International Journal of Agriculture and Biosciences 2026 15(3): 984-992.
https://doi.org/10.47278/journal.ijab/2026.020

RESEARCH ARTICLE
eISSN: 2306-3599; pISSN: 2305-6622

Integrating Bioscience and Market Research in Functional Dairy Food Development

Nina Dunchenko [1], Valentina Yankovskaya [1]*, Kermen Mikhailova [1] and Igor Korotkiy [2]

[1]Russian State Agrarian University – Timiryazev Moscow Agricultural Academy, 49 Timiryazevskaya str, Moscow, 127434, Russia
[2]Kemerovo State University, 6 Krasnaya str., Kemerovo, 650000, Russia
*Corresponding author: vs3110@rgau-msha.ru

ABSTRACT

This study presents the development of functional dairy desserts with enhanced nutritional and technological properties, using the qualitative forecasting method. A two-stage consumer survey was conducted to identify key quality indicators valued by consumers, such as low-fat content, absence of added sugar, and high protein levels. These insights were integrated into the formulation of yogurt-based desserts enriched with a collagen-containing structurizer, designed to improve product plasticity and health benefits. The formulations were optimized using a complete factorial experimental design to assess the influence of key variables, including skimmed yogurt content, pasteurization temperature, and collagen additive concentration. A regression model describing their effect on product plasticity was developed. The final product met the target specifications of 0.5% fat, a plasticity of around 21cm^2/g, and no added sugar. The integration of consumer expectations with statistical modeling and sensory analysis demonstrates a novel, systematic approach to developing clean-label, functional dairy products with potential nutraceutical value. The study successfully demonstrates a novel, systematic approach to developing clean-label, functional dairy products with potential nutraceutical value by integrating consumer expectations with statistical modeling and sensory analysis. The proposed qualimetric forecasting approach, which includes a two-stage sociological survey, effectively implements the "customer orientation" principle of quality management, providing a competitive advantage in product design.

Keywords: Quality management; Product design; Qualimetric forecasting; Consumer requirements; Dairy dessert.

Article History
Article # 25-659
Received: 20-Oct-25
Revised: 11-Dec-25
Accepted: 13-Dec-25
Online First: 14-Jan-26

INTRODUCTION

Ensuring sustainable development in existing and forecasted external circumstances is one of the necessary conditions for the successful development of business, regional economy, or society (Almassawa et al., 2025). The efficiency of any manufacturing organization depends on the approach to continuous improvement of their products and management processes (Gual et al., 2024), particularly to quality management (Vandenbrande, 2020; Gejdoš et al., 2024). The preferable methods are the non-price ones to improve the competitiveness of manufactured products and the search for non-standard ways (Pacana et al., 2024) in conjunction with a systematic approach (Sanchez-Dominguez & Almanza-Rueda, 2025). This involves leveraging qualimetric forecasting and marketing research to thoroughly understand consumer motivations and preferences, which is crucial for designing innovative, competitive products that meet specific health-improving properties and market demands (Zhumanova et al., 2023).

When producing raw food materials and food products in the agricultural area, it is necessary to take into account a set of specific and relevant knowledge in order to ensure competitiveness (Dimitrijević et al., 2023), meet the mandatory requirements of regulatory documentation on identification indicators (Tutelyan, 2023), and safety requirements (Dunchenko et al., 2021; Fufa, 2023). In Russia, the Technical Regulations of the Customs Union 021/2011 "On food safety" contains the main requirements for the safety of raw food materials and finished products (Zherdev et al., 2025).

Cite this Article as: Dunchenko N, Yankovskaya V, Mikhailova K and Korotkiy I, 2026. Integrating bioscience and market research in functional dairy food development. International Journal of Agriculture and Biosciences 15(3): 984-992. https://doi.org/10.47278/journal.ijab/2026.020

A Publication of Unique Scientific Publishers

Both in Russia and the rest of the world, it is high competition among manufacturers of the same products and the struggle for the buyer`s choice that are the peculiarity of the mass-consumption food production. In this regard, a food product`s success directly depends on studying the requirements and expectations of the consumer, analyzing them and taking them into account when designing such products (Babayev & Balajayeva, 2023; Rai et al., 2023; Dörnyei & Tégla, 2024; Saldaña et al., 2024). Non-standard ways of product quality management at the stages of the product life cycle, implementation of the basic principles of international quality management, in particular "Customer orientation" (De La Peña et al., 2023; Okeke et al., 2024; Zawierucha-Kozłowska, 2024), are the most preferable in terms of increasing the competitiveness of the organization. The science of qualimetry, its basic principles and methods, are partially known and implemented in Russian quality management experience (Hrinchenko et al., 2023). Qualimetric forecasting is the most effective methodology for product design in view of the complexity of consumer expectations and initial regulatory requirements for products. In 2008, a team of scientists from the Department of Quality Management and Commodity Science of Products at the Russian State Agrarian University – Moscow Timiryazev Agricultural Academy applied qualitative forecasting in the food industry. That method demonstrated high efficiency in defining the initial requirements for food products with specified consumer characteristics. Led by Dunchenko et al. (2022), the methodology of qualimetric forecasting was further developed when designing new food products and adjusting the manufactured ones in view of the identification, analysis and evaluation of the nomenclature and the importance of consumer requirement indicators for products. The efficiency of qualimetric forecasting is conditioned by the synergy of consumer opinion research, benchmarking (Mtotywa, 2022; Golubeva et al., 2023; Grebski, 2023), other marketing research (Abdulsalam et al., 2024; Li et al., 2024; Stremersch et al., 2024) and a qualimetric analysis at the initial stages of the product life cycle (Gurov et al., 2023; Lin et al., 2023; Gajdzik et al., 2024; Mandler et al., 2025) as the most preferable and economically feasible one (Pacana et al., 2024; Balogun et al., 2025; Cheng et al., 2025).

In the conditions of saturation of the market with the same name products and acute competition, the issues of forecasting the quality and product safety, the search for new non-price ways to increase the attractiveness of products for consumers are relevant and timely for the production of dairy desserts as a popular and dynamically developing branch in Russia (Yankovskaya et al., 2022).

