Jurnal Pemberdayaan Masyarakat
Volume 4 Nomor 3 Tahun 2025 | Hal. 560–578
ykgm.org

ISSN 2962-8091
DOI: 10.46843/jpm.v4i3.502

Home Gardens, Local Knowledge, and Public Health: The Distinctive KESURGA Approach to Stunting Reduction

Dewi Ayu Hidayati[1]*, Suwarno[2], Yuni Ratna Sari[3], M. Eki Pratama[4], Komang Ariyanto[5]
[1-4]Faculty of Social and Political Sciences, Universitas Lampung, Indonesia
[5]Faculty of Human Ecology, IPB University, Indonesia

ABSTRACT

Stunting is a growth failure condition caused by inadequate nutrition during a child's developmental years. In Indonesia, stunted toddlers are prevalent, particularly in Lampung Province, where rates exceed the WHO standard of 20%. In 2019, the Tanggamus region had a stunting prevalence of 27.39%. This study examines the impact of the KESURGA demonstration plot intervention, which aims to promote balanced nutrition in Kagungan Village, Kota Agung Timur District, using a qualitative phenomenological approach. Data were gathered through observations, in-depth interviews, and documentation analysis. The findings indicate that the KESURGA intervention, which included training, garden development, and socialization activities, resulted in a reduction in stunting rates from 19.17% in 2020 to 14.18% in 2021. Key supporting factors included effective communication, availability of resources, aligned policies, and positive attitudes. Challenges such as economic conditions of underprivileged families, the Covid-19 pandemic, and a lack of information hindered progress. These results highlight that multi-stakeholder, nutrition-focused interventions can significantly reduce stunting. This study provides qualitative evidence of locally adaptable strategies that contribute to public health nutrition interventions in rural Indonesia, offering insights for global health initiatives. It demonstrates how community-driven, resource-sensitive, and policy-aligned interventions can address malnutrition challenges in low- and middle-income countries.

ARTICLE INFORMATION

Keywords:
balanced nutrition; demonstration plot; kesurga; stunting; stunting prevention

Correspondent Author:
Dewi Ayu Hidayati

Email:
dewiayu.hidayati@fisip.unila.ac.id

Recommended citation: Hidayati, D. A., Suwarno., Sari, Y. R., Pratama, M. E., & Ariyanto, K. (2025). Home Gardens, Local Knowledge, and Public Health: The Distinctive KESURGA Approach to Stunting Reduction. *Jurnal Pemberdayaan Masyarakat, 4*(3), 560-578.

INTRODUCTION

Children form the very bedrock of a nation's future, and safeguarding their well-being in health, education, and the environment is essential to fostering their optimal growth and development. The Indonesian Constitution (UUD 1945 Article 28H Paragraph 1) enshrines every individual's right to live in "physical and spiritual prosperity," to enjoy "a good and healthy environment," and to have access to medical care. In adherence to this constitutional mandate, the Indonesian government is charged with protecting and promoting public health under Law No. 36/2009 on Health, which underscores health development as a right rooted in humanity, equity, and respect, and calls for elevating public awareness and improving nutrition quality across all stages of life—with special priority for vulnerable groups including children and mothers. On the global stage, the United Nations Convention on the Rights of the Child (1989) amplifies children's rights to life, development, protection, and participation—principles that Indonesia reinforced through ratification via Law No. 35/2014 on Child Protection, thereby reaffirming its commitment to ensuring child survival and growth. A pivotal element of this commitment is ensuring adequate nutrition during early childhood, especially throughout the first 1,000 days—the so-called "golden age" that spans from the fetal stage to two years of age—a period foundational to lifelong cognitive and physical development, with lasting

implications (Black & Heidkamp, 2018; Rahayu, 2020). As scholars like Uce (2017) emphasize, this stage establishes the bedrock for children's intellectual, emotional, moral, and social capabilities. Without proper nourishment during this vulnerable window, children face elevated risks of developmental impairments, notably stunting, which further undermines their future potential (Anggryni et al., 2021).

Stunting is a chronic developmental condition characterized by significantly impaired linear growth, operationally defined as a height-for-age measurement falling more than two standard deviations below the World Health Organization's median benchmark (WHO, 2017). It stems primarily from prolonged undernutrition and frequent infections, especially during the critical first 1,000 days of life—from conception to age two—during which both physical and neurological systems develop most rapidly. The consequences of stunting are profound and frequently irreversible, extending far beyond stature to undermine cognitive abilities, educational performance, and long-term economic productivity (Gibney, 2009; Kemenkes, 2018). In Indonesia, such awareness has translated into legislation: Law No. 36 of 2009 on Health establishes the legal foundation for improving nutrition, enhancing public health awareness, expanding access to nutrition services, and strengthening health-monitoring systems—all integral to stunting prevention. To operationalize these mandates, Presidential Regulation No. 42 of 2013 launched the National Movement for the Acceleration of Nutrition Improvement ("Gerakan Nasional Percepatan Perbaikan Gizi"), explicitly prioritizing the first 1,000 days of life and institutionalizing coordinated, multi-stakeholder engagement across sectors. This framework envisions the active collaboration of central and regional governments, community cadres, educational institutions, civil society, media, the private sector, and international partners in fostering nutritional awareness, delivering both direct and indirect interventions, and embedding nutrition within development agendas.

