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Application of weighted aggregated sum product assessment method in determining the best flour to produce vermicelli

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ABSTRACT

This study explores the application of the Weighted Aggregated Sum Product Assessment (WASPAS) method's selection of the best wheat flour for vermicelli production, which aims to improve product quality and production efficiency. The study aimed to integrate experimental data with sophisticated decision-making models to identify the most suitable type of flour based on a comprehensive set of criteria. Using a quantitative approach, this study combines experimental methods, quantitative analysis, and model validation, using the WASPAS method to evaluate and rank various flours. The results showed significant differences among flour types, with selected flours showing superior performance across multiple parameters, including chemical composition and functional properties. The study's findings underscore the potential of advanced decision-making tools such as WASPAS in improving food production processes, demonstrating broader applicability across the food industry to optimise raw material selection.

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1. INTRODUCTION

The search for quality and efficiency in production processes is becoming increasingly urgent in the rapidly growing food industry (Duong et al., 2020). This is especially true for producing vermicelli, a staple food in many Asian countries (McKenzie et al., 2024). This is especially true for producing vermicelli, a staple food in many Asian countries (Landers & Sanchez, 2022).

The problem lies in quantitatively analysing and comparing the characteristics of various flours to determine the most suitable flour for vermicelli production (Li et al., 2023). This complexity makes the selection process time-consuming and prone to inaccuracies, resulting in suboptimal production results (Chua et al., 2021). Moreover, the lack of a systematic approach to flour selection can result in variations in the quality of vermicelli, affecting consumer satisfaction and brand reputation (Nabatian, 2022).

This study addresses this problem by applying the Weighted Aggregated Sum Product Assessment (WASPAS) method to select the best flour for vermicelli production (Ali et al., 2021).
For several reasons, the WASPAS method was chosen over other MCDM methods. First, WASPAS combines the advantages of the Weighted Sum Model (WSM) and the Weighted Product Model (WPM), providing a balance between subjective and objective criteria in decision-making (Klumbytė et al., 2021) Second, this method allows for the adjustment of the weight of the criteria according to the preferences of the decision-maker, which is very important in the context of the food industry where quality criteria can be very diverse and specific (Ma et al., 2021).

Although there are several references on the use of WASPAS and MCDM methods in the food industry, this research still needs more supporting literature, especially studies that apply similar methods in similar contexts. Previous studies have shown that MCDM methods, including WASPAS, have great potential to enhance decision-making processes in food production. However, specific applications to vermicelli production are still underexplored. Therefore, this study aims to fill that gap and significantly contribute to food science and the vermicelli production industry. Therefore, this research aims to fill this gap and significantly contribute to food science and the vermicelli production industry (Susanto et al., 2022).

In addition, this research contributes to the broader field of food science by demonstrating the application of MCDM methods in addressing complex decision-making problems in food production. (Yalcin et al., 2022). To address the problem, the study will involve collecting and analysing data on different types of flour, identifying and weighing selection criteria relevant to vermicelli production, and applying the WASPAS method to determine the best flour. (Susanto et al., 2023)This approach fills gaps in the existing literature, where the application of MCDM methods in food production, especially vermicelli, still needs to be improved. It also introduces innovative solutions to long-standing problems in the industry (Paul et al., 2021).

This research proposal is innovative in applying the WASPAS method to select raw materials for food production (Hashemkhani Zolfani et al., 2023) Although MCDM methods have been widely used in other fields, their potential in food science has yet to be fully explored (Kumar et al., 2022) By demonstrating the effectiveness of the WASPAS method in optimising the flour selection process for vermicelli production, this research paves the way for the further application of MCDM tools in the food industry (Srivastava & Dashora, 2022). In conclusion, this study aims to provide a comprehensive solution to the problem of selecting the best flour for vermicelli production by applying the WASPAS method. (Zhang et al., 2022) By improving the accuracy and efficiency of the selection process, this research seeks to enhance the quality of vermicelli products, contribute to food science knowledge, and inspire further innovation in the use of MCDM methods in the food industry (Romagnoli et al., 2022).