MATERIALS & METHODS

When implementing the methodology of qualimetric forecasting in the design of new dairy dessert technology, the following quality tools and generally accepted and standard methods were used:

i) Sociological survey (Federal Agency for Technical Regulation and Metrology, 2014)

ii) Organoleptic studies (Interstate Council for Standardization, Metrology and Certification, 2015).

The design of recipes and production parameters was carried out using a full factor experiment (Federal Agency for Technical Regulation and Metrology, 2005). The plasticity measured according to the Grau method served as the target function. The controllable factors included the mass fraction of fat-free yogurt base (from 30 to 80%), the temperature of the product's heat treatment (from 67 to 95°C), and the mass fraction of collagen-containing structurizer ScanPro MP 95 (from 0.1 to 1.1%).

The product's target values were derived using the Quality Function Deployment methodology (Mizuno & Akao, 1994). Significance coefficients for product quality indicators were calculated using qualimetric methods (Azgaldov & Kostin 2012). Expert groups for sensory and expert assessments were formed based on expert qualimetry (Dunchenko et al., 2022). The results of expert and experimental studies underwent statistical processing (Federal Agency for Technical Regulation and Metrology, 2005).

RESULTS

To design a dairy dessert, sociological studies were conducted in two stages in Moscow and the Moscow region at the initial stage of implementing qualimetric forecasting of quality and safety indicators. Fifteen years of experience allowed us to develop a two-stage approach to conducting sociological research within the framework of qualimetric forecasting. Empirically, it was found that, for qualitative forecasting, the quality of consumer responses depends directly on the complexity and number of questions in the questionnaire. Therefore, when interviewing, it is necessary to ask some questions that do not require quantitative results. It is also advisable to limit the questionnaire to no more than 10 questions, a combination of open- and closed-ended questions. In this regard, it is necessary to conduct preliminary research before designing the questionnaire, with the first stage being interviews with a small number of respondents. Long-term practice has shown that using a two-stage sociological survey allows us to obtain relatively complete data on the nomenclature and importance of indicators of consumer requirements with minimal time and labor costs. The first stage of the sociological survey included interviewing 50 buyers of dairy desserts. The purpose of that stage was:

- Defining the terms related to the studied product in the "language of consumers";
- Defining the wording of the questions that are easy to understand by consumers;
- Getting answers to the questions that are difficult to explain and require immediate clarification;
- Approbation of the questionnaire elements for a mass poll.

A questionnaire based on the analysis of the interviewing results was developed for the sociological part of qualimetric forecasting (Appendix 1). The answers

to open-ended question No. 8 are of the most outstanding value for qualimetric forecasting, which allows to learn the consumer's nomenclature of indicators of their expectations for product quality. Since the question is open-ended, the survey can reveal not only the basic indicators according to the Kano model (Watson, 2019) but also the anticipatory characteristics of products, which is highly desirable to identifying consumers' deep desires and obtaining competitive advantages for new products. We have proposed an approach towards determining the importance of indicators of consumer preferences. The approach is based on a direct relationship between the indicator's importance to consumers and the number of respondents who rated it as important when choosing a product. Thus, the indicator's importance is determined by the number of respondents who consider it important.

An open-ended question implies the presence of a large number of various answers that require additional processing. For this purpose, an affinity diagram has been used, given the number of respondents for whom a specific indicator is essential. Such an approach makes it possible to reduce the number of duplicate indicators, save the data on the importance of each indicator (or an enlarged group of similar indicators), and systematize them for further formation of a property tree and other elements of qualimetric forecasting.

The second stage of the sociological survey involves a poll of a larger number of respondents (on average, about 120-240 people) who are buyers of the studied product. The criterion for determining the sample size is the absence of new answers to question No. 8 from 20 respondents. That is, if the last 20 respondents do not provide new answers to question No. 8, the study can be stopped because there is a high probability that no new answers are expected.

The author's two-stage approach to the sociological survey (50 respondents participated in the first stage, 200 in the second) was used to design the dairy dessert technology. The consumer classification of Russian dairy desserts has been established. The results are presented as a consumer classification tree for dairy desserts (Fig. 1), indicating the popularity of the desserts among consumers (the number of respondents who eat this product at least once a month). Dairy desserts based on yogurt are the most popular among the respondents. These desserts include the yogurts themselves and yogurt products that have undergone heat treatment. It should be noted that the surveys have shown a relatively low level of consumer awareness of the difference between yogurt (with living microflora of the starter) and pasteurized yogurt. Majority of respondents (74%) consider these two products the same. The same results were obtained for the products based on cottage cheese. This can be explained by the very similar consumer characteristics of the pasteurized and fermented milk products with flavor fillers, since their organoleptic properties are conditioned by the fermentation processes of the dairy base (yogurt or cottage cheese) and the taste and aromatic characteristics of flavor fillers (fruit or berry ones).

The results of sociological research have shown that dairy products are a popular food among Russians: the majority of the respondents are consumers of dairy desserts, and a third of the respondents (36%) are active consumers who partake of dairy desserts almost daily, and a quarter (26%) eat them once or twice a week. The studies show that the most popular products among Russian consumers are those with either a yogurt base (yogurt and yogurt products) or a cottage cheese base (soft cottage cheese and cottage cheese products), with sweet fillers. These two groups of dairy desserts are very similar in their consumer properties, in terms of names used for fruit and berry fillers, packaging, and the place of the product in the consumer's diet. The differences between these products lie in their production technologies, regulatory documentation requirements, and the content of dry substances (primarily protein). The interview has shown that from the consumer's point of view, dairy desserts based on yogurt and cottage cheese are similar and, in a certain sense, interchangeable. The flavor preference for yogurt-based dairy desserts over cottage cheese-based desserts lies in their lower price and reduced energy value. At the same time, cottage cheese desserts are valued by consumers for their higher protein content (Trukhachev et al., 2024).