Despite national initiatives aimed at combating childhood malnutrition and enhancing human capital, Indonesia continues to grapple with a disturbingly high prevalence of stunting. According to the 2019 Susenas-integrated *Survei Status Gizi Balita Indonesia* (SSGBI), 27.67 percent of children under five were categorized as stunted—well above the World Health Organization's accepted maximum of 20 percent. This figure also surpasses other nutrition-related concerns recorded in the same survey, including underweight children at 16.29 percent and wasting (thinness) at approximately 7.19 percent (BPS, 2019). Regionally, Lampung Province consistently reports stunting rates exceeding the national average, specifically 26.26 percent in 2019, based on BPS-Kemenkes data. At a more granular superintendent (kabupaten/kota) level within Lampung, disparities are even starker. Some districts exhibit alarmingly elevated stunting rates: North Lampung Regency at 38.56 percent, Bandar Lampung City at 36.08 percent, South Lampung at 30.39 percent, Mesuji at 27.44 percent, Tanggamus at 27.39 percent, East Lampung at 26.12 percent, Pesawaran at 25.84 percent, and Metro City at 25.03 percent (BPS, 2019; Hadi, 2020)—each far beyond the WHO threshold and highlighting uneven progress across the region. These data underscore the urgent necessity for localized, context-sensitive interventions, delivered through strong multi-sector stakeholder coordination, to address deeply entrenched malnutrition. In response to these high rates, Tanggamus Regency has taken proactive steps, designating 33 villages as stunting loci in 2020 and reducing this number to 26 in 2021, based on toddler anthropometric measurements from August 2020 (Bapperida Tanggamus, 2021). Concurrently, the local government launched a triad of targeted programs to combat stunting: improving community-based sanitation, increasing the number of villages free from open defecation, and ensuring quality nutritional intake for children. Equally important, the private sector's involvement has begun to play a significant role, complementing public efforts with additional resources and partnerships to enhance the local response.

The collaboration between PT Tirta Investama (Aqua Danone) and the Yayasan Konservasi Way Seputih (YKWS) gave rise to the innovative KESURGA program—*Kebun Sayur, Buah, dan Toga*—in Kagungan Village, Kota Agung Timur District, designed to transform household yards into productive spaces for growing vegetables, fruits, and medicinal plants to bolster food security and counter stunting; since around 2019 in Tanggamus, PT Tirta Investama Tanggamus actively promoted demplot (demonstration plot) KESURGA in partnership with YKWS, seeking to educate households on organic, pesticide-free cultivation for family nutrition and to embed the idea that healthy gardens grow healthy people. Beginning early in 2021, the initiative ramped up through community-based strategies like training and mentoring for women's farmer groups (Kelompok Wanita Tani, or KWT), plus facilitating the physical development of home gardens alongside efforts to socialize the messages of balanced nutrition and improved sanitation via integrated Nutrition-WASH (Water, Sanitation, and Hygiene) approaches. These initiatives reflect the broader understanding that dietary intake, hygiene practices, and environmental health are deeply interconnected and central to reducing malnutrition and stunting. By building capacity through practical on-site demonstrations and embedding nutrition knowledge in local women's groups, KESURGA not only strengthens households' immediate access to produce nutrient-rich food but also fosters long-term behavioral shifts regarding food production and hygiene. Furthermore, the program serves as a living teaching model, where community members learn by doing, in their own yards, with support and guidance, thereby promoting sustainability and community empowerment. The involvement of agricultural extension services (BPP) and local government officials underscores the multi-stakeholder nature of the intervention, reinforcing how public, private, and civil society actors can align to enact tangible change. Ultimately, KESURGA demonstrates a practical, place-based application of the integrated Nutrition-WASH model—grounded in local ownership, education, food diversity, and environmental health—to address stunting in a holistic, context-sensitive manner.

Preliminary outcomes from the KESURGA intervention in Kagungan Village indicate a notable decline in stunting prevalence, falling from 19.17 percent in 2020 to 14.18 percent in 2021, as reported by Bapperida Tanggamus (2021); this decline underscores the potential of community-based, multi-stakeholder strategies as viable, scalable models for stunting prevention in other high-risk areas. Against this encouraging backdrop, the current study aims to examine the implementation of an Integrated Nutrition-WASH program in Kagungan Village, located within the Kota Agung Timur Sub-district of Tanggamus Regency, to assess the program's operational dynamics in a localized context. In doing so, the research seeks to identify both enabling and inhibiting factors that influence program performance and uptake, whilst offering a rigorous evaluation of effectiveness vis-à-vis stunting reduction measures. By situating the study within the nexus of health sociology, this research contributes to broader academic discourses on community-level interventions, power dynamics, participatory governance, and intersectoral coordination. Importantly, the findings can furnish practical insights for policymakers tasked with resource allocation and program design, offering empirical evidence on what works—and what does not—within a specific rural Indonesian setting. Similarly, development practitioners engaged in the field may draw transferable lessons concerning stakeholder mobilization, behavior change communication, supply chain logistics (particularly in water, sanitation, and nutrient delivery), and community ownership of health outcomes.

Additionally, local communities themselves stand to benefit from the identification of locally resonant strategies that ensure the sustainability of positive nutritional outcomes beyond the study's timeframe. The study's articulation of operational dynamics—including governance structures, coordination mechanisms among health, water, and community actors, and feedback loops—will help unpack how the program achieves alignment across diverse stakeholders. Investigating enabling factors, such as existing social capital, local leadership, cultural acceptance, and existing

infrastructure, will highlight what facilitates success. Conversely, analyzing inhibiting factors—such as resource constraints, coordination breakdowns, cultural resistance, or environmental challenges—will elucidate the barriers to translating program design into impact. By systematically evaluating effectiveness through quantitative indicators (e.g., changes in stunting rates) and qualitative measures (e.g., stakeholder perceptions, quality of community engagement), the study promises a well-rounded assessment. Altogether, this research not only enriches the theoretical understanding of integrated, multi-sectoral interventions in health sociology but also generates actionable guidance for on-the-ground efforts to reduce stunting, thereby aligning academic rigor with practical relevance for a range of stakeholders invested in improving child health outcomes in high-risk rural contexts.

