

Shaping Farmer Regeneration in Early Childhood Through Verticulture Farming System Education

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Sulik Sofinda¹, Sugeng Santoso², Setyo Ajie Wibowo³, Yayang Ristiana Putri⁴

¹Politeknik Negeri Malang, Indonesia

²Universitas Pendidikan Ganesha, Indonesia

³Universitas Negeri Malang, Indonesia

⁴Universitas Islam Blitar, Indonesia

Abstract

Purpose	: Indonesia is currently facing a critical challenge characterized by the declining interest of younger generations in the agricultural sector, as evidenced by the aging farmer phenomenon. This demographic shift poses a significant threat to the sustainability of national food production and agricultural development. To address this pressing issue, this study aims to introduce verticulture farming systems to kindergarten students as an early educational intervention designed to foster agricultural awareness and cultivate future farmer regeneration among young children.
Methodology	: This study employed a descriptive qualitative approach conducted at Dharma Wanita Maliran 2 Kindergarten in Blitar Regency, East Java, Indonesia. The participants consisted of Group B students aged five to six years. Data were collected through multiple techniques, including systematic observation of children's engagement during agricultural activities, semi-structured interviews with teachers and students, direct hands-on training sessions, and a comprehensive literature review. The educational activities encompassed the introduction of verticulture farming concepts, practical planting experiences, and ongoing plant maintenance routines, further reinforced through the proposed "Friday Gardening" program as a sustainable school-based initiative.
Results	: The findings revealed that children demonstrated high levels of enthusiasm and active participation throughout the verticulture educational activities. Students gained a meaningful understanding of the benefits of farming and showed improved knowledge regarding plant growth processes. Beyond the acquisition of technical agricultural skills, the activities effectively instilled essential developmental values, including a sense of responsibility, heightened environmental awareness, teamwork, and collaborative behavior among the young learners.
Conclusions	: This study concludes that verticulture-based farming education can serve as an effective and contextually relevant strategy to initiate farmer regeneration from an early age. Integrating agricultural education into early childhood curricula has the potential to shape positive attitudes toward farming and contribute to addressing the generational gap in Indonesia's agricultural workforce.

Keywords: early childhood education, agricultural awareness, verticulture farming, farmer regeneration

Corresponding Author:

Sulik Sofinda, Politeknik Negeri Malang, Indonesia.

Email sofins27@gmail.com

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1. Introduction

Indonesia has long been recognized as an agrarian nation, with a substantial proportion of its population historically dependent on the agricultural sector for livelihood and economic sustenance (Santoso & Negara, 2021). The country's vast arable land, tropical climate, and rich biodiversity have positioned agriculture as a foundational pillar of the national economy. From rice paddies stretching across Java to plantation crops in Sumatra and Sulawesi, agricultural activities have shaped not only the economic landscape but also the cultural identity of Indonesian society for generations.

The significance of the agricultural sector becomes even more pronounced in light of Indonesia's steadily growing population. As the fourth most populous country in the world, the demand for food production continues to escalate year after year, placing immense pressure on the agricultural system to maintain adequate food supply. This reality underscores the strategic importance of agriculture in safeguarding national food security. In line with this concern, President Prabowo has emphasized that food sovereignty constitutes an absolute prerequisite for national independence and resilience, signaling the government's recognition that a nation's

strength is inseparable from its capacity to feed its own people (Humas Sekretariat Kabinet Republik Indonesia, 2025).

However, a paradox emerges when examining the current state of agricultural human resources in Indonesia. While the nation's dependence on the agricultural sector continues to grow, the interest of younger generations in pursuing farming as a viable career path has been declining at an alarming rate. Data from the 2023 agricultural census paint a troubling picture: approximately 44% of farmers fall within the 43–58 age bracket, another 29% are aged between 59 and 77 years, and only a small fraction of the farming population is under 43 years old (Fauzun dkk., 2024). These figures clearly indicate the presence of a farmer aging phenomenon in Indonesia, where the agricultural workforce is progressively dominated by older individuals with limited prospects for natural generational replacement.

Several interrelated factors contribute to the reluctance of young Indonesians to enter the agricultural profession. Among the most prominent is the widespread perception that farming offers limited economic returns and lacks the prestige associated with other career paths in urban or industrial sectors (Nurjanah (2021). This negative perception is further compounded by insufficient knowledge and exposure to modern agricultural practices, which perpetuates the outdated image of farming as a labor-intensive and unprofitable endeavor (Adilla dkk., 2023). The combination of these attitudinal and informational barriers has created a significant gap between the need for agricultural workforce renewal and the willingness of young people to fill that gap.