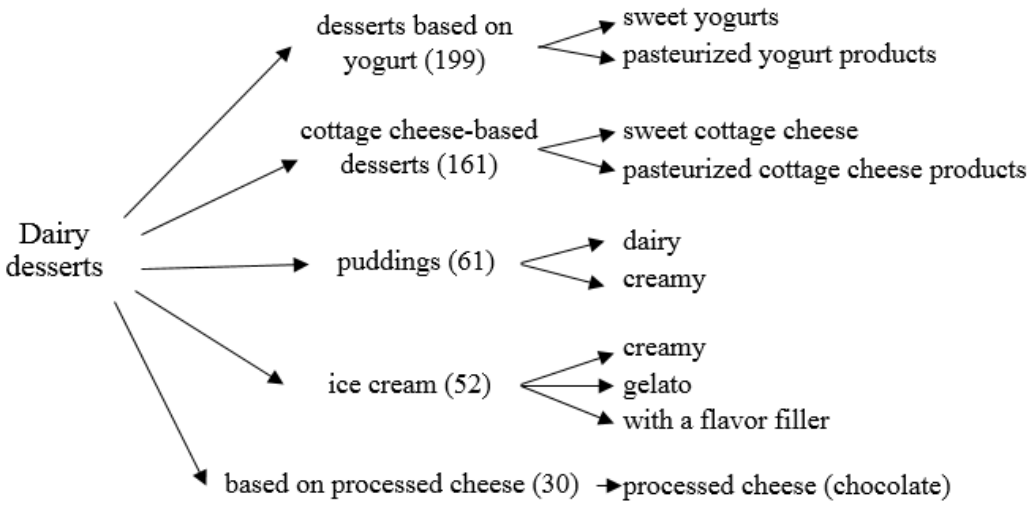

Fig. 1: Tree of Consumer Classification of Dairy Desserts With Indication of Popularity Among Consumers.

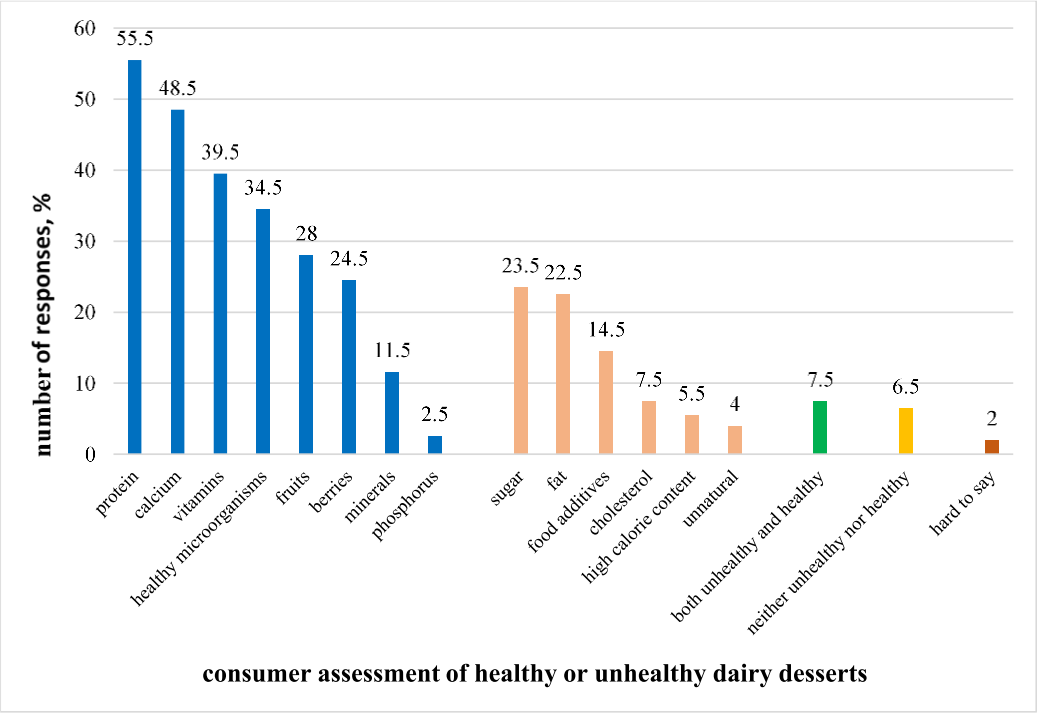

Fig. 2: Diagram of the Respondents' Responses Depending on the Assessment of the Usefulness or Non-Usefulness of Dairy Desserts.

It has been found that 84% of respondents have their own opinion about the content of healthy and unhealthy ingredients in dairy desserts: 69% of the respondents believe that dairy desserts contain healthy ingredients, and 24% of the respondents think there are unhealthy ingredients (Fig. 2). Thus, we can say that Russians associate dairy desserts with healthy products, although there are still unrealized opportunities for increasing the value of the products in consumers` eyes. It has been found which yogurt ingredients consumers consider useful and which they do not. From their point of view, protein is the healthiest ingredient of dairy desserts, but sugar is the unhealthiest and undesirable one introduced into the product. It should be noted that 18% of respondents reported excessive sugar (excessive sweetness) in dairy desserts sold in the Moscow region. Consumers perceive the presence of food additives in the product as a negative factor when choosing it. These days, there is a trend toward natural dairy desserts that do not contain undesirable food additives with E-numbers.

The obtained data make it possible to design the composition of dairy desserts in such a way that it might satisfy consumers' expectations for the usefulness of the product by increasing its protein content while reducing its fat. Thus, these consumers` wishes can be implemented in the designing of dairy yogurt-based desserts that have a significant advantage over similar products sold in the market.

Analysis of the processing questionnaires' results based on the method proposed above made it possible to identify the nomenclature of key indicators of consumer requirements for the quality of yogurt desserts. In addition, it allowed for the determination of the importance of these indicators in the consumers` assessment of the product quality and the formation of a tree of the most important consumer requirements in the product design with weighting coefficients indicated (Fig. 3). Separately, it should be mentioned that consumers would like to see the following additional characteristics related not only to the product itself, but to its packaging: the possibility of resealable and environmentally friendly packaging (recyclable).

The data obtained by constructing a tree of indicators of consumer requirements for the quality of dairy desserts based on yogurts, indicating the weighting coefficients reflecting the importance of each indicator for the consumer when evaluating products as a whole, allows us to purposefully form those characteristics of the projected product that will increase its value in the eyes of buyers.