This study makes a significant contribution to scientific and practical understanding by empirically examining the implementation of an Integrated Nutrition-WASH intervention—specifically, the KESURGA (*Kebun Sayur, Buah, dan Toga*) home-garden initiative in Kagungan Village—to reduce stunting within Tanggamus Regency's high-risk context. Its novelty lies in integrating health sociology with a multi-stakeholder, place-based strategy by collaborating across public, private, and civil society sectors to cultivate household gardens that serve nutritional, environmental, and educational roles. Through rigorous qualitative insights into governance, social capital, cultural acceptance, and implementation bottlenecks, it enriches academic discourse on how integrated, community-embedded interventions work in real-world rural Indonesian settings. Consequently, the findings not only advance theoretical understanding of participatory governance and intersectoral coordination in health interventions but also offer policymakers, development practitioners, and communities concrete, context-specific strategies for sustainable stunting prevention.

Table 1. Comparative Features of KESURGA and Similar Intervention Models

Dimension	Conventional Home-Garden / Nutrition-Sensitive Agriculture	Donor-Driven / Top-Down Stunting Interventions	KESURGA Program (Distinctive Features)
Primary Focus	Household food production is often limited to nutrition improvement.	Short-term stunting reduction via supplementation or campaigns	Integrated nutrition + WASH + health education in a unified model
Governance	Household or individual-based	Centralized, top-down donor or government management	Collective governance mobilizing village, public, private, and civil society actors
Cultural Integration	Limited adaptation to local traditions	Often generic and externally imposed	Deeply rooted in local cultural practices and community norms
Participation	Individual household effort	Beneficiaries as passive recipients	Community-driven co-ownership and active participation
Scope	Food security focus	Health/nutrition only	Multi-dimensional: food security + hygiene + social learning + ecological benefits
Sustainability	Dependent on household continuity	Declines after donor withdrawal	Designed for long-term sustainability via social capital and place-based ownership

This study significantly enhances both scientific and practical understanding by empirically examining the implementation of the Integrated Nutrition WASH intervention, specifically the KESURGA (*Kebun Sayur, Buah, dan Toga*) home-garden initiative in Kagungan Village. The goal is to reduce stunting in the high-risk context of Tanggamus Regency. Its novelty lies in integrating health sociology with a multi-stakeholder, place-based approach that collaborates across public, private, and civil society sectors to cultivate household gardens that fulfill nutritional, environmental, and educational roles. Unlike conventional home-garden or nutrition-sensitive agriculture programs that focus solely on household-level food production, the KESURGA initiative links WASH, food security, and health education within a single unified model (see Table 1). It distinguishes itself from donor-driven or top-down stunting interventions by embedding local cultural practices, promoting collective governance, and fostering co-ownership among public, private, and community actors. This multidimensional design positions KESURGA not merely as a food security measure, but as a socially embedded, health-oriented ecosystem tailored to the realities of rural Indonesia. Through rigorous qualitative insights into governance, social capital, cultural acceptance, and implementation challenges, this study enriches academic discourse on the functioning of integrated, community-embedded interventions in real-world rural Indonesian settings. Consequently, the findings advance theoretical understanding of participatory governance and intersectoral coordination in health interventions, while also providing policymakers, development practitioners, and communities with concrete, context-specific strategies for sustainable stunting prevention.

METHOD

This research employs a qualitative, phenomenological approach to explore a social phenomenon, examining individual understanding through experiences, events, and interactions with others and the environment (Pabel et al., 2021; Seamon & Gill, 2016). Researchers analyzed the activities and actions involved in facilitating the KESURGA demonstration plot, aimed at promoting balanced nutrition for stunting prevention. The study was conducted in Kagungan Village, Kota Agung Timur Subdistrict, Tanggamus Regency. The location was selected based on data and preliminary research, which indicated that the implementation of KESURGA demonstration plot activities would lead to a decrease in stunting prevalence afterward.

Informants were selected through purposive sampling, a method that involves choosing subjects based on characteristics relevant to the target population (Bernard & Gravlee, 2014; Margono, 2005). This study included 13 informants who were knowledgeable about the implementation of the Integrated WASH Nutrition program. The informants comprised: 1 representative from the Tanggamus District Bapperida; 1 representative from the Tanggamus District Health Office; 1 representative from the Tanggamus District Education Office; 1 representative from the Tanggamus District Office for Women's Empowerment, Child Protection, Population Control, and Family Planning; 1 representative from the Tanggamus District Office for Community and Village Empowerment; 1 representative from the Food Security, Food Crops, and Horticulture Office of Tanggamus District; 1 Coordinator from the Integrated WASH Nutrition Program at the Way Seputih Conservation Foundation; 1 Nutritionist from the Pasar Simpang Community Health Center in East Kota Agung Subdistrict; 1 Secretary from Kagungan Village; 1 Village Midwife from Kagungan Village; and three informants who were Housewives and Posyandu Cadre Leaders. The criteria for informants were: 1) Parties involved in the KESURGA facilitation activities in Kagungan Village; 2) Community members who benefited from the KESURGA activities; and 3) Community members with infants or toddlers who have experienced or not experienced stunting.

Before data collection, the research protocol received ethical review and approval from the Research Ethics Committee of Lampung University. This ensured compliance with the principles of

voluntary participation, confidentiality, and informed consent. All informants were given clear explanations of the study's objectives, methods, and their right to withdraw at any time. Following this, written or verbal informed consent was obtained from each participant.

Data collection utilized three methods. First, observation guidelines and field notes served as data collection instruments. This information was analyzed after collection. Second, structured and unstructured interview guidelines were used to gather interview results during field data collection. Third, documentation involved elements such as photographs, recordings, and written materials as part of the data collection process. The data analysis method included the following steps (Ariyanto, 2023a; Miles & Huberman, 1994): 1) Pre-field analysis, which evaluates data from preliminary studies or secondary sources to direct the research focus, including previous pre-research; 2) Analysis conducted during field activities, where analysis occurs both during and after data collection. An interactive analysis approach was used at the data collection stage; 3) Data verification and inference, where initial conclusions are presented tentatively and refined as more complete data is acquired.

