British Food Journal	0	2	25	1,406	3,166	50
6.	British Medical Journal Public Health (BMC Public Health)	0	1	35	2,265	3,039	35
7.	Food Quality and Preference	0	1	32	2,798	4,178	32

1	2	3	4	5	6	7	8
8.	Journal of Consumer Behaviour	0	1	25	1,659	2,270	25
9.	Meat Science	0	1	40	2,821	3,550	40
10.	Nutrients	0	1	35	4,196	4,603	35
11.	Polish Journal of Food and Nutrition Sciences	0	1	15	1,276	1,760	15
12.	Sustainability	0	2	20	4,150	4,354	40
13.	Żywność Nauka Technologia Jakość	0	2	15	0,380	0,295	30
14.	Żywność Nauka Technologia Jakość	0	1	15	0,311	0,295	15
Total		0	17	-	28,149	36,943	412
B. Publications in scientific journal without Impact Factor, included in the list B of MSaHE journal rank							
1.	Acta Scientiarum Polonorum. Oeconomia	0	2	9	-	-	18
2.	Acta Scientiarum Polonorum. Oeconomia	0	1	15	-	-	15
3.	Bromatologia i Chemia Toksykologiczna	0	4	4	-	-	16
4.	Biuletyn Naukowy UWM	0	1	2	-	-	2
5.	Folia Universitatis Agriculture Stetinensis 2003, Oeconomica	0	1	1	-	-	1
6.	Handel Wewnętrzny	0	2	6	-	-	12
7.	Handel Wewnętrzny	0	2	7	-	-	14
8.	Handel Wewnętrzny	0	4	12	-	-	48
9.	Journal of Agribusiness and rural Development	0	2	13	-	-	26
10.	Journal of Research and Application in Agricultural Engineering	0	2	5	-	-	10
11.	Marketing i Rynek	0	2	6	-	-	12
12.	Polish Journal of Food and Nutrition Sciences	0	1	6	-	-	6
13.	Prace Naukowe AE im. Oskara Langego we Wrocławiu	0	2	6	-	-	12
14.	Problemy Higieny i Epidemiologii	0	1	6	-	-	6
15.	Roczniki Naukowe Stowarzyszenia Ekonomistów Rolnictwa i Agrobiznesu	2	2	1	-	-	4
16.	Roczniki Naukowe Stowarzyszenia Ekonomistów Rolnictwa i Agrobiznesu	0	2	6	-	-	12
17.	Roczniki Naukowe Zootechniki	1	0	3	-	-	3

1	2	3	4	5	6	7	8
18.	Studia i Materiały Polskiego Stowarzyszenia Zarządzania Wiedzą	0	1	6	-	-	6
19.	Wieś i Rolnictwo	1	2	6	-	-	18
20.	Zeszyty Naukowe Akademii Rolniczej w Krakowie	0	1	1	-	-	1
21.	Zeszyty Naukowe SGGW w Warszawie, Ekonomika i Organizacja Gospodarki Żywnościowej	0	3	13	-	-	39
22.	Zeszyty Naukowe Uniwersytetu Ekonomicznego w Poznaniu	0	1	6	-	-	6
23.	Zeszyty Problemowe Postępów Nauk Rolniczych	0	1	6	-	-	6
24.	Żywność Człowieka i Metabolizm	2	1	3	-	-	9
25.	Żywność Człowieka i Metabolizm	0	1	4	-	-	4
26.	Żywność Człowieka i Metabolizm	0	1	2	-	-	2
27.	Żywność. Nauka, Technologia, Jakość	0	4	4	-	-	16
28.	Żywność. Nauka, Technologia, Jakość	0	1	15	-	-	15
Total		6	47	-	-	-	339
C. Original creative works published in another foreign magazine in English and other languages							
1.	Agronomy Research	0	1	2	-	-	2
Total		0	1	2	-	-	2
D. Authorship and editing of monographs and academic textbooks							
1.	Authorship and editing of monographs in Polish	0	2	18	-	-	36
2.	Authorship and editing of academic textbooks in Polish	0	1	0	-	-	0
Total		0	3	-	-	-	36
E. Chapters in scientific monographs							
1.	Research works published in English as chapters in a monograph.	0	2	5	-	-	10
2.	Research works published in Polish as chapters in a monograph	8	15	3	-	-	69
3.	Research works published in Polish as chapters in a monograph	0	10	4	-	-	40
Total		8	27	-	-	-	119

1	2	3	4	5	6	7	8
F. Publications in conference materials indexed in Web of Science							
1.	Abstracts in English	0	2	-	-	-	0
Total		0	2	-	-	-	0
G. Publications in conference materials not indexed in Web of Science							
1.	Abstracts in Polish and English	2	8	-	-	-	0
2.	Chapters in conference proceedings in Polish and English	5	20	-	-	-	0
Total		7	28	-	-	-	0
H. Popular science publications in English and Polish							
1.	Bezpieczeństwo i Higiena Żywności	0	1	-	-	-	0
2.	Biuletyn Informacyjny Agencji Rynku Rolnego	0	1	-	-	-	0
3.	ECOLOGY AND FARMING	1	0	-	-	-	0
4.	ERNTE	0	1	-	-	-	0
5.	Gospodarstwo Domowe w Kraju i na Świecie	3	0	-	-	-	0
6.	Harvard Business Review Polska	0	1	-	-	-	0
7.	Kwartalnik Rolnictwa Ekologicznego Ekoland	0	4	-	-	-	0
8.	Kwartalnik Ekorolnictwo	0	1	-	-	-	0
9.	Nowoczesna Gospodyni	1	0	-	-	-	0
10.	Polish Food	0	2	-	-	-	0
11.	Rolnictwo Ekologiczne na Mazowszu	0	1	-	-	-	0
12.	Top Agrar Polska. Magazyn Nowoczesnego Rolnictwa	0	2	-	-	-	0
13.	Wieś Jutra	1	0	-	-	-	0
Total		6	14	-	-	-	0
SUMMARY							
Total		27	140	-	28,149	36,943	906⁴



⁴the summary is based on the archive lists of Committee of Scientific Research and on: Komunikat Ministra Nauki i Szkolnictwa Wyższego w sprawie wykazu czasopism naukowych z dnia 21 października 2005 r.; Ujednolicony wykaz ze strony internetowej Ministerstwa Nauki i Szkolnictwa Wyższego (2007-2010); Komunikat Ministra Nauki i Szkolnictwa Wyższego w sprawie wykazu czasopism naukowych z dnia 20 grudnia 2012 r.; Komunikat Ministra Nauki i Szkolnictwa Wyższego w sprawie wykazu czasopism naukowych z dnia 17 grudnia 2013 r.; Komunikat Ministra Nauki i Szkolnictwa Wyższego w sprawie wykazu czasopism naukowych z dnia 31 grudnia 2014 r. (ze zmianami z 25 marca 2015 r.); Komunikat Ministra Nauki i Szkolnictwa Wyższego w sprawie wykazu czasopism naukowych z dnia 23 grudnia 2015 r.; Komunikat Ministra Nauki i Szkolnictwa Wyższego w sprawie wykazu czasopism naukowych z dnia 9 grudnia 2016 r.