



DEVELOPMENT OF MORIJAWA-BASED FUNCTIONAL FOODS (MORINGA OLEIFERA, CORN, SWALLOW'S NEST) TO IMPROVE THE NUTRITIONAL STATUS OF TODDLERS AND PREGNANT WOMEN

Hairunnisah*, Juraidin, Abdul Munir, M. Noris

Universitas Muhammadiyah Bima, Jl. Anggrek, Nae, Rasanae Barat, Kab. Bima, Nusa Tenggara Barat 84111, Indonesia

*hairunnisah@umbima.ac.id

ABSTRACT

Malnutrition remains a challenge affecting the health and development of toddlers and pregnant women. The development of MORIJAWA-based functional food containing Moringa oleifera, corn, and swallow's nest is important as an innovative nutritional intervention using local resources. This study aims to develop and evaluate MORIJAWA functional food to improve the nutritional status of toddlers and pregnant women. Metode penelitian yang digunakan adalah Research and Development (R&D). This study involved 200 participants, consisting of 100 toddlers and 100 pregnant women. Data were collected through an organoleptic test of MORIJAWA Cookies and an assessment of nutritional status using anthropometric measurements. The organoleptic data were analyzed using descriptive statistics, while the nutritional status data and the factors influencing improvements in nutritional status were analyzed using Structural Equation Modeling (SEM) with the SmartPLS approach. The results of the paired t-test indicated a significant difference ($p < 0.05$) in anthropometric indicators before and after the intervention. Among toddlers, there was an average weight gain of 1.3 kg, an increase in the proportion with normal nutritional status from 59% to 78%, and a decrease in the prevalence of stunting from 25% to 15%. Among pregnant women, there was an increase in mid-upper arm circumference (MUAC) of 1.7 cm, an increase in the proportion with normal nutritional status from 64% to 86%, as well as a reduction in the risk of KEK from 30% to 12%. The PLS-SEM analysis showed that MORIJAWA's product characteristics had a strong influence on organoleptic quality ($\beta = 0.886$), while organoleptic quality influenced consumption intention ($\beta = 0.863$) and perceived benefits ($\beta = 0.855$). These findings indicate that MORIJAWA has the potential to serve as a locally sourced functional food to support improved nutritional status among toddlers and pregnant women.

Keywords: local functional foods; MORIJAWA; moringa oleifera; nutritional status of pregnant women; nutritional status of toddlers

How to cite (in APA style)

Hairunnisah, H., Juraidin, J., Munir, A., & Noris, M. (2026). Development of Morijawa-Based Functional Foods (Moringa Oleifera, Corn, Swallow's Nest) to Improve the Nutritional Status of Toddlers and Pregnant Women. *Indonesian Journal of Global Health Research*, 8(6), 273–290. <https://doi.org/10.37287/ijghr.v8i6.2625>.

INTRODUCTION

Stunting is a serious nutritional problem in Indonesia, primarily affecting toddlers and having a significant impact on their physical and cognitive development (Byna, 2020; Childhood Stunting, Wasting, and Obesity, as the Critical Global Health Issues: Forging Cross-Sectoral Solutions, 2020; Danaei et al., 2016; Fauziah et al., 2024; Hidayat, 2022; Indriati, 2023; Mustakim et al., 2022; P. M. Putri et al., 2024; Scheffler & Hermanussen, 2021; Suryani et al., 2023). This condition is caused by prolonged malnutrition during the first 1,000 days of life, often due to limited access to nutritious foods and low dietary diversity (Priyono, 2020; Sutarto et al., 2018; Sutrisminah et al., 2023). Recent data indicate that Bima Regency has a high stunting rate, recorded at approximately 24.59% in 2022, down from 36.7% according to the 2025 Indonesian Nutrition Status Survey. This improvement is attributed to effective local government interventions. However, nearly 1 in 4 toddlers in the region still suffer from stunting, exceeding the WHO target of less than 20% (Al., 2024; Darmin, Walliyudin, Gufran, Muh. Fitrah, M. Noris, Adnan, 2023; Darmin et al., 2023, 2025; Darmin & Noris, 2023; Sarman & Darmin, 2021). Efforts to reduce stunting face challenges in providing sustainable and affordable nutritional interventions.

The problem of stunting in Bima Regency, including Karumbu Subdistrict, remains a priority health issue due to its relatively high prevalence and long-term impact on the quality of human resources (Darmin, Walliyudin, Gufran, Alkhair, M. Noris, Muammar Iksan, Dea Zara Avila, Nur Husnul Khatimah, 2023; Darmin, Walliyudin, Gufran, Muh. Fitrah, M. Noris, Adnan, 2023; Darmin, 2024; Darmin & Noris, 2023; Hairunnisah, Suminah, 2025). Given these challenges, this study is important for developing functional foods based on MORIJAWA (*Moringa oleifera*, corn, and swiftlet nests). The distribution of stunting in West Nusa Tenggara (NTB) Province shows variations across regions, with fluctuating patterns during the 2018–2025 period. Several regions, such as East Lombok, Central Lombok, and Bima Regencies, account for a relatively high proportion of cases, influenced by differences in socioeconomic conditions, access to healthcare, child-rearing practices, and the availability of nutritious food. Based on the number of toddlers with nutritional status issues as measured by the weight-for-height (WFH) indicator, NTB still has a significant number of affected toddlers, making innovative nutrition interventions based on local foods necessary. The development of the functional food MORIJAWA (*Moringa oleifera*, corn, and swallow's nest) is one potential approach to support improvements in the nutritional status of toddlers and pregnant women.

Current supplementation programs often rely on processed products that are not suited to the local cultural and economic context. An alternative solution involves developing functional foods from available local resources that are nutritious and acceptable to the community, especially for toddlers and pregnant women. *Moringa oleifera* is a nutrient-rich plant containing high levels of protein, vitamins A and C, iron, and antioxidants, which are beneficial for the growth and immune systems of infants (Arise et al., 2014; Ashour et al., 2020; Azra, 2024; Budiastuti, 2024; Budury et al., 2022; Embuai & Siauta, 2022; Febrianti et al., 2024; Haq, 2022; Sakung, 2024; Silva et al., 2022; Study et al., 2025). Corn provides carbohydrates, high energy, and improves food intake (Indriyani et al., 2023; Mansur, 2020; Putu Ayu Sri Devi et al., 2023; Sebagai et al., 2017). Swallow nests contain bioactive proteins and essential amino acids, which support cell growth and tissue repair jaringan (Armitage-Chan & May, 2018; Dewi, 2020; Flynn, 2019; Hamil et al., 2024; Putriyani et al., n.d.; Rossi et al., 2006; Sirenden et al., 2018; Utomo et al., 2018; Whiffin et al., 2022). This combination creates a functional food that meets the nutritional needs of stunted toddlers and pregnant women while providing additional health benefits.

Research on the functional use of *Moringa oleifera*, corn, and swiftlet nests for stunted toddlers and pregnant women remains limited, with few studies addressing formulation, nutritional value, and their impact on improving the nutritional status of toddlers and pregnant women. Additionally, there are gaps in understanding regarding product acceptance, ease of processing, and community sustainability that require further investigation. Given these issues, this study is important for developing MORIJAWA-based functional foods (*Moringa oleifera*, corn, and swiftlet nests) as a local food innovation with the potential to support improvements in the nutritional status of stunted toddlers. This development is expected not only to contribute to efforts to combat stunting but also to promote food self-sufficiency, the utilization of local resources, and the strengthening of sustainable and context-specific nutrition interventions tailored to community needs.

METHOD

This study offers a problem-solving approach through the development of functional foods based on MORIJAWA (*Moringa oleifera*, corn, and swiftlet nests) as an innovative and context-specific solution. Research Methodology: This study adopts an R&D (Research and Development) methodology, focusing on the development of MORIJAWA-based functional foods (*Moringa oleifera*, corn, and swiftlet nest) to improve the nutritional status of toddlers and pregnant women. This study involved 200 participants consisting of toddlers and pregnant women. The intervention involved the use of MORIJAWA Cookies a functional food made from moringa leaves (*Moringa oleifera*), corn, and swallow nests for 8 weeks. Anthropometric measurements were taken before and after the intervention to evaluate changes in the participants' nutritional status.

