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REVIEW

of the doctoral dissertation of MSc. Surya Sasikumar Nair
entitled: **„Food Safety Management and Sustainability Approaches in Selected Stakeholders"** carried out at the Department of Food Gastronomy and Food Hygiene, Warsaw University of Life Sciences,
under the supervision of Prof. Joanna Trafiałek, PhD, DSc (Habil.)

Basis for preparing the review

The basis for preparing the review is Resolution No. 63/TŻiŻ-2025/2026 of the Scientific Council of the Discipline of Food Technology and Nutrition at the Warsaw University of Life Sciences of April 17, 2026, entrusting me with the evaluation of the doctoral dissertation, as communicated in a letter dated April 17, 2026, by the Chair of the Council Prof. Ewa Jakubczyk, PhD, DSc (Habil.).

The subject of the review is to assess whether the doctoral dissertation of MSc Surya Sasikumar Nair (hereinafter also referred to as the "Doctoral Candidate" or the "Author") meets the requirements set out in Article 187(1-4) of the Act of July 20, 2018 - Law on Higher Education and Science (Journal of Laws of 2024, item 1571, as amended).

Basic information about the doctoral dissertation

The doctoral dissertation of MSc Surya Sasikumar Nair, entitled "Food Safety Management and Sustainability Approaches in Selected Stakeholders", was prepared in English and presented as a printed monograph totalling 166 pages. Of these, 61 pages constitute the main body of the work, structured in a format typical for experimental studies and comprising seven chapters: *Introduction* (2 pages), preceded by abstracts in Polish and English, *Review of Literature* (5 pages), *Purpose, Hypothesis, and Scope of Research* (1 page), *Materials and Methods* (10 pages), *Results and Discussion* (23 pages), *Conclusions* (1 page), *References* (8 pages), listing 96 entries A minor inconsistency was noted in the citation list. The works cited as Chen et al. (2021) and Yen et al. (2021) on page 36 are not currently included in the *References* section. For the sake of completeness and consistency, it would be advisable to add the corresponding full bibliographic entries. This part of the dissertation includes eight figures and eleven tables. A minor issue was identified regarding the numbering of figures. The sequence appears to be inconsistent, as Figure 2 is missing.

The subsequent pages of the dissertation contain the full texts of four published articles:

1. Nair, S. S.; Czarnecka-Skubina, E.; Jakubowska-Gawlik, K.; Trafiałek, J. American Foreign Supplier Verification Program (FSVP)-Requirements, Benefits or Burdens for Indian Food Companies, and Difficulties in the Implementation. *Technological Progress in Food Processing* 2022, 32 (2), 176–183.
2. Sasikumar Nair, S.; Mazurek-Kusiak, A. K.; Trafialek, J.; Kolanowski, W. Assessing Food Safety Compliance in a Small-Scale Indian Food Manufacturer: Before and after Certification of the Food Safety Management System and Foreign Supplier Verification Program. *Applied Sciences* 2023, 13 (22), 12190.
3. Sasikumar Nair, S.; Varghese, A.; Trząskowska, M.; Kolanowski, W.; Mazurek-Kusiak, A. K.; Trafiałek, J. Post-Certification Quality Analysis of Traditional Indian Fried Snacks. *Applied Sciences* 2025, 15 (13), 7404.
4. Nair, S. S.; Murali, A. P.; Kolanowski, W.; He, S.; Trafiałek, J. Food Safety Management System Compliance of Food Retail Shops: A Comparative Study Between Mazovia and Kerala. *Applied Sciences* 2026, 16 (7).

