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Innovation of Cilembu Sweet Potato-Based Chicken Nuggets as an Effort to Prevent Stunting

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Abstract. *Stunting remains an important health issue in Duyung Village, Trawas Subdistrict, Mojokerto Regency. Cilembu sweet potatoes, which are nutrient-dense and widely available in the village, currently have low economic value. Processing these sweet potatoes into food products can enhance nutrient value, support stunting prevention, and improve their economic worth. To effectively and healthily utilize the local potential of Cilembu sweet potatoes, a training activity focused on preparing Cilembu-based chicken nuggets was conducted using the Participatory Action Research (PAR) method, which encompasses problem and needs identification, action planning, implementation, and reflection and sustainability. Fourteen participants were involved in the activity. The median score for perceived knowledge and skills in making Cilembu sweet potato-based chicken nuggets increased significantly after training compared with before training (3.0 vs 1.5, p = 0.006; 3.0 vs 1.0, p = 0.002). As many as 92.9% of participants reported the activity was beneficial and satisfying. Continuous monitoring and evaluation are necessary to ensure the continued production of Cilembu sweet potato-based chicken nuggets and to assess their long-term effects on the village community's economy and health.*

Katakunci:
Pelatihan; Nugget Ayam; Ubi Jalar Cilembu; Stunting.

Abstrak. *Stunting* masih merupakan masalah kesehatan yang penting di Desa Duyung, Kecamatan Trawas, Kabupaten Mojokerto. Ubi Cilembu yang kaya nutrisi dan tersedia melimpah di desa, saat ini memiliki nilai ekonomi yang rendah. Memproses ubi tersebut menjadi produk makanan dapat meningkatkan nilai gizi, mendukung pencegahan *stunting*, dan memperbaiki kebermanfaatan secara ekonomi. Untuk memanfaatkan potensi lokal ubi Cilembu secara efektif dan sehat, dilakukan suatu kegiatan pelatihan yang berfokus pada pembuatan nugget ayam berbasis ubi Cilembu menggunakan metode *Participatory Action Research* (PAR), yang meliputi identifikasi masalah dan kebutuhan, perencanaan aksi, implementasi, serta refleksi dan keberlanjutan. Skor median persepsi terhadap pengetahuan dan keterampilan dalam membuat nugget berbahan dasar ubi Cilembu secara

statistik meningkat signifikan pada setelah dibandingkan dengan sebelum training (3,0 *vs* 1,5, *p* = 0,006; 3,0 vs 1,0, *p* = 0,002). Sebesar 92,9% partisipant melaporkan bahwa aktivitas ini bermanfaat dan memuaskan. Monitoring dan evaluasi berkelanjutan penting dilakukan untuk memastikan kontinuitas produksi nugget ayam berbasis ubi Cilembu dan menilai efek jangka panjangnya terhadap ekonomi dan kesehatan masyarakat desa.

1 Introduction

Children who experience stunting typically exhibit impaired physical growth and cognitive development due to chronic nutritional deficiencies from the prenatal period through age 2 years (Sumadewi et al., 2025). Children with stunting tend to face delays in cognitive development, metabolic disorders, and a higher susceptibility to degenerative diseases later in life. The toddler years represent a critical period—often referred to as the "golden age"—for a child's growth and development (Iswahyudi et al., 2024).

According to Ratnayani et al. (2024), there is a significant relationship between carbohydrate intake and the incidence of stunting among toddlers. Stunting is caused by multidimensional factors, including maternal and child undernutrition, inadequate parenting practices—such as poor breastfeeding and complementary feeding (MP-ASI), lack of maternal supplement intake during pregnancy, irregular attendance at community health posts (Posyandu), insufficient immunization coverage, limited access to nutritious food, and inadequate clean water and sanitation (TNP2K, 2017; Nenu et al., 2022; Faiz, 2023).

