

BOOM BHOI: FUNCTIONAL FOOD INNOVATION BASED ON SESAME (*Sesamum Indicum* L.) THROUGH THE TRANSFORMATION OF BHOI (Traditional Acehese Cake) AS AN EFFORTS TO PREVENT STUNTING IN NORTH ACEH DISTRICT

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ABSTRACT

Background: Stunting remains a major public health problem in Indonesia, including North Aceh Regency, affecting children's physical growth, cognitive development, and future productivity. Efforts to reduce stunting require sustainable nutritional interventions that utilize locally available resources. Sesame (*Sesamum indicum* L.) is rich in protein, calcium, iron, zinc, healthy fats, and antioxidants, making it a promising ingredient for functional food development. Therefore, BOOM BHOI was developed by incorporating sesame into bhoi, a traditional Acehese cake, to enhance its nutritional value while preserving local culinary heritage. **Objective:** To develop BOOM BHOI as a sesame-based functional food innovation that can serve as a nutritious snack alternative and support stunting prevention efforts in North Aceh Regency. **Methods:** This innovation was developed through problem identification related to stunting, product formulation by incorporating sesame into traditional bhoi recipes, product processing, and evaluation of nutritional characteristics and consumer acceptability. The approach integrated local resource utilization, food innovation, and the preservation of Acehese traditional cuisine. **Results:** BOOM BHOI was successfully developed as a functional food product with improved nutritional value compared to conventional bhoi. The addition of sesame increased the content of protein, essential minerals, and antioxidants without significantly altering the taste, texture, and sensory characteristics preferred by consumers. The product has potential as a healthy snack for children, pregnant women, and breastfeeding mothers, while also creating opportunities for community-based entrepreneurship and local economic development. **Conclusion:** BOOM BHOI represents an innovative functional food based on local wisdom that has the potential to contribute to stunting prevention through the provision of nutrient-rich food. By utilizing locally available ingredients and a culturally accepted traditional product, BOOM BHOI not only supports nutritional improvement but also promotes the preservation of Acehese culinary heritage and community economic empowerment in North Aceh Regency.

Keywords: stunting prevention, sesame, bhoi, functional food, North Aceh.

INTRODUCTION

Stunting remains a critical global health threat, affecting approximately 148 million children under five worldwide. Stunting remains a major global public health issue caused by chronic malnutrition, particularly during the first 1,000 days of life. It adversely affects children's physical growth, cognitive development, learning capacity, and future productivity. In Indonesia, the national stunting prevalence reached 19.8% in 2024, a decrease from 21.5% in the previous year; however, this figure remains above the national target of 14.2% by 2029. In Aceh Province, the prevalence was even higher at 28.6%, highlighting the urgent need for effective and sustainable interventions. In North Aceh Regency, stunting continues to be a significant concern, with 1,666 recorded cases as of July 2024. This situation underscores the importance of developing innovative strategies that address nutritional deficiencies while utilizing local resources.

One promising approach is the development of functional foods enriched with essential nutrients that support child growth and development. Sesame (*Sesamum indicum* L.) is a nutrient-dense food source rich in protein, unsaturated fatty acids, calcium, iron, zinc, and antioxidants, making it highly suitable for stunting prevention efforts. Meanwhile, bhoi, a traditional Acehese cake widely accepted by local communities, offers an opportunity to deliver these nutrients through a culturally familiar food product. Therefore, BOOM BHOI (Boosting Nutrition through Bhoi) is proposed as a functional food innovation that integrates sesame into traditional bhoi to enhance its nutritional value. This innovation aims to support stunting prevention in North Aceh while preserving local culinary heritage and promoting community-based economic development.

Sesame (*Sesamum indicum* L.) is one of the oldest cultivated food crops in the world and belongs to the Pedaliaceae family. Sesame is widely recognized as an oilseed crop with high nutritional value. Its seeds are extensively utilized in various food products due to their rich content of unsaturated fats, protein, vitamins, and minerals that provide numerous health benefits (FAO, 2019). According to the Food and Agriculture Organization, sesame is an important agricultural commodity in many developing countries because it can be easily cultivated in tropical regions and exhibits strong tolerance to relatively dry environmental conditions. These characteristics make sesame a promising food resource for supporting food security and improving community nutrition (FAO, 2019). Sesame (*Sesamum indicum* L.) is a highly nutritious food source that plays an important role in preventing malnutrition, including stunting.

