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Participation, agency, and youth voice in establishing school gardens: comparing cases from Kenya and Papua New Guinea

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This community case study investigates the establishment of school gardens in Kenya and Papua New Guinea (PNG), focussing on engagement and participation. The gardens are intersectional interventions addressing education, health and nutrition, food security, career development, and life skills. We focus on engagement between implementing agencies and schools—including youth—during establishment as it influences garden governance, activity, and organizational and educational cultures going forward. Following a synthesis of school garden literature, country contexts, and participation and engagement models, we present two case studies based on narrative interviews with in-country project managers, project experiences, and desktop reviews. Analysis reveals distinct culturally and project-influenced typologies of participation and engagement—Kenya's was bottom-up driven by student participation, whereas PNG was top-down with little student participation—with differences affecting school and student garden ownership and motivation. The findings provide valuable lessons for low- and middle-income countries' (LMIC) school garden establishment, particularly in understanding how evolving project goals affect engagement, managing power differentials in top-down and bottom-up models, considering how educational and broader culture affects student participation, emphasizing the need for cultural capacity building in implementing agencies, and recognizing the potential of school gardens as assets in disrupting educational norms and student-centered approaches.

KEYWORDS

school gardens, participation, engagement, culture, student-centered

Introduction

School gardens are popular interventions in high- and low- and middle-income countries (LMICs; Bhattarai and Schreinemachers, 2020), potentially yielding integrated education, nutrition, health, wellbeing, financial (agribusiness), and food security outcomes. Thus, single-garden interventions—when well designed and implemented—can address intersectional disadvantage, particularly in low-income settings.

This article investigates the 'origin stories' of school gardens in Kenya and Papua New Guinea (PNG). While sharing much in common, including COVID-19 impacts, the two gardens were

established with different levels of school and community participation. Drawing on typologies of participation (Reed et al., 2018), the projects can be categorized as bottom-up (Kenya) and top-down (PNG) and involve different engagement types (i.e., communication, consultation, deliberation, and/or co-production) between schools, funding bodies, and project teams. Furthermore, student participation, i.e., student voice (Lundy, 2007), varied. These aspects evolved over time—from founding motives for the gardens, to design and establishment, through to present-day operation.

Here, we contrast these case studies to provide insights for garden establishment. We focus on the projects' establishment phase because decisions with enduring effects are taken, donor organizations seek evidence of best practices, and policies, processes, and project culture are formed. This article compares the cases to reflect on and inform how such projects should begin, rather than assess their longer-term outcomes.

Context and nature of the problem—lifelong effects of childhood malnutrition

Non-communicable diseases linked to poor diet and nutrition are a development challenge in PNG and Kenya. In both countries, changes in how food is sourced and produced have led to the decline of traditional diets and replacement with Western energy-dense, nutritionally poor diets, causing negative health impacts (Saweri, 2001; Kigaru et al., 2015). Comparable countries, particularly in the Pacific, are similarly affected, with both over- and under-nutrition leading to poor health outcomes (Lyons et al., 2020). A PNG systematic review showed increases in non-communicable diseases due to 'greater exposure to modernisation' (Rarau et al., 2020, p. 9)—mainly replacement of traditional diets with processed food and less active lifestyles—with urban populations (our focus) most impacted.

Children are at particular risk, with stunting due to malnutrition affecting almost one-quarter in Kenya and almost half in PNG—the fourth highest globally (International Food Policy Research Institute, 2016). Childhood malnutrition in PNG causes developmental problems, leading to a 33–76% increase in deaths of children under five, lifelong and intergenerational disadvantage, and costs the economy $USD508 million annually (Hurney, 2017). Climate change is further impacting agriculture and food availability in both countries (Grace et al., 2012; Bourke, 2018).