Compounding this challenge is the absence of deliberate policy interventions aimed at cultivating agricultural interest through the formal education system. The current national curriculum, from early childhood through secondary education, offers minimal exposure to agricultural concepts or hands-on farming experiences. This represents a missed opportunity, as educational institutions serve as critical spaces for shaping children's attitudes, values, and aspirations from a young age. Without a concerted effort to embed agricultural literacy into educational frameworks, the prospect of nurturing a generation that values and commits to the agricultural sector remains uncertain. If left unaddressed, Indonesia risks deepening its reliance on food imports from other countries, thereby compromising the very food sovereignty that national leaders have championed.

In response to this challenge, the present study proposes the introduction of verticulture farming systems as an educational approach for early childhood settings. Verticulture, a method of cultivating plants in vertically arranged layers, offers a practical and space-efficient alternative to conventional farming techniques, making it particularly suitable for implementation in densely populated urban areas or locations with limited land availability (Sitinjau dkk., 2024). The simplicity and visual appeal of verticulture make it an ideal medium for introducing agricultural concepts to young children in a manner that is both accessible and engaging. Furthermore, this study incorporates the design of a "Friday Gardening" program, envisioned as a recurring school-based activity that provides children with regular, structured opportunities to interact with plants and experience the fundamental processes of farming in an enjoyable and age-appropriate context.

The selection of early childhood as the target population for this intervention is grounded in well-established developmental theory. Drawing upon John Locke's *Tabula Rasa* philosophy, which posits that children are born as blank slates whose character and knowledge are shaped predominantly by experience and environmental stimuli, this study argues that early exposure to agricultural activities can leave lasting impressions on children's attitudes toward farming (Wahyuni, 2025). The formative years of childhood represent a critical window during which foundational values, interests, and behavioral patterns are established. By introducing farming experiences during this developmental period, it becomes possible to plant the seeds of agricultural appreciation that may grow and mature as children advance through subsequent stages of education and life.

Previous empirical studies lend support to the premise that early agricultural education yields meaningful developmental outcomes. Amanda & Sit (2025) demonstrated that planting activities effectively enhance naturalistic intelligence among kindergarten children, suggesting that direct engagement with natural processes stimulates cognitive and affective domains associated with environmental sensitivity. Similarly, Ramdani, et.al. (2024) reported that verticulture-based learning successfully increased farming interest among elementary school students by as much as 43.2%, providing quantitative evidence of the method's capacity to shift attitudes toward agriculture. These studies collectively affirm that agricultural education, when appropriately designed and implemented, can serve as a powerful tool for reshaping young learners' perceptions of farming.

Nevertheless, a notable gap persists in the existing literature. While prior research has examined agricultural education among kindergarten and elementary school populations separately, few studies have specifically targeted early childhood learners with a verticulture-based approach aimed explicitly at fostering farmer regeneration. This study distinguishes itself from previous work by combining the verticulture methodology with an early childhood focus and an explicit goal of cultivating long-term agricultural interest as a strategy for addressing the farmer aging crisis. It is anticipated that the findings of this research will serve as a valuable reference for schools, parents, and policymakers seeking evidence-based strategies to prepare the next generation of agricultural stewards in Indonesia.

2. Methodology

This study adopted a descriptive qualitative research design. Qualitative research is fundamentally concerned with analyzing existing facts and phenomena through words rather than numerical quantification (Nasution, 2023). Descriptive research, more specifically, involves the detailed portrayal and interpretation of findings derived from direct engagement with the research context (Rusandi & Rusli, 2021). The descriptive qualitative method was deemed appropriate for the present study as it enabled a comprehensive depiction of the verticulture farming training provided to early childhood students at Dharma Wanita Maliran 2 Kindergarten, as well as the conceptualization of a school-based agricultural activity entitled "Friday Gardening."

Data were collected through three primary techniques: direct training sessions, literature review, and structured interviews. The direct training was conducted as an educational intervention aimed at instilling verticulture farming knowledge among Group B students at Dharma Wanita Maliran 2 Kindergarten. Group B was purposively selected based on information obtained from the classroom teachers, who indicated that children at this level had developed sufficient attention span and cognitive readiness to engage with structured learning materials. The school is located in Maliran Village, Ponggok Sub-district, Blitar Regency, East Java, Indonesia. The training session was carried out on June 6, 2024, and all preparatory procedures and sequential activities were systematically documented throughout the process.

