

Utilization of Local Food Resources through the Empowerment of Posyandu Cadres in Sorghum-Fish Nugget Production to Support the Supplementary Feeding Program

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Abstract

Nutritional problems among children under five remain a concern in Rote Barat Laut District, while local food resources such as sorghum and fish have not yet been optimally utilized in community-based food processing. This community service program aimed to strengthen the practical capacity of Posyandu cadres to utilize local food resources through the production of sorghum-fish nuggets to support supplementary feeding activities (Pemberian Makanan Tambahan or PMT). The program involved 30 participants, consisting of 15 Posyandu cadres and 15 mothers of children under five, and included a needs assessment, nutrition education, production demonstrations and hands-on practice, packaging, distribution, and an introduction to basic marketing. Pretests and posttests were administered as part of the formative evaluation. Following supervised practical sessions, all 15 cadres completed the main production and packaging stages during the simulation session, as documented through direct observation by the implementation team. The activity produced 100 nuggets, which were divided into 20 packages and distributed through mothers or caregivers to 20 children under five registered at the Posyandu. A cadre-based group was also initiated as an initial platform for follow-up production and marketing activities. The program demonstrated the preliminary feasibility of practice-based training for promoting the utilization of local food resources. However, further evaluation is required regarding formulation standardization, nutritional content, food safety, acceptability, and post-program sustainability.

KEYWORDS local food resources; sorghum-fish nuggets; posyandu cadres; supplementary feeding; community empowerment

HIGHLIGHTS

- All 15 Posyandu cadres completed the main stages of sorghum-fish nugget production and packaging during the supervised simulation.
- A total of 100 nuggets were divided into 20 packages and distributed through mothers or caregivers to 20 children under five registered at the Posyandu.
- Training in production and basic marketing represented an initial step toward utilizing local food resources and establishing a cadre-based group

INTRODUCTION

Nutritional problems among children under five include stunting, wasting, underweight, and overweight. Stunting is defined as length/height-for-age below -2 standard deviations from the median of the WHO Child Growth Standards, whereas wasting and underweight are assessed using different anthropometric indicators. These conditions are not caused by a single factor but are associated with inadequate dietary intake, infectious diseases, caregiving practices, socioeconomic conditions, sanitation, and access to health services. Their consequences may extend to cognitive development, health, and productivity later in life (World Health Organization & United Nations Children's Fund, 2019; Fernandes & Le, 2021).

Data from Rote Barat Laut District in 2023 indicate that maternal and child nutrition problems remain a concern. Of 263 live births, 55 infants (20.91%) were recorded as having low birth weight. The district also reported 17 children with severe wasting and a stunting prevalence of 21.2% (Dinas Kesehatan Kabupaten Rote Ndao, 2024). These district-level data do not directly represent all children under five in Daudolu Village but provide an epidemiological context for strengthening health promotion efforts and the utilization of local food resources within the community.

At the same time, Rote Barat Laut District has considerable potential for the development of local food resources. Kecamatan Rote Barat Laut Dalam Angka 2024, which reports 2023 data, recorded sorghum production of 18 tons from a harvested area of 15 hectares (Badan Pusat Statistik Kabupaten Rote Ndao, 2024). Based on an initial assessment conducted with the village government and Posyandu management, fish is also readily available locally. However, the use of sorghum and fish as processed food products for community nutrition activities remains limited. Posyandu cadres were not yet accustomed to processing these two ingredients into nuggets, while their skills in packaging and basic marketing also required further strengthening.

Supplementary feeding based on local food resources is one approach used to support the management of nutritional problems among children under five. The 2025 technical guidelines issued by the Ministry of Health define the target groups for local food-based supplementary feeding as children with growth faltering, underweight, and moderate malnutrition, with or without stunting. Supplementary feeding is provided as an additional source of dietary intake and is accompanied by nutrition education and community empowerment activities (Direktorat Jenderal Kesehatan Primer dan Komunitas, 2025). Similar community-based PMT and nutrition education initiatives have been reported in Indonesia (Askandary et al., 2024; Salsabila et al., 2023). In this program, sorghum-fish nuggets were not positioned as a therapeutic formula or as a complete cycle of rehabilitative supplementary feeding that met all of these standards. Rather, they were introduced as a pilot local food product intended to support supplementary feeding activities and nutrition education at the Posyandu level.

Posyandu plays a strategic role because its cadres are involved in family education, growth monitoring, and support for appropriate feeding practices. Empowerment in the health context goes beyond the provision of information and encourages community participation in identifying needs, developing skills, and taking an

active role in sustaining follow-up activities (World Health Organization, 2020). In this program, this approach was implemented by involving cadres in needs assessment, production practice, packaging, distribution, marketing discussions, and the initiation of a follow-up group. Sorghum was selected as a locally available cereal-based food source, while fish was selected as a source of animal protein. Both are included in the Indonesian Food Composition Table as food ingredients that can contribute to dietary diversity when appropriately processed (Kementerian Kesehatan Republik Indonesia, 2020).