Rationale for the solution—school gardens as intersectional interventions

The causes and populations affected by poor nutrition highlight youth-focussed interventions that positively influence food production, physical activity, and consumption of fresh, unprocessed food, e.g., school gardens. The benefits of school gardens include improved nutritional outcomes and knowledge, academic performance, social benefits, environmental attitudes, and parental and community involvement (Diaz et al., 2019). Critically, meta-analysis shows garden-based education programs increase vegetable consumption while classroom-based nutrition education does not, a finding attributed to better access to and more positive attitudes toward vegetables (Langellotto and Gupta, 2012). Interventions combining gardens with other elements (nutrition, cooking, grocery shopping, etc.) are more effective (Muzaffar et al., 2018). Indicators for school garden success, or conversely, barriers, include adequate funding and space, community partnerships, garden committees, curriculum incorporation, high and regular student usage, teacher training, and executive support (Burt et al., 2018; Hoover et al., 2021). These factors ensure gardens are sustainable and valued by schools, rather than passion projects reliant on transient staff or start-up resourcing from donors.

LMICs such as PNG and Kenya have much to gain from garden interventions, yet the context is less researched than in high-income countries (Schreinemachers et al., 2020b). Studies in comparable countries (Nepal, Tanzania, Uganda, and Burkina Faso) show school gardens—usually with water, sanitation, and hygiene (WASH) initiatives—led to increases in agriculture, health, food, and nutrition knowledge, reduced parasites, improved WASH behaviors, improved vegetable quality, and higher intention to eat fruit and vegetables (Ssekyewa et al., 2007; Bhattarai et al., 2015; Schreinemachers et al., 2017; Shrestha et al., 2020).

Health and nutrition outcomes were, however, mixed, with the outside school context being critical. Studies showed anemia and thinness decreased only when gardens were combined with WASH and nutrition education (Shrestha et al., 2020), while others saw no increases in fruit and vegetable consumption or nutritional status despite improvements in knowledge and intention (Schreinemachers et al., 2017). These findings align with knowledge-attitudes-practices research showing Kenyan children's nutritional knowledge alone does not equate to healthy eating and highlighting parental and household factors (Kigaru et al., 2015). Studies indicate greater parental and community engagement—both in the gardens and more broadly—and a wider availability of healthy food outside school may improve outcomes and translate knowledge gains into nutritional improvements (Ssekyewa et al., 2007; Schreinemachers et al., 2017; Roothaert et al., 2021). Significantly, a Nepalese follow-up study where household education and support (seeds, compost, pest control, etc.) for parents or caregivers was added to a garden intervention led to improvements in diet and vegetable consumption (Schreinemachers et al., 2020a). These findings concur with research beyond school gardens, e.g., studies in Kenya show households with higher levels of maternal education experienced lower levels of child stunting (Grace et al., 2012). These studies underscore the importance of connecting home, school, and community and engaging parents as part of effective interventions.

Participation fosters student motivation and ownership

Participatory processes involving actors within schools are important in establishing integrated school gardens, rather than dissociated gardens at schools. While appearing self-evident, this is a critical consideration in LMICs, as garden projects are often driven by foreign donors and international development providers working at high levels with LMIC governments (Bhattarai and Schreinemachers, 2020). This brings the risk that more powerful voices dominate design and decisions and that individual school input is diluted, overshadowed, or not even sought. This can affect outcomes both in practice (e.g., fit-for-purpose garden design) and in principle (e.g., school's ownership of and motivation toward gardens). Hence, the participation literature has much to offer those establishing school gardens in LMICs.

Participation, particularly by students, positively influences ownership and motivation. Here, we define participation broadly in line with models that stratify degrees of participation based on agency, power to inform options, and decision-making influence when deciding options, with particular reference to adult–youth dynamics (Arnstein, 1969; Hart, 1992). Korfiatis and Petrou (2021) compared six school gardens with differing levels of student decision-making, ownership, and participation. In two schools with more student-led regular garden activity, decision-making, and responsibility for plants, students were more intrinsically motivated and felt greater ownership. In contrast, schools with sporadic garden activity, teacher-centered management, and less student participation saw students as less motivated and unlikely to apply learning outside school. This concurs with studies showing ownership is key for effective school gardens (Hoover et al., 2021) and wider studies on participation and ownership in international development contexts (OECD, 2005; Rabinowitz, 2015). While these studies focus on garden operations, one can infer that participation will also be critical during garden establishment—given this phase sets the foundation for the garden's culture, participation may be even more critical.