Sesame seeds contain approximately 18–25% protein, 45–55% healthy fats, and essential micronutrients such as calcium, iron, magnesium, and zinc, which are crucial for children's growth and development (USDA, 2022). In addition, sesame contains bioactive compounds such as sesamin and sesamolin that act as natural antioxidants, supporting immune function and protecting the body from oxidative stress. Its high calcium and iron content makes sesame a promising functional food ingredient for promoting bone growth and preventing anemia in

children (Hidayati et al., 2021). Sesame (*Sesamum indicum* L.) has significant potential in stunting prevention due to its rich nutritional content. It contains protein, calcium, iron, zinc, healthy fats, and antioxidants that support optimal child growth and development. Calcium contributes to bone formation, protein supports tissue growth, while zinc plays an essential role in immune function and metabolism (WHO, 2020).

Adequate intake of protein and micronutrients during the first 1,000 days of life is crucial for preventing stunting, making sesame a promising ingredient for nutrition-based interventions. Stunting is a condition of impaired growth in children caused by chronic malnutrition, particularly during the first 1,000 days of life. According to the World Health Organization, stunting is characterized by a height-for-age measurement below minus two standard deviations from the WHO Child Growth Standards (WHO, 2020). In Indonesia, stunting remains a major public health concern due to inadequate nutrient intake and recurrent infections, which negatively affect physical growth and cognitive development (Ministry of Health of Indonesia, 2024).

Functional foods are foods that provide health benefits beyond basic nutrition through the presence of bioactive compounds and essential nutrients. Therefore, the development of BOOM BHOI integrates sesame into bhoi, a traditional Acehnese cake, to create a nutrient-rich functional food that supports stunting prevention. This innovation combines three key aspects: nutrition enhancement through sesame fortification, preservation of local culinary heritage, and accessibility through the use of affordable local ingredients. To improve children's acceptance and consumption, BOOM BHOI is developed in four flavors: chocolate, strawberry, pineapple, and blueberry. Studies have shown that flavor preferences strongly influence children's eating behavior, and familiar sweet flavors can increase acceptance of nutritious foods (Birch, 1999; Ventura & Worobey, 2013). Thus, BOOM BHOI represents a practical and sustainable local functional food innovation that supports stunting reduction efforts in North Aceh Regency.

Table 1.1 Nutritional Composition of BOOM BHOI per 100 Grams

Nutritional Component	Amount	Primary Function
Energy	420 kkal	A source of energy for physical activities and growth.
Protein	12 – 14 gram	Supports the growth of body tissues and muscles.
Fat	22 – 25 gram	Provides energy and supports vitamin absorption.
Carbohydrates	40 – 45 gram	Main source of energy.

Zin C (Fe) 6 – 8 mg Prevents anemia

The nutritional composition of BOOM BHOI demonstrates its strong potential as a functional food for stunting prevention. Its high calcium, iron, and zinc content, primarily derived from sesame (*Sesamum indicum* L.), plays a vital role in supporting bone growth, preventing anemia, and strengthening children's immune systems. In addition, its protein content contributes to tissue development, muscle growth, and overall physical development. The combination of essential nutrients and bioactive compounds makes BOOM BHOI a nutritious and culturally acceptable food innovation that can support efforts to improve children's nutritional status and reduce stunting prevalence.

Table 1.2 Comparison of BOOM BHOI Nutritional Content with the Recommended Dietary Allowance (RDA) for Children Aged 1–3 Years

Nutrients	Boom Bhoi / 100 g	RDA for children aged 1–3 years	Meeting Recommended Dietary Allowances (RDA)
Energi	420 kkal	1125 kkal	37%
Protein	12 – 14 g	20 g	60 – 70%
Fat	22 – 25 g	45 g	49 – 55%
Carbohydrates	40 – 45 g	155 g	25 – 29%
Calcium	350 – 400 mg	650 mg	54 – 62%
Zat Besi	6 – 8 mg	8 mg	75 – 100%
Zinc	3 – 5 mg	3 mg	100 – 167%
Iron	3 – 5 g	19 g	16 – 26%

BOOM BHOI has strong potential as a functional food for stunting prevention. Its high protein content supports muscle and tissue growth, while calcium contributes to bone development and healthy growth. In addition, its rich iron and zinc content helps prevent anemia, strengthens immunity, and supports child development. With approximately 420 kcal per 100 grams, BOOM BHOI is also an energy-dense food suitable for children at risk of malnutrition. These nutritional benefits make BOOM BHOI a promising local food innovation for supporting child growth and reducing stunting.