This study provides a comprehensive overview of MCDM's application in the food industry. It highlights its importance in improving decision-making processes related to product development, quality control, and supply chain management. The study underscores the potential of MCDM tools to address complex decision-making scenarios where multiple criteria must be considered simultaneously (Theunissen et al., 2024).

This study examines the application of the WASPAS method in selecting the optimal type of oil for frying potato chips. It shows how WASPAS can effectively balance cost, health benefits, and sensory quality in making choices, demonstrating the versatility of this method in addressing diverse criteria (Tang et al., 2024). Evaluating various MCDM methods, including WASPAS, Analytic Hierarchy Process (AHP), and Technique for Order Preference by Similarity to Ideal Solution (TOPSIS), in food processing technology selection, his findings show that although each method has advantages, WASPAS is particularly effective in scenarios requiring balanced consideration between subjective and objective criteria (Gyani et al., 2022).

In the field of quality assessment, Chen's paper explores the use of WASPAS in evaluating the quality of various wheat variations for bread making. The study highlights the ability of this method to combine multiple quality parameters into one comprehensible score, thus facilitating direct comparisons (Utami et al., 2024; Tang et al., 2024).

This study applies the WASPAS method to assess the sustainability of various agricultural practices. Integrating environmental, economic, and social sustainability criteria demonstrates the application of these methods beyond ingredient selection to the broader context of food production (Adams et al., 2021).

2. RESEARCH METHOD

Research Objectives

This study aims to apply the Weighted Aggregated Sum Product Assessment (WASPAS) method to determine the best type of flour for vermicelli production. (Quintieri et al., 2023). The specific objectives of this study were to identify and assess essential criteria affecting vermicelli quality, optimise decision-making models based on the WASPAS method, and validate the effectiveness of models in selecting the best flour for vermicelli production.

Research design

This study used a combination design involving laboratory experiments, quantitative analysis, and model validation. This approach allows research to identify the best flour through experimentation and measure and validate selections using the WASPAS method.

WASPS method

The WASPAS method is a multi-criteria decision-making approach that combines the Weighted Sum Model (WSM) with the Weighted Product Model (WPM). This method specifies weights for each criterion and membership values for each alternative within each criterion. Then, by multiplying the weight of the requirements by the membership value of each criterion and summing them up, we can evaluate the alternatives in aggregate. This method is flexible in adjusting the weight of criteria according to decision-makers' preferences and can be used in various decision-making contexts.

Follow the steps of the WASPAS Method: Determining Matrix Normalization in Decision-Making

$$X = \begin{bmatrix} x11 & x12 & x1n \\ x21 & x22 & x2n \\ xm1 & xm2 & xm3 \end{bmatrix} \quad (1)$$

If the maximum and minimum values have been determined, then the equation is as follows:

For the benefit criteria:

$$Xij = \frac{Xij}{Maxi\ Xij} \quad (2)$$

For cost criteria:

$$Xij = \frac{Mini\ Xij}{Xij} \quad (3)$$

Calculate the Normalized Value of Matrix Qi by using the following formula:

$$Qi = 0.5\ \Sigma\ \bar{x}ijwj + 0.5\Pi j=1(\bar{x}iij)wj \quad (4)$$

The best Qi value is the highest value, Xij w is the multiplication of the Xij value by weight (w), and 0.5 is the determination.

Flour

Flour is a fine powder from grinding grains, tubers, or nuts. These materials, such as wheat, corn, rice, potatoes, or soybeans, are processed into fine powder using a grinding machine. Flour is often used as a base ingredient in making bread, cakes, noodles, pot dough, and various other types of food. Depending on the essential ingredients and processing process, different types of flour, such as wheat flour, cornstarch, rice flour, etc., have different characteristics and uses in cooking and baking.