In this study, data validation was performed using triangulation techniques, which test the validity of data from multiple sources and methods, providing repeated verification (Miles & Huberman, 1994). The triangulation included various research informants such as the coordinator of the Integrated WASH Nutrition program, officials from Bapperida Tanggamus Regency, and representatives from the Education Office, Health Office, Women's Empowerment Office, Child Protection, Population Control and Family Planning, Community and Village Empowerment Agency, Food Security, Food Crops and Horticulture Agency, Pasar Simpang Community Health Center, Village Midwives, Posyandu Cadres, and Kagungan Village Officials. Researchers compared and checked the consistency of findings from these diverse sources to ensure greater accuracy. To enhance reliability, the researcher conducted time triangulation by interviewing informants two to three times at different intervals to assess whether their responses remained consistent over time. Method triangulation was also employed, gathering information through in-depth interviews with 13 selected informants who met the research criteria. Non-participatory observation was conducted by attending various program activities to observe the implementation and interactions between program implementers, local stakeholders, and the community. Document analysis was also performed by reviewing program reports, implementation guidelines, and other relevant documents to gain a comprehensive understanding of how the program should be executed.

RESULTS AND DISCUSSION

The KESURGA program contributes to stunting reduction through a multidimensional pathway that links increased fruit and vegetable consumption, strengthened maternal nutritional knowledge, and improved sanitation behaviors into one integrated model. At the household level, demonstration plots and home gardens increased dietary diversity by providing continuous access to nutrient-rich vegetables and medicinal plants, reducing dependency on market purchases, and directly improving child feeding practices. Simultaneously, structured training and participatory health education targeted mothers and secondary caregivers, fostering a deeper understanding of nutrition, hygiene, and childcare—addressing knowledge gaps that often undermine feeding practices in low-income households. Unlike conventional home-garden interventions, KESURGA combines agroecological literacy, gender-focused empowerment, and climate-smart technologies such as dual fertigation systems, producing not only higher yields but also behavioral change through hands-on mentorship. These experiential approaches generated ecological resilience, food sovereignty, and women's decision-making power, amplifying nutrition-sensitive outcomes. At the community level, participatory communication strategies, small-group socialization, and culturally tailored dialogues reinforced awareness and fostered collective ownership, ensuring behavioral internalization rather

than passive compliance. The program's novelty further lies in its integration with institutional scaffolding: partnerships with the Agriculture Department's P2L program, NGO facilitation, and local government regulations ensured policy legitimacy, resource continuity, and vertical coordination—features absent in many donor-driven, short-term interventions. Importantly, its adaptive strategies under COVID-19—maintaining safe, in-person training while embedding empathy-based facilitation—demonstrated resilience in adverse contexts. Collectively, KESURGA advances the science of stunting prevention by showing that locally embedded, multi-sectoral, and socially participatory interventions outperform siloed models, producing measurable dietary, behavioral, and institutional gains that align with Indonesia's national stunting reduction strategy and offer transferable lessons for global nutrition-sensitive development.

Implementation, a critical phase in the policy cycle, transforms nutrition-sensitive agricultural program design into measurable community outcomes. A 2023 study of Indonesia's national convergence action policy at the district through village levels revealed strong implementation at the district level but limited acceptability, appropriateness, and coverage in villages—due to weak capacity, poor coordination, and politicization—underscoring the need for context-specific operational strategies (Herawati & Sunjaya, 2022; Kasmad, 2018). Similarly, a large cluster randomized controlled trial (2014–2018) of multifaceted community-based interventions (including agriculture, WASH, nutrition counseling) failed to reduce stunting, though it improved intermediate outcomes like maternal iron-folic supplementation and exclusive breastfeeding—pointing to the challenge of synchronous complex implementation over short periods (Beatty et al., 2024). These findings are novel insofar as they empirically demonstrate that even well-resourced, multi-sectoral models can fall short without phased, capacity-strengthening approaches. Unlike prior studies that assume integrated packages will succeed, these highlight the temporal and operational realities. The contribution to science lies in emphasizing the importance of implementation realism—that interventions must align with local system readiness and stakeholder behavior over time, resonating with Van Meter and Van Horn's framework but providing grounded evidence of where alignment falters. This insight advances the literature by shifting the focus from design to adaptive execution, informing future community-level stunting prevention efforts, such as the KESURGA demonstration plot.

The initiative supporting Women Farmer Groups (Kelompok Wanita Tani) and residents to optimize household yards for cultivating vegetables and medicinal plants operationalizes micro-level sustainable food systems, echoing Krause et al. (2021) and Subandar et al. (2022), who demonstrated that demonstration gardens significantly boost agricultural knowledge, production, and preschool-child dietary diversity (DDS), and home food security in subsistence contexts (Galhena et al., 2013; Subandar et al., 2022; Ariyantob, 2023). More recently, a cluster-randomized trial in rural Tanzania found that women participating in homestead food production (HFP) interventions consumed 0.50 more food groups daily and were 14 percentage points more likely to achieve minimal dietary diversity. At the same time, households tended toward reduced moderate-to-severe food insecurity (Blakstad et al., 2021). A qualitative study in Bangladesh documented how HFP techniques—like sack gardening—help women overcome environmental and soil constraints, empowering them to establish productive gardens even during flood seasons (Dupuis et al., 2022). These findings advance the field by providing robust experimental and contextual evidence that micro-scale, gender-focused garden interventions not only enhance nutritional outcomes but also build resilience and adaptive capacity in vulnerable rural settings, demonstrating novel, scalable pathways for integrating agriculture with nutrition and gender empowerment.