The literature review was employed to support the development of the "Friday Gardening" program concept by drawing upon relevant theoretical foundations from existing scholarly sources. This technique provided the necessary academic grounding for designing an agricultural education program that is both pedagogically sound and contextually appropriate for early childhood settings.

Structured interviews were conducted to elicit responses from the target participants regarding the research topic. The interview questions were carefully designed in alignment with predetermined research objectives. Two separate sets of questions were prepared: one directed at the classroom teachers and another adapted for the young students. Table 1 presents the complete list of post-training interview questions administered to both groups.

Table 1. Post-Training Interview Questions

No.	Questions for Teachers	Questions for Children
1	In your opinion, how would you describe the children's interest in farming at this school?	Did you know about verticulture farming before today?
2	Do you believe that introducing agriculture is important for early childhood students?	Have you ever participated in any farming activity before?
3	As a teacher, how do you typically teach agricultural concepts to young children?	Has your teacher ever invited you to do farming activities at school?
4	What is your assessment of the verticulture farming training that has been conducted?	What do you think about the verticulture farming training that was conducted?
5	What are your expectations for future agricultural activities at this school?	What are your hopes for future farming activities at your school?

Given that one group of interview participants consisted of kindergarten-aged children, the language of the questions directed at them was deliberately simplified to ensure comprehension while preserving the substantive intent and relevance of each inquiry. This adaptation was essential to obtain meaningful and authentic responses from young respondents whose linguistic and cognitive capacities differ substantially from those of adult participants.

Data analysis followed the interactive model proposed by Miles and Huberman. As cited in Nugrahani & Al-Ma'ruf (2015), this analytical framework comprises three interconnected stages: data reduction, data display, and conclusion drawing. During the data reduction phase, the collected data were carefully sorted to identify relevant information, while irrelevant or redundant data were excluded from further analysis. The data display stage involved the systematic presentation of the analyzed findings in a coherent and organized manner. Finally, conclusion drawing was undertaken to synthesize the presented data into meaningful interpretations that directly addressed the research questions guiding this study.

3. Results

3.1. Preparation Prior to the Introduction of the Verticulture System

The implementation of the verticulture farming education at Dharma Wanita Maliran 2 Kindergarten was preceded by four systematic preparatory stages. The first stage involved a preliminary analysis of the target subjects' conditions. This assessment was conducted to ascertain the children's existing knowledge base, developmental characteristics, and prior exposure to agricultural concepts within the school setting. Preliminary interviews and observational visits were carried out at the school, and the results confirmed that Dharma Wanita Maliran 2 Kindergarten was a suitable site for the research intervention.

The second stage focused on designing the socialization activity plan. This process encompassed defining specific objectives, developing instructional materials, formulating delivery methods appropriate for young learners, and compiling a comprehensive list of required media and materials. Given the early childhood target population, every aspect of the activity design was carefully calibrated to capture children's interest and optimize their comprehension of the content delivered.

The third stage involved the procurement and preparation of all necessary materials and media. The items prepared included plastic bottles fitted with suspension cords to serve as vertical planting containers, small shovels, soil as the planting medium, and vegetable seedlings. All materials were assembled in advance to ensure uninterrupted implementation of the socialization activities.

The fourth stage consisted of conducting a planting trial prior to the socialization session. This trial enabled the researchers to evaluate the effectiveness of the planting procedures, the arrangement of vertical containers, and the associated maintenance requirements. Through this preliminary testing, potential technical obstacles were identified and addressed, ensuring that the subsequent socialization would proceed in a focused and developmentally appropriate manner.

3.2. The Process of Introducing the Verticulture System

On the day of implementation, all 18 enrolled Group B students were present. The verticulture introduction was structured into three sequential phases. The first phase was the opening classroom session, during which the teachers and the research team provided a brief introduction regarding the importance of farming and the advantages of verticulture in everyday life. The explanation was delivered using simplified language and supported by visual media and illustrative images. Interactive question-and-answer exchanges were incorporated to stimulate children's curiosity and encourage participation.