Based on these conditions, this community service program aimed to strengthen the practical capacity of Posyandu cadres to utilize sorghum and fish through the production and packaging of sorghum-fish nuggets, introduce their use as a local food alternative to support supplementary feeding activities, and provide basic marketing skills as an initial step toward the development of group-based activities.

METHODS

Design, Setting, and Participants

The community service program was conducted in Daudolu Village, Rote Barat Laut District, Rote Ndao Regency, using a community empowerment approach. The main partners were the Daudolu Village Government and Posyandu management. The program involved 30 individuals, each recorded once according to their primary role, comprising 15 Posyandu cadres and 15 mothers of children under five. Several cadres also had children under five. However, for this program, they participated and were recorded as cadres rather than as mothers of children under five. In addition to the main participants, 20 children under five registered at the Posyandu were designated as recipients of the distributed products. The number of recipients was limited to 20 children due to the resource constraints of the program. Detailed nutritional status data were not collected for all 20 recipient children. Some were known to have stunting and were enrolled in rehabilitative supplementary feeding programs, whereas others attended routine Posyandu services.

The village government and Posyandu management were involved in coordination, needs identification, participant mobilization, venue provision, program implementation, and follow-up discussions. One member of the community service team had a background in nutrition, was a permanent lecturer at a private higher education institution, and had received training in food processing. This team member assisted with ingredient measurement during the practical sessions. Students supported technical assistance, documentation, and program evaluation.

Program Implementation Stages

The first stage consisted of coordination and a needs assessment conducted with the village head, Posyandu management, and cadres. The assessment was carried out through discussions addressing nutritional problems encountered in the community, the availability of sorghum and fish, types of supplementary foods commonly provided, cadres' experience in food processing, and opportunities for packaging and marketing. The main findings indicated that sorghum and fish were locally available ingredients but had not commonly been processed into nuggets for Posyandu activities. The cadres also had no prior experience in producing sorghum-fish nuggets and still required guidance in basic packaging and marketing.

The second stage involved nutrition education for the 30 participants on the First 1,000 Days of Life, the prevention of stunting and wasting, the utilization of local food resources, principles of supplementary feeding, and food-processing safety. Education was delivered through interactive lectures, discussions, question-and-answer sessions, and visual media. Simple pretests and posttests were administered as a formative evaluation. However, individual score records were no longer available at the time of manuscript preparation. Therefore, the results were not analyzed quantitatively and were not used to draw conclusions regarding improvements in participants' knowledge.

The third stage consisted of demonstrations and hands-on practice in producing sorghum-fish nuggets. Ingredients were measured using practical household measures, guided by the experience of a team member who had received training in food processing, without standardized gram-based measurements for each ingredient. The practical session covered the preparation of sorghum/sorghum flour and fish, mixing the ingredients, shaping the nuggets, cooking until fully cooked, and simple packaging. Throughout the practical session, the team emphasized hand and equipment hygiene as well as the separation of raw ingredients from cooked products. Core temperature was not measured using a food thermometer. Therefore, no claim was made regarding the achievement of a specific cooking temperature. Following the demonstration, participants completed a supervised simulation. The cadres' practical skills were assessed through direct observation of their ability to complete the main stages of ingredient preparation, processing, cooking, and packaging without requiring the team to repeat the entire demonstration. This observation served as a practical evaluation and was not based on a competency assessment instrument with established validity or reliability.

The fourth stage involved packaging and distribution of the products prepared during the practical session. A total of 100 nuggets were divided into 20 packages, with the number of nuggets per package varying according to the production yield. Each package was intended for one child under five registered at the Posyandu and was distributed through the child's mother or caregiver. Several cadres had children under five who were among the distribution recipients. However, these cadres continued to be recorded according to their primary role as cadres rather than as mothers of children under five. At the time of distribution, most of the children had already left the activity venue. Consequently, product consumption was not directly observed. The program did not measure the actual amount consumed or the children's acceptability of the product.

The fifth stage consisted of an introduction to basic economic aspects and the initiation of a cadre-based group. The materials covered value-added packaging, basic production cost components, methods for offering the product to potential consumers, and local marketing opportunities. Participants also discussed the potential division of roles in production, packaging, and marketing. At the end of the program, one group was initiated as a platform for follow-up activities. However, the program did not evaluate the establishment of a formal business structure, sales transactions, profitability, post-program production frequency, or the group's financial sustainability.