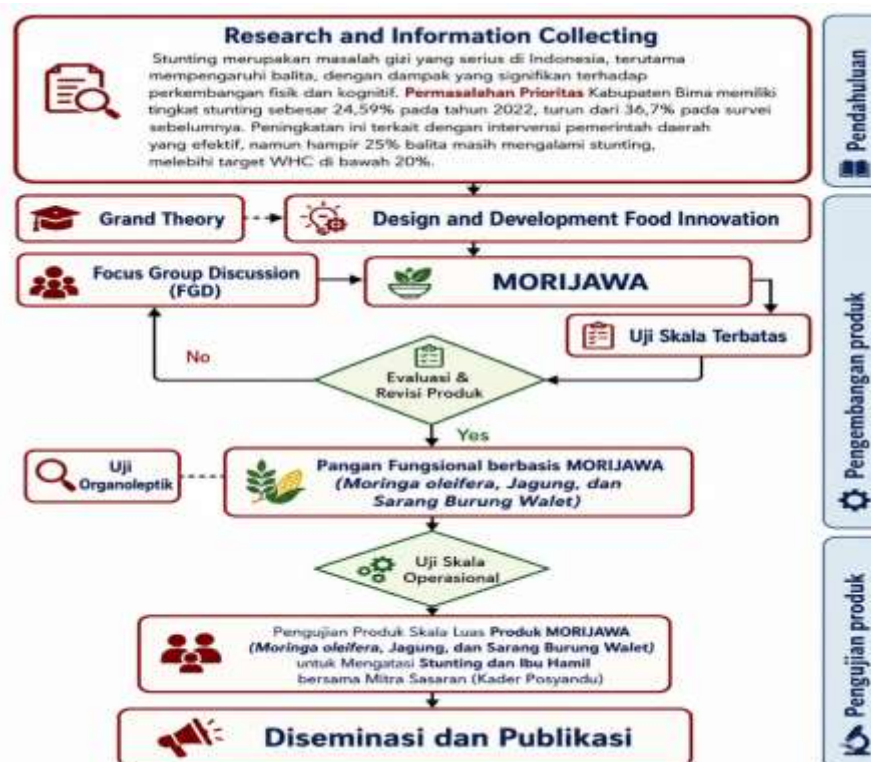


Figure 3. Research and Development (R&D) Research Procedure
Table 1.

Distribution of Participant Characteristics

Kelompok Responden	f	%
Toddlers	100	50
Pregnant women	100	50

This study involved 200 participants, consisting of 100 toddlers and 100 pregnant women. Data were collected through an organoleptic test of MORIJAWA Cookies and an assessment of nutritional status using anthropometric measurements. The organoleptic data were analyzed using descriptive statistics, while the nutritional status data and the factors influencing improvements in nutritional status were analyzed using Structural Equation Modeling (SEM) with the SmartPLS approach.

RESULT

Research on developing functional foods from MORIJAWA (*Moringa oleifera*, Corn, and Swallow's Nest) aims to improve the nutritional status of toddlers and pregnant women by utilizing locally sourced foods. This initiative addresses issues like stunting and anemia, linking to the Strategic Issues Framework by promoting sustainable, local solutions to public health challenges. The study seeks to enhance nutritional awareness among mothers and encourage healthier eating behaviors, while also equipping families and communities to effectively use local food resources, fostering a model for applicable nutritional interventions tailored to specific community contexts.

In the long term, the implementation of MORIJAWA-based functional foods is expected to contribute to the sustainable improvement of the nutritional status of toddlers and pregnant women, as reflected in improved growth and health indicators for mothers and children. This approach is expected to support the accelerated reduction of stunting and other nutritional problems, while strengthening household food security and community self-reliance. Globally, this research aligns with the achievement of the Sustainable Development Goals (SDGs), particularly SDG 2 (Zero Hunger) through the strengthening of food security and nutrition, SDG 3 (Good Health and Well-being) through the improvement of maternal and child health, and SDG 12 (Responsible Consumption and Production) through the optimization of the sustainable use of local foods (Aliyu et al., 2021; Djekic et al., 2021; McCowan & McCowan, 2019). Furthermore, this approach is expected to evolve into a local-food-based nutrition intervention model that can be replicated in

various regions and serve as a reference in the formulation of policies and nutrition programs oriented toward long-term public health development.

Results of the MORIJAWA Product Development

Research activities focused on scaling up the production of MORIJAWA Cookies, following a successful initial prototype. The process involved standardizing manufacturing stages from raw material preparation to packaging to ensure consistent product quality. Parameters such as production efficiency, dough homogeneity, and cookie stability were monitored. The final product features a natural green color from moringa leaf flour, a crisp texture, and various toppings for visual appeal. Results indicate that MORIJAWA Cookies can be consistently produced on a larger scale while maintaining high quality.



Figure 4. Small-Scale and Large-Scale Product Development

Table 2.
Results of the Organoleptic Test Evaluation by Panelists (Nutrition Faculty and Students)

Panelist	Color	Aroma	Taste	Texture	Overall
P1	5	4	5	5	5
P2	4	4	5	4	5
P3	5	5	5	5	5
P4	4	4	4	4	4
P5	5	4	5	5	5
P6	4	4	4	4	4
P7	5	5	5	5	5
P8	4	4	4	5	4
P9	5	4	5	4	5
P10	4	4	4	4	4
P11	5	5	5	5	5
P12	4	4	4	4	4
P13	5	5	5	5	5
P14	4	4	4	4	4
P15	5	4	5	5	5
P16	4	4	4	4	4
P17	5	5	5	5	5
P18	4	4	4	4	4
P19	5	4	5	5	5
P20	4	4	4	4	4
P21	5	5	5	5	5
P22	4	4	4	4	4
P23	5	4	5	5	5
P24	4	4	4	4	4
P25	5	5	5	5	5
P26	4	4	4	5	5
P27	5	5	5	5	5
P28	4	3	4	4	4
P29	5	4	5	5	5
P30	4	4	4	4	4

Organoleptic testing was performed on the MORIJAWA Cookies prototype, which includes moringa leaf flour, corn, and swiftlet nests, to assess consumer acceptance. Thirty untrained panelists, consisting of college students and members of the public, evaluated five sensory attributes color, aroma, taste, texture, and overall acceptability using a 1–5 hedonic scale.

Table 3.
Results of the Descriptive Analysis

Parameters	Mean	SD	Median	Min.	Max.	Category
Color	4,50	0,51	5	4	5	Very Liked
Aroma	4,23	0,50	4	3	5	Liked
Flavor	4,53	0,51	5	4	5	Very Liked
Texture	4,53	0,51	5	4	5	Very Liked
Overall	4,57	0,50	5	4	5	Very Liked

The coefficient of variation (CV) was below 15% for all attributes, suggesting that the panelists' evaluations were homogeneous with no significant differences in their perceptions of the product's sensory quality.

Table 4.
Distribution of Panelists' Preference Levels

Parameters	Score 3	Score 4	Score 5
Color	0 (0%)	15 (50,0%)	15 (50,0%)
Aroma	1 (3,3%)	21 (70,0%)	8 (26,7%)
Flavor	0 (0%)	14 (46,7%)	16 (53,3%)
Texture	0 (0%)	14 (46,7%)	16 (53,3%)
Overall	0 (0%)	13 (43,3%)	17 (56,7%)

Results of the MORIJAWA Functional Food Treatment

A study involving 100 toddlers who consumed MORIJAWA Cookies for 8 weeks indicated an improvement in growth indicators based on anthropometric measurements.

Table 5.
Changes in the Anthropometric Measurements of Toddlers Before and After the MORIJAWA Intervention (n=100)

Parameters	Pre-test (Mean $\pm$ SD)	Post-test (Mean $\pm$ SD)	Changes	p-value
Age (months)	33,2 $\pm$ 14,6	33,2 $\pm$ 14,6	-	-
Weight (kg)	10,7 $\pm$ 2,8	12,0 $\pm$ 3,0	+1,3	<0,001
Height (cm)	86,8 $\pm$ 12,5	89,6 $\pm$ 12,9	+2,8	0,002
BB/U Z-score	-1,18 $\pm$ 1,12	-0,56 $\pm$ 1,04	+0,62	<0,001
TB/U Z-score	-1,72 $\pm$ 1,38	-1,15 $\pm$ 1,26	+0,57	0,001
BB/TB Z-score	-0,68 $\pm$ 1,01	-0,27 $\pm$ 0,94	+0,41	0,003

Based on the results of the paired t-test, there was a significant difference between anthropometric measurements before and after the MORIJAWA Cookies intervention ($p < 0.05$). The average weight gain of 1.3 kg indicates an improvement in the energy status and nutritional adequacy of toddlers during the intervention period.

Table 6.
Distribution of Under-Five Children's Nutritional Status Before and After the Intervention (n=100)

Nutritional Status Categories	Pre-test n (%)	Post-test n (%)
Normal	59 (59%)	78 (78%)
Stunting	25 (25%)	15 (15%)
Underweight	11 (11%)	6 (6%)
Wasting	5 (5%)	1 (1%)

The study indicated an increase in toddlers with normal nutritional status from 59% to 78% and a decrease in stunting prevalence from 25% to 15% following the intervention. This suggests that MORIJAWA Cookies contribute to improved growth in toddlers by supplying essential nutrients from moringa leaves.

Table 7.
Changes in the Anthropometric Measurements of Pregnant Women Before and After the MORIJAWA Intervention

Paramete	Pre-test	Post-test	Changes	p-value
Body weight (kg)	54,8 ± 8,6	58,2 ± 8,9	+3,4	0,001
IMT	21,6 ± 3,2	22,9 ± 3,4	+1,3	0,002
LILA (cm)	23,4 ± 2,8	25,1 ± 2,9	+1,7	0,000

The statistical analysis revealed significant improvements in anthropometric indicators for pregnant women after the MORIJAWA Cookies intervention ($p < 0.05$). Notably, LILA increased by 1.7 cm, suggesting enhanced energy reserves and a lower risk of acute malnutrition. The proportion of women with normal nutritional status rose from 64% to 86%, while acute malnutrition prevalence dropped from 30% to 12%.