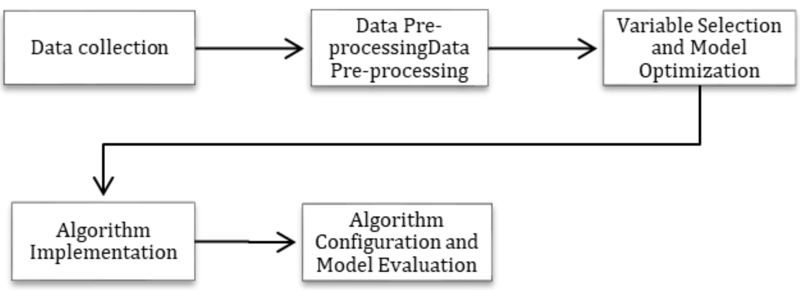

Figure 1. Research Flow

Figure 1 describes the research flow that begins with "Data Collection." After the data is collected, the next step is "Data Pre-processing." After the data is processed, the next step is "Variable Selection and Model Optimization." This process aims to prepare the data for processing. Furthermore, the data that has been processed goes to the "Algorithm Implementation" stage. This process seeks to process data and calculate values. The next stage is "Algorithm Configuration and Model Evaluation." In this process, it aims to maximise model performance. Model evaluation is done through cross-validation with data to test the accuracy of model predictions in selecting the best flour. Where the results of the analysis are evaluated based on testing to ensure the data makes final adjustments to the model before being applied to vermicelli production. This flow describes the methods used in research data to ensure the quality and accuracy of research results.

Data collection

Laboratory experiments to assess the quality of rice noodles produced using different types of flour based on criteria such as texture, taste, and nutritional value (Sparvoli et al., 2021). The survey experts will determine the relative weight of the requirements based on their experience and knowledge regarding the production of vermicelli.

Data Pre-processing

Data obtained from experiments and expert surveys will undergo pre-processing to ensure data quality. This includes normalising experimental data to ensure consistency of measurement scales and processing survey responses to determine criteria weighting.

Variable Selection and Model Optimization

The variables in this study consist of vermicelli quality criteria that have been identified. The WASPAS model will be optimised by adjusting the criteria weight based on expert survey inputs. This optimisation aims to create a balanced decision model that reflects industry preferences.

Algorithm Implementation

The WASPAS algorithm is implemented using programming software capable of processing numerical and categorical data. This application includes calculating the aggregate value of each type of flour based on predetermined criteria and weights.

Algorithm Configuration and Model Evaluation

Algorithm configuration involves adjusting specific parameters, such as normalisation methods and aggregation formulas, to maximise model performance. Model evaluation is done through cross-validation with experimental data to test the accuracy of the model's predictions in selecting the best flour. The evaluation results will be used to make final adjustments to the model before being applied to vermicelli production.

Determining Flour Selection Criteria

The selection criteria for flour will be determined through a combination of expert surveys and laboratory experiments. Experts in food science, vermicelli production, and nutrition will be surveyed to identify critical criteria affecting vermicelli quality, such as texture, taste, nutritional value, cost, and processing characteristics. The survey responses will be analysed to determine each criterion's relative importance and weight. Laboratory experiments will then evaluate different types of flour based on these criteria, ensuring a comprehensive and systematic approach to selecting the best flour for vermicelli production.

3. RESULTS AND DISCUSSION

This study aims to identify the best flour for vermicelli making using experimental methods, quantitative analysis, and model validation using the Weighted Aggregated Sum Product Assessment (WASPAS) method. The results obtained from this comprehensive approach shed light on the diverse criteria that influence flour selection and their impact on vermicelli quality.

Table 1. Criterion weights

Criterion	Information	Attribute	Weight
C1	Quality	Benefit	5
C2	Brand	Benefit	4
C3	Texture	Benefit	3
C4	Price	Cost	2

From Table 1. Criteria have sets and values, except price, because prices contain numbers that have precise values. There are several stages of applying the Waspas method in decision-making to determine the best flour. Alternatives and criteria will be sampled to determine the best flour.