The second phase involved hands-on planting practice using the verticulture system. Children were introduced to the necessary tools and materials, including planting containers, soil media, and vegetable seedlings. The planting process was conducted step by step: preparation of vertical containers, packing of planting media, and placement of seedlings into designated openings. Teachers first provided demonstrations, after which the children replicated the steps under guided supervision. Several children were invited to come forward and assist during the demonstration, further enhancing active involvement.

The third phase comprised simple reflection and evaluation. The teacher invited children to share comments about their experiences, including challenges encountered and aspects they found most enjoyable. The teacher subsequently emphasized positive values such as the importance of plant care and the nutritional benefits of vegetables. The session concluded with a collective prayer and encouragement for children to take turns caring for the plants, thereby extending the learning experience into daily school routines.

3.3. The Friday Gardening Program Concept

Beyond the verticulture socialization, this study proposed a recurring school-based program designated as "Friday Gardening" for Dharma Wanita Maliran 2 Kindergarten. This structured learning activity was designed to introduce young children to agricultural practices through simple and enjoyable hands-on experiences, implemented every Friday utilizing the verticulture system. The selection of Friday was based on the school's existing schedule, which allocates that day for outdoor activities where children wear sports attire, providing a natural context for gardening engagement.

The implementation of Friday Gardening is organized into five sequential stages. The first stage involves plant introduction, during which the teacher familiarizes children with simple vegetable types such as water spinach, mustard greens, chili peppers, and tomatoes through pictures and real specimens. The second stage encompasses planting practice, where children work in groups to plant seedlings using recycled bottles, polybags, or tiered racks. The third stage focuses on plant maintenance, involving children in watering, applying organic fertilizer, and cleaning planting media. The fourth stage centers on growth observation, where children observe weekly changes in plant growth and express their observations through drawings or simple narratives. The fifth stage is the collective harvest, where children and teachers harvest mature vegetables together and discuss the practical benefits of the produce for daily life.

3.4. Participant Responses

Structured interviews were conducted with two representative participants: SPP, representing the early childhood students, and IP, representing the teaching staff. IP conveyed that the children at Dharma Wanita Maliran 2 Kindergarten demonstrated considerable enthusiasm during the farming activities, as evidenced by their spirited engagement throughout the verticulture training. IP assessed that agriculture is sufficiently important to introduce to young children as a means of instilling foundational knowledge and preparing

future generations of farmers. At the school, agricultural learning is typically delivered in accordance with thematic curriculum using approaches such as storytelling, play-based learning, singing, and practical planting exercises. IP stated that the verticulture training offered meaningful benefits by providing new knowledge and perspectives to both children and teachers. IP expressed the hope that agricultural activities could be sustained on a continuous basis, particularly through the proposed Friday Gardening program.

SPP reported that prior to the training, the concept of verticulture farming was entirely unfamiliar. However, following participation in the researcher-led training, SPP gained a clear understanding of verticulture and its functions. SPP also mentioned that simple agricultural activities had previously been carried out at the school, including watering plants and growing vegetables from seedlings. The child expressed that the training was highly enjoyable and articulated a desire to apply verticulture techniques at home with parents and at school with teachers and classmates.

4. Discussion

The systematic preparatory process adopted in this study proved essential for the successful implementation of the verticulture socialization program. The four-stage preparation sequence subject analysis, activity planning, material procurement, and planting trial ensured that the intervention was contextually grounded and technically sound before its delivery to young learners. This preparatory approach aligns closely with the methodology employed by Maryani & Fathia (2020), who introduced vegetable recognition to early childhood students at Pertiwi XI Kindergarten in Jambi City by commencing their study with interviews involving teachers, school principals, and parents as foundational steps. The importance of thorough preparation is further supported by Lathif & Suprpto (2023) who, in their analysis of teacher preparation for the Pancasila Student Profile Strengthening Project, concluded that adequate preparation before any learning activity significantly maximizes the desired outcomes. These converging findings reinforce the necessity of structured preparation when implementing educational interventions targeting early childhood populations.

The verticulture introduction process revealed that children responded positively to the structured three-phase approach of classroom orientation, hands-on practice, and reflective evaluation. The opening session, which employed simplified language and visual media, successfully captured children's attention and established a foundation for understanding. The subsequent hands-on planting phase, in which teachers demonstrated procedures before children replicated them under guidance, proved particularly effective in maintaining engagement and facilitating skill acquisition. The children's enthusiastic participation throughout the session, including those who volunteered to assist in demonstrations, suggests that experiential agricultural activities resonate strongly with early childhood learners' developmental needs and natural curiosity. The inclusion of a reflective phase at the conclusion of the session served a dual purpose: consolidating the knowledge gained and embedding positive values related to environmental stewardship and healthy eating into the children's emerging value systems.