Table 8.
Distribution of Nutritional Status Among Pregnant Women Before and After the Intervention

Nutritional Status	Pre-test f (%)	Post-test f (%)
Normal	32 (64%)	43 (86%)
KEK	15 (30%)	6 (12%)
Overweight	3 (6%)	1 (2%)

The research team launched MORIJAWA Cookies, a functional food aimed at pregnant women, seeking feedback on its qualities. Distribution included details on ingredient benefits and the product's nutritional value. Participants provided positive feedback on taste, aroma, texture, serving size, and packaging, which will assist in refinement. The event received support from health workers and Posyandu cadres, improved knowledge of pregnancy nutrition, and strengthened collaboration for MORIJAWA's development, documented with photographs and notes.

Results of the Smart-PLS Analysis

The results of the Smart-PLS analysis were used to assess public acceptance of the Morijawa product, which was developed to improve the nutritional status of toddlers and pregnant women.

Tabel 9.
Outer Loading

Karakteristik Produk MORIJAWA	Organoleptic Quality	Intended Use	Perceived Benefits	Potential for Implementation
KO1	0.848			
KO2	0.818			
KO3	0.840			
KO4	0.811			
KO5	0.833			
KP1	0.821			
KP2	0.823			
KP3	0.813			
KP4	0.789			
KP5	0.815			
NK1		0.837		
NK2		0.846		
NK3		0.836		
NK4		0.841		
PI1				0.805
PI2				0.853
PI3				0.846
PI4				0.833
PM1			0.834	
PM2			0.844	
PM3			0.818	
PM4			0.803	

The outer loading analysis revealed that all constructs' indicators exceeded the 0.70 threshold, ranging from 0.789 to 0.853, indicating adequate explanation of the latent constructs and

confirming convergent validity. No indicators were eliminated. Specifically, for the MORIJAWA Product Characteristics, values ranged from 0.789 to 0.823, with KP2 (0.823) being the most representative. The Organoleptic Quality's values ranged from 0.811 to 0.848, led by KO1 (0.848). Consumption Intention indicators showed values between 0.836 and 0.846, dominated by NK2 (0.846). The Perceived Benefits construct ranged from 0.803 to 0.844, with PM2 (0.844) as the strongest descriptor. Finally, the Implementation Potential indicators had values between 0.805 and 0.853, with PI2 (0.853) contributing most. Overall, the results indicate excellent convergent validity, validating the measurement model for further analysis. See figure 5.

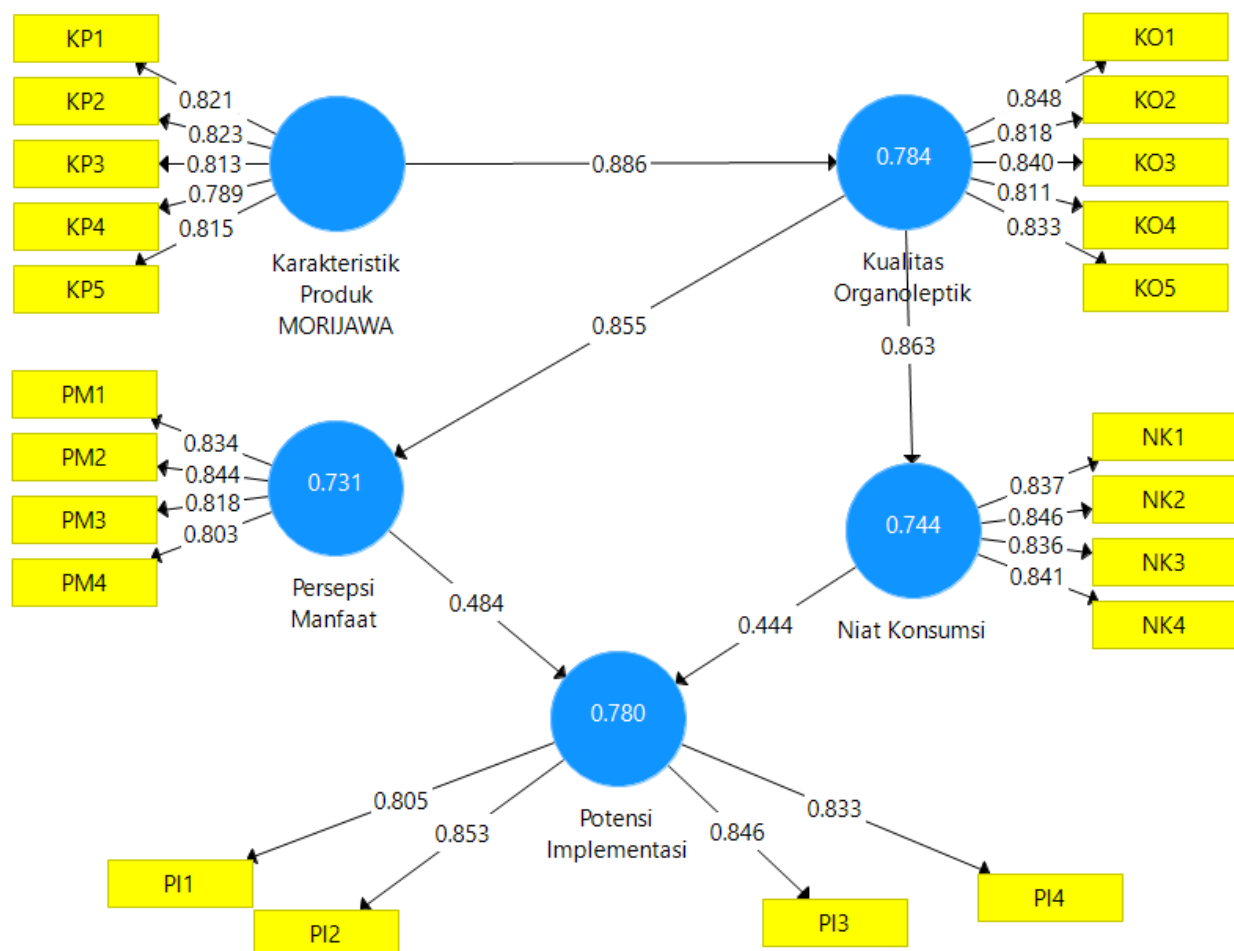


Figure 5. Results of Smart-PLS Analysis

Tabel 10.
Construct Reliability and Validity

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
MORIJAWA Product Characteristics	0.871	0.871	0.907	0.660
Organoleptic Quality	0.887	0.887	0.917	0.689
Intended Use	0.861	0.862	0.906	0.706
Perceived Benefits	0.844	0.846	0.895	0.681
MORIJAWA Product Characteristics	0.854	0.855	0.902	0.696

The Construct Reliability and Validity tests show that all constructs in the research model meet reliability and convergent validity requirements. Cronbach's Alpha values ranged from 0.844 to 0.887, and rho_A values from 0.846 to 0.887, all exceeding the 0.70 threshold. Composite Reliability values ranged from 0.895 to 0.917, confirming excellent reliability. Average Variance Extracted (AVE) values between 0.660 and 0.706 indicate that each construct explains over 50% of the variance of its indicators. The Organoleptic Quality construct had the highest reliability, while the Consumption Intention construct had the highest AVE. Overall, all constructs met the criteria

set by Hair et al. (2022), ensuring the measurement model's suitability for further structural model analysis.

Tabel 11.
Model FIT

	Saturated Model	Estimated Model
SRMR	0.046	0.064
d _{ULS}	0.530	1.034
d _G	0.393	0.497
Chi-Square	428.040	488.406
NFI	0.875	0.857

The Model Fit evaluation indicates that the research model aligns well with empirical data, with SRMR values of 0.046 (Saturated Model) and 0.064 (Estimated Model), both below the threshold of 0.08. The Normed Fit Index (NFI) values are 0.875 and 0.857, surpassing the minimum requirement of 0.80. These findings validate the PLS-SEM model, which includes constructs like MORIJAWA Product Characteristics and Consumption Intentions, allowing for further structural analysis of latent variable relationships.

Tabel 12.
Nilai *R Square*

	R Square	R Square Adjusted
Organoleptic Quality	0.784	0.783
Intention to Consume	0.744	0.743
Perceived Benefits	0.731	0.730
Potential for Implementation	0.780	0.778

The R^2 analysis indicates that the PLS-SEM model demonstrates strong predictive capability in explaining consumer perceptions of MORIJAWA functional food products. The model explains 78.4% of the variance in Organoleptic Quality ($R^2 = 0.784$), 78.0% in Implementation Potential ($R^2 = 0.780$), 74.4% in Consumption Intention ($R^2 = 0.744$), and 73.1% in Perceived Benefits ($R^2 = 0.731$). Overall, the R^2 values ranging from 0.731–0.784 confirm that the structural model has strong explanatory power, highlighting that product characteristics, sensory quality, and perceived benefits are key factors influencing the acceptance and development potential of MORIJAWA as a functional food based on moringa, corn, and swiftlet nest.