Based on data from the conducted sociological survey and expert and experimental studies, a matrix of consumer requirements for the quality of yogurt desserts has been developed, which enables the setting of quality targets for the designed products and the formulation of the main directions for improving their consumer properties. Based on the analysis of the conducted sociological surveys, the matrix of consumer requirements and existing trends in the theory and practice of processing agricultural raw materials and food preservation (Amit et al., 2017), the main directions for improving the consumer properties of dairy yogurt-based desserts, necessary for the new products` design, have been developed:

• Increasing the Protein Content of the Product, Including Through the Addition of Protein Ingredients;

• Reducing the Product's Fat Mass Fraction to 0.5% – Primarily Due to the Use of Low-Fat Raw Materials, Namely, Low-Fat Yogurt as the Basis for Obtaining Yogurt Desserts;

• Reducing the Added Sugar Content – Due to the Selection of Recipe Ingredients That Form High Taste Properties with a Lower Sucrose Content (for Example, Due to the Partial Replacement of Sucrose with Low-Calorie Sweeteners or Fructose Contained in Fruit Fillers);

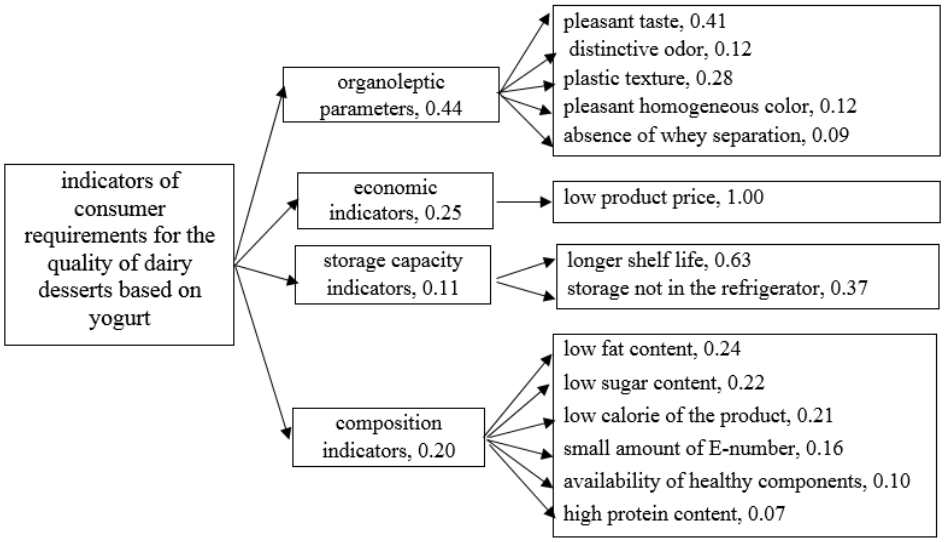

Fig. 3: Tree of Consumer Requirements Indicators in the Design of Dairy Yogurt-Based Desserts.

• Reducing the Energy Value of Dairy Desserts (to 100 Kcal or Less) by Reducing the Fat Content and Added Sugar;
• Increasing the Stability of the Structural and Mechanical Characteristics of the Product by Increasing the Plasticity Index to 21cm^2/g;
• Increasing the Product's Shelf Life without the Use of Preservative Food Additives, but Rather Through the Heat Treatment of the Product;
• Adding Healthy Natural Food Additives to the Product (Protein Sources or Other Functional Additives);
• Expanding the Range of Yogurt Desserts at the Expense of Less Sweet Items.

Ensuring the safety of perishable food products, including dairy products, is a necessary condition for maintaining product quality throughout the production chain from the manufacturer to the store counter. Reducing the risk of microbiological spoilage can be achieved by strictly adhering to the requirements for the refrigerated storage conditions of products in the flow of goods (Arriaga-Lorenzo et al., 2023). Increasing the storage capacity of products, for example, by pasteurization, can be a preventive method (Kushchev, 2009).

Based on the analysis of the scientific literature on the valuable and technological properties of food additives and preliminary experiments, we have developed a proposal for the use of the collagen-containing preparation ScanPro MP 95 as a source of natural dietary fiber of a protein nature (Neklyudov, 2003), which gives the product high structural and mechanical properties, plasticity, moisture-binding capacity, and low calorie content at acidic values of active acidity.

When developing multi-component food products, an important part of predicting the quality of the finished products is a mathematical description of how the main recipe and production parameters influence key indicators of product quality (Prosekov, 2020). It has been decided to include the following pasteurized yogurt product components in the basic recipe: low-fat yogurt (0.5% fat in yogurt base), collagen-containing preparation (the amount according to the manufacturers' recommendations: from 0.4 to 2.2%) and skimmed milk (with a fat mass fraction of 0.5%) to dissolve the collagen-containing preparation.

As part of further qualimetric forecasting to study the influence of technological modes of heat treatment that are necessary for the product shelf life increase, and justifying the dose of the collagen-containing preparation, we have conducted a set of experimental studies with the use of the methodology of a complete factorial experiment. We have obtained a regression equation of the effect on the plasticity (P) of the pasteurized yogurt base with the mass fraction of the collagen-containing preparation, the mass fraction of low-fat yogurt (0.5%) and the pasteurization temperature of the mixture (Fig. 4):

$$P = -1{,}029 + 0{,}191 \cdot j + 3{,}731 \cdot n + 0{,}059 \cdot t - 0{,}174 \cdot j \cdot n - 0{,}025 \cdot n \cdot t + 0{,}002 \cdot n \cdot t;$$

j is the mass fraction of a low–fat yogurt base, %,
n is the mass fraction of the collagen–containing preparation, %,
t is the pasteurization temperature of the mixture, °C.

Based on the mathematical regularity observed in the plasticity formation of a low-fat yogurt product with a collagen-containing preparation, the recipes presented in Table 1 have been developed. Besides, pasteurization modes for the new product, with established targets (mass fraction of fat 0.5%, plasticity about 21 cm2/g), have also been developed. Apricot cryopowder was chosen as a natural additive that forms a sweet, fruity taste.