To classify youth participation, we employ Shier and Train's (2001) five-stage model: youth being listened to, supported to share views, taking those views into account, involvement in decision-making, and finally sharing power and responsibility for decisions. At each stage, the model asks if organizational contexts present openings (i.e., willingness of individuals or a project), opportunities (i.e., means to facilitate participation), and obligations (i.e., policy or other requirements). Although enshrined as a human right (United Nations, 1989), youth are still often inhibited from genuine participation and sidelined from decisions concerning them (Lundy, 2007).

While higher levels of participation are often linked to better outcomes—a perception reinforced by earlier 'ladder' models—the most appropriate form of participation depends on aims, participants' wishes and capacity, and constraints on decisions and participation (e.g., COVID-19)—more participation will not necessarily create better outcomes (Hart, 2008; Reed et al., 2018). In response, Reed et al. (2018) proposed a wheel of participation 'to help select the appropriate type of engagement for a given context and purpose' (Reed et al., 2018, p. S9). The wheel includes two concentric circles—first, top-down and bottom-up *agency* describing who leads, and second, types of *engagement* (one-way communication, feedback and consultation, two-way deliberation, and co-production/codesign)—giving eight combinations of agency and engagement. The model rejects that greater participation leads to better outcomes; rather, it identifies underlying factors of engagement context, engagement design, power dynamics, and scalar fit that inform whether participation will lead to beneficial outcomes. Within context, cultural norms and whether a culture of participation exists are highlighted, making the model sensitive to cross-cultural contexts. Its focus on agency—who leads—makes it relevant for the assessment of cases here.

Context and programmatic elements—case studies

The following case studies are primarily based on semi-structured and narrative interviews with local project leaders, with added data/context from project experiences and a review of project documents. The informants have extensive 'lived' contextual knowledge and are familiar with and/or come from the cultural groups present in the schools and community. Narrative interviews were used to assess participation and engagement as they 'reconstruct social events from the perspective of informants as directly as possible' (Jovchelovitch and Bauer, 2000, p. 59) and illuminate social norms and context-based factors such as ownership, with researchers advocating for their greater use in investigating deliberative engagement processes and outcomes (Constant and Roberts, 2017). Semi-structured questioning was also employed. The interviewer's relationships with the informants, prior knowledge of the projects, and structural considerations to allow case study comparisons with participation models created challenges in adhering to the strict requirements for a 'pure' narrative interview. This is not uncommon when applying narrative interviewing, which "in practice… often requires a compromise between narrative and questioning" (Jovchelovitch and Bauer, 2000, p. 66). The lead author conducted interviews; authors not involved in project implementation formalized them into cases; and finally, the cases were cross-checked and edited by the interviewees. In line with participatory goals, the informants are also co-authors here. The research was approved by the Australian National University Human Research Ethics Committee, and approvals in PNG and Kenya were deemed unnecessary by local representatives given the existing ethical review.

Kenya—Agri-COVID gardens project

The school garden project in Nairobi, Kenya, began in the family home garden of the principal organizer, Kenneth Monjero, during the COVID-19 lockdown. Led by the organizer's NGO, Fun and Education Global Network (FEGNe), the concept evolved from the home garden participation of Kenneth's daughters, Susan and Grace, into online workshops and mentoring for youth and families. The initial motive was to increase families' food security, mitigate financial challenges with buying food exacerbated by COVID-19, lockdowns, and job losses, and provide family income through the sale of excess produce. The initiative was one of many across Kenya with the government's COVID-19 response promoting urban farming, particularly for youth and women (Demeke et al., 2020), including relaunching school agriculture programs (CGIAR, 2021).