Tabel 13.
F Square (Effect Size)

	Organoleptic Quality	Intended Use	Perceived Benefits	Potential for Implementation
MORIJAWA Product Characteristics	3.633			
Organoleptic Quality		2.907	2.721	
Intended Use				0.303
Perceived Benefits				0.361

The effect size (f^2) analysis demonstrates that all structural relationships in the model have meaningful effects on endogenous constructs. The relationship between MORIJAWA Product Characteristics and Organoleptic Quality shows a very large effect ($f^2 = 3.633$), followed by Organoleptic Quality on Consumption Intention ($f^2 = 2.907$) and Perceived Benefits ($f^2 = 2.721$), indicating that sensory attributes strongly influence consumer acceptance and perceived value. Meanwhile, Consumption Intention and Perceived Benefits contribute to Implementation Potential with moderate to large effects ($f^2 = 0.303$ and 0.361). Overall, the findings confirm that product characteristics and organoleptic quality are the dominant factors shaping consumer acceptance, perceived benefits, and the implementation potential of MORIJAWA as a functional food innovation.

Tabel 14.
Path Coefficient

	Organoleptic Quality	Intended Use	Perceived Benefits	Potential for Implementation
MORIJAVA Product Characteristics	0.886			
Organoleptic Quality		0.863	0.855	
Intended Use				0.444
Perceived Benefits				0.484

The path coefficient analysis indicates that all structural relationships in the model have positive effects, demonstrating that improvements in one construct enhance others. MORIJAWA Product Characteristics strongly influence Organoleptic Quality ($\beta = 0.886$), while Organoleptic Quality significantly affects Consumption Intention ($\beta = 0.863$) and Perceived Benefits ($\beta = 0.855$). Furthermore, Consumption Intention ($\beta = 0.444$) and Perceived Benefits ($\beta = 0.484$) positively contribute to Implementation Potential. These findings confirm that product characteristics and sensory quality are key determinants in shaping consumer acceptance, perceived functional value, and the development potential of MORIJAWA as an innovative functional food product.

Tabel 15.
Specific Indirect Effect

	Specific Indirect Effects
Karakteristik Produk MORIJAWA -> Kualitas Organoleptik -> Niat Konsumsi	0.764
Karakteristik Produk MORIJAWA -> Kualitas Organoleptik -> Persepsi Manfaat	0.757
Kualitas Organoleptik -> Niat Konsumsi -> Potensi Implementasi	0.383
Karakteristik Produk MORIJAWA -> Kualitas Organoleptik -> Niat Konsumsi -> Potensi Implementasi	0.339
Kualitas Organoleptik -> Persepsi Manfaat -> Potensi Implementasi	0.414
Karakteristik Produk MORIJAWA -> Kualitas Organoleptik -> Persepsi Manfaat -> Potensi Implementasi	0.366

The Specific Indirect Effect analysis reveals strong mediation mechanisms among MORIJAWA constructs. Product Characteristics indirectly influence Consumption Intention ($\beta = 0.764$) and Perceived Benefits ($\beta = 0.757$) through Organoleptic Quality, indicating that sensory attributes act as key mediators in shaping consumer responses. Furthermore, Organoleptic Quality affects Implementation Potential through Consumption Intention ($\beta = 0.383$) and Perceived Benefits ($\beta = 0.414$). The serial mediation pathways involving Product Characteristics, Organoleptic Quality, Consumption Intention, and Implementation Potential ($\beta = 0.339$), as well as Product Characteristics, Organoleptic Quality, Perceived Benefits, and Implementation Potential ($\beta = 0.366$), confirm that product attributes, sensory acceptance, and perceived benefits collectively drive the adoption potential of MORIJAWA as a functional food innovation.

DISCUSSION

The analysis results indicate that MORIJAWA Product Characteristics have the strongest positive effect on Organoleptic Quality ($\beta = 0.886$). This finding suggests that intrinsic product attributes, such as color, aroma, texture, taste, and ingredient formulation, are key factors shaping consumers' perceptions of the product's sensory quality. From the perspective of Expectation-Confirmation Theory (ECT), consumers form expectations toward a product before evaluation and then compare their actual experience with those expectations. When product characteristics meet or exceed consumer expectations, the evaluation of organoleptic quality becomes more positive. Therefore, organoleptic quality is influenced not only by the physical characteristics of the product but also by the alignment between consumption experiences and consumers' initial expectations. This finding is consistent with previous studies demonstrating that sensory attributes are major determinants of functional food acceptance and significantly influence overall product quality evaluation.

In addition, Perceived Benefits also showed a very strong positive effect on Organoleptic Quality ($\beta = 0.855$). This finding indicates that perceptions of health benefits can shape more positive sensory evaluations of the product. This phenomenon explains that consumers do not evaluate functional foods solely based on taste or aroma but also consider their health value. Within the framework of the Theory of Planned Behavior (TPB), perceived benefits contribute to the formation of a positive attitude toward a product, thereby influencing the overall consumer evaluation process. Consumers who believe that MORIJAWA provides health benefits, particularly as a food product supporting stunting prevention, tend to give higher evaluations of its organoleptic quality. The relationship between Organoleptic Quality and Consumption Intention ($\beta = 0.863$) demonstrates that sensory quality is a dominant factor in shaping consumers' willingness to consume MORIJAWA. This finding supports the fundamental concept of the Theory of Planned Behavior, which states that positive attitudes toward an object increase the intention to perform a specific behavior. In this study, organoleptic quality creates positive consumption experiences, thereby increasing consumers' tendency to consume the product repeatedly.

Furthermore, Perceived Benefits directly influence Implementation Potential ($\beta = 0.484$). This finding indicates that the stronger the public's belief in the health benefits of MORIJAWA, the greater the opportunity for its application as an alternative functional food in nutritional intervention programs. From the perspective of the Theory of Planned Behavior, perceived benefits reflect the development of a positive attitude toward a product, which subsequently encourages innovation, acceptance and readiness to implement the product in daily life. Therefore, successful product implementation is not only determined by product quality itself but also by consumers' beliefs regarding the benefits obtained after consumption. The results also demonstrate that Consumption Intention positively affects Implementation Potential ($\beta = 0.444$). This finding confirms the main proposition of the Theory of Planned Behavior, which states that intention is the strongest predictor of actual behavioral engagement. In this context, the higher the community's intention to consume MORIJAWA, the greater the potential for its sustainable implementation as a functional food.

Overall, the research model demonstrates that the implementation of MORIJAWA as a functional food is not determined by a single factor but through an interconnected mechanism. Product characteristics shape organoleptic quality, which subsequently enhances consumption intention and strengthens implementation potential (Ardiyansyah et al., 2021; Erinda, 2021; Ladja et al., 2020; Rumida et al., 2023; Salsabila et al., 2022). At the same time, perceived benefits serve as a psychological factor that strengthens product evaluation and increases public readiness to adopt the product. These findings extend the application of the Theory of Planned Behavior in the context of local functional foods by demonstrating that the relationship between attitudes, intentions, and implementation is simultaneously influenced by sensory attributes and perceptions of health benefits. Therefore, the successful development of MORIJAWA is determined not only by its nutritional content and bioactive compounds but also by its ability to meet consumers' sensory expectations and establish confidence in the health benefits offered.

The organoleptic evaluation demonstrated that MORIJAWA Cookies achieved high consumer acceptance, with all sensory attributes rated from liked to highly liked. Overall acceptance received the highest score (4.57 ± 0.50), followed by taste and texture (4.53 ± 0.51), color (4.50 ± 0.51), and aroma (4.23 ± 0.50). These findings indicate that the moringa (*Moringa oleifera*), corn, and swiftlet nest formulation successfully produced a nutritious functional food that met consumer sensory preferences, highlighting its potential for sustainable consumption, particularly among pregnant women and toddlers. The high scores for taste and texture demonstrate that the MORIJAWA formulation effectively overcomes the characteristic flavor limitations commonly associated with moringa-based products. This achievement is important because taste is a major determinant influencing repeated consumption and adherence to functional food intake (Al., 2024; David & Borolla, 2025; Nofrida et al., 2023; Prof. Dr. rer. nat. Sajidan, M.Si. M. Noris, S.Pd. & Dr. Idam Ragil Widiyanto Atmojo, M.Si. Dr. Ari Susilowati, S.Si., M.Si. Dr. Artini Pangastuti, S.Si., M.Si Bahana Safiria Dito, S.Pi Zahra Konitah, S.Pd Mutia Dinda Lestari, S.Si Novitasari Arumaningtyas,

2025; Sutrisno et al., 2023a, 2023b). In nutritional interventions, consumption adherence plays a critical role in determining the success of supplementation programs and complementary feeding strategies for pregnant women and toddlers.

The high overall acceptance score further indicates that panelists accepted the product after evaluating all sensory attributes collectively. This finding supports the concept of Consumer Acceptance of Functional Foods, which emphasizes that the success of functional foods is determined not only by nutritional content but also by consumer acceptance of sensory characteristics [60]–[66]. Therefore, MORIJAWA has greater potential to be adopted as a local food-based complementary food alternative. From a public health perspective, these findings have important implications for improving the nutritional status of pregnant women and toddlers. Moringa leaves contain protein, vitamins A and C, calcium, iron, folate, and antioxidant compounds that contribute to fetal and child growth and development (Aekthammarat et al., 2020; Cahyaningsih et al., n.d.-a, n.d.-b; Dwi et al., 2025, 2025; Essa et al., 2014; Hasan Basri, Veni Hadju, Andi Zulkifli, Aminuddin Syam, 2021; Riniasih et al., 2023; Rohmawati et al., 2023; Srianjani et al., 2023). Corn provides complex carbohydrates as an energy source while swiftlet nest contributes protein and essential amino acids that may enhance the nutritional value of the product (Arifin et al., 2021a, 2021b; Mashur et al., 2021; Nengsih et al., 2019; Nihayah et al., 2024; Novita et al., 2022, 2022; Putu Ayu Sri Devi et al., 2023; Warnita & Aisman, 2017; Wibowo & Ilmi, 2021). The combination of these three ingredients produces a functional food with potential to support macro- and micronutrient requirements among vulnerable populations.