When developing a yogurt dessert with a collagen-containing preparation, the basic technology was taken as a basis (Dunchenko et al., 2008). The established targets of the new product are achieved at a pasteurization temperature of 75 to 90°C. The achievement of the established target values for quality indicators, with the formulated directions for improving the consumer properties of yogurt desserts to increase their storage capacity, is achieved by a higher temperature, i.e., recipe 3.

The conducted studies of the organoleptic properties of the obtained yogurt-based dessert samples, developed according to recipes No. 1-3, showed high taste qualities (Fig. 5). It should be noted that the addition of apricot cryopowder with a collagen-containing preparation gives the skimmed product an unmistakable, pleasant creamy taste and flavor and allows for a rich tasting product with a low-calorie content.

Table 1: Recipes of a low-fat yogurt dessert with target indicators

Component Name	Mass Fraction of Components, %		
	Recipe Number		
	No. 1	No. 2	No. 3
Low-fat Yogurt (with a Fat Mass Fraction of 0.5%)	85.40	85.40	85.40
Skimmed Milk (with a Mass Fraction of 0.5% Fat)	13.00	13.05	13.10
Collagen-containing Preparation	0.60	0.55	0.50
Apricot Cryopowder	1.0	1.0	1.0
Total	100.0	100.0	100.0
Pasteurization Temperature, °C	75-80	81-85	86-90

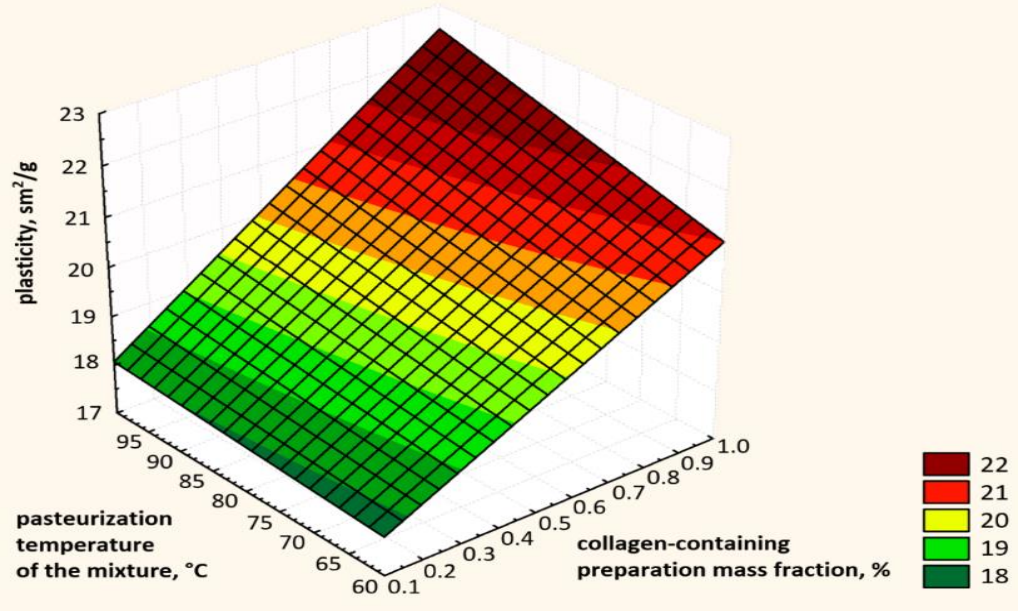

Fig. 4: Response Surface of the Effect of the Mass Fraction of the Collagen-Containing Preparation and the Pasteurization Temperature on the Plasticity of the Pasteurized Low-Fat Yogurt Product.

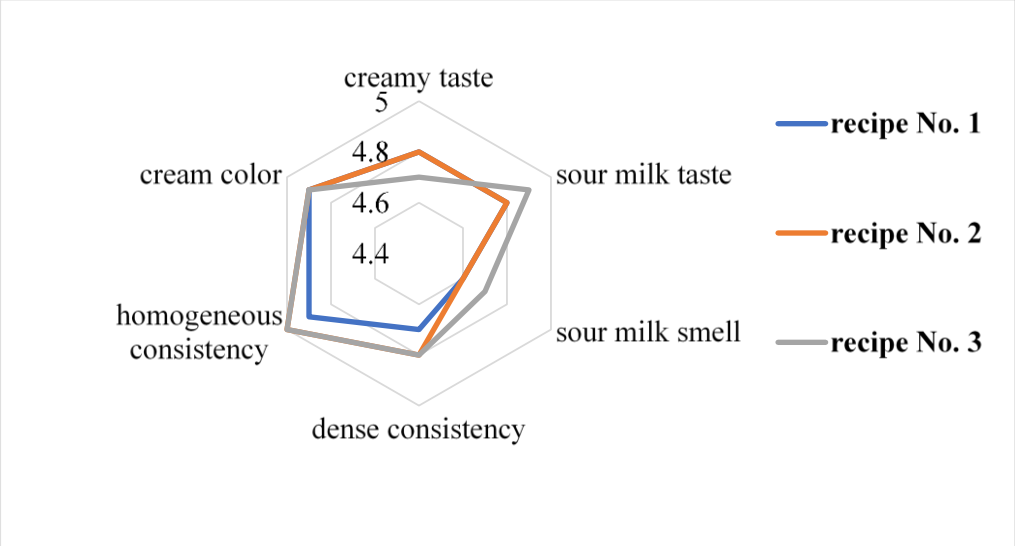

Fig. 5: General Profile Assessment of Organoleptic Properties of Samples of Low-Fat Yogurt Desserts With a Collagen-Containing Preparation.

DISCUSSION

The proposed approach to designing new products, illustrated by the example of dairy desserts, requires taking into account consumers' requirements for product quality indicators, such as those that characterize and determine key product properties. This implies the disclosure of the term "product quality" (Watson, 2017, 2019). The expediency of applying the methodology of qualimetric analysis for these purposes as an effective tool for decomposing product quality into a set of specific indicators. Each of them makes its own contribution to the formation of quality, as confirmed by other studies (Azgaldov & Kostin 2012).