All of the mentioned articles are co-authored works (ranging from four to six authors), including the Supervisor (four publications). In each case, however, the Doctoral Candidate is listed as the first author, and in one publication, she additionally served as the corresponding author. The attached statements confirm the significant, individual contribution of MSc. Surya Sasikumar Nair to the preparation of these publications. Her contribution to each publication included the development of the research concept, the literature review, the execution of part of the experimental work, and the preparation and interpretation of the results. These statements clearly demonstrate MSc Surya Sasikumar Nair's leading role in the research presented in the doctoral dissertation, as well as her substantial contribution to experimental design, methodological development, experimental work, data analysis, and manuscript preparation.
In addition to the publications listed above, the Doctoral Candidate also drew upon unpublished research results, including those reported in Publication 5, which has been resubmitted to a Wiley journal following minor revisions: Sasikumar Nair, S.; Murali, A. P.; Atuna, R. A.; Akabanda, F.; Kolanowski, W.; He, S.; & Trafiałek, J., Prevailing Food Safety and Sustainability Practices in Grocerants: A Cross-Sectional Study in Three Countries. *International Journal of Food Science* (2026), manuscript ID: 9949256.
The structure of the dissertation adopted by MSc Surya Sasikumar Nair is logical and raises no objections. In my opinion, it meets the requirements of Article 187(3) of the Act of 20 July 2018 – Law on Higher Education and Science, and is consistent with the interpretative guidance of the Council for Scientific Excellence set out in Communication No. 19/2020 on the submission of doctoral dissertations, which states that "a doctoral dissertation, as a written work, may consist partly of published works and partly of results that have not yet been published."

Justification for choosing the research topic

In recent years, growing attention has been devoted in the scientific literature to the effectiveness of food safety management systems (FSMS) and their role in ensuring both food quality and consumer protection across increasingly complex food supply chains. This interest is closely linked to the globalisation of food systems, the expansion of retail

and food service sectors, and the rising expectations regarding sustainable and safe food production. Contemporary research highlights that effective FSMS implementation requires not only compliance with formal standards but also their consistent application across diverse operational contexts, including manufacturing, retail, and hybrid food service formats.

At the same time, the literature indicates that significant variability exists in the implementation and effectiveness of food safety practices among different stakeholders, particularly between developed and developing regions, as well as between large-scale and small-scale enterprises. While numerous studies focus on certification schemes such as ISO 22000 or HACCP-based systems, relatively fewer investigations address the practical functioning of these systems in real operational environments, including their relationship with product quality outcomes and sustainability-oriented practices.

Moreover, the growing integration of sustainability into food system research has revealed important interdependencies between food safety and environmental performance, especially in areas such as food loss and waste, resource efficiency, and operational practices at the retail and consumer interface. Despite this, empirical evidence examining the joint occurrence of food safety and sustainability practices—particularly in emerging formats such as grocerants—remains limited.

Against this background, the research undertaken by MSc Surya Sasikumar Nair is well justified. The study addresses a clearly identifiable research gap by providing a comprehensive, multi-level analysis of FSMS implementation across different stakeholders, while simultaneously examining its relationship with product quality and sustainability practices. The adopted approach, combining audit-based assessments, laboratory analyses, and observational studies across multiple countries, enables a more integrated understanding of food safety management in contemporary food systems.

Therefore, the selection of the research topic should be regarded as both scientifically relevant and practically significant, as it contributes to the development of evidence-based strategies for improving food safety governance and supporting the integration of sustainability within food system operations.

Scientific evaluation of the dissertation

The title of the dissertation is appropriately formulated and accurately reflects both the scope and the multidisciplinary nature of the research undertaken. It clearly indicates the focus on food safety management and sustainability approaches across selected stakeholders, which is consistent with the structure and content of the work.

The dissertation opens with *Abstracts* in both English and Polish, which provide a concise and well-structured introduction to the subject matter. These sections effectively outline the research objectives, methodological approach, and the overall scope of the study, including its multi-phase design covering different levels of the food supply chain.

The summaries of the key findings presented in the abstracts are clear and informative, highlighting the most important outcomes, such as the observed improvements in food safety compliance following certification, the maintenance of acceptable product quality parameters, and the identified relationships between food safety and sustainability practices. By synthesizing the core results in a coherent manner, the *Abstracts* successfully encourage the reader to engage with the subsequent chapters of the dissertation.

In the *Introduction* chapter, the Author provides a clear overview of the key challenges related to food safety and sustainability in modern food systems, emphasising the role of FSMS) in ensuring regulatory compliance across the food supply chain. The Candidate highlights the increasing complexity of global food systems and the need for effective implementation of internationally recognised standards, particularly in small- and medium-sized enterprises and emerging markets, while also linking food safety with sustainability aspects such as waste reduction and resource efficiency. The chapter further discusses the current state of knowledge on FSMS implementation and identifies a research gap concerning the lack of integrated studies addressing system effectiveness, product quality, and sustainability practices, especially in cross-country contexts and emerging retail formats. On this basis, a well-justified research problem is formulated, supported by a coherent rationale for the adopted multi-phase research design.