This initiative embeds hands-on training for women—organic cultivation, compost production, and integrated pest control—to build practical competencies and behavioral shifts toward eco-

conscious, health-oriented systems. By consistently pairing mentorship with experiential learning, it fosters household food autonomy, promoting food sovereignty and gender-inclusive development. Recent research in Oaxaca has demonstrated that women's revitalization of home gardens using organic pest control methods increased food security, reduced food expenses by 20%, and enhanced women's decision-making and empowerment in both household and community contexts (Acevedo-Ortiz et al., 2024). In Ethiopia, studies have shown that redistributing decision-making power and assets enhances dietary diversity and nutrition outcomes, underscoring how empowerment translates into tangible food security gains (Jemaneh & Shibeshi, 2023). Unlike prior work, which mostly documents outcomes, this program's novelty lies in its integrated, multifaceted approach—combining practical skill-building, sustained mentorship, and behavior change to generate both ecological resilience and gendered empowerment. Its contribution to science lies in demonstrating how experiential, women-centered agroecological training can simultaneously drive environmental sustainability, nutritional improvements, and women's agency—offering a model with clear implications for designing gender-responsive, resilient food systems globally (Herforth et al., 2019).

Beyond community-level activities, institutional partnerships, such as the Tanggamus Regency Agriculture Department's engagement via the Sustainable Food Yard Program (Pekarangan Pangan Lestari, P2L), exemplify policy-level reinforcement that both legitimizes and scales grassroots innovation. Recent research in Sleman Regency has evidenced P2L's distinctive effectiveness during the COVID-19 pandemic: the program acted as a "living food barn," supplying 60% of household vegetable needs and supporting stunting reduction efforts—an impact not previously demonstrated in conventional nutrition interventions (Renita et al., 2023). In Sukabumi, a quantitative case study reported that the frequency of harvests within P2L significantly increased household energy consumption, indicating a direct link to food security outcomes (Ramadanti, 2023). Meanwhile, in Sindangkarya Village, a participatory action research approach markedly enhanced farmers' knowledge and skills in utilizing home gardens for food independence—a participatory innovation that distinguishes P2L from top-down models (Mariyani et al., 2024). Together, these findings underscore P2L's novel contribution to empirical understanding: it not only strengthens local nutritional resilience under crisis, but also facilitates measurable, sustainable improvements in food access, knowledge, and empowerment. This knowledge advances science by bridging nutrition policy, behavioral change, and community resilience, offering a replicable model for integrating governmental programs with grassroots transformation (Ranisavljev et al., 2025).

The KESURGA program's holistic integration of food production**,** nutrition education, and community organizing forms an innovative, replicable model of resilience-building by embedding interventions in localized community contexts (e.g., family food gardens, locally tailored nutrition messaging), which is novel compared to more siloed or centrally managed approaches. It yields a significant impact in advancing sustainable livelihoods and improving dietary quality, particularly for women and children, which aligns with upstream (nutrition-sensitive) and downstream (nutrition-specific) strategies as promoted in Indonesia's national framework. By syncing with Indonesia's National Strategy to Accelerate Stunting Prevention 2021–2024, the program demonstrates how localized**,** integrated solutions complement national policy while delivering context-sensitive adaptation in real-world settings. Crucially, KESURGA's emphasis on strategic partnerships, active community engagement, and flexible adaptations to local contexts reinforces and extends the literature on sustainable development practice by illustrating effective bottom-up convergence mechanisms that improve both implementation fidelity and outcomes (Gillespie et al., 2019; UNICEF et al., 2019). This contributes to scientific understanding by providing an empirically grounded model for integrating multi-sectoral actions at the community level, offering transferable lessons for resilience-building, nutrition interventions, and the implementation of Sustainable Development.

The facilitation of the KESURGA demonstration plots in Kagungan Village embodied a novel, localized**,** nutrition-sensitive agroecological intervention, uniquely implemented during the COVID-19 pandemic. Unlike many prior programs, it preserved face-to-face, hands-on training with organic composting and biological pesticide techniques, maintaining safety through strict health protocols—even as much of the literature shifted toward remote or hybrid models (Félix & Sanfiorenzo, 2022; Nicolétis et al., 2019). This site-specific pekarangan optimization, aimed at bolstering household food diversity through fruits, vegetables, and medicinal plants, underscores an innovative, ground-level capacity-building approach (Shetty, 2018). While home-garden interventions are known to enhance resilience and nutrition, most lack integrative, context-adapted facilitation under restrictive conditions (Baliki et al., 2023). The novelty lies in maintaining in-person, place-tailored agroecological training in a pandemic context—a contrast to the dominant remote methods (Félix & Sanfiorenzo, 2022). Its impact is twofold: first, it reinforces nutrition-sensitive agriculture by enhancing local dietary diversity and ecological stewardship; second, it contributes to the science of resilient training modalities, offering an empirical model that shows that carefully managed in-person programs can succeed safely under extreme conditions. This demonstration thus advances both the practical resilience of rural food systems and academic discourse on sustainable intervention delivery in crisis contexts.

The KESURGA demonstration plot's greenhouse—with both sprinkler and drip fertigation systems—embodies a climate-smart approach that sharply improves nutrient-use efficiency compared to conventional methods, paralleling recent findings that fertigation can boost fertilizer use efficiency up to 80–90 %, saving about 25 % of nutrients while curbing runoff and eutrophication (Sahoo et al., 2025). What sets KESURGA apart is its dual-system design (sprinkler plus drip fertigation) combined with hands-on community training from land clearing to seedling care—this integrated experiential model is more novel than single-technology trials. Prior studies largely focus on technology performance; KESURGA's participatory deployment promotes both adoption and behavior change, a vital step toward scalable CSA. Moreover, the selection of nutrient-rich, medicinal crops like spinach, eggplant, long beans, turmeric, and galangal aligns with emerging "nutrition-smart" CSA strategies promoting dietary diversity and resilience—extending beyond staple yield gains to combine health and agroecological benefits (Yudiyanto et al., 2022). By integrating food, health, and resource-efficient infrastructure within a demonstration context, the intervention enhances household resilience more holistically than yield-centric CSA models (World Bank et al., 2015). This multimodal design therefore contributes to science by operationalizing CSA in a socially embedded, nutrition-sensitive, and technically efficient manner, offering a scalable framework for CSA extension.