Duyung Village, located in Trawas Subdistrict, Mojokerto Regency, covers 232.5 hectares and has a population of 1,526 residents. The village consists of two hamlets: Duyung and Bantal. A situational analysis conducted in 2023 revealed that the village faces several issues requiring community service (Pengabdian kepada Masyarakat, PkM) interventions, particularly in health and food security. One of the ongoing health challenges in Duyung Village, especially among children, is stunting. To accelerate the prevention of stunting, the Indonesian government has implemented targeted nutrition-specific and nutrition-sensitive

interventions (Kementerian/Lembaga Pelaksana Program/Kegiatan Pencegahan Anak Kerdil (Stunting), 2019). According to the situational analysis conducted in Duyung Village in 2025, the nutrition-specific interventions include iron tablet supplementation for all pregnant women, additional food for pregnant women experiencing chronic energy deficiency (CED), and immunization programs. Despite these efforts, 9 cases of stunting were still reported in Duyung Village in 2023, although this number has decreased from 11 cases in the previous year (Situational Analysis Report of Duyung Village, 2024).

Several factors are suspected to contribute to the incidence of stunting in the village, including a lack of understanding among pregnant women regarding proper nutritional intake during pregnancy, and the fact that many children rely solely on milk as a source of nutrition rather than receiving a balanced diet from solid foods (Situational Analysis Report of Duyung Village, 2023). In 2023, it was found that, among 20 participants (women aged 26-47 years), 78% and 43% had not yet understood the principles of clean and healthy lifestyle (*Perilaku Hidup Bersih Sehat,* PHBS) and had not previously been exposed to education on stunting (Irawati et al., 2023). In 2024, following a mentoring activity, the proportion of participants who reported improved knowledge of the importance of nutrition during the first 1000 days, basic immunization, and exclusive breastfeeding remained below 40% (Final report of Community Service in Duyung Village, 2024). Improving children's nutritional status and increasing parental awareness are expected to help prevent further stunting in the village. Providing appropriate complementary feeding (MP-ASI) can be a practical solution to address stunting.

One local potential of Duyung Village that warrants further development is the Cilembu sweet potato (*Ipomoea batatas*). Duyung Village can produce up to 200 tons of Cilembu sweet potatoes annually. However, during certain seasons, known as peak harvest periods, the market price of Cilembu sweet potatoes declines significantly due to abundant yields. This situation is detrimental to farmers, as the selling price of the sweet potatoes often fails to reflect the high cost of cultivation. During these periods, the Cilembu sweet potatoes should be

diversified into processed food products to increase their value. However, the community lacks the knowledge and skills needed to process Cilembu sweet potatoes (Situational Analysis Report of Duyung Village, 2023).

Increasing the community's capacity to process and utilize Cilembu sweet potatoes independently could contribute significantly to strengthening food security in the village. Cilembu sweet potatoes are a carbohydrate-rich alternative source that also contains high levels of vitamin A, vitamin C, vitamin E, and folic acid (Panda and Sonkamble, 2012; Hamakonda, 2024). The Ministry of Health of the Republic of Indonesia has set dietary recommendations (*Angka Kecukupan Gizi*) for the Indonesian population, including children under 2 years old. Table 1 shows the Indonesian dietary recommendations for several macro- and micronutrients for children aged 0-3 years (Peraturan Menteri Kesehatan Republik Indonesia No. 28, 2019; Fahmida, et al., 2022).

Table 1. Indonesian Dietary Recommendations for Children (per Day)

Age groups	Carbohydrate (g)	Protein (g)	Total Fat (g)	Vit A (RE)	Vit C (mg)	Vit E (mcg)	Folate (mcg)
0-5 months *	59	9	31	375	40	4	80
6-11 months	105	15	35	400	50	5	80
1-3 years	215	20	45	400	40	6	160

The dietary needs for this age group are met by exclusive breastfeeding g, gram; mcg, microgram; RE, retinol equivalent; vit, vitamin RE (or µg RE) is used to indicate vitamin A intakes or requirements. One RE is defined as the biological activity equivalent to 1 µg of all-trans retinol, 6 µg of all-trans β-carotene, or 12 µg of α-carotene, β-cryptoxanthin, and other provitamin A carotenoids. Additionally, 1 International Unit (IU) is equal to 0.3 µg of RE (Commonwealth of Australia, 2006; Thurnham, 2007)

The Cilembu sweet potato's high nutritional value, soft texture, natural sweetness, and abundant availability make it an excellent candidate for various food applications (Mas'ud et al., 2019; Queenie et al., 2019; Meisara et al., 2021; Islam, 2024). Cilembu sweet potatoes can be processed into a variety of food products, including pudding, dried noodles, cereal, nuggets, cookies, and traditional cakes. Typically, the sweet potatoes are first processed into flour, which can then be used as a substitute for wheat flour in food production.