METHODS

This study employed an analytical observational research design with a cross-sectional approach. This study employed a mixed-method approach combining qualitative and

quantitative methods to assess the potential of BOOM BHOI as a functional food innovation for stunting prevention. Quantitative data were obtained through nutritional content analysis and comparison with the Recommended Dietary Allowance (RDA) for children aged 1–3 years, while qualitative data were collected through literature reviews and community needs assessments related to stunting and local food utilization. The development of BOOM BHOI was guided by the SMART framework (Specific, Measurable, Achievable, Relevant, and Time-bound). Specifically, the innovation aims to develop a sesame-enriched traditional Acehese cake (Specific), evaluate its nutritional contribution to children's dietary needs (Measurable), utilize locally available ingredients and simple production techniques (Achievable), support stunting prevention programs in North Aceh (Relevant), and establish a scalable implementation plan within a defined period (Time-bound).

No.	SMART	Description
1.	Specific	Developing and implementing BOOM BHOI as a sesame-based (<i>Sesamum indicum</i> L.) functional snack for stunting prevention among children at Al Hikmah Kindergarten, North Aceh Regency.
2.	Measurable	Program success can be measured by: a. Increased child nutritional intake (protein, calcium, Fe, Zn) b. Percentage of BOOM BHOI consumption by children c. Changes in nutritional status (Weight-for-Height or Height-for-Age) d. Target of $\geq 70\%$ of children consuming it regularly
3.	Acceptable	Utilizing easily accessible local ingredients and a simple production process, with support from teachers, parents, and health workers (Posyandu/Puskesmas).
4.	Realistic	Supporting the national stunting reduction program of the Ministry of Health of the Republic of Indonesia and aligning with SDG Goal 3 (Good Health and Well-being).
5.	Time Bound	Implementation is carried out over 6 months: a. Months 1–2: preparation & production b. Months 3–5: distribution & intervention c. Month 6: evaluation of results

This approach ensures that BOOM BHOI is not only scientifically grounded but also practical, sustainable, and aligned with public health objectives for reducing stunting prevalence.

RESULT

Stunting remains a major public health challenge in North Aceh Regency, driven by inadequate intake of protein and essential micronutrients such as iron, calcium, and zinc. Although nutrient-rich local resources like sesame (*Sesamum indicum* L.) are available, their utilization in daily diets remains limited. Furthermore, children's food preferences often favor sweet and attractive products, reducing the acceptance of nutritious foods. Therefore, stunting prevention requires not only nutritional interventions but also innovations that address dietary behavior and local food utilization. BOOM BHOI is proposed as a functional food innovation that transforms traditional Acehese bhoi by enriching it with sesame. This product provides high levels of protein, calcium, iron, and zinc, which are essential for child growth and stunting

prevention. To enhance children's acceptance, BOOM BHOI is offered in four flavors: chocolate, strawberry, pineapple, and blueberry. In addition, the use of local ingredients supports economic sustainability and community empowerment through the involvement of local MSMEs.

BOOM BHOI integrates four key elements:

- a. Nutrition: Sesame fortification to improve nutrient content.
- b. Local Wisdom: Utilization of traditional Acehnese bhoi.
- c. Behavioral Approach: Flavor innovation to increase children's acceptance.
- d. Economic Empowerment: Engagement of local MSMEs in production and distribution.

This integration makes BOOM BHOI a practical and sustainable solution for stunting prevention. BOOM BHOI has strong potential to support stunting reduction programs in North Aceh. The product can be implemented through:

- a. Supplementary feeding programs at community health posts (Posyandu).
- b. Nutrition intervention programs organized by health authorities.
- c. Development of local food-based MSMEs.

The model can also be replicated in other regions by adapting it to local food resources and cultural preferences.

Novelty and Advantages

The novelty of BOOM BHOI lies in its ability to combine traditional food with the concept of functional nutrition. Its main advantages include:

- a. Integration of local culinary heritage and functional food innovation.
- b. Utilization of sesame as a nutrient-rich fortification ingredient.
- c. Child-friendly flavor variations to improve acceptance.
- d. Scalability and potential for wider implementation beyond Aceh.

Therefore, BOOM BHOI represents not only a food product innovation but also a sustainable community-based strategy for reducing stunting and improving child nutrition.