Community-based, women-led interventions—such as those within Women Self-Help Groups (WSHGs)—have been shown to significantly boost the adoption of improved seed varieties and quality seed practices, outperforming non-collective extension methods and demonstrating the added value of participatory institutional structures within randomized controlled trials (Hossain et al., 2024). In Wonosobo's KWT program in Central Java, sustained social capital—measured through participation, trust, reciprocity, and cooperation—was directly associated with members' increased income, indicating tangible economic and agency benefits stemming from collective engagement. Similarly, a qualitative study in North Luwu, Indonesia, confirms that social capital components, including social networks, trust, communal values, and active participation, materially underpin food security in agroforestry systems, illustrating how participatory involvement enhances resilience and sustainability (Yusriadi, 2025). A recent systematic review further clarifies that while women's deep participation in agriculture can improve dietary diversity and income, it also risks increased labor burden unless designed with safeguards—highlighting the necessity of participatory designs that balance empowerment, efficiency, and well-being (Gupta, 2025). Collectively, these studies introduce

novel empirical evidence—from experimental trials, correlational analyses, and conceptual frameworks—demonstrating that participatory structures do more than build technical competence; they critically cultivate social capital, economic gains, and sustainable, equitable change, while also calling attention to the careful design needed to avoid unintended burdens: a significant contribution to the science of agricultural development and gender-sensitive empowerment strategies (Pretty, 2003; Thakur et al., 2025).

The KESURGA model introduces a fundamentally transformative approach in the field of food security by shifting from reactive food aid to proactive agroecological self-reliance. Unlike conventional gardening programs, KESURGA embeds agroecological literacy into everyday life, enabling participants to understand soil health, plant and microbial diversity, nutrition, and ecosystem services in an integrated manner. Recent journal studies corroborate the novelty of this approach: agroecological diversification practices—such as intercropping, cover cropping, and organic amendments—have been shown to enhance soil quality, biodiversity, carbon sequestration, and long-term profitability by up to 2000 % over decades (Raveloaritiana & Wanger, 2024). Moreover, studies in smallholder systems have demonstrated that combined ecological and nutritional indicator frameworks significantly improve agroecosystem resilience, creating synergies among productivity, diversity, and functional quality (Folke et al., 2005; Stratton et al., 2020). KESURGA's adaptive management component—featuring continual monitoring and iterative learning—parallels cutting-edge transdisciplinary participatory research that bridges ecological monitoring, farmer co-design, and feedback mechanisms to foster both institutional trust and system resilience (Blundo-Canto et al., 2025; Kpienbaareh et al., 2022). Scientifically, KESURGA contributes to agroecology by operationalizing integration of educational, ecological, and management dimensions, advancing both theory and practice in sustainable livelihood interventions (Gliessman, 2014). The program's implications extend beyond local food sovereignty: it demonstrates how holistic agroecological interventions can align with Sustainable Development Goals—particularly zero hunger (SDG 2), good health and well-being (SDG 3), and sustainable cities and communities (SDG 11)—and thus offers a scalable model for transforming food systems globally through place-based, knowledge-rich, and adaptive pathways.

Effective communication and education are crucial to promoting behavioral change, particularly in addressing public health challenges such as stunting (see Table 2). In Kagungan Village, the intervention led by Aqua Danone and YKWS exemplifies how strategic, participatory communication models can foster awareness and catalyze action. These multifaceted socialization activities were designed not only to disseminate information but also to engage the community in shared learning experiences. Collaborations with key health institutions, such as Puskesmas and Posyandu, ensured that the messages delivered carried both authority and contextual relevance. Educational components such as lectures, focus group discussions (FGDs), and interactive Q&A sessions became critical avenues for unpacking the causes, impacts, and prevention strategies of stunting. This aligns with Blanchet-Cohen and Torres (2023) and Li et al. (2024), who argue that public understanding—particularly when co-constructed—is fundamental to sustaining behavioral transformation in health settings.

Table 2. Education Level of Kagungan Village Residents in 2021

Education Level	Total
Master's Degree (Strata 2)	3
Undergraduate/Bachelor's Degree (D4/Strata 1)	86
Diploma 3 (Associate Degree)	6
Senior High School Equivalent	614
Junior High School Equivalent	546
Elementary School Equivalent	614
No Schooling	268
Did Not Complete Elementary School/Equivalent	668
Not Yet Attending School	487
Total	3.026

Source: Kagungan Village Government Data, 2021

Lectures primarily targeted mothers and caregivers, focusing on essential aspects of early childhood development, including nutrition, sanitation, and the immunization-growth nexus. This group is crucial, given the evidence that maternal knowledge and behavior have a direct influence on child health outcomes (Saleh et al., 2021). By presenting structured, evidence-based content, facilitators aimed to improve decision-making capabilities regarding food preparation, hygiene routines, and illness prevention. Following this, FGDs created a space for dialogical reflection, enabling participants to process and personalize new information. These discussions not only surfaced local cultural practices and prevailing beliefs but also identified structural constraints, such as economic limitations or access to clean water, that might hinder behavior change—an approach supported by Ebata et al. (2020), who emphasize the importance of contextual sensitivity in community-based health programs.

Recent studies have demonstrated that dialogic, participatory Q&A sessions in community health education significantly outperform traditional lecture-based methods by transforming learning into a co-creative, responsive process. For instance, Kusuma et al. (2023) found that a Participatory Learning and Action (PLA) approach led to a statistically significant increase in mothers' knowledge of stunting prevention ($p = 0.002$) compared with a conventional lecture format, highlighting its novelty in shifting educational dynamics toward active learner engagement. In Central Lombok, participatory counseling that engaged local puppeteers to address balanced nutrition notably improved intake of energy, protein, vitamin C, iron, calcium, and fiber ($p < 0.05$), illustrating an innovative, culturally embedded technique that facilitated immediate behavioral uptake (Darawati et al., 2020). These dialogic and culturally tailored strategies embody Freire's problem-posing pedagogy by empowering participants to articulate misunderstandings—such as nutrient needs or growth myths—and collaboratively co-construct knowledge (Freire, 1970). Scientifically, these interventions contribute novel evidence that participatory learning not only enhances cognitive outcomes but also drives personal investment in health behaviors. Their broader impact lies in fostering social cohesion and collective responsibility, thereby strengthening the sustainability of stunting prevention efforts through peer modeling and community ownership (Nisbett et al., 2014).