In Chapter 2, *Review of Literature*, the Author presents a comprehensive and well-structured overview of the current state of knowledge relevant to the dissertation topic. The chapter covers key aspects of food safety management systems, including regulatory frameworks, international standards, and practical challenges associated with their implementation across different segments of the food supply chain. Particular attention is given to the variability of FSMS performance in diverse operational contexts, including small- and medium-sized enterprises, retail environments, and food service settings. The Author also addresses issues related to food safety culture, compliance behaviour, and the effectiveness of control measures, drawing on a wide range of contemporary scientific sources. Importantly, the literature review extends beyond food safety to incorporate sustainability considerations, highlighting the growing importance of integrating environmental and resource-efficiency practices within food system operations. The discussion includes topics such as food waste management, sustainable retail practices, and the interconnections between food safety and sustainability objectives.

The chapter demonstrates a critical and analytical approach to the literature, allowing the Author to identify key research gaps, particularly the limited availability of integrated, cross-sectoral and cross-country studies combining FSMS effectiveness, product quality, and sustainability practices.

Overall, the literature review is thorough, up-to-date, and well aligned with the aims of the dissertation, providing a solid theoretical foundation for the empirical research undertaken.

In Chapter 3, *Purpose, Hypothesis, and Scope of the Research*, the Doctoral Candidate clearly defines the subject of the study and formulates a coherent set of research hypotheses addressing key aspects of food safety management and sustainability within the food sector. The hypotheses focus on the assumption that the implementation of food safety management systems contributes to improved compliance with regulatory requirements, supports the maintenance of product quality, and is associated with the adoption of sustainability practices in food-related operations.

The formulated hypotheses are logically structured, consistent with the previously presented literature review, and can be verified through the applied research methods. They reflect a comprehensive understanding of the studied phenomena and appropriately address the identified research gaps, particularly in relation to the effectiveness of FSMS implementation across different stakeholders and operational contexts.

The main objective of the dissertation is clearly defined and concerns the evaluation of food safety management system performance, including its impact on compliance with food safety

requirements, product quality parameters, and the integration of sustainability practices. The scope of the research is broad and well justified, encompassing multiple study phases, different types of stakeholders, and a cross-country comparative approach.

Overall, this chapter is well developed and provides a clear conceptual framework for the empirical studies, ensuring coherence between the research objectives, hypotheses, and methodological approach adopted in the dissertation.

In Chapter 4, *Materials and Methods*, the Author presents a well-organised and coherent description of the research design, structured into four consecutive phases corresponding to the stated research objectives and hypotheses. The first phase involved the assessment of the effectiveness of FSMS through internal audits conducted before and after certification, supported by a structured checklist and statistical analysis. The second phase focused on the evaluation of post-certification product quality, including physicochemical and microbiological analyses of selected food products. In the subsequent phases, the Author extended the research to the retail and food service sectors. Phase III included a large-scale observational assessment of FSMS compliance in retail shops across two regions, using a structured inspection tool and quantitative scoring system. Phase IV addressed both food safety and sustainability practices in grocerants across three countries, based on direct on-site observations and a comprehensive checklist covering key operational indicators.

The chapter also provides a concise description of the applied analytical and statistical methods, including both descriptive and inferential techniques. Detailed methodological procedures are appropriately supplemented by references to the publications forming part of the dissertation.

In the Reviewer's opinion, the methodology has been properly selected and demonstrates a high level of coherence with the research objectives. The multi-phase and multi-method approach enables a comprehensive analysis of the studied phenomena across different levels of the food system. The scope and diversity of the methods employed confirm the Doctoral Candidate's very good command of research techniques and her ability to apply both observational and analytical methods in a consistent and methodologically sound manner.

The *Results and Discussion* chapter is structured into four main subsections corresponding to the individual research phases, in which the Doctoral Candidate sequentially presents:

1. the assessment of the effectiveness of food safety management system implementation before and after certification,
2. the evaluation of post-certification product quality based on physicochemical and microbiological parameters,
3. the analysis of FSMS compliance in retail shops across different regions, and
4. the comparative assessment of food safety and sustainability practices in grocerants across three countries.