As schools reopened, two students shared their online program experiences with their schools, and following presentations by FEGNe, schools requested an in-school program. School enthusiasm was bolstered by the 2017 introduction of a competence-based curriculum aiming to holistically develop students' competencies and skills. The revised curriculum focussed on aspects like critical thinking, collaboration, cross-disciplinary learning, continuous assessment rather than exams, inclusive education, parental and community involvement, and—critically—hands-on experiential learning (Amutabi, 2021)—aspects highly suited to school gardening initiatives. FEGNe and schools codeveloped the gardens; however, students provided the initial impetus. FEGNe and schools deliberated on an agreement regarding stakeholder responsibilities and a student subscription fee (to cover FEGNe costs) and communicated the need for a student-centered participation model. Centring students, including decision-making power, was key in Kenya; in fact, FEGNe declined an additional school that wanted a teacher-centered model.

> "Our approach was to engage everyone—professionals, teachers, parents, learners [students]—but the learner being the centre."

As teachers typically used 'chalk and talk' rote learning with little student hands-on activity or decision-making, centring students and student agency became a FEGNe 'regulation'.

> "We wanted to change the norm, sit down and listen to these learners and… obtain ideas. I wanted them to have leadership skills; have a say about what they want to do, discuss in groups [then] present ideas we might not have thought and think through how viable it is. That was my main approach, why I put the learner centre."

Many Kenyan school gardens involved rote learning, where "learners stand next to the garden and [teachers] explain everything about farming when learners are quiet and not engaging," while other models were solely gardens at schools with no student participation. Perceptions of agriculture as "dirty work" contributed to these norms; however, changing to a competence-based, more hands-on curriculum encouraged more genuine student participation.

In FEGNe's student-centered model, however, students felt ownership, calling it "our garden," with ownership extending to individual plants they had responsibility for and/or had purchased seeds themselves. Hence, students' participation drove both in-practice and in-principle ownership. FEGNe purchased prizes for garden outputs, increasing student motivation and ownership. Students made decisions about planting and garden development and, where it was beyond their capabilities, participated in adult-mediated problem-solving processes.

Along with focusing on students' participation, FEGNe highlighted the role of parents and the community. Parents typically paid the participation fee; however, orphans, students with disabilities, and others who showed passion but were financially restricted participated for free. Parents and the community also helped direct produce to those in need, formed community associations to assist with garden tasks difficult for students, and ran initiatives such as the donation of indigenous seed varieties. The school gardens inspired more home gardening, particularly through learning from community gardeners. FEGNe plans to involve the community more as a source of traditional agriculture and nutrition knowledge.

Establishment processes and student participation affected students' curiosity and intrinsic motivation: "developing that model of working together and listening to them, it gave us a more sustainable model because learners love it and want to do it." Other outcomes included increased agricultural knowledge, social outcomes between students, and better school–household–community links.

Diverse teacher participation and decision-making were key during establishment and day-to-day operation, including school administrators (e.g., infrastructure, garden design, finances, and parental liaison) and particularly classroom teachers (e.g., organizing lessons, assisting students, and facilitating learning): "it's not just establishing a garden in a school but it's establishing a garden for learning." One teacher and two students managed class logistics and learning and liaised with other staff, with FEGNe running a weekly session and consulting with teachers about the "need on the ground." FEGNe developed a legally binding agreement to formalize operations with regular two-way communication: "talking with schools, listening to schools has been key so they realize we are not there for money but we are there for development."