Moreover, the integration of socialization activities with the KESURGA (Family Garden) program strengthened the intervention outcomes. Participants were not only exposed to abstract health knowledge but also engaged in hands-on learning about nutrition, gardening, and hygiene—an approach consistent with experiential learning theory (Kolb, 2015). This cross-program synergy ensured reinforcement of key messages through multiple, interconnected pathways. For instance, while learning about vegetable cultivation, caregivers also received information about micronutrient

intake and child feeding practices, thereby linking behavioral advice with tangible, daily routines. As such, the intervention shifted from passive information delivery to the practical embodiment of knowledge—a hallmark of successful community-based nutrition programs (Black et al., 2016).

Multiple intersecting factors contributed to the effective implementation of the KESURGA program in Kagungan Village, illustrating a model of integrative community-based intervention. One of the most critical enablers was strategic and participatory communication, which served as a mechanism for disseminating information, managing expectations, and facilitating collaborative problem-solving**.** Consistent and transparent messaging between Aqua Danone, YKWS, and community members fostered mutual understanding and alignment of goals. This aligns with Edwards' (1980) argument that effective communication is not merely about transmitting information but also about transferring the underlying logic and intentions of a program to ensure coherence among stakeholders. In practice, this communicative clarity helped define roles, reduce misinformation, and catalyze a sense of shared ownership, all of which are central to grassroots program sustainability.

Table 3. Logic Model of the KESURGA Implementation

Component	Role in KESURGA
Inputs	Communication strategies, qualified staff, financial investment, enabling policies, and emotional labor
Activities & Processes	Participatory messaging, interdisciplinary facilitation, resource deployment, policy enforcement, empathetic engagement
Outputs	Defined roles, cohesive teamwork, infrastructure/training delivered, intersectoral coordination, community trust
Short-Term Outcomes	Clear understanding, increased capacities, stakeholder alignment, and behavioral shifts
Long-Term Impact	Sustained health improvements, policy integration, and lasting community resilience

The second key factor was the deployment of qualified human resources with interdisciplinary competencies. As reported by Faeni (2024), facilitators and technical staff involved in the program were selected not only for their technical expertise in agriculture and sanitation but also for their ability to engage and mobilize communities. This combination of hard and soft skills enabled a holistic response to stunting, integrating nutrition-sensitive agriculture, hygiene education, and household-level food security. Moreover, these actors played a crucial role in knowledge translation—converting technical guidelines into culturally relevant and practically feasible actions for villagers. Their presence helped bridge the gap between program design and grassroots realities, reinforcing the idea that community development is as much about people as it is about tools and methods.

Financial investment was another indispensable pillar. The commitment of Aqua Danone, channeling IDR 496 million through its CSR initiative, provided more than just material support—it signaled institutional seriousness and long-term vision. This funding underwrote the costs of training, infrastructure, and human resources, ensuring continuity and professionalism in service delivery. In contrast to donor-driven programs, which are often susceptible to political cycles, collaboration with YKWS—an NGO unaffiliated with government grants—ensured that budget allocations remained participatory and adaptable to community needs (Sufri et al., 2023). This reflects broader findings in development literature that resource flexibility and local ownership often yield stronger program outcomes than rigid, top-down disbursement models.

The enabling policy environment provided by local government markedly bolstered both legitimacy and scalability of the KESURGA initiative; specifically, the Tanggamus Regent's anti-stunting regulation conferred legal recognition and established a formal institutional framework for inter-sectoral coordination—mandating participation of local OPD across health, agriculture, and education—which transformed fragmented actions into a coherent system, aligning with implementation science evidence that stakeholder engagement and policy coherence significantly enhance program fidelity and sustainability (Sadler et al., 2018). This bureaucratic synergy represents a novel operational dynamic, extending beyond theoretical coordination into a legally supported structure that ensures continuity and vertical integration—a contribution less documented in prior implementation studies. Equally, the emotional labour and ethical commitment of implementers emerged as a subtle yet transformative enabler: reminiscent of recent findings in public health equity work, where emotional labour—rooted in personal investment—was quantitatively linked to burnout yet also associated with deeper trust-building and engagement when adequately supported (Abresch et al., 2023). In Kagungan Village, this human-centred approach—characterized by care, empathy, and sustained moral engagement—served as a crucial trust-building mechanism that softened resistance, nurtured mutual respect, and embedded behavioral change, illustrating how emotional labour, though non-institutionalizable, materially contributes to community resonance and sustained habit formation (Heimlich & Ardoin, 2008). Collectively, these findings contribute to science by empirically demonstrating that legal-institutional scaffolding, combined with emotionally human-centered implementation strategies, yields more durable, integrated, and trusted public health interventions.

Despite its grassroots relevance, the KESURGA program's implementation in Kagungan Village was undermined by entrenched socioeconomic vulnerabilities among pre-prosperous households, leading to delegation of childcare to kin—often grandparents or aunts—who lacked formal nutritional knowledge; this mirrors findings in rural Nepal, where disadvantaged settings exhibit poor caregiving, delayed complementary feeding, and low dietary diversity among young children (Dulal et al., 2022). Notably, recent evidence reveals a crucial disparity between self-efficacy and actual nutrition-best practices in low-income family childcare settings—providers often feel capable yet underperform in serving fruits, vegetables, and whole grains (Li et al., 2009; Sisson et al., 2022; Wilkinson, 2020)—which uncovers a novel psychological–behavioral gap not previously emphasized. Moreover, child-care–provided meals have been shown to reduce household food insecurity, lower odds of fair or poor child health, and reduce emergency hospital admissions among very young children from low-income families (Cuba et al., 2023; Engle et al., 2000); this demonstrates a substantial community-level buffering effect of institutional nutrition support. Collectively, these findings advance scientific understanding by pinpointing the dual need for interventions that (1) engage secondary caregivers alongside parents through targeted nutrition education, and (2) incorporate structural support—such as subsidized, nutrition-rich childcare meals—to bridge self-efficacy and practice, thereby improving child health outcomes and alleviating household stress. For program sustainability, these structural supports should be institutionalized through village budgets (APBDes) or linked with school-feeding schemes, ensuring that nutrition provision persists beyond external donor cycles.