This chapter constitutes a synthesis of the results presented in the publications forming the doctoral dissertation, supplemented by additional analyses and interpretations. The obtained results are presented in a clear and logical manner, supported by appropriate statistical analyses and graphical representations.

The Author interprets the findings in a consistent and scientifically sound way, demonstrating the relationships between FSMS implementation, product quality, and operational practices across different segments of the food system. Particular attention is given to identifying differences between regions, stakeholder groups, and operational conditions,

which allows for a comprehensive understanding of the studied phenomena. The discussion is supported by relevant literature, and the Author critically compares her findings with those of other researchers, highlighting both consistencies and discrepancies. This approach confirms the maturity of scientific reasoning and the ability to draw well-founded conclusions.

A significant strength of this chapter is the integration of food safety and sustainability perspectives, particularly in the analysis of grocerants, where the Author identifies both common patterns and country-specific differences. The results also provide valuable insights into the practical challenges of FSMS implementation, especially in smaller enterprises and diverse regulatory contexts.

Overall, the chapter demonstrates a high level of analytical competence and constitutes an important contribution to the field of food safety management and sustainable food systems.

The Author formulated a set of conclusions that are logically derived from the conducted research and fully consistent with the stated objectives and hypotheses. In the Reviewer's opinion, the conclusions are scientifically sound and clearly reflect the multi-phase nature of the study, providing a coherent synthesis of the obtained results. The presented conclusions enable a comprehensive overview of the most important findings of the dissertation and effectively summarise both the scientific and practical achievements of the Doctoral Candidate.

The Author demonstrated that the implementation of food safety management systems significantly enhances compliance with regulatory requirements and supports the maintenance of appropriate product quality parameters. Furthermore, the results confirm a relationship between food safety practices and sustainability-oriented activities, particularly within retail and hybrid food service environments, indicating the growing importance of integrated management approaches in the food sector. The findings also highlight that the effectiveness of FSMS implementation depends on organisational and contextual factors, including the scale of operation, type of enterprise, and regulatory environment.

Overall, the conclusions confirm the high relevance of the undertaken research and underline its practical application potential, particularly in improving food safety performance and supporting the integration of sustainability practices within contemporary food systems

The reference list included in the dissertation is extensive and composed entirely of English-language sources. The selection of literature is appropriate and well aligned with the subject of the study, reflecting the Doctoral Candidate's ability to identify and utilise relevant scientific publications in the field of food safety and sustainability. The cited sources include both foundational documents, such as international standards and regulatory frameworks, as well as a substantial number of recent scientific publications, which confirms the timeliness of the undertaken research problem. The diversity of the references, covering scientific articles, reports, and official guidelines, further supports the interdisciplinary character of the dissertation. Overall, the bibliography demonstrates the Candidate's good command of the current state of knowledge and provides a solid theoretical foundation for the conducted research.

Evaluation of the language and technical quality of the dissertation

The dissertation has been prepared with due care in terms of language and editorial standards. The Doctoral Candidate consistently uses terminology appropriate to the discipline of food science and food safety management, which demonstrates a good command of scientific writing conventions.

Nevertheless, certain minor linguistic and editorial inaccuracies can be identified. Their scope does not affect the overall positive assessment of the formal quality of the dissertation; however, they should be noted for the sake of completeness.

Minor inconsistencies in formatting and terminology appear throughout the text, including the parallel use of different naming conventions (e.g. "Food and Drug Administration" and "U.S. FDA"), inconsistent presentation of standards (e.g. "ISO 22000:2018" versus "ISO, 2018"), and variation in citation style (e.g. "Reboucas et al." vs "Rebouças et al."). Occasional typographical and stylistic imperfections are also present, such as inconsistencies in punctuation and spacing in references, as well as minor issues in the numbering and formatting of figures and sections, including the missing Figure 2.

In addition, minor linguistic inconsistencies can be observed, including occasional non-native phrasing (e.g. "this study seeks to assess" instead of "aims to assess"), minor grammatical inaccuracies (e.g. "referred as" instead of "referred to as"), and isolated cases of subject–verb agreement inconsistency (e.g. "Descriptive statistics includes" instead of "include"). Slight inconsistencies in statistical notation and formatting are also noted (e.g. "p =0.0240" instead of "p = 0.0240").

These remarks are of a technical nature and do not diminish the substantive value of the dissertation; however, their correction would further improve the overall editorial quality of the work.