FEGNe takes care not to replace teachers; rather, they support them to complement classroom-based lessons with "the gardens as the practical session … to drive deeper into learning and teaching agriculture." Several factors motivated teachers and helped shift norms regarding practical teaching, including professional development workshops, certificates, events, VIP visits, partnerships to provide equipment, and publicly sharing successes. These built pride in the gardens—"teachers feel good when they are presenting their school and the school is acknowledging them: yes, you have done great"—which in turn fostered ownership. Observations suggest female teachers and school leadership promote effective gardens, with women "more in love with their gardens." Teachers and students studying mathematics, biology, and other sciences were also attracted to the garden and sought permission to use it. Nevertheless, FEGNe faced barriers around teacher participation and engagement, primarily due to teachers lacking time and staff turnover—changes in school leadership could have seriously negative effects.

Garden produce is eaten by students, school families in need, and the wider community and used within school feeding programs. In some cases, students and schools decided to sell produce back to the school kitchen, learning about agribusiness while directing profits into other school activities; however, food is not sold externally (primarily due to the amount produced in the small urban gardens). Other schools have contacted FEGNe after seeing the successful gardens—"they are calling on us other than us preaching to them or doing a lot of marketing."

PNG—Morobe school gardens project

The Morobe School Gardens Project (MSGP) is a partnership between the governments of Australia and Papua New Guinea, funded by the Australian Government Department of Foreign Affairs and Trade, in collaboration with the Morobe Provincial Division of Education, Lae City Authority, and local schools. The project was conceived during an Australian delegation's visit to PNG in collaboration with PNG agricultural agencies and global bodies interested in school gardens. It has two sets of aims. Initially, it sought to address unemployment and food supply chain issues created by COVID-19. In the long term, first, it aimed to develop financially sustainable school garden models and improve nutrition through healthy school meals and education. Second, it aimed to strengthen the capacity of high schools to develop students' agribusiness skills and knowledge, given that many students will go on to work in the agricultural field and school-based teaching in this area is often more theoretical than practical.

The project operated in primary schools—focussed on growing and selling food, school feeding, and nutrition education—and secondary schools—with the addition of poultry meat and egg production, Agriculture and Business Studies teaching, and fostering agribusiness skills. Income generated funds garden operations to ensure ongoing sustainability.

Initially, the MSGP approached schools and asked whether they would like to participate. Direction came from MSGP, with pre-participation checklists provided to schools to ensure sufficient land, water, security, and so on. Though led by MSGP, this is a two-way process, and schools can negotiate terms of participation, with some schools negotiating changes to

MSGP's original layout or plans, such as customizing layout, fencing, and other infrastructure. Schools are informed that they will be responsible for gardens when the project period is over.

The MSGP team led planning and decision-making in consultation with agriculture teachers and school leadership, however, without student involvement. Specific school-based garden governance committees are planned for the future, each with their own terms of reference and working toward their school's specific goals and context. The MSGP's local team includes horticultural and poultry supervisors, who work in conjunction with community workers, whose roles were generated during the COVID-19 recovery as an employment stimulus. Project staff deliberate with school leadership and agriculture teachers to determine the direction and activities of the garden at each participating school.

PNG is a strongly hierarchical society, in which the community is generally led by committees headed by an elected leader, and the family is led by the father. Accordingly, it is the norm both in schools and at home for adults to make decisions while children take direction. In addition to cultural considerations, logistical barriers such as large class sizes make teachers apprehensive about increasing student agency, decision-making, and hands-on learning. Reflecting on project establishment, the MSGP project manager noted earlier that student and community participation would increase ownership and ongoing sustainability.

> "I strongly think the students … could be involved in the process at the beginning or even at the planning stage. I think the community… are the people that can contribute to enabling the different options or ideas or can support the school for running of the school gardens when the project pulls out."

The project plans to engage student leaders/representative teams in future phases of the project to build students' skills and interests and "bridge the gap" between home and school, an important factor for longevity, financial support, and community buy-in.

MSGP develops educational resources for teachers using a two-way process (primarily social media) based on gaps identified by teachers and general feedback. Classroom teachers engaged with MSGP to varying degrees—some passionate agricultural teachers took ownership, drove decision-making, and built on existing garden initiatives; however, barriers—particularly COVID-19 teaching disruption—remain for more widespread teacher (and subsequently student) engagement. MSGP staff reflected that engaging teachers is critical.