The onset of the COVID-19 pandemic significantly disrupted delivery of participatory health education programs such as KESURGA by mandating strict limits on community gatherings, which compelled organizations like Aqua Danone and YKWS to shift toward smaller, physically distanced sessions—nonetheless substantially diminishing both the frequency and depth of direct, hands-on educational engagement (Ariyanto, 2023b; Friska & Andriani, 2022). Recent studies underscore that low literacy—both general and health-specific—remains a critical barrier in rural communities, manifesting in reduced engagement and poorer outcomes in participatory interventions (Li et al., 2023). For example, a quasi-experimental evaluation in impoverished southwestern China

demonstrated that augmenting standard health literacy programs with culturally sensitive, non-verbal media and local "maven" communicators produced a ~18 % increase in adequate health literacy (versus just ~6 % in controls), highlighting a novel, high-impact strategy for enhancing program efficacy (Li et al., 2023). Meanwhile, a 2024 study in rural Zhejiang found that improvements in digital literacy significantly boosted participation in—and diversity of—digital health behaviors, with health literacy uniquely supporting greater behavioral diversity, marking a fresh insight into digital avenues for reaching low-literacy populations (Ji et al., 2024). Collectively, these findings not only validate how COVID-driven adaptations have weakened traditional outreach but also advance the field by revealing innovative, culturally adapted, and digitally mediated strategies to overcome literacy-related barriers, thereby reinforcing the design of more resilient, equitable health education interventions. Embedding these adaptive literacy and digital approaches into ongoing community health systems—through Posyandu cadres, local schools, and rural health posts—would further strengthen resilience and ensure continuity in the face of future crises.

Table 4. Strategic Interventions & Outcomes

Intervention Theme	Strategy	Expected Impact
Structural Support	Subsidized, nutrition-rich childcare meals	Improve child health, reduce food insecurity & emergency admissions
Caregiver Education	Inclusive programs engaging secondary caregivers	Bridge the gap between self-efficacy and practice
Adaptive Literacy Approaches	Culturally tailored non-verbal tools, local communicators	Boost health literacy effectively
Digital & Media Integration	Strengthening digital literacy	Expand behavior change diversity and reach
Empathy-Based SBCC	Small-group, trust-centered facilitation	Encourage internalization of knowledge and sustainable behavior

Program facilitators in diverse rural contexts have implemented inclusive, empathy-based communication strategies to improve health and nutrition outcomes among marginalized populations. In rural Tanzania, structured social and behavior change communication (SBCC) through regular group nutrition meetings significantly increased caregiver knowledge of health, childcare, and dietary diversity—especially among those attending four or more sessions (Ji et al., 2024; Nutbeam & Harris, 2004; Rifkin, 2009). Similarly, a nutrition-focused interpersonal communication campaign in rural Indonesia improved mothers' understanding of optimal feeding practices and was directly linked to behavior change, including increased dietary diversity and meal frequency (Starkweather et al., 2020). Unlike traditional one-directional messaging, these interventions leveraged familiarity and trust—through small-group, approachable formats—which lowered participation barriers and cultivated active engagement. This represents a novel shift, distinguishing itself from past top-down efforts by integrating empathy-grounded facilitation and culturally resonant interactions. The novelty lies in formalizing empathy-centered dialogue and small-group dynamics as core design elements, rather than peripheral features. These approaches yielded measurable gains in community engagement and internalization of nutritional knowledge, advancing the field by linking communication style to cognitive uptake and behavior change. The contributions are twofold: methodologically, they validate participatory, culturally adaptive strategies as effective tools in health promotion; and scientifically, they underscore the critical role of empathetic, context-aware communication in achieving sustainable behavior change. By coupling empathy-centered

communication with institutional anchoring (village budgets, schools, and Posyandu), the program's behavior change impacts are more likely to endure beyond pilot cycles and donor support.

CONCLUSION

Ultimately, the collaborative stunting prevention intervention was implemented in early 2021 by PT. Tirta Investama (Aqua Danone) and the Way Seputih Conservation Foundation in Kagungan Village, East Kota Agung, successfully reduced the prevalence of stunting from 19.17 percent in 2020 to 14.18 percent in 2021, demonstrating significant positive outcomes. This achievement was driven by enabling factors, including effective communication, sufficient human and financial resources, aligned policy frameworks, and constructive emotional engagement. However, it was constrained by challenges such as the economic hardships faced by underprivileged families, disruptions from the COVID-19 pandemic, and disparities in information dissemination. The empirical evidence from this initiative reinforces the value of private–community partnerships in addressing rural stunting, highlighting that key facilitators—clear communication, resource alignment, and policy support—are instrumental to measurable health improvements. These insights carry important practical and policy implications, suggesting that tailored interventions aimed at economically vulnerable families, along with strategies to ensure equitable access to information, can enhance stunting prevention efforts. Moreover, the findings advocate for stronger synergy among the public, private, and community sectors to sustain beneficial outcomes and elevate children's future well-being. While promising, the results are tempered by limitations: the impact of external shocks, such as the pandemic, and the localized scope of the study limit broader generalizability. Consequently, further research is recommended to explore ways to safeguard public health initiatives against pandemic-related constraints and to enhance outreach, equity, and economic resilience among disadvantaged households. By integrating these considerations into future efforts, policymakers and practitioners can enhance the effectiveness and sustainability of stunting prevention programs, ultimately contributing to long-term improvements in children's growth and quality of life.

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