For pregnant women, adequate intake of energy, protein, iron, folate, vitamin A, and other micronutrients is essential to support fetal growth and prevent chronic energy deficiency, anemia, low birth weight, and intrauterine growth restriction (Darmin & Noris, 2023; Firmansyah et al., 2024; Hamil et al., 2024; Nilakesuma et al., n.d.; Noris, 2025; A. D. Putri & Maulidia, 2024; Risky et al., 2022; Sulistyorini, 2011; Sutrisno et al., 2023b; Syamsuadi et al., 2023; Ulfa et al., 2024; Yanto et al., 2024). Meanwhile, for toddlers, sufficient energy and protein intake during the first 1,000 days of life is crucial for supporting linear growth, brain development, immune function, and stunting prevention (Fitriahadi et al., 2023; Mentari, 2020; Priyono, 2020; Rosianti et al., 2022; Sriyanah & Efendi, 2022; Sutrisno et al., 2023a, 2023b; Waroh, 2019). Therefore, functional foods with good nutritional quality and high sensory acceptance, such as MORIJAWA, have the potential to contribute to food diversification strategies supporting nutritional interventions for both groups. However, these findings do not indicate that MORIJAWA consumption directly improves the nutritional status of pregnant women or toddlers, as this study only evaluated product development and sensory acceptance aspects. Nevertheless, the high product acceptance demonstrates that MORIJAWA has strong implementation potential as a local food-based complementary food. Products with high consumer acceptance tend to have greater consumption frequency, thereby increasing the opportunity to contribute to nutrient adequacy when consumed regularly as part of a balanced diet (Sukanty et al., 2023).

These findings support the recommendations of the World Health Organization (WHO, 2023) and UNICEF (2023), which emphasize that successful stunting reduction interventions depend not only on the availability of nutritious foods but also on acceptability, sustainable consumption, and the utilization of locally appropriate food sources. Thus, MORIJAWA shows promising prospects as a local functional food innovation to support stunting prevention programs through improved dietary quality among pregnant women and toddlers, although its effectiveness in improving nutritional status requires further validation through intervention studies or clinical trials among target populations.

CONCLUSION

This study successfully developed MORIJAWA Cookies, a functional food based on Moringa oleifera, corn, and swiftlet nest, with high organoleptic acceptance and significant improvements in the nutritional status of 100 toddlers and 100 pregnant women ($p < 0.05$). The PLS-SEM results showed that Product Characteristics strongly influenced Organoleptic Quality ($\beta = 0.886$), which subsequently enhanced Consumption Intention ($\beta = 0.863$) and Perceived Benefits ($\beta = 0.855$). These findings highlight the potential of MORIJAWA Cookies as a locally based functional food to support nutrition improvement programs, although further long-term intervention and biomarker studies are needed.

REFERENCES

- Aekthamarat, D., Tangsucharit, P., Pannangpetch, P., Sriwantana, T., & Sibmooh, N. (2020). Moringa oleifera leaf extract enhances endothelial nitric oxide production leading to relaxation of resistance artery and lowering of arterial blood pressure. *Biomedicine and Pharmacotherapy*, 130(August), 110605. <https://doi.org/10.1016/j.biopha.2020.110605>
- Aliyu, U. S., Ozdeser, H., Çavuşoğlu, B., & Usman, M. A. M. (2021). Food security sustainability: A synthesis of the current concepts and empirical approaches for meeting SDGs. *Sustainability (Switzerland)*, 13(21). <https://doi.org/10.3390/su132111728>
- Ardiyansyah, S., Atma, C. D., Agustin, A. L. D., & Tirtasari, K. (2021). Uji Organoleptik dan Tingkat Keasaman Susu Kuda Liar di Desa Penyaring Kecamatan Moyo Utara Kabupaten Sumbawa. In *Mandalika Veterinary Journal* (Vol. 1, Issue 2, p. 7). LPPM IKIP Mataram. <https://doi.org/10.33394/mvj.v1i2.4295>
- Arifin, Z., Sasmito, C., & Gunawana, C. I. (2021a). PEMBERDAYAAN PETANI JERUK MELALUI BADAN USAHA MILIK DESA UNTUK MENINGKATKAN PENDAPATAN MASYARAKAT (Desa Sumbersekar, Kecamatan Dau, Kabupaten Malang). In *J-Dinamika : Jurnal Pengabdian Masyarakat* (Vol. 6, Issue 1, pp. 193–204). Politeknik Negeri Jember. <https://doi.org/10.25047/jdinamika.v6i1.2522>
- Arifin, Z., Sasmito, C., & Gunawana, C. I. (2021b). Pemberdayaan Petani Jeruk Melalui Badan Usaha Milik Desa Untuk Meningkatkan Pendapatan Masyarakat Desa Sumbersekar, Kecamatan Dau, Kabupaten Malang. In *J-Dinamika : Jurnal Pengabdian Masyarakat* (Vol. 6, Issue 1, pp. 186–194). Politeknik Negeri Jember. <https://doi.org/10.25047/jdinamika.v6i1.2522>
- Arise, A. K., Arise, R. O., Sanusi, M. O., Esan, O. T., & Oyeyinka, S. A. (2014). Effect of Moringa oleifera flower fortification on the nutritional quality and sensory properties of weaning food. *Croat. J. Food Sci. Technol*, 6, 65–71.
- Armitage-Chan, E., & May, S. A. (2018). Identity, environment and mental wellbeing in the veterinary profession. *Veterinary Record*, 183(2), 68. <https://doi.org/10.1136/vr.104724>
- Ashour, E. A., El-Kholy, M. S., Alagawany, M., El-Hack, M. E. A., Mohamed, L. A., Taha, A. E., Sheikh, A. I. E., Laudadio, V., & Tufarelli, V. (2020). Effect of dietary supplementation with moringa oleifera leaves and/or seeds powder on production, egg characteristics, hatchability and blood chemistry of laying Japanese quails. *Sustainability (Switzerland)*, 12(6), 1–9. <https://doi.org/10.3390/su12062463>
- Azra, J. M. (2024). Pelatihan Pengolahan Pangan Lokal untuk Balita Berbasis Singkong dan Daun Kelor di Desa Cibatok II Kabupaten Bogor. *Abdi: Jurnal Pengabdian Dan Pemberdayaan Masyarakat*, 6(3), 580–586.
- Budiastuti, R. F. (2024). Upaya Peningkatan Status Gizi Balita Untuk Pencegahan Stunting Melalui Pemberdayaan Kader Posyandu Dengan Nutrasetikal Daun Kelor (Moringa Oleifera). *Jurnal Kreativitas Pengabdian Kepada Masyarakat (PKM)*, 7(2), 706–721.
- Budury, S., Purwanti, N., & Fitriyari, A. (2022). Edukasi tentang Stunting dan Pemanfaatan Puding Daun Kelor dalam Mencegah Stunting. In *JURNAL KREATIVITAS PENGABDIAN KEPADA MASYARAKAT (PKM)* (Vol. 5, Issue 10, pp. 3242–3249). Universitas Malahayati Bandar Lampung. <https://doi.org/10.33024/jkpm.v5i10.6896>