> "Getting the education component established in the beginning is one of the keys… to not just building … but connecting the gardens to the school. We should be engaging teachers at the beginning and [having] student's participation encouraged and initiated at that stage. Getting [all members of our team] talking to teachers, working with the teachers more closely, if all of that was in place, I think much more benefit should come out from the project."

Participation opportunities have been initiated by the MSGP education team, limiting teacher and student input into garden planning, design, and establishment; however, future phases will increase two-way communication and collaboration between MSGP ground staff and teachers. The project has created wider outcomes, with neighboring schools inspired to start their own gardens and poultry to bolster food security and income.

Typology of participation

Table 1 summarizes participation and engagement in PNG and Kenyan school gardens based on Reed et al.'s (2018) and Shier and Train's (2001) models.

Discussion and lessons learned—recommendations

This study tracked two school garden initiatives that shared much in common but differed in engagement and participation. In the following, we reflect on the case studies in light of the models discussed earlier, revealing contrasts likely to affect school and student ownership and motivation going forward. Recommendations and lessons learned are integrated throughout. Engagement between schools and implementing organizations is top-down, one-way consultation and/or deliberation in PNG and bottom-up deliberation and/or co-production in Kenya. As per Reed et al. (2018), this describes participation and engagement, not effectiveness of outcomes—both countries have established school gardens, but with differences.

Students participated intensively in Kenya—even providing initial impetus—while in PNG they had little or no role. While appearing counterintuitive for a school garden, PNG's evolving project goals explain this: initial goals focused on COVID-19 employment and food production, and later the goals focussed on developing financially sustainable garden models. While essential for project outcomes, this meant that establishing an educational garden culture (i.e., values) through engagement with classroom teachers was a lower priority and came later in the project. Influencing deeper values through deliberation and engagement, however, happens over longer time scales than more straightforward shared decision-making regarding project design (Reed et al., 2018). Moreover, COVID-19 limited the prioritization and practicalities of teacher and student participation, and when schools reopened, teachers focussed on the core curriculum, reducing both groups' participation, particularly students' practical activity—an issue globally, including LMICs (Shah, 2020). PNG's participation typology (top-down one-way consultation and/or deliberation) further limited student and classroom teacher voices. The opposite, however, occurred in Kenya, where establishment began as the students' goal and youth voice was nurtured due to COVID-19 impacts, rather than the converse. This amplification of initial agency flowed through into student motivation, driving establishment and fostering garden ownership. Kenyan students, supported by FEGNe, were able to motivate teachers and administrators, better-enabling garden activities for students. Shared initial decision-making with students from the beginning and continuity of goals throughout the Kenyan experience have been major advantages.

Evolving goals affected (non-)participation by different actors at different stages. While we agree with Reed et al. that neither top-down nor bottom-up are inherently worse, they have considerably influenced participation in these cases. Consideration of factors that influence outcomes in Reed et al.'s model gives further insight: *context* is affected by the (non-)participation culture initially created (both cases); engagement *design* is more challenging if actor representation shifts over time (PNG), but manageable when everyone is included initially (Kenya); *power* dynamics are problematic if incoming actors cannot influence past decisions (PNG), but strengthened when actors see the outcomes of their agency (Kenya); and *scalar fit* must be recalibrated as new actors participate, meaning engagement comes late (PNG educational aspects),

TABLE 1 The cases with respect to the participation models reviewed earlier.