Experimental Results: Initially, various flour samples underwent a series of practical tests to evaluate their physical, chemical, and functional properties, including moisture content, protein content, ash content, water absorption capacity, and sticking properties. These properties are very important in determining the suitability of flour for the production of vermicelli. The experimental results showed significant differences among flour samples, which showed that not all flours had the desirable characteristics to produce high-quality vermicelli. The following sample data can be seen in Table 2:

Table 2. Sample data

Alternative	Quality	Price	Brand	Texture
Tapioca Flour(A1)	1	25000	Rose Brand	Good adhesion
Wheat Flour(A2)	2	14000	Blue Triangle	Smooth and soft
Sago Flour (A3)	1	20000	Alini	Unscented, smooth, and soft
Rice Flour(A4)	3	30000	Rice’n Shine	Natural, smooth, and chewy taste

Quantitative Analysis and Model Optimization: Data is processed first and analysed quantitatively after the experimental stage. The WASPAS method integrates observational data into a comprehensive decision-making framework. This phase involves selecting relevant variables based on their significance to vermicelli quality and optimising the model to accurately reflect the vermicelli production process's priorities. The optimisation process uses sensitivity analysis to determine the model's resistance to variations in weight assignment for each criterion. After selecting the sample data, an assessment is carried out.

Table 3. Assessment of each alternative and criterion

Alternative	C1	C2	C3	C4
Tapioca Flour(A1)	1	3	4	30000
Wheat Flour(A2)	2	1	3	14000
Sago Flour (A3)	1	4	2	20000
Rice Flour(A4)	3	2	1	25000

Implementation and Evaluation: The WASPAS algorithm's application facilitates ranking flour samples based on their aggregate score, obtained from the weighted sum and product model. This dual approach ensures a balanced assessment of each flour's strengths and weaknesses across the evaluated criteria. The performance evaluation of this model ensures its effectiveness in distinguishing flours that meet the comprehensive set of criteria required to produce high-quality vermicelli.

The following are the processing steps using the WASPAS method.

1. Calculates normalised matrix X

C1

$x11 =$ [illegible] $= 0,33$

$x12 =$ [illegible] $= 0,66$

$x13 =$ [illegible] $= 0,33$

$x14 =$ [illegible] $= 1$

C2

$x21 =$ [illegible] $= 0,75$

$x22 =$ [illegible] $= 0,25$

$x23 =$ [illegible] $= 1$

$x24 =$ [illegible] $= 0,5$

C3

$x31 =$ [illegible] $= 0,25$

$x32 =$ [illegible] $= 0,33$

$x33 =$ [illegible] $= 0,5$

$x34 =$ [illegible] $= 1$

C4

$x21 = \frac{30000}{.....} = 1$

$x22 = \frac{14000}{.....} = 0{,}46$

$x23 = \frac{20000}{.....} = 0{,}66$

$x24 = \frac{25000}{.....} = 0{,}83$

Table 4. Normalisation results

Q1	0,33	0,75	0,25	1
Q2	0,66	0,25	0,33	0,46
Q3	0,33	1	0,5	0,66
Q4	1	0,5	1	0,83

Calculating the Value of the X Matrix Normalization Results

$Q1 = 0{,}5\Sigma(0{,}33 \times 5) + (0{,}75 \times 4) + (0{,}25x\,3) + (1x2) + 0{,}5\pi(0{,}33)^5x(0{,}75)^4x(0{,}25)^3x(1)^2$

$= 0{,}5\Sigma(1{,}65 + 3 + 0{,}75 + 2)$ $\quad 0{,}5\pi\,(0{,}0039x0{,}3164x0{,}156x1)$

$= 0{,}5\Sigma(7{,}4)$ $\quad 0{,}5\pi\,(0{,}00019)$

$= 0{,}5x7{,}4$ $\quad = 0{,}5 \times 0{,}00019$

$= 3{,}7$ $\quad + 0{,}000095$

3,7 + 0,000095 = 3,700095

$Q2 = 0{,}5\Sigma(0{,}66 \times 5) + (0{,}25 \times 4) + (0{,}33x\,3) + (0{,}46x\,2) + 0{,}5\pi(0{,}66)^5x(0{,}25)^4x(0{,}33)^3\,x(0{,}46)^2$