The results of a sociological survey conducted among consumers of dairy desserts in the Moscow region show a growing trend toward natural and healthy food products. This is confirmed by scientific data on the growth of demand for environmentally friendly and organic food products (Belyakova et al., 2018). These products do not contain, or contain only a minimum amount of, food additives, such as preservatives (Sati & Sati, 2013), flavors, thickeners, and dyes (Igonina, 2014).

The established requirements of Russian consumers for low-calorie and low-fat dairy yogurt-based products are confirmed by earlier studies (Kushchev, 2009). The

obtained data expand the requirements for the content of the product's desired (healthy) and undesired (unhealthy) components and reflect the refined data on their importance for a modern consumer.

To identify universal approaches to designing recipes and technological modes for yogurt dessert production that meet constantly changing consumer requirements, the mathematical regularity governing the formation of the plasticity index of a low-fat yogurt product with a collagen-containing preparation was studied and described. As the results of scientists' studies (Lisitsyn et al., 2020) show, such an approach to designing multi-component food products with a complex mechanism for the formation of technological properties is effective and enables the development of universal solutions for correcting their composition.

Thus, the use of a combination of the proposed approaches and results, which are the elements of qualimetric forecasting (Igonina, 2014; Mikhailova & Cherstvoy, 2010), in the design of formulations and product technology has shown its efficiency and consistency.

Conclusion

On the example of designing a recipe and technology for the production of a new dairy dessert, a new approach of qualimetric forecasting was applied. That approach included developing a two-stage methodology for conducting a sociological survey and designing specialized questionnaires. Moreover, it determined the nomenclature of indicators of consumer requirements for product quality and their importance when choosing a product. The other significant results were determining targets that ensured a high degree of consumer satisfaction, studying patterns, describing the effect of the mass fractions of the collagen-containing preparation and yogurt based on the values of the product's plasticity. The proposed approach enables the implementation of the key principle of quality management, "customer orientation," by applying methods from the science of qualimetry. This unique synergy gives a competitive advantage by enabling the rapid and accurate design of new products (or the adjustment of manufactured products) to meet the constantly changing quality requirements of consumers.

DECLARATIONS

Funding: This study did not receive any financial support from any organization/agency.

Acknowledgement: The authors also thank the expert panel members who contributed their time and expertise to the qualitative assessment of the article.

Conflict of Interest: The authors declare no potential conflict of interest.

Data Availability: Data will be available upon request.

Ethics Statement: This study did not involve animals or human clinical interventions. All sociological surveys were conducted voluntarily and anonymously in accordance with institutional ethical standards and national guidelines.

Author's Contribution: ND and VY: Conceptualization, Methodology, Formal analysis, Writing – review & editing. KM and IK: Data curation, Formal analysis, Writing – review & editing. All authors participated in the investigation, writing, and final manuscript revision.

Generative AI Statement: The authors declare that no Gen AI/DeepSeek was used in the writing/creation of this manuscript.

Publisher's Note: All claims stated in this article are exclusively those of the authors and do not necessarily represent those of their affiliated organizations or those of the publisher, the editors, and the reviewers. Any product that may be evaluated/assessed in this article or claimed by its manufacturer is not guaranteed or endorsed by the publisher/editors.

REFERENCES

Abdulsalam, T.A., Tajudeen, R.B., Ogungbemi, S.S., & Francis, E. (2024). Impact of forensic marketing on consumer behavior: Evidence from beauty Products\' purchase decision. *Business Ethics and Leadership*, *8*(1), 129–148. https://doi.org/10.61093/bel.8(1).129-148.2024

Almassawa, S.F., Rustiadi, E., Fauzi, A., & Sutriadi, R. (2025). The relationship between regional development, smart mobility and transportation planning: a bibliometric analysis. *Frontiers in Sustainable Cities*, *7*, 1424859. https://doi.org/10.3389/frsc.2025.1424859

Amit, S.K., Uddin, M.M., Rahman, R., Islam, S.M.R., & Khan, M.S. (2017). A review on mechanisms and commercial aspects of food preservation and processing. *Agriculture & Food Security, 6*, 51. https://doi.org/10.1186/s40066-017-0130-8

Arriaga-Lorenzo, P., De Jesús Maldonado-Simán, E., Ramírez-Valverde, R., Martínez-Hernández, P.A., Tirado-González, D.N., & Saavedra-Jiménez, L.A. (2023). Cold chain relevance in the food safety of perishable products. *Foods and Raw Materials, 11*(1), 116-128. https://doi.org/10.21603/2308-4057-2023-1-559

Azgaldov, G.G., & Kostin, A.V. (2013). Stanovleniye kvalimetrii: Zagadki priznaniya ili zakonomernosti razvitiya [The establishment of qualimetry: The riddles of recognition or patterns of development]? *Economic Strategies, 14*(4), 98-101.

Babayev, F., & Balajayeva, T. (2023). Ways of increasing the competitiveness of food industry enterprises. *International Journal of Innovative Technologies in Economy, 4(44)*. https://doi.org/10.31435/rsglobal_ijite/30122023/8069

Balogun, O., Abass, O.S., & Didi, P.U. (2025). Aligning Consumer Insights with Profitability Objectives: A Planning Framework for Multinational FMCG Brands. *Engineering and Technology Journal*, *10*(08). https://doi.org/10.47191/etj/v10i08.42

Belyakova, Z.Y., Makeeva, I.A., Stratonova, N.V., Pryanichnikova, N.S., Bogatyrev, A.N., Diel, F., & Hanferyan, R.A. (2018). Role of organic products in the implementation of the state policy of healthy nutrition in the Russian Federation. *Foods and Raw Materials, 6*(1), 4-13. https://doi.org/10.21603/2308-4057-2018-1-4-13

Cheng, F., Wang, J., Chen, C., Hu, G., & Cao, Z. (2025). Product design improvement method driven by online product reviews. *Scientific Reports*, *15*(1), 10252. https://doi.org/10.1038/s41598-025-94422-2

De La Peña, M.L. M., Silva, K.M., Parra, J.M.R., & Paz-Luna, J.L. (2023). Quality and Organizational Innovation: competitiveness tools in the Table grape system. *Mercados Y Negocios*, *50*, 21–50. https://doi.org/10.32870/myn.vi50.7703