- Byna, A. (2020). MONOGRAF ANALISIS KOMPARATIF MACHINE LEARNING UNTUK KLASIFIKASI KEJADIAN STUNTING. Center for Open Science. <https://doi.org/10.31237/osf.io/dtcz>
- Cahyaningsih, O., Trihastuti, O., & Retnaningrum, D. (n.d.-a). The Utilization of Moringa Leaves (*Moringa Oleifera*) as a Nutritional Supplement in Preventing Stunting in Toddlers : Nutrition Study and the Impact of Routine. Proceedings of International Conference on Health Science, Practice, and Education The, 956–968.
- Cahyaningsih, O., Trihastuti, O., & Retnaningrum, D. (n.d.-b). The Utilization of Moringa Leaves (*Moringa Oleifera*) as a Nutritional Supplement in Preventing Stunting in Toddlers : Nutrition Study and the Impact of Routine. 956–968.
- Childhood Stunting, Wasting, and Obesity, as the Critical Global Health Issues: Forging Cross-Sectoral Solutions. (2020). Masters Program in Public Health, Universitas Sebelas Maret. <https://doi.org/10.26911/the6thicph>
- Danaei, G., Andrews, K. G., Sudfeld, C. R., Fink, G., McCoy, D. C., Peet, E., Sania, A., Smith Fawzi, M. C., Ezzati, M., & Fawzi, W. W. (2016). Risk Factors for Childhood Stunting in 137 Developing Countries: A Comparative Risk Assessment Analysis at Global, Regional, and Country Levels. *PLOS Medicine*, 13(11), e1002164. <https://doi.org/10.1371/journal.pmed.1002164>
- Darmin, Walliyudin, Gufran, Alkhair, M. Noris, Muammar Iksan, Dea Zara Avila, Nur Husnul Khatimah, M. F. (2023). Risiko Pernikahan Dini dan Konvergensi Pencegahan Stunting Pada Remaja di Desa Karampi Kecamatan Langgudu Kabupaten Bima. *Jurnal Pengabdian Kepada Masyarakat Nusantara (JPkMN)*, 4(3), 2395–2400.
- Darmin, Walliyudin, Gufran, Muh. Fitrah, M. Noris, Adnan, A. (2023). Edukasi Anti-Narkoba dan Penyuluhan Hukum Bagi Remaja di Desa Kerampi Kecamatan Langgudu Kabupaten Bima. *Jurnal Pengabdian Kepada Masyarakat Nusantara (JPkMN)*, 4(3), 2436–2443.
- Darmin. (2024). Determinan Tinggi Badan Lahir Dan Prevalensi Wasting Pada Anak Usia 12-59 Bulan Di Desa Karampi, Kecamatan Langgudu, Kabupaten Bima, Nusa Tenggara Barat. *Prepotif : Jurnal Kesehatan Masyarakat*, 8(3), 6006–6013.
- Darmin, D., Alkhair, A., Avila, D. Z., Khatimah, N. H., & Noris, M. (2023). Hubungan Aktivitas Pertanian Ibu Dengan Kejadian Stunting Pada Anak Usia 2-5 Tahun Di Desa Sai. In *Prepotif : Jurnal Kesehatan Masyarakat* (Vol. 7, Issue 3, pp. 16397–16405). Universitas Pahlawan Tuanku Tambusai. <https://doi.org/10.31004/prepotif.v7i3.20475>
- Darmin, D., Faujiah, N., Arini, A., Rhosmiati, R., Lestari, E. P., & Noris, M. (2025). Pemanfaatan Pangan Fungsional Lokal Sebagai Makanan Tambahan Dan Edukasi Tentang Gizi Pada Masyarakat Di Wilayah Kerja Puskesmas Kolo. *Taroa: Jurnal Pengabdian Masyarakat*, 4(2), 171–179. <https://doi.org/10.52266/taroa.v4i2.4209>
- Darmin, D., & Noris, M. (2023). Hubungan Pemberian Bantuan Sosial Dan Pemberian Asi Eksklusif Terhadap Status Gizi Balita. *Prepotif : Jurnal Kesehatan Masyarakat*, 7(3), 16106–16113. <https://doi.org/10.31004/prepotif.v7i3.18163>
- David, H., & Borolla, J. (2025). Penyuluhan dan Pelatihan Pembuatan Pudding Daun Kelor sebagai Inovasi Pangan Bernutrisi bagi Masyarakat Desa Bintana Counseling and Training on Making Moringa Leaf Pudding as a Nutritious Food Innovation for the Community Bintana Village. *Solusi Bersama : Jurnal Pengabdian Dan Kesejahteraan Masyarakat*, 2(1), 136–142.
- Dewi, M. E. (2020). Manfaat Konsumsi Sarang Burung Walet Benefits Of Edible Bird Nest Consumption Mega. *S ISSN*, 9(1), 12–16.
- Djekic, I., Batlle-Bayer, L., Bala, A., Fullana-I-palmer, P., & Jambrak, A. R. (2021). Role of the food supply chain stakeholders in achieving un sdgs. *Sustainability (Switzerland)*, 13(16). <https://doi.org/10.3390/su13169095>
- Dwi, N., Budiono, P., Faqihatus, D., & Has, S. (2025). The effectiveness of moringa leaves extract to prevent stunting at toddlers aged 23-59 months. 13(1).
- Embuai, S., & Siauta, M. (2022). Pengembangan Produk Daun Kelor Melalui Fortifikasi Dalam Upaya Penanganan Stunting. In *Moluccas Health Journal* (Vol. 2, Issue 3). Universitas Kristen Indonesia Maluku. <https://doi.org/10.54639/mhj.v2i3.718>

- Erinda, S. (2021). Uji Organoleptik Pemanfaatan Garam dan Abu Dapur terhadap Detoksifikasi Umbi Gadung (*Dioscorea Hispida* Dennst) dalam Pembuatan Tepung. *Jurnal Sosial Dan Sains*. <http://sosains.greenvest.co.id/index.php/sosains/article/view/182>
- Essa, M. M., Subash, S., Parvathy, S., Meera, A., Guillemain, G. J., Memon, M. A., & Manivasagam, T. (2014). Brain health benefits of *Moringa oleifera*. *Food and Brain Health*, 2, 113–118.
- Fauziah, J., Trisnawati, K. D., Rini, K. P. S., & ... (2024). Stunting: Penyebab, gejala, dan pencegahan. *Jurnal Parenting Dan* <https://edu.pubmedia.id/index.php/jpa/article/view/220>
- Febrianti, N., Mukaromah, L., D, F. N. R., & Mariasih, N. K. (2024). Pemberdayaan kader posyandu melalui diversifikasi pangan lokal pada ibu. *SELAPARANG: Jurnal Pengabdian Masyarakat Berkemajuan*, 8(September), 2908–2914.
- Firmansyah, M., Noris, M., Iksan, M., & Bunda, H. (2024). Upaya Pemeriksaan Tekanan Darah Melalui Program Pelayanan Kesehatan Gratis Di Amahami , Kota Bima , Ntb Blood Pressure Screening Efforts Through The Free Health Service Program In Amahami , Bima City , NTB. *Journal of Excellence, Humanities and Religiosity*, 1(1), 100–109.
- Fitriahadi, E., Suparman, Y. A., Silvia, W. T. A., G, K. W., Syahputra, A. F., Indriyani, A., Ramadhani, I. W., Lestari, P., & Asmara, R. F. (2023). Meningkatkan Pengetahuan dan Kesadaran Tentang Stunting Sebagai Upaya Pencegahan Terjadinya Stunting. In *Jurnal Masyarakat Madani Indonesia* (Vol. 2, Issue 4, pp. 410–415). Alesha Media Digital. <https://doi.org/10.59025/js.v2i4.154>
- Flynn, S. (2019). Rethinking debates in narrative methods: Narrative orthodoxy and research challenges with children with intellectual disability. *Scandinavian Journal of Disability Research*, 21(1), 167–176. <https://doi.org/10.16993/sjdr.613>
- Hairunnisah, Suminah, B. W. (2025). Hubungan asupan protein dan keragaman pangan dengan kejadian underweight pada balita usia 12-59 bulan di Kabupaten Bima The. *SAGO: Gizi Dan Kesehatan*, 6(1), 221–228.
- Hamil, I. B. U., Desa, D. I., & Bima, W. K. A. B. (2024). BURUNG WALET UNTUK MENCEGAH STUNTING PADA. 8, 5794–5802.
- Haq, T. U. (2022). Pengembangan Nutrasetikal Es Krim Daun Kelor (*Moringa oleifera* L.) Development of Nutraceutical Ice Creams Using Moringa Leaf (*Moringa oleifera* L.). *Jurnal Kefarmasian Indonesia*, 2022(2), 163–169. <https://doi.org/10.224>
- Hasan Basri, Veni Hadju, Andi Zulkifli, Aminuddin Syam, R. I. (2021). Effect of *Moringa oleifera* supplementation during pregnancy on the prevention of stunted growth in children between the ages of 36 to 42 months. *Journal of Public Health Research*, 10, 290–295.
- Hidayat, R. (2022). Prevalensi Stunting Pada 1000 Hari Pertama Kehidupan. In *JOURNAL OF BAJA HEALTH SCIENCE* (Vol. 2, Issue 1, pp. 61–77). Universitas Banten Jaya. <https://doi.org/10.47080/joubahs.v2i01.1903>
- Indriati, M. (2023). Peningkatan Kapasitas Kader Posyandu Dalam Mendeteksi Dan Mencegah Stunting. In *Jurnal Abdi Masada* (Vol. 4, Issue 1, pp. 1–4). STIKes Dharma Husada Bandung. <https://doi.org/10.38037/am.v4i1.66>
- Indriyani, R., Novika, Y., Lupiana, M., & Wahyuni, E. S. (2023). Kajian Camilan Tortilla Chips dari Formulasi Tepung Jagung dan Tempe untuk Pencegahan Stunting. In *Amerta Nutrition* (Vol. 7, Issue 3, pp. 358–364). Universitas Airlangga. <https://doi.org/10.20473/amnt.v7i3.2023.358-364>
- Ladja, T., Sulistijowati, R., & Harmain, R. M. (2020). Mutu Ikan Nila (*Oreochromis Niloticus*) Segar Secara Organoleptik Yang Diawetkan Menggunakan Larutan Daun Matoa (*Pometia Pinnata*). In *Jambura Fish Processing Journal* (Vol. 1, Issue 2, pp. 46–51). Universitas Negeri Gorontalo. <https://doi.org/10.37905/jfpj.v1i2.5428>
- Mansur, A. (2020). Pembuatan Pasta Spagetti dengan Menggunakan Tepung Jagung (*Zea Mays Saccharata*) Lokal sebagai Substitusi Tepung Terigu Dilihat dari Aspek Kandungan Gizi Vitamin. *Gemawisata: Jurnal Ilmiah Pariwisata*, 16(2), 94–103.
- Mashur, M., Subagio, S., Hamid, G., & Oktaviana, D. (2021). Pemberdayaan Masyarakat Desa Taman Ayu Melalui Inovasi Teknologi Sistem Integrasi Jagung Dan Sapi (Sijasa). In *Sasambo: Jurnal Abdimas (Journal of Community Service)* (Vol. 3, Issue 2, pp. 57–69).