$= 0{,}5\Sigma(3{,}3 + 1 + 0{,}99 + 0{,}92)$ $\quad 0{,}5\pi(0{,}125x0{,}0039x0{,}0359x0{,}2116)$

$= 0{,}5\Sigma(6{,}21)$ $\quad 0{,}5\pi\,(0{,}00037)$

$= 0{,}5x6{,}21$ $\quad = 0{,}5 \times 0{,}00037$

$= 3{,}105$ $\quad + 0{,}000195$

3,105 + 0,000195 = 3,1051

$Q3 = 0{,}5\Sigma(0{,}33 \times 5) + (1 \times 4) + (0{,}5x\,3) + (0{,}66x\,2) + 0{,}5\pi(0{,}33)^5x(1)^4x(0{,}5)^3x(0{,}66)^2$

$= 0{,}5\Sigma(1{,}65 + 4 + 1{,}5 + 1{,}32)$ $\quad 0{,}5\pi(0{,}0039\;x\;1\;x\;0{,}125\;x\;0{,}4356)$

$= 0{,}5\Sigma(8{,}47)$ $\quad 0{,}5\pi\,(0{,}00021)$

$= 0{,}5\;x\;8{,}47$ $\quad = 0{,}5 \times 0{,}00021$

$= 4{,}235$ $\quad + 0{,}000105$

4,235 + 0,000105 = 4,235105

$Q4 = 0{,}5\Sigma(1 \times 5) + (0{,}5 \times 4) + (1x\,3) + (0{,}83x2) + 0{,}5\pi(1)^5x(0{,}5)^4x(1)^3x(0{,}83)^2$

$= 0{,}5\Sigma(5 + 2 + 3 + 1{,}66)$ $\quad 0{,}5\pi(1\;x\;0{,}0625x\;1x\;0{,}6889)$

$= 0{,}5\Sigma(11{,}66)$ $\quad 0{,}5\pi\,(0{,}0430)$

$= 0{,}5\;x\;11{,}66$ $\quad = 0{,}5 \times 0{,}0430$

$= 5{,}83$ $\quad + 0{,}0215$

5,83 + 0,0215 = 5,8515

From the results of calculations in the table obtained:

Q1 = 3,700095
Q2 = 3,1051
Q3 = 4,235105
Q4 = 5,8515

The calculation value above shows that Q4 has the largest value, so it can be concluded that rice flour is the preferred value as it is the best flour for producing vermicelli.

Discussion

This study's findings underscore the complexity of selecting the optimal flour for vermicelli production. The WASPAS method allows systematic and quantitative comparison of different flours, thus demonstrating that the best flour for vermicelli production is superior in chemical composition and functional properties. Notably, the study highlights the importance of considering a variety of criteria in the selection process beyond the traditional focus on cost and essential nutritional value.

Comparative analysis also revealed that the flour choice significantly affected the final product's textural and sensory qualities. This understanding is essential for producers who want to meet consumer expectations of high-quality vermicelli. In addition, this study approach demonstrates the benefits of integrating experimental methods with advanced decision-making tools such as WASPAS to navigate the complexities of food production processes.

In conclusion, this study contributes to knowledge in the food industry by providing a robust methodology for selecting raw materials. These findings assist vermicelli producers in improving product quality and offer a framework that can be adapted to other food production contexts, emphasising the need for a holistic approach to ingredient selection. Future research could explore the application of this methodology to other food products, further validating its usefulness and adaptability.

4. CONCLUSION

This study successfully demonstrated the efficacy of the Weighted Aggregated Sum Product Assessment (WASPAS) method in selecting the optimal flour for vermicelli production, integrating experimental analysis with quantitative decision-making. The practical application of these results in the vermicelli industry will enhance production standards by ensuring consistent, high-quality products through systematic flour selection.