Dimitrijević, M., Ristić, L., & Despotović, D. (2023). Agri-food products quality as exports competitiveness determinant of the Republic of Serbia. *Facta Universitatis Series Economics and Organization*, 117. https://doi.org/10.22190/fueo230412008d

Dörnyei, O., & Tégla, Z. (2024). Cluster analysis of the "Trustworthy product" criteria, in the FMCG sector - Aspects of the Hungarian product remuneration system in the FMCG sector. *Acta Polytechnica*

Hungarica, *21*(12), 241–258. https://doi.org/10.12700/aph.21.12.2024.12.14

Dunchenko, N.I., Al-Qaisi, R., Kononov, N.S., Yankovskaya, V.S., Kuptsova, S.V., & Savenkova, I.P. (2008). Sposob polucheniya termizirovannogo molochno-syvorotochnogo produkta [Method of production of terminated whey-milk product] (Patent RU 2328128). Federal Service for Intellectual Property Patents and Trademarks, Russia.

Dunchenko, N.I., Voloshina, E.S., Kuptsova, S.V., Yankovskaya, V.S., & Mikhaylova, K.V. (2021). A design of the quality control and safety mechanism for convenience meat products. *IOP Conference Series: Earth and Environmental Science, 640*(3), 032008. http://dx.doi.org/10.1088/1755-1315/640/3/032008

Dunchenko, N.I., Yankovskaya, V.S., Voloshina, E.S., Ginzburg, M.A., & Kupriy, A.S. (2022). Quality designing and food safety provisioning based on qualimetric forecasting. *Food Science and Technology, 42*, e112021. https://doi.org/10.1590/fst.112021

Federal Agency for Technical Regulation and Metrology (2005). GOST R ISO/TR 10017-2005 Statisticheskiye metody. Rukovodstvo po primeneniyu v sootvetstvii s GOST R ISO 9001 [Statistical methods. Guidance on application for according to GOST R ISO 9001]. Approved and enacted by Order of the Federal Agency for Technical Regulation and Metrology of May 31, 2005 No. 111-st. Moscow: Standartinform.

Federal Agency for Technical Regulation and Metrology (2014). GOST R 56087.2-2014 Sistema natsional'nykh standartov v oblasti kachestva uslug svyazi. Metodika provedeniya oprosa pol'zovateley [System of national standards in the field of quality of communication services. Methodology for conducting a survey of users]. Approved and enacted by Order of the Federal Agency for Technical Regulation and Metrology of August 19, 2014 No. 911-st. Moscow: Standartinform.

Fufa, D.D. (2023). Food Safety. In *Health Risks of Food Additives-Recent Developments and Trends in Food Sector*. IntechOpen. https://doi.org/10.5772/intechopen.109075

Gajdzik, B., Siwiec, D., & Pacana, A. (2024). Framework of QLCA model considering quality and life cycle assessment to sustainable product development. Zeszyty Naukowe. Organizacja i Zarządzanie/Politechnika Śląska, (203), 49–60. https://doi.org/10.29119/1641-3466.2024.203.4

Gejdoš, P., Potkány, M., Schmidtová, J., Závadský, J., & Knop, K. (2024). Quality management in the context of performance and agility of manufacturing enterprises. *Journal of Infrastructure, Policy and Development, 8*(11), 7829. https://doi.org/10.24294/jipd.v8i11.7829

Golubeva, O., Pogorelova, A., Kreinin, V., & Dimitrov, V. (2023). Analysis of the automated production management systems market in Russia. *E3S Web of Conferences*, *371*, 06003. https://doi.org/10.1051/e3sconf/202337106003

Grebski, W. (2023). The usage of benchmarking in Industry 4.0 conditions. *Scientific Papers of Silesian University of Technology Organization and Management Series*, *2023*(188). https://doi.org/10.29119/1641-3466.2023.188.40

Gual, J.C., Climent, R.P., Regaliza, J.C.P., & García, F.J.P. (2024). Pipes and puddles framework: Risk management in manufacturing processes to reduce the total cost of quality. *Journal of Industrial Engineering and Management, 17*(1), 35-62. https://doi.org/10.3926/jiem.6448

Gurov, V., Deniskina, A., Pocebneva, I., & Politi, V. (2023). Quality management integration in the functionality of product lifecycle management in energy-effective production. *E3S Web of Conferences*, *460*, 10034. https://doi.org/10.1051/e3sconf/202346010034

Hrinchenko, H., Trishch, R., Mykolaiko, V., & Kovtun, O. (2023). Qualimetric approaches to assessing sustainable development indicators. *E3S Web of Conferences*, *408*, 01013. https://doi.org/10.1051/e3sconf/202340801013

Igonina, I.N. (2014). Kvalimetricheskoye prognozirovaniye pokazateley kachestva rybnykh produktov dlya detskogo pitaniya [Qualimetric prediction of the indicators of quality of fish products for baby food]: Abstract of dissertation of Candidate of Technological Sciences. All-Russian Research Institute of Meat Industry named after V.M. Gorbatov, Moscow.

Interstate Council for Standardization, Metrology and Certification (2015). GOST ISO 13299-2015 Organolepticheskiy analiz. Metodologiya. Obshcheye rukovodstvo po sostavleniyu organolepticheskogo profilya [Organoleptic analysis. Methodology. General guidelines for establishing an organoleptic profile]. Adopted by the Interstate Council for Standardization, Metrology and Certification by correspondence (Minutes of February 27, 2015 No. 75-P). Moscow: Standartinform.

Kushchev, S.N. (2009). Development of a methodology for assessing technological risks in the production of yogurt products: Dissertation of Candidate of Technological Sciences. Moscow state University of Applied Biotechnology, Moscow.