- Lembaga Penelitian dan Pemberdayaan Masyarakat - LITPAM.
<https://doi.org/10.36312/sasambo.v3i2.422>
- McCowan, T., & McCowan, T. (2019). Impact on the SDGs. Higher Education for and beyond the Sustainable Development Goals, 211–248.
- Mentari, T. S. (2020). Pola Asuh Balita Stunting Usia 24-59 Bulan. *Higeia Journal of Public Health Research and Development*, 4(4), 84–94. <http://journal.unnes.ac.id/sju/index.php/higeia>
- Mustakim, M. R. D., Irawan, R., Irmawati, M., & ... (2022). Impact of stunting on development of children between 1-3 years of age. *Ethiopian Journal of*
<https://www.ajol.info/index.php/ejhs/article/view/226231>
- Nengsih, Y., Hartawan, R., & Marpaung, R. (2019). Meningkatkan Pola Pangan Harapan Masyarakat Desa Betung Melalui Pemberdayaan Masyarakat. In *Sakai Sambayan Jurnal Pengabdian kepada Masyarakat* (Vol. 3, Issue 2, p. 18). Lembaga Penelitian dan Pengabdian kepada Masyarakat Universitas Lampung. <https://doi.org/10.23960/jss.v3i2.107>
- Nihayah, A. N., Rahmayani, D., Marpaung, G. N., & Ayuntavia, A. (2024). Uni.Corn: Membangun Desa Mandiri Melalui Pemberdayaan Masyarakat Berbasis Kearifan Lokal Untuk Meningkatkan Perekonomian Desa Jragung. In *Kumawula: Jurnal Pengabdian Kepada Masyarakat* (Vol. 7, Issue 1, p. 212). Universitas Padjadjaran.
<https://doi.org/10.24198/kumawula.v7i1.51316>
- Nilakesuma, A., Jurnal, Y. D., & Rusjdi, S. R. (n.d.). Hubungan Status Gizi Bayi dengan Pemberian ASI Eksklusif, Tingkat Pendidikan Ibu dan Status Ekonomi Keluarga di Wilayah Kerja Puskesmas Padang Pasir. 4(1), 37–44.
- Nofrida, R., Rahayu, N., Zainuri, Z., & Saputra, I. K. (2023). Puding Kedelai Porang Instan dengan fortifikasi tepung daun kelor Sebagai Pangan Fungsional Pencegah Stunting. In *Pro Food* (Vol. 9, Issue 1, pp. 58–67). Universitas Mataram. <https://doi.org/10.29303/profood.v9i1.320>
- Noris, M. et al. (2025). Pemanfaatan Pangan Fungsional Lokal Sebagai Makanan Tambahan Dan Edukasi Tentang Gizi Pada Masyarakat Di Wilayah Kerja Puskesmas Kolo. *Taroa: Jurnal Pengabdian Masyarakat*, 4(2), 171–179. <https://doi.org/10.52266/taroa.v4i2.4209>
- Novita, D., Roosmawarni, A., & Ulum, B. (2022). Pemberdayaan Masyarakat Pekerja Migran Melalui Produk Olahan Jagung Di Lamongan. In *Swarna: Jurnal Pengabdian Kepada Masyarakat* (Vol. 1, Issue 3, pp. 166–170). LPPM Institut Pendidikan Nusantara Global.
<https://doi.org/10.55681/swarna.v1i3.92>
- Priyono, P. (2020). Strategi Percepatan Penurunan Stunting Perdesaan (Studi Kasus Pendampingan Aksi Cegah Stunting di Desa Banyumundu, Kabupaten Pandeglang). In *Jurnal Good Governance*. STIA LAN Jakarta. <https://doi.org/10.32834/gg.v16i2.198>
- Prof. Dr. rer. nat. Sajidan, M.Si. M. Noris, S.Pd., M. P., & Dr. Idam Ragil Widiyanto Atmojo, M.Si. Dr. Ari Susilowati, S.Si., M.Si. Dr. Artini Pangastuti, S.Si., M.Si Bahana Safiria Dito, S.Pi Zahra Konitah, S.Pd Mutia Dinda Lestari, S.Si Novitasari Arumaningtyas, S. P. (2025). Potensi Industri Bioteknologi Spirulina. In *Karya Bakti Makmur (KBM) INDONESIA* (Vol. 11, Issue 1, pp. 1–118). http://scioteca.caf.com/bitstream/handle/123456789/1091/RED2017-Eng-8ene.pdf?sequence=12&isAllowed=y%0Ahttp://dx.doi.org/10.1016/j.regsciurbeco.2008.06.005%0Ahttps://www.researchgate.net/publication/305320484_Sistem_Pembetulan_Terpusat_Strategi_Melestari
- Putri, A. D., & Maulidia, S. (2024). Pengelompokan Kejadian Stunting di Indonesia pada Tahun 2022 dan Faktor-faktor yang Memengaruhinya: Sebuah Gambaran. *Seminar Nasional Official Statistics*, 2024(1), 449–458. <https://doi.org/10.34123/semnasoffstat.v2024i1.1972>
- Putri, P. M., Shafira, A. S., & Mahardhika, G. S. (2024). Stunting Reduction Strategy In Indonesia: Maternal Knowledge Aspects. *Indonesian Journal of Public Health*, 19(2), 329–343. <https://doi.org/10.20473/ijph.v19i2.2024.329-343>
- Putriyani, H., Fitriani, S. P., & Yuniarni, U. (n.d.). Studi Literatur Potensi Sediaan Topikal Sarang Burung Walet (*Aerodramus fuciphagus*) sebagai Penyembuh Luka.
- Putu Ayu Sri Devi, Pande Made Nova Armita Sari, Ni Made Dinda Pradnya Pangesti, Ni Komang Angelina Sinta Pratiwi, & Luh Putu Citramas Pradnya Rahmasari. (2023). Potensi Daun Kelor (*Moringa oleifera* L.) Pada Olahan Makanan Populer Sebagai Antioksidan Untuk

- Meningkatkan Nilai Gizi. Prosiding Workshop Dan Seminar Nasional Farmasi, 2, 464–482. <https://doi.org/10.24843/wsnf.2022.v02.p37>
- Riniasih, W., Hapsari, W. D., & Nuur, U. A. (2023). Pengaruh Pemberian Daun Kelor Terhadap Penurunan Tekanan Darah Pada Penderita Hipertensi Lansia Selama Masa Pandemi Covid-19 Penderita Hipertensi Lansia Selama Masa Pandemi Covid-19 The Effect Of Moringa Oleifera Leaf On Blood Pressure Reduction In Elderl. May. <https://doi.org/10.34310/jskp.v8i2.491>
- Risky, S., Nofitasari, A., & Lisnawati, L. (2022). PREDISPONDING FACTOR KEJADIAN STUNTING. In (Jurnal Ilmiah Mahasiswa Kesehatan Masyarakat) (Vol. 7, Issue 4). Universitas Halu Oleo. <https://doi.org/10.37887/jimkesmas.v7i4.29201>
- Rohmawati, N., Rachmawati, S. N., Antika, R. B., & Hermilasari, R. D. (2023). TRAINING AND ASSISTANCE IN THE CREATION OF Je-Co Moringa. *Communnity Development Journal*, 4(3), 5504–5511.
- Rosianti, N., Sunarsih, S., & Banudi, L. (2022). Hubungan Pola Makan, Tinggi Badan Ibu dan Riwayat Penyakit Infeksi dengan Status Stunting pada Balita Usia 6-59 Bulan di Wilayah Pesisir Desa Manuru Kabupaten Buton. In *Jurnal Stunting Pesisir dan Aplikasinya* (Vol. 1, Issue 1). Poltekkes Kemenkes Kendari. <https://doi.org/10.36990/jspa.v1i1.456>
- Rossi, A., Daneluzzo, E., Tomassini, A., Struglia, F., Cavallaro, R., Smeraldi, E., & Stratta, P. (2006). The effect of verbalization strategy on Wisconsin Card Sorting Test performance in schizophrenic patients receiving classical or atypical antipsychotics. *BMC Psychiatry*, 6. <https://doi.org/10.1186/1471-244X-6-3>
- Rumida, R., Bakara, T. L., Manalu, M., & Siahaan, G. (2023). Pengaruh Penambahan Berbagai Bahan Makanan terhadap Daya Terima dan Kadar Protein Cookies Sebagai PMT untuk Balita Stunting. In *Amerta Nutrition* (Vol. 7, Issue 3, pp. 434–441). Universitas Airlangga. <https://doi.org/10.20473/amnt.v7i3.2023.434-441>
- Sakung, J. M. (2024). The effects of Moringa oleifera leaves on the nutritional status of children under five years. *Food Research*, 8(5), 319–323.
- Salsabila, R., Rosmana, D., Mahmudah, U., Priawantiputri, W., & Fikri, E. (2022). Formulasi Dan Sifat Organoleptik Nugget Berbasis Tempe Dan Serbuk Daun Kelor Sebagai Makanan Selingan Tinggi Kalsium Untuk Lacto-Ovo Vegetarian. In *Jurnal Inovasi Bahan Lokal dan Pemberdayaan Masyarakat* (Vol. 1, Issue 1). Politeknik Kesehatan Kemenkes Bandung. <https://doi.org/10.34011/jibpm.v1i1.1060>
- Sarman, & Darmin. (2021). Hubungan ASI Eksklusif dan Paritas dengan Kejadian Stunting pada Anak Usia 6-12 Bulan di Kota Kotamobagu : Studi Retrospektif. *Gema Wiralodra*, 12(2), 206–216. <https://gemawiralodra.unwir.ac.id/index.php/gemawiralodra/article/view/186>
- Scheffler, C., & Hermanussen, M. (2021). Stunting does not impair physical fitness in Indonesian school children. In *Human Biology and Public Health* (Vol. 2). Universitaet Potsdam. <https://doi.org/10.52905/hbph.v2.19>
- Sebagai, K., Pangan, B., Beras, P. I., Ilmu, P., Teknologi, J., & Fakultas, P. (2017). Komposisi Kimia Dan Gizi Jagung Lokal Varietas 'Manado Kuning' Sebagai Bahan Pangan Pengganti Beras Chemical. *Jurnal Teknologi Pertanian*, 8(1).
- Silva, M. G. D., Barbosa, S. L. F., Silva, D. S., Bezerra, I. B. M., Alves Bezerra, É., Coelho, A. G., Pinheiro Da Silva Morais, I. C., Rezende-Júnior, L. M., Carmo, I. S. D., Lima-Neto, J. D. S., Comerma-Steffensen, S. G., Citó, A. M. D. G. L., & Arcanjo, D. D. R. (2022). Bioactive Natural Products against Systemic Arterial Hypertension: A Past 20-Year Systematic and Prospective Review. *Evidence-Based Complementary and Alternative Medicine*, 2022. <https://doi.org/10.1155/2022/8499625>
- Sirenden, M. T., Puspita, D., Sihombing, M., & Nugrahani, F. (2018). Analisis Profil Makronutrien Dan Kandungan Nitrit Pada Bagian Sarang Burung Walet (*Aerodramus fuciphagus*). April, 101–106.
- Srianjani, P., Made, N., & Susanti, P. (2023). Teh Daun Kelor (*Moringa Oleifera*) sebagai Antihipertensi. 2, 805–812.
- Sriyanah, N., & Efendi, S. (2022). Strengthening Family Knowledge As A Stunting Prevention Effort In Upt Puskesmas Moncobalang Kab. Gowa. In *Jurnal Pengabdian Masyarakat*