Wheat flour can be partially replaced with mashed Cilembu sweet potatoes to enhance nutritional value and promote the use of local foods. This is due to the high vitamin A content found in sweet potatoes. A 100-gram serving of sweet potatoes can provide up to 14,187 IU of vitamin A. Therefore, incorporating different proportions of sweet potato flour into wheat flour can increase the overall fiber and carotenoid content of processed food products (Giri et al., 2019). Processed food products with enhanced nutritional content can be beneficial as complementary foods to support stunting prevention.

One example of a processed product is the chicken nugget (Anjarsari, 2010), which children particularly favor. The typical ingredients used in chicken nugget production include chicken meat, wheat flour, carrageenan, seasonings (such as salt, garlic, and pepper), and water. A training program on chicken nugget production using Cilembu sweet potatoes was conducted in Duyung Village, Trawas, Mojokerto, aimed at empowering the partner group by enhancing their knowledge and skills. This initiative also serves as an effort to prevent stunting through improved food processing and nutrition practices. It is important to note that the production of nuggets from Cilembu sweet potatoes has never been undertaken by the community in Duyung Village, making this community empowerment activity essential to implement.

2 Method

The community service activity was conducted in Duyung Village, Trawas Subdistrict, Mojokerto Regency, involving key partners consisting of members of the Family Welfare Movement (PKK), Posyandu (integrated health post) cadres, and Village-Owned Enterprise (BUMDes) members. The selection of these partners was based on their strategic roles in household food management, provision of food during community health activities, and the potential development of processed food products as village-based economic enterprises

The approach applied in this activity was the Participatory Action Research (PAR) method, which positions the community as active subjects throughout the entire community service process. The PAR method emphasizes collaboration between community members and the academic team in identifying problems, designing solutions, implementing actions, and conducting continuous evaluation. Through this approach, the activity was not only oriented toward knowledge transfer but also toward community empowerment, enabling participants to develop independent and sustainable solutions.

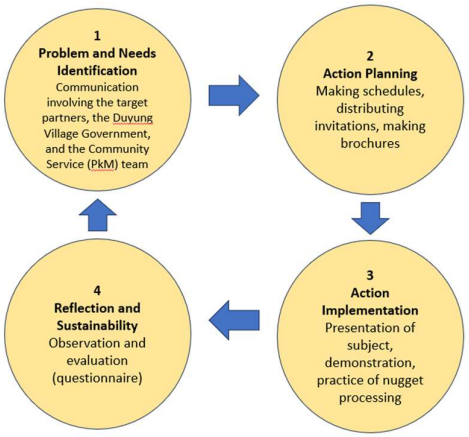

Figure 2. The PAR stages for Cilembu sweet potato-based chicken nuggets

The initial stage of the activity involved the identification of problems and needs, engaging target partners, the Duyung Village government, and the community service team. At this stage, intensive communication was carried out to explore the issue of stunting in the village and to identify local food potential that could be utilized. The mutual agreement reached was to use Cilembu sweet potatoes as the main ingredient for developing nutritious chicken nugget products as an alternative food to support stunting prevention.

The next stage was action planning, which included preparing the activity schedule, developing training materials, and producing supporting media in the form of brochures that outlined the procedures for making Cilembu sweet potato-based chicken nuggets. The implementation of the activity took place on July 29, 2025, at the Duyung Village Hall, using methods such as material presentations, demonstrations, and hands-on practice. Participants gained an understanding of the concept of chicken nuggets, their nutritional value, and the technical steps involved in production, ranging from ingredient preparation to frozen storage. To measure improvements in knowledge and participant satisfaction, questionnaires were administered before and after the training.

The final stage involved reflection and sustainability through observation and evaluation of the activities conducted. The evaluation focused on changes in participants' knowledge, skills, and awareness regarding the importance of utilizing nutritious local food resources for stunting prevention. The reflection outcomes are expected to strengthen the commitment of partners to sustainably develop Cilembu sweet potato-based chicken nuggets, both for household consumption and as a potential village economic venture managed collaboratively through the BUMDes.