Evaluation and Indicators of Achievement

Program evaluation was conducted through attendance records, observation of participation in discussions, observation of

practical skills during the simulation session, the number of products produced, the number of packages distributed, and the initiation of a follow-up group. Pretests and posttests were used as a formative evaluation but were not reported quantitatively because individual scores were unavailable. The verifiable indicators of achievement reported in this article were the participation of 30 individuals, completion of the main production and packaging stages by all 15 cadres during the simulation, production of 100 nuggets, distribution of 20 packages to 20 registered children under five, and initiation of one cadre-based group.

Sustainability was assessed in terms of planned follow-up rather than as a long-term outcome. The team transferred practical knowledge and experience to the cadres and discussed the possibility of continued production, packaging, and marketing activities. No structured post-program monitoring had yet been conducted to assess independent production, economic transactions, changes in household practices, or impacts on children's nutritional status.

Ethics and Partner Participation

The program was conducted in coordination with the Daudolu Village Government and Posyandu management. The objectives, implementation stages, participant involvement, and planned use of documentation were explained verbally, and verbal consent was obtained from the village government and participants for participation and the use of documentation in reports and publications. Documentation was limited to program activities and group photographs. No clinical procedures or biological specimen collection were involved. Products were distributed through consenting mothers or caregivers, while individual allergy screening and monitoring of children's consumption were not documented and were treated as program limitations.

RESULTS AND DISCUSSION

Participant Engagement and Involvement

The program involved 30 participants, comprising 15 Posyandu cadres and 15 mothers of children under five. All 30 participants were counted once according to their primary role. Several cadres also had children under five, but they participated and continued to be classified as cadres rather than as mothers of children under five. Participants took part in educational sessions, discussions, demonstrations, hands-on production practice, packaging, and an introduction to basic marketing.

During the educational sessions, participants actively asked questions and discussed feeding practices, the utilization of local food resources, and household food-processing practices. Because individual pretest and posttest scores were unavailable, these responses were reported as indicators of participant engagement and were not interpreted as evidence of increased knowledge.



Figure 1. Sequence of activities: (a) education, discussion, and question-and-answer sessions on nutrition and local food resources, (b) demonstration and hands-on practice in producing sorghum-fish nuggets, (c) assistance with product packaging and, (d) group photograph following completion of the activities.

The approach combining discussion and hands-on practice provided opportunities for Posyandu cadres and mothers of children under five to relate the material to local conditions and to take an active role in the food-processing activities. This is consistent with the concept of community engagement, which positions community members as active participants in identifying needs, developing skills, and contributing to health-related actions rather than merely serving as recipients of information (World Health Organization, 2020). However, the level of empowerment achieved in this program remained primarily at the stage of capacity strengthening and the initiation of collective action and therefore cannot yet be equated with long-term program self-reliance.

Production and Practical Skills of Posyandu Cadres

The practical session produced 100 sorghum-fish nuggets. Following the demonstration and supervised practice, all 15 cadres were able to complete the main stages of ingredient preparation, processing, cooking, and packaging during the simulation session, based on direct observation by the implementation team. This achievement indicates that hands-on practice can be used to develop basic skills that can be applied immediately. However, the assessment was observational and did not use a validated competency rubric. Therefore, it was not intended as a form of skills certification.

The use of sorghum and fish provided a locally relevant context for the program because sorghum is produced in Rote Barat Laut District and fish is readily available according to the community partners. Fish-based nutrition education has also been reported in Indonesia (Mainassy & Birahy, 2023). The Ministry of Health emphasizes the use of local food resources and animal-source protein in supplementary feeding for children under five with nutritional problems (Direktorat Jenderal Kesehatan Primer dan Komunitas, 2025). Nevertheless, the nugget formulation used in this program relied on practical measures without standardized gram-based quantities, and the nutritional composition of the product was not analyzed. Accordingly, the product cannot yet be assessed for compliance with supplementary feeding standards for energy, protein, and portion size, and should not be interpreted as a standardized supplementary feeding formulation.

Summary of Program Achievements

The verifiable achievements of the program are summarized in Table 1.

Table 1. Summary of Program Achievements

Indicator	Measured Outcome
Participation	30 participants: 15 Posyandu cadres and 15 mothers of children under five.
Cadre skills simulation	All 15 cadres (15/15) completed the main production and packaging stages following supervised practice.
Production	100 sorghum-fish nuggets were produced. The formulation had not yet been standardized using gram-based measurements.
Distribution	20 packages were distributed to 20 children under five through their mothers or caregivers. Children's consumption was not measured.
Follow-up	One cadre-based group was initiated. Its economic sustainability has not yet been evaluated.

Source: Primary data, 2026.