Model elements during establishment	Kenya	PNG
Reed et al. (2018)		
Agency—who leads	Students and teachers	Project managers/donors
• top-down or bottom-up	Bottom-up: students advocated for gardens initially; then developed by students, teachers, and FEGNe	Top-down: government agencies conceptualized/advocated for the gardens initially; then developed by a project team engaging with teachers
Engagement types and context:		
• communication	Schools informed of requirement for student-centred model	
• consultation	Learning resources—identified support needs based on teacher input; ran weekly sessions	Garden management—engagement with school leadership Garden design/operations—schools completed checklists to inform the feasibility of standard design
• deliberation	Garden management—negotiated contract re-governance	Learning resources—identified support needs based on teacher input; written resources refined through feedback Garden design/operations—some schools varied elements, designs, and activities
• co-production	Garden design/operations—led by students and teachers, sometimes independently, with engagement where needed	
Who is participating in establishment	Students and teachers	Teachers
Shier and Train (2001)		
Level of children's participation:		
• being listened to	Yes—students presented the concept initially and subsequently influenced establishment/design	No—no student participation, primarily due to the evolving nature of the project
• supported to share their views	Yes—facilitated discussions to gather ideas from a wide sample of students	No
• taking those views into account	Yes—gardens were developed following student proposal; students co-designed gardens	No
• being involved in decision-making	Yes—students made decisions independently; when beyond capability adults mediated student decisions	No
• sharing power and responsibility for decisions	Partly—As above. Students and teachers co-managed gardens.	No
Organizational context:		
• openings	Yes—fundamental underpinning of the establishment model	Yes—plan to develop student representatives
• opportunities	Yes—facilitated conversations to seek students' views	No—evolving aims/priorities of the project meant students were not involved early in establishment
• obligations	Yes—mandated student participation and rejected teacher-centred models	No—no policies regarding the degree of student participation

but more manageable if all key goals and associated engagement are considered from the beginning (Kenya). In line with the model, this affected outcomes, with PNG teachers and students using gardens infrequently and feeling less ownership compared to Kenya, where classroom teachers and hence educational values were prominent early and bolstered by student motivation and garden ownership—concurring with Korfiatis and Petrou (2021). Shier and Train's (2001) model shows both what worked in Kenya and could be addressed in PNG: *openings* in schools' and project implementers' culture to accommodate student agency; *opportunities* to enable such agency; and *obligations* by making student participation and agency standard procedure/policy—this was a starting point in the Kenyan case, which prevented some schools' involvement but improved outcomes in those willing to comply. These student participation enhancements are likely to require capacity building for adults, e.g., project staff and teachers (Lundy, 2007).

*Lesson #1: Engage with all actors—particularly youth, who should not be underestimated—from the beginning, regardless of temporal primacy or actors' relevance to particular goals, noting influencing values—*e.g., *teaching philosophies and garden ownership—takes longer than practicalities like garden design.*

Lesson #2: While there is no 'correct' engagement typology, top-down approaches involve extra risk of non-participation by less powerful voices, particularly youth, while bottom-up approaches will benefit when adults empower youth by providing them greater agency.

Cultural nuance

Cultural norms influenced student participation in both cases; however, one must distinguish between wider culture, school culture, and their intersection. In Kenyan and PNG cultures, youth have limited decision-making power within families, and community decision-making by youth is facilitated by adults—but youth voices are heard (Yari and Suruweng, 2022, personal communication, 10 March). In contrast, experience with PNG and Kenyan teachers suggests that youth agency is uncommon in schools, where students implement teachers' decisions, as observed in many countries and cultures (Lundy, 2007). Possible causes include a tradition of rote learning pedagogies driving unequal student–teacher power dynamics and diminishing participatory methods, curriculum pressures on teachers, and teacher training methods. Tension exists between these norms, effective school gardens, and learning benefits and curriculum elements requiring student agency and decision-making. The Kenyan case suggests, first, that these educational norms can be productively challenged using gardens, and second, PNG's transition from outcomes- to standards-based curriculum (emphasising student-centered learning) may also address this tension. Furthermore, practical barriers to student-centered learning in Kenya, PNG, and other LMICs may be addressed through improved teacher training and school resourcing, however, deeper issues of cultural norms, hierarchy, learned social roles, teacher authority, and power are more challenging to address (Schweisfurth, 2011).