- Kesehatan (Vol. 8, Issue 3, pp. 309–316). UPPM STIKES Pemkab Jombang. <https://doi.org/10.33023/jpm.v8i3.1297>
- Study, N., Impact, T. H. E., & Routine, O. F. (2025). Nutritional Supplement In Preventing Stunting In Toddlers: 7(1), 849–856.
- Sukanty, N. M. W., Jauhari, M. T., Ardian, J., Rahmiati, B. F., Anwariah, J., Sari, E., & Putri, B. A. E. H. (2023). Penerapan Lima Pilar Strategi Penanganan Stunting Melalui Program DASHAT (Dapur Sehat Atasi Stunting) Dengan Pemanfaatan Sumber Daya Pangan Lokal. In JAPI (Jurnal Akses Pengabdian Indonesia) (Vol. 8, Issue 3, pp. 265–276). Unitri Press. <https://doi.org/10.33366/japi.v8i3.5193>
- Sulistyorini, E. (2011). Hubungan Pekerjaan Ibu Balita Terhadap Status Gizi Balita Di Posyandu Prima Sejahtera Desa Pandean Kecamatan Ngemplak Kabupaten Boyolali Tahun 2009. Jurnal Kebidanan Indonesia, 1(2), 1–17. [http://eprints.ums.ac.id/41781/1/Naskah Publikasi Nur Azikin Rozali.pdf](http://eprints.ums.ac.id/41781/1/Naskah_Publikasi_Nur_Azikin_Rozali.pdf)
- Suryani, K., Rini, M. T., Hardika, B. D., & ... (2023). Analisis faktor penyebab kejadian stunting. Jurnal <https://www.ejournal.stikstellamarismks.ac.id/index.php/JKFN/article/view/112>
- Sutarto, S. T. T., Mayasari, D., & ... (2018). Stunting, Faktor Resikodan Pencegahannya. Agromedicine Unila. <http://repository.lppm.unila.ac.id/9767/>
- Sutrisminah, E., Surani, E., Yuniarti, H., & Syofa, A. N. (2023). Pengentasan Stunting Menuju Gondang Bebas Stunting. In Jurnal Abmas Negeri (JAGRI) (Vol. 4, Issue 1, pp. 16–21). LPPM Akper Yapenas 21 Maros. <https://doi.org/10.36590/jagri.v4i1.516>
- Sutrisno, E., Dewi, D. O., Ariani, M., Sayekti, W. D., Lestari, D. A. H., Syafani, T. S., Triyanti, R., Wijaya, R. A., Zamroni, A., Ramadhan, A., Apriliani, T., Huda, H. M., Pramoda, R., Pramono, L. H., Koeshendrajana, S., Anggraeni, A., Yuniati, R., Silalahi, M., Irwandi, A., ... Hassanah, I. F. (2023a). Diversifikasi Pangan Lokal untuk Ketahanan Pangan: Perspektif Ekonomi, Sosial, dan Budaya. In Diversifikasi Pangan Lokal untuk Ketahanan Pangan: Perspektif Ekonomi, Sosial, dan Budaya (Issue December). <https://doi.org/10.55981/brin.918>
- Sutrisno, E., Dewi, D. O., Ariani, M., Sayekti, W. D., Lestari, D. A. H., Syafani, T. S., Triyanti, R., Wijaya, R. A., Zamroni, A., Ramadhan, A., Apriliani, T., Huda, H. M., Pramoda, R., Pramono, L. H., Koeshendrajana, S., Anggraeni, A., Yuniati, R., Silalahi, M., Irwandi, A., ... Hassanah, I. F. (2023b). Diversifikasi Pangan Lokal untuk Ketahanan Pangan: Perspektif Ekonomi, Sosial, dan Budaya. In Badan Riset dan Inovasi Nasional (BRIN) (Issue December). <https://doi.org/10.55981/brin.918>
- Syamsuadi, A., Febrianita, Y., Febriani, A., Psikospol, F., Abdurrah, U., Abdurrah, U., & Abdurrah, U. (2023). The Influence Of Stunting Reduction Program Performance On The Growth of Under-Free Children In Rokan Hulu District Pengaruh Kinerja Pelaksanaan Program Penurunan Stunting Terhadap Tumbuh Kembang Anak Balita. 1(2), 27–38.
- Ulfa, N. F., Lauk, M., Selat, D., Soraya, S., & Fentika, F. (2024). Diversifikasi Olahan Daun KELOR (Moringa Oleifera) melalui Program Dapur Sehat. Jurnal Agro Dedikasi Masyarakat (JADM), 5(2), 40–45.
- Utomo, B., Widyatri, Y., Widyanto, R. M., Gizi, J., Kedokteran, F., & Brawijaya, U. (2018). Metode untuk Mempertahankan Kandungan Nitrit Sarang Burung Walet S elama Penyimpanan. 1(September), 1–5.
- Warnita, W., & Aisman, A. (2017). Pemberdayaan Masyarakat Melalui Budidaya Tanaman Cabai Merah Dalam Pot. In Logista - Jurnal Ilmiah Pengabdian kepada Masyarakat (Vol. 1, Issue 2, p. 41). Universitas Andalas. <https://doi.org/10.25077/logista.1.2.41-50.2017>
- Waroh, Y. K. (2019). Pemberian Makanan Tambahan Sebagai Upaya Penanganan Stunting Pada Balita Di Indonesia. Embrio, 11(1), 47–54. <https://doi.org/10.36456/embrio.vol11.no1.a1852>
- Whiffin, C. J., Smith, B. G., Selveindran, S. M., Bashford, T., Esene, I. N., Mee, H., Barki, M. T., Baticulon, R. E., Khu, K. J., Hutchinson, P. J., & Kolias, A. G. (2022). The Value and Potential of Qualitative Research Methods in Neurosurgery. World Neurosurgery, 161, 441–449. <https://doi.org/10.1016/j.wneu.2021.12.040>
- Wibowo, S. A., & Ilmi, M. B. (2021). Peningkatan Skill Berwirausaha Masyarakat Melalui Inovasi Pengolahan Susu Sapi Siap Jual. In Prosiding Seminar Nasional Program Pengabdian Masyarakat. Universitas Muhammadiyah Yogyakarta. <https://doi.org/10.18196/ppm.33.196>

Yanto, D., Susanto, H., Darmanto, H., Saputra, A. B., & Andika, F. D. (2024). Penerapan Sistem Informasi Geografis Pada Pemetaan Dan Monitoring Balita Stunting. *Journal of Electrical Engineering and Computer (JEECOM)*, 6(2), 494–507. <https://doi.org/10.33650/jecom.v6i2.9598>.