Pilot Distribution of the Product through Posyandu

A total of 100 nuggets were divided into 20 packages and intended for 20 children under five registered at the Posyandu. The products were distributed through their mothers or caregivers. Several cadres also had children under five who were included among the distribution recipients, but these individuals continued to be recorded as cadres. The number of nuggets per package varied according to the production yield. Because most of the children had already left the venue at the time of distribution, product consumption was not directly observed. Therefore, this activity is more appropriately understood as a pilot distribution of a local food product through Posyandu activities rather than as evidence of integration into routine services or completion of a rehabilitative supplementary feeding cycle.

The program also did not include structured sensory testing, measurement of plate waste, or monitoring of consumption at home. Consumption monitoring has been used in community-based PMT activities (Sinaga et al., 2023). Accordingly, the acceptability of the product among children could not yet be assessed. These limitations are important because product acceptance, the amount consumed, nutritional content, and food safety are key components that should be evaluated before the product is considered for repeated use as a supplementary food. The 2025 technical guidelines for local food-based supplementary feeding likewise identify target determination, menu standards, consumption monitoring, and the involvement of Puskesmas as important components of formal program implementation (Direktorat Jenderal Kesehatan Primer dan Komunitas, 2025).

Implications for Empowerment and Sustainability

In addition to food-processing skills, participants were introduced to packaging, production cost components, product promotion, and local marketing opportunities. One cadre-based group was initiated as an initial platform for discussing continued production and marketing. This achievement indicates an early step toward collective action. However, the program has not yet demonstrated business sustainability because the management structure, sources of capital, selling price, transactions, profitability, and post-program production frequency have not been evaluated.

Factors supporting implementation in the field included the enthusiasm of the cadres and mothers of children under five, the availability of sorghum and fish, and support from the village government. The main constraints included limited production facilities, the absence of a standardized formulation, the lack of food safety and shelf-life testing, and the absence of a structured follow-up system after the program. Nutritional targeting and supplementary feeding monitoring in this activity also did not follow all procedures required under the local food-based supplementary feeding program. These conditions further emphasize that the activity represented training and an initial implementation of local food utilization rather than a clinical or therapeutic supplementary feeding program.

The combined model of education, hands-on practice, packaging, and introductory marketing has the potential to be adapted to other communities by adjusting the type of local food resources, cadre capacity, and partner support. Such adaptation would require, at a minimum, a standardized formulation, hygiene and food safety procedures, equipment requirements, cost calculations, a mechanism for determining target recipients in collaboration with Puskesmas, and evaluation of product

acceptability and follow-up activities. With these components in place, strengthening cadre skills could progress from a one-time training activity toward a more consistent and accountable community-based practice.

LIMITATIONS

This program had several limitations. Pretests and posttests were administered. However, individual score records were no longer available, and therefore changes in knowledge could not be quantified. Cadres' practical skills were assessed through direct observation without the use of a validated instrument. The product formulation had not been standardized using gram-based measurements, the core cooking temperature was not verified with a food thermometer, and the nutritional composition, microbiological safety, shelf life, and individual allergy screening were not assessed. Detailed nutritional status data were also not collected for all 20 children under five, while actual consumption and product acceptability among the children were not observed.

The product was distributed only once in a single village and did not follow all procedures required under the local food-based supplementary feeding program. Accordingly, the activity should not be considered a complete cycle of local food-based supplementary feeding in accordance with the technical guidelines. In addition, no evaluation was conducted on subsequent production, business feasibility, economic transactions, or the sustainability of the cadre-based group after the community service team had completed its mentoring activities.

CONCLUSION

The community service program involved 30 participants, comprising 15 Posyandu cadres and 15 mothers of children under five. At the end of the practical session, all 15 cadres were able to complete the main stages of sorghum-fish nugget production and packaging, based on direct observation by the implementation team following supervised practice. The program produced 100 nuggets, which were divided into 20 packages and distributed through mothers or caregivers to 20 children under five registered at the Posyandu. In addition, one cadre-based group was initiated to support follow-up production and marketing activities.

These achievements demonstrate the preliminary feasibility of an education- and practice-based approach to introducing the utilization of sorghum and fish as local food resources. Future development should prioritize standardization of the formulation and portion sizes, analysis of nutritional content, verification of food safety, acceptability testing, formal coordination with Puskesmas for determining supplementary feeding target groups, and evaluation of the sustainability of production and the group's economic benefits.

DECLARATIONS

Author Contributions. All authors contributed to program planning, implementation and mentoring, outcome evaluation, and manuscript preparation.

Conflict of Interest. The authors declare that there are no conflicts of interest.

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Ethics, Participation, and Publication. The program did not involve clinical procedures or the collection of biological specimens. Verbal consent for program implementation, participation, and the use of activity documentation was obtained from the Daudolu Village Government and participants after the objectives and implementation stages had been explained.

Data Availability. Program documentation and output records supporting the reported findings are available from the authors upon reasonable request. Individual pretest and posttest score records are no longer available.

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