Final conclusion

The doctoral dissertation submitted for review by MSc Surya Sasikumar Nair addresses an original and relevant scientific problem concerning the effectiveness of food safety management systems and their relationship with product quality and sustainability practices across different segments of the food supply chain. The study provides a comprehensive and multi-level analysis of FSMS implementation, including its impact on regulatory compliance, operational performance, and sustainability-oriented activities in diverse organisational and geographical contexts.

The dissertation falls within the discipline of food technology and nutrition, and its execution demonstrates the Doctoral Candidate's very good preparation for independent scientific research. The Author exhibits solid theoretical knowledge of food safety management and related regulatory frameworks, as well as a high level of competence in the application of both analytical and observational research methods.

The work has significant cognitive value, particularly in the area of integrated assessment of food safety and sustainability practices. It contributes to the existing body of knowledge by providing empirical evidence on the effectiveness of FSMS implementation in manufacturing, retail, and hybrid food service environments, as well as by identifying key factors influencing compliance and system performance.

In addition to its scientific contribution, the dissertation also has practical relevance. The obtained results highlight the importance of structured food safety management and its linkage with sustainability practices, indicating directions for improving operational efficiency, reducing food waste, and enhancing overall food system performance.

The few critical remarks identified do not diminish the scientific value of the dissertation, the relevance of the research problem undertaken, or the appropriateness of the methodological approach applied to address it.

I hereby state that the doctoral dissertation of MSc Surya Sasikumar Nair, entitled "Food Safety Management and Sustainability Approaches in Selected Stakeholders", meets the requirements set forth in Article 187(1-4) of the Act of July 20, 2018 - Law on Higher Education and Science (Journal of Laws of 2024, item 1571, as amended).

I therefore submit a recommendation to the Scientific Council of the Discipline of Food Technology and Nutrition at the Warsaw University of Life Sciences to admit MSc Surya Sasikumar Nair to the subsequent stages of the doctoral procedure.

Taking into account the high scientific quality of the dissertation, I hereby submit a motion to award the doctoral dissertation of MSc Surya Sasikumar Nair with distinction.

The justification for this motion is based on several key aspects of the work. First, the dissertation addresses an original and highly relevant scientific problem concerning the effectiveness of food safety management systems and their integration with sustainability practices across different segments of the food supply chain. The topic is both timely and significant, responding to current challenges related to global food safety, regulatory compliance, and sustainable development. Secondly, the Author adopted a comprehensive and methodologically advanced research approach, combining audit-based assessments, laboratory analyses, and large-scale observational studies conducted across multiple countries. This multi-phase and interdisciplinary design demonstrates a high level of scientific maturity and enables a holistic evaluation of the studied phenomena. A particular strength of the dissertation is the integration of food safety and sustainability perspectives, which remains relatively underexplored in the literature, especially in the context of emerging food service formats such as grocerants. The results obtained provide valuable new insights and significantly contribute to the development of knowledge in the discipline of food technology and nutrition. Moreover, the Doctoral Candidate has demonstrated a leading and substantial contribution to the research, as confirmed by her first authorship in all publications included in the dissertation, as well as her active involvement in the development of research concepts, methodology, data analysis, and interpretation of results. The scientific output forming the basis of the dissertation includes high-quality publications, including papers published in reputable international journals and a manuscript currently under review following minor revisions. Finally, the dissertation is characterised not only by high cognitive value but also by clear practical relevance. The findings have direct application potential in improving food safety performance, supporting regulatory compliance, and promoting the integration of sustainability practices in food systems.

In light of the above, the dissertation clearly exceeds the standard requirements for doctoral theses and constitutes a valuable and original contribution to the discipline. Therefore, awarding it with distinction is fully justified.

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Szanowna Pani Profesor,

w odpowiedzi na pismo z dnia 17 kwietnia 2026 r. przedstawiam recenzję rozprawy doktorskiej **mgr Surya Sasikumara Nair** pt.: „Food Safety Management and Sustainability Approaches in Selected Stakeholders" wykonanej w Katedrze Technologii Gastronomicznej i Higieny Żywności Szkoły Głównej Gospodarstwa Wiejskiego w Warszawie pod kierunkiem prof. dr hab. Joanny Trafiałek jako Promotora.

Z poważaniem

Joanny Stadnik