This method will improve operational efficiency by reducing trial-and-error processes and optimising resource use. Enhanced product quality will increase customer satisfaction and brand loyalty, driving market competitiveness and profitability. Future research should expand the criteria to include environmental sustainability and consumer preferences, refining decision-making models and validating the method's versatility in improving food production processes across industries.

REFERENCES

Adams, D., Donovan, J., & Topple, C. (2021). Achieving sustainability in food manufacturing operations and their supply chains: Key insights from a systematic literature review. *Sustainable Production and Consumption*, *28*, 1491–1499. https://doi.org/10.1016/J.SPC.2021.08.019

Ali, J., Bashir, Z., & Rashid, T. (2021). WASPAS-based decision making methodology with unknown weight information under uncertain evaluations. *Expert Systems with Applications*, *168*, 114143. https://doi.org/10.1016/J.ESWA.2020.114143

Chua, I. S., Gaziel-Yablowitz, M., Korach, Z. T., Kehl, K. L., Levitan, N. A., Arriaga, Y. E., Jackson, G. P., Bates, D. W., & Hassett, M. (2021). Artificial intelligence in oncology: Path to implementation. In *Cancer Medicine* (Vol. 10, Issue 12, pp. 4138–4149). Blackwell Publishing Ltd. https://doi.org/10.1002/cam4.3935

Duong, L. N. K., Al-Fadhli, M., Jagtap, S., Bader, F., Martindale, W., Swainson, M., & Paoli, A. (2020). A review of robotics and autonomous systems in the food industry: From the supply chains perspective. In *Trends in Food Science and Technology* (Vol. 106, pp. 355–364). Elsevier Ltd. https://doi.org/10.1016/j.tifs.2020.10.028

Gyani, J., Ahmed, A., & Haq, M. A. (2022). MCDM and Various Prioritization Methods in AHP for CSS: A Comprehensive Review. In *IEEE Access* (Vol. 10, pp. 33492–33511). Institute of Electrical and Electronics Engineers Inc. https://doi.org/10.1109/ACCESS.2022.3161742

Hashemkhani Zolfani, S., Görener, A., & Toker, K. (2023). A hybrid fuzzy MCDM approach for prioritising the solutions of resource recovery business model adoption to overcome its barriers in emerging economies. *Journal of Cleaner Production*, *413*, 137362. https://doi.org/10.1016/J.JCLEPRO.2023.137362

Klumbytė, E., Bliūdžius, R., Medineckienė, M., & Fokaides, P. A. (2021). An MCDM model for sustainable decision-making in municipal residential buildings facilities management. *Sustainability (Switzerland)*, *13*(5), 1–16. https://doi.org/10.3390/su13052820

Kumar, A., Mangla, S. K., & Kumar, P. (2022). An integrated literature review on sustainable food supply chains: Exploring research themes and future directions. *Science of The Total Environment*, *821*, 153411. https://doi.org/10.1016/J.SCITOTENV.2022.153411

Landers, R. N., & Sanchez, D. R. (2022). Game-based, gamified, and gamefully designed assessments for employee selection: Definitions, distinctions, design, and validation. In *International Journal of Selection and Assessment* (Vol. 30, Issue 1, pp. 1–13). John Wiley and Sons Inc. https://doi.org/10.1111/ijsa.12376

Li, C., Zheng, P., Yin, Y., Wang, B., & Wang, L. (2023). *Deep Reinforcement Learning in Smart Manufacturing: A Review and Prospects*.

Ma, S., Wang, Z., Guo, X., Wang, F., Huang, J., Sun, B., & Wang, X. (2021). Sourdough improves the quality of whole-wheat flour products: Mechanisms and challenges—A review. In *Food Chemistry* (Vol. 360). Elsevier Ltd. https://doi.org/10.1016/j.foodchem.2021.130038

McKenzie, B. L., Lo, Y.-R., Idzwan Mustapha, F., Battumur, B.-E., Batsaikhan, E., Sukhbaatar, B., Untoro, J., Chandran, A., Michael, V., Webster, J., & Trieu, K. (2024). Strengthening national salt reduction strategies using multiple methods process evaluations – case studies from Malaysia and Mongolia. *Public Health Nutrition*, 1–29. https://doi.org/10.1017/s1368980023002781