Li, P., Castelo, N., Katona, Z., & Sarvary, M. (2024). Frontiers: Determining the validity of large language models for automated perceptual analysis. *Marketing Science*, *43*(2), 254–266. https://doi.org/10.1287/mksc.2023.0454

Lin, B., Wu, Y., Wu, J., & Yang, C. (2023). Demand forecasting for the full life cycle of new electronic products based on KEM-QRGBT model. *Journal of Engineering Science and Technology Review*, *16*(6), 90–97. https://doi.org/10.25103/jestr.166.11

Lisitsyn, A.B., Chernukha, I.M., & Nikitina, M.A. (2020). Russian methodology for designing multicomponent foods in retrospect. *Foods and Raw Materials, 8*(1), 2-11. https://doi.org/10.21603/2308-4057-2020-1-2-11

Mandler, T., Kupfer, A., Hennig-Thurau, T., Schauerte, R., & Cziehso, G.P. (2025). The contagious nature of pre-release consumer buzz: How observing other consumers' anticipation for a new product influences adoption. *Journal of Product Innovation Management*, *42*(6), 1044–1067. https://doi.org/10.1111/jpim.12785

Mikhailova, K.V., & Cherstvoy, A.A. (2010). Kvalimetricheskoye prognozirovaniye pokazateley kachestva i bezopasnosti [Qualimetric forecasting of quality and safety indicators]. *Competency, 7*(78), 11-13.

Mizuno, S., & Akao, Y. (1994). QFD: the customer-driven approach to quality planning and development. Tokyo: Asian Productivity Organization.

Mtotywa, M.M. (2022). Developing a Quality 4.0 Maturity Index for improved business operational efficiency and performance. *Quality Innovation Prosperity*, *26*(2), 101–127. https://doi.org/10.12776/qip.v26i2.1718

Neklyudov, A.D. (2003). Dietary fiber of animal origin. Collagen and its fractions as necessary components of new and effective products. *Applied Biochemistry and Microbiology, 39*(3), 261-272. https://doi.org/10.1023/A:1023589624514

Okeke, N.N.I., Alabi, N.O.A., Igwe, N.A.N., Ofodile, N.O.C., & Ewim, N.C.P. (2024). Customer-Centric quality management: A framework for organizational excellence in SMEs. *International Journal of Management & Entrepreneurship Research*, *6*(10), 3517–3540. https://doi.org/10.51594/ijmer.v6i10.1659

Pacana, A., Siwiec, D., & Dizaye, H.S.M. (2024). Concept of improvement of product considering the qualitative-ecological interactions and weights of attributes. *Acta Montanistica Slovaca, 29*(4), 862–872. https://doi.org/10.46544/AMS.v29i4.06

Prosekov, A.Y. (2020). Lisitsyn AB, Chernukha IM, Nikitina MA. Designing multicomponent food products. Moscow, 2020. *Foods and Raw Materials, 8*(2), 429-430. https://doi.org/10.21603/2308-4057-2020-2-429-430

Rai, S., Wai, P.P., Koirala, P., Bromage, S., Nirmal, N.P., Pandiselvam, R., Nor-Khaizura, M.A.R., & Mehta, N.K. (2023). Food product quality, environmental and personal characteristics affecting consumer perception toward food. *Frontiers in Sustainable Food Systems*, *7*. https://doi.org/10.3389/fsufs.2023.1222760

Saldaña, E., Eduardo, K., Mayta-Hancco, J., Huamán-Castilla, N.L., & Escobedo-Pacheco, E. (2024). Application of sensory and consumer science for the development of novel food products. *Current Food Science and Technology Reports*, *2*(2), 183–199. https://doi.org/10.1007/s43555-024-00027-7

Sanchez-Dominguez, O., & Almanza-Rueda, L.M.A Scalable Open Innovation Framework: Leveraging Mckinsey's Horizons for Global Competitiveness. Available at SSRN 5108341. https://doi.org/10.2139/ssrn.5108341

Sati, S.P., & Sati, N. (2013). Artifcial preservatives and their harmful efects: looking towards nature for safer alternatives. *International Journal of Pharmaceutical Sciences and Research, 4*(7), 2496-2501.

Stremersch, S., Cabooter, E., Guitart, I.A., & Camacho, N. (2024). Customer insights for innovation: A framework and research agenda for marketing. *Journal of the Academy of Marketing Science*, *53*(1), 29–51. https://doi.org/10.1007/s11747-024-01051-8

Trukhachev, V., Yankovskaya, V., & Shipilov, A. (2024). Biotechnology factors influence on formation of curd cheese quality indicators. *BIO Web of Conferences, 116*, 02019. https://doi.org/10.1051/bioconf/202411602019

Tutelyan, V. (2023). Key problems of nutrition and dietetics. *Problems of Nutrition, 92*(5), 24. https://doi.org/10.33029/0042-8833-2023-92-5s-001

Vandenbrande, W.W. (2020). The role of quality management in ensuring a sustainable planet. *Journal for Quality and Participation, 42*(4), 8-14.

Watson, G.H. (2017). What does quality actually mean? *Journal for Quality and Participation, 39*(4), 12-14.

Watson, G.H. (2019). Using the Kano Model as a basis for strategic thinking. *Journal for Quality and Participation, 42*(3), 8-14.

Yankovskaya, V.S., Dunchenko, N.I., & Mikhaylova, K.V. (2022). New structured dairy products based on quality complaints and risk qualimetry. *Food Processing: Techniques and Technology, 52*(1), 2-12. https://doi.org/10.21603/2074-9414-2022-1-2-12

Zawierucha-Kozłowska, K. (2024). Future trends in quality management. Scientific Papers of Silesian University of Technology. Organization & Management/Zeszyty Naukowe Politechniki Slaskiej. *Seria Organizacji i Zarzadzanie*, (203). https://doi.org/10.29119/1641-3466.2023.203.35

Zherdev, A.V., Zvereva, E.A., Taranova, N.A., Safenkova, I.V., Vostrikova, N.L., & Dzantiev, B.B. (2025). Immunochromatographic food control tools: New developments and practical prospects. *Theory and Practice of Meat Processing*, *9*(4), 280–295. https://doi.org/10.21323/2414-438x-2024-9-4-280-295

Zhumanova, G., Bakirova, L., Baybalinova, G., Ashakayeva, R., Dautova, A., & Moldagaliyeva, D. (2023). Chicken combs as a raw material in the manufacturing of chopped semi-finished horse meat products. *Slovak Journal of Food Sciences, 17*, 955-971. https://doi.org/10.5219/1887