3 Results

Fourteen members of the PKK participated in the training activity. The mean age of participants was 42.36 years; the youngest was 35, and the oldest was 49. The majority of participants, accounting for 35.7%, completed their education at the junior high school level.

Before the training activity, 92.9% and 85.7% of participants had never made and were unable to make Cilembu sweet potato-based chicken nuggets, respectively. After training, 85.7% of participants perceived they were able to make Cilembu sweet potato-based chicken nuggets or had an interest in making them. The number of participants who perceived they could make Cilembu-based chicken nuggets increased from 1 before the training to 12 thereafter. Following the training, the median score for perceived knowledge and skills in making Cilembu sweet potato-based chicken nuggets increased significantly compared with pre-training levels. As many as 92.9% participants regarded the training activity as beneficial and satisfying. Details on participant characteristics and training outputs are presented in Table 2.

Table 2. Characteristics of Training Participants and Outputs

Activity	Participants	Key Outcomes
Training on the utilization of Cilembu sweet potatoes in chicken nugget processing	14 female participants; mean age 42.36 ± 5.47 years; education levels ranged from elementary school to university	**Before training:** Most participants had never made chicken nuggets or attended similar training (≥85%). **After training:** 85.7% perceived they were able and interested in making Cilembu sweet potato-based chicken nuggets. Perceived knowledge increased significantly (median 1.5 to 3.0; $p = 0.006$), as did perceived skills (median 1.0 to 3.0; $p = 0.002$). Most participants reported the training was very beneficial (92.9%) and were satisfied or very satisfied (92.9%).

Throughout the activity, all participants showed enthusiasm and actively engaged in the processing practice. Some participants reported that they had previously made chicken nuggets but had not tried adding Cilembu sweet potatoes. According to the participants, processing Cilembu sweet potato-based chicken nuggets was a novel experience, and they expressed interest in attempting it at home again.

The finished product of Cilembu sweet potato-based chicken nuggets had a soft texture and a flavor similar to traditional chicken

nuggets. It was analyzed for fat, saturated fat, protein, carbohydrates, sugar, sodium, moisture, and ash content. The nutrient analysis of the Cilembu sweet potato-based chicken nuggets, per 100 g serving, is presented in Table 3.

Table 3. Nutritional Value of Cilembu Sweet Potato-based Chicken Nuggets per 100 g

Nutritional Value	Amount per 100 g
Total Lipid	9 g
Saturation Lipid	4 g
Protein	12 g
Total Carbohydrate	20 g
Sugar	6 g
Sodium	500 mg

From a social perspective, this community service activity improved the quality of life by enabling participants to acquire new productive skills. The training on processing chicken nuggets enriched with Cilembu sweet potatoes contributed to strengthening household food security, particularly through the diversification of Cilembu sweet potato-based products. This is reflected in the questionnaire results, in which 92.9% of participants reported that the training was highly beneficial, and there was a significant increase in perceived skills. Additionally, the processing of Cilembu sweet potatoes into chicken nuggets also supports the preservation of local food traditions.

From an economic perspective, this community service activity has the potential to develop local micro-, small-, and medium-sized enterprises (MSMEs) and create job opportunities. The partner communities are now able to process local food ingredients into higher-value food products. This aligns with the questionnaire findings, which show that 85.7% of participants were able to produce Cilembu sweet potato chicken nuggets, with an increase in the number of participants capable of making the product.

Improving community health and quality of life is also one of the impacts of this community service activity. Knowledge gained from training in making Cilembu sweet potato chicken nuggets can help

increase the consumption of nutritious food. Partners who have understood the nugget-making process can apply it on a small scale at the household level and potentially develop it into a home-based business, although the economic impact has not yet been significantly realized following the training.

4 Discussion

During the problem and needs identification stage, communication was established with the local government of Duyung Village, Trawas District, Mojokerto Regency. At that time, it was noted that there were 14 children with stunting out of a total of 126 children in 2022. In 2023–2024, there were still 9 children experiencing stunting, indicating the need for community assistance and training focused on stunting prevention efforts. In addition, there was a food security issue in Duyung Village related to the abundant local food potential, namely Cilembu sweet potatoes.