The theoretical foundation underpinning the Friday Gardening program draws upon well-established pedagogical frameworks. John Dewey's Learning by Doing philosophy posits that children learn more effectively through direct experiential engagement rather than passive verbal instruction alone (Onanuga, Ifamuyiwa, & Alebiosu, 2021). This perspective is consistent with Piaget's developmental theory, which identifies kindergarten-aged children as being in the preoperational stage, during which concrete learning activities such as planting, watering, and observing plants are highly effective in stimulating cognitive, affective, and psychomotor development (Faraz & Nugrahanta, 2025). The program also resonates with the principles of environmental education articulated by Nurjannah dkk. (2022), who argued that introducing children to agricultural activities from an early age constitutes a strategic step toward building ecological awareness while simultaneously cultivating concern for national food security. These theoretical underpinnings collectively position Friday Gardening not as a superficial

recreational activity, but as a pedagogically grounded educational intervention with multidimensional developmental benefits.

The empirical literature further substantiates the educational value of the Friday Gardening concept. Agustina dkk. (2023) noted that school gardening activities can gain increasing popularity, particularly when they incorporate enjoyable physical activities and allow children to consume the produce they have grown. Rachmawaty & Lestari (2025) reported that gardening activities such as planting, sowing, and harvesting, when integrated with learning themes, support children's development across cognitive, social, emotional, and motor domains. Similarly, Handayani & Ichsan (2025) demonstrated that farming activities enhance children's naturalistic intelligence. Taken together, these findings affirm that the five-stage implementation structure of Friday Gardening spanning plant introduction, planting practice, maintenance, growth observation, and collective harvest is well-grounded in both theory and evidence. The program represents a strategic initiative for nurturing responsibility, independence, and professional pride in farming among young children, thereby contributing meaningfully to the long-term goal of farmer regeneration.

The interview responses from both participant categories provide corroborating evidence for the positive reception of the verticulture training. The teacher's observations regarding children's high enthusiasm and active engagement are consistent with the behavioral patterns documented during the socialization process, suggesting an alignment between observed and reported outcomes. The teacher's recognition that verticulture training offered new knowledge to both children and educators indicates that the intervention generated value beyond its primary target audience, extending its educational impact to the professional development of the teaching staff. Meanwhile, the student participant's transition from complete unfamiliarity with verticulture to expressed comprehension and desire for continued practice illustrates the transformative potential of well-designed, age-appropriate agricultural education. The child's aspiration to replicate verticulture techniques at home further suggests that the intervention may catalyze knowledge transfer beyond the school setting, potentially engaging families in agricultural practices and amplifying the regenerative impact of the program.

5. Conclusion

This study demonstrates that the introduction of verticulture farming systems to early childhood students is capable of cultivating an initial interest in agriculture. The active involvement of children in the processes of planting, maintaining, and harvesting plants not only provided a tangible and enjoyable learning experience but also instilled a sense of responsibility, environmental awareness, and collaborative skills among the young learners. The heightened enthusiasm observed throughout the activities indicates that verticulture can serve as an effective pedagogical approach for introducing the agricultural world to young children while simultaneously laying the foundation for naturalistic intelligence development from an early age.

In light of these findings, several practical recommendations are offered for relevant stakeholders. Schools are encouraged to integrate verticulture activities into their programs on a sustained and continuous basis, incorporating a wider variety of plant species to enrich the learning experience and maintain children's interest over time. Teachers are advised to creatively adapt their instructional methods to align verticulture-based activities with the thematic curriculum framework of early childhood education, thereby ensuring coherence between agricultural learning and broader educational objectives. Parents also play a vital role in reinforcing school-based learning by supporting children through simple farming activities at home, which would contribute to greater consistency and continuity in the children's agricultural learning experiences.

For future research, it is recommended that subsequent studies expand the scope of investigation by involving multiple schools across diverse geographical and socioeconomic contexts to enhance the generalizability of the findings. Additionally, future inquiries should examine the impact of verticulture-based education on other developmental dimensions

beyond agricultural interest, including fine motor skill development, character formation related to environmental stewardship, and the long-term sustainability of children's attitudes toward farming as they progress through subsequent stages of education.

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