Nabatian, T. (2022). *CUNY Academic Works CUNY Academic Works Dissertations, Theses, and Capstone Projects CUNY Graduate Center 2-2023 Dendritic Spine Density and Morphology in the Dorsolateral Dendritic Spine Density and Morphology in the Dorsolateral Striatum Following a High Fat Diet Striatum Following a High Fat Diet*. https://academicworks.cuny.edu/gc_etds/5237Discoveradditionalworksat:https://academicworks.cuny.edu

Paul, A., Shukla, N., Paul, S. K., & Trianni, A. (2021). Sustainable supply chain management and multi-criteria decision-making methods: A systematic review. In *Sustainability (Switzerland)* (Vol. 13, Issue 13). MDPI. https://doi.org/10.3390/su13137104

Quintieri, L., Nitride, C., De Angelis, E., Lamonaca, A., Pilolli, R., Russo, F., & Monaci, L. (2023). Alternative Protein Sources and Novel Foods: Benefits, Food Applications and Safety Issues. In *Nutrients* (Vol. 15, Issue 6). MDPI. https://doi.org/10.3390/nu15061509

Romagnoli, F., Masiero, M., & Secco, L. (2022). Windstorm Impacts on Forest-Related Socio-Ecological Systems: An Analysis from a Socio-Economic and Institutional Perspective. In *Forests* (Vol. 13, Issue 6). MDPI. https://doi.org/10.3390/f13060939

Sparvoli, F., Giofré, S., Cominelli, E., Avite, E., Giuberti, G., Luongo, D., Gatti, E., Cianciabella, M., Daniele, G. M., Rossi, M., & Predieri, S. (2021). Sensory characteristics and nutritional quality of food products made with a biofortified and lectin free common bean (Phaseolus vulgaris l.) flour. *Nutrients*, *13*(12). https://doi.org/10.3390/nu13124517

Srivastava, A., & Dashora, K. (2022). A Fuzzy ISM approach for modelling electronic traceability in agri-food supply chain in India. *Annals of Operations Research*, *315*(2), 2115–2133. https://doi.org/10.1007/s10479-021-04072-6

Susanto, D. A., Suef, M., & Karningsih, P. D. (2022). Effectiveness of hazard control through HACCP critical control points in the wet noodle production process on product quality. *International Journal of Applied Science and Engineering*, *19*(2). https://doi.org/10.6703/IJASE.202206_19(2).001

Susanto, D. A., Suef, M., & Karningsih, P. D. (2023). Level of Implementation of GMP and SSOP in SMEs Wet Noodle Production Process with Gap Analysis Tools. *Evergreen*, *10*(1), 510–518. https://doi.org/10.5109/6782155

Tang, X., Zhang, J., & Liang, R. (2024). The design of heating, ventilation, and air conditioning systems based on building information modelling: A review from the perspective of automatic and intelligent methods. *Journal of Building Engineering*, *82*, 108200. https://doi.org/10.1016/J.JOBE.2023.108200

Theunissen, F. M., Bezuidenhout, C. N., & Alam, S. (2024). Exploring the shortcomings in formal criteria selection for multicriteria decision making based inventory classification models: a systematic review and future directions. In *International Journal of Production Research*. Taylor and Francis Ltd. https://doi.org/10.1080/00207543.2024.2320680

Yalcin, A. S., Kilic, H. S., & Delen, D. (2022). The use of multi-criteria decision-making methods in business analytics: A comprehensive literature review. *Technological Forecasting and Social Change*, *174*, 121193. https://doi.org/10.1016/J.TECHFORE.2021.121193

Zhang, J., Kong, H., Ban, X., Li, C., Gu, Z., & Li, Z. (2022). Rice noodle quality is structurally driven by the synergistic effect between amylose chain length and amylopectin unit-chain ratio. *Carbohydrate Polymers*, *295*, 119834. https://doi.org/10.1016/J.CARBPOL.2022.119834