During the peak harvest season, Cilembu sweet potatoes are highly plentiful, resulting in a significant decline in their selling price. This situation is detrimental to the community, as the selling price does not compensate for the planting costs incurred. Therefore, utilizing Cilembu sweet potatoes as processed food products can improve food security in Duyung Village. Processed food products made from Cilembu sweet potatoes include dried noodles, cereals, nuggets, cookies, and various traditional cakes, such as brownies, kue lumpur, and bread. The current training, focused on the utilization of Cilembu sweet potatoes in chicken nugget production to prevent stunting in Duyung Village, Trawas, Mojokerto, is highly appropriate. It addresses two existing issues in the village: the ongoing problem of stunting and the abundance of local food resources (Cilembu sweet potatoes).

The selection of Cilembu sweet potato-based chicken nuggets was based on the consideration that this food product is a source of protein, particularly animal-based protein. Protein plays a vital role in children's growth. Several key functions of proteins include building and repairing body tissues such as muscles and bones, supporting brain development,

strengthening the immune system, facilitating hormone and enzyme production, and maintaining the health of the skin, hair, and nails. Haryani et al. (2023) reported that animal protein intake is associated with stunting in toddlers, based on a case study conducted at the Minggir Community Health Center in Yogyakarta. The study by Anggita et al. (2018) reported a significant association between total animal protein consumption and stunting (p = 0.000). Children who consume low amounts of animal protein have a sixfold higher risk of experiencing stunting compared to those who consume adequate amounts of animal protein. Similarly, the study by Nurul et al. (2020) found that weekly consumption of animal protein was associated with a protective effect against stunting in toddlers. These findings indicate that animal protein is an essential nutrient needed for growth and the development of body structures, as well as for repairing damaged tissues. Therefore, children who consume sufficient animal protein are less likely to experience stunting.

In addition to providing animal-based protein, Cilembu sweet potato-based chicken nuggets also provide energy, vitamins, minerals, and other essential nutrients required for child development. A deficiency in these nutrients can lead to stunting, an increased risk of infectious diseases, impaired brain and cognitive development, and physical weakness. A review by Imeldawati (2025) indicated that children with stunting tend to experience delays in cognitive development. If not addressed appropriately, such cognitive delays may adversely affect the child's learning.

The protein content of Cilembu sweet potato-based chicken nuggets is 12 g per 100 g. This value meets the Indonesian National Standard (SNI 01-6683:2022), which requires that chicken nuggets in Indonesia contain at least 12 g of protein per 100 g. This indicates that Cilembu sweet potato-based chicken nuggets can be categorized as a protein-rich food product. In addition to protein, these nuggets also provide energy, with a total carbohydrate content of 20 g per 100 g. Adequate energy intake is essential to support optimal child development. Given their nutritional composition, Cilembu sweet

potato-based chicken nuggets have the potential to be utilized as a dietary intervention to address stunting.

At the reflection and sustainability stage, participants were asked to complete a questionnaire before and after the training. The questionnaires were then analyzed. The analysis indicated a significant improvement in participants' knowledge and skills following the training. Furthermore, regarding perceived benefits and satisfaction, most participants reported that the training was highly beneficial and expressed high satisfaction. This indicates that the training conducted in Duyung Village was appropriate and contributed meaningfully to addressing health and food security issues in Duyung Village, Trawas, Mojokerto.

From the social, economic, and health perspectives, this community service program demonstrated tangible impacts. From a health standpoint, the training on the production of chicken and Cilembu sweet potato nuggets provided participants with practical skills to prepare nutritious food, which can help prevent and manage stunting. From a social perspective, the program equipped the community partners with new knowledge and skills to develop innovative products by utilizing the local potential of Duyung Village. From an economic standpoint, the training is expected to initiate new entrepreneurial opportunities and support local employment.

5 Conclusion

The perceived knowledge and skill scores of participants in Duyung Village increased significantly after the implementation of the Training on the Development of Chicken Nugget Products Based on Cilembu Sweet Potatoes as a Nutritious Food Alternative for Stunting Prevention in Duyung Village, Trawas, Mojokerto. Participants stated that the training was very beneficial and expressed satisfaction with the program. Continuous monitoring and evaluation are necessary to ensure the continued production of Cilembu sweet potato-based chicken nuggets and to assess their long-term impacts on the economy and stunting incidence in the community at the Duyung Village, Trawas District, Mojokerto Regency.

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