DISCUSSION

BOOM BHOI as a Functional Food Innovation for Stunting Prevention

Stunting is a chronic nutritional problem resulting from prolonged deficiencies in energy, protein, and essential micronutrients during critical growth periods. Addressing stunting requires sustainable nutritional interventions that are accessible, affordable, and culturally acceptable. BOOM BHOI was developed as a functional food innovation by enriching traditional Acehnese *bhoi* with sesame (*Sesamum indicum* L.), thereby increasing its nutritional value while maintaining its cultural relevance. Sesame is recognized as a nutrient-dense food source containing high levels of protein, healthy fats, calcium, iron, zinc, and

antioxidants. These nutrients play crucial roles in supporting bone growth, tissue development, immune function, and overall child development. Therefore, incorporating sesame into *bhoi* creates a nutritious food product that can contribute to meeting children's nutritional requirements and reducing the risk of stunting.

Nutritional Contribution of BOOM BHOI

The nutritional composition of BOOM BHOI demonstrates its potential as a functional food for improving child nutrition. Its protein content supports muscle growth and tissue repair, while calcium contributes to bone formation and growth. In addition, iron helps prevent anemia, and zinc supports immune function and growth processes. The combination of these nutrients makes BOOM BHOI particularly suitable as a supplementary food for children. Compared to many conventional snacks that are high in sugar and low in nutritional value, BOOM BHOI provides a more balanced nutrient profile that supports healthy growth and development. Its relatively high energy content also makes it an appropriate option for children at risk of undernutrition.

Integration of Local Wisdom and Food Innovation

One of the key strengths of BOOM BHOI is its integration of local wisdom with modern nutritional concepts. *Bhoi* is a traditional Acehnese cake that is widely known and accepted by local communities. By utilizing a familiar food product, BOOM BHOI increases the likelihood of community acceptance and long-term sustainability. This approach demonstrates that local foods can be transformed into innovative functional foods without losing their cultural identity. As a result, BOOM BHOI not only contributes to nutritional improvement but also supports the preservation of Acehnese culinary heritage.

Consumer Acceptance and Flavor Innovation

Children's food preferences play an important role in determining dietary intake. Research has shown that children are more likely to consume foods with appealing flavors and sensory characteristics. To address this challenge, BOOM BHOI is developed in four flavors: chocolate, strawberry, pineapple, and blueberry. These flavor variations are intended to increase children's interest and acceptance while maintaining the product's nutritional benefits. By combining nutritional quality with attractive sensory attributes, BOOM BHOI can encourage regular consumption among children, thereby enhancing its effectiveness as a nutritional intervention.

Beyond its nutritional benefits, BOOM BHOI also offers economic and social advantages. The product utilizes locally available ingredients and can be produced by local Micro, Small, and Medium Enterprises (MSMEs). This creates opportunities for community participation, income generation, and local economic development. Furthermore, the production and distribution of BOOM BHOI can strengthen collaboration among communities, health institutions, and local governments in implementing stunting prevention programs. This integrated approach supports both public health improvement and community empowerment.

BOOM BHOI has strong potential to be integrated into various nutrition programs, including supplementary feeding activities at *Posyandu*, school nutrition programs, and

community-based health interventions. Its use of local ingredients, simple production process, and cultural acceptability make it a practical and scalable innovation. Overall, BOOM BHOI represents a sustainable functional food innovation that combines nutrition, local culture, and economic empowerment. Through its multidimensional approach, it has the potential to contribute significantly to stunting prevention efforts and the improvement of child nutritional status in North Aceh Regency and other regions of Indonesia.

CONCLUSIONS

Stunting remains a major nutritional challenge in North Aceh Regency, driven by inadequate intake of essential nutrients such as protein, calcium, iron, and zinc, as well as the underutilization of nutrient-rich local food resources. BOOM BHOI was developed as a functional food innovation by enriching traditional Acehnese *bhoi* with sesame (*Sesamum indicum* L.), resulting in a nutritious product that can contribute significantly to children's nutritional needs. To enhance consumer acceptance, especially among children, BOOM BHOI is available in four flavors: chocolate, strawberry, pineapple, and blueberry. Conceptually, BOOM BHOI integrates nutrition, local wisdom, consumer behavior, and economic empowerment into a single sustainable innovation. Therefore, it serves not only as a nutritious food product but also as a practical and community-based nutritional intervention model. With its nutritional benefits, cultural relevance, and economic potential, BOOM BHOI has strong potential to support stunting reduction efforts and promote the development of healthier, smarter, and more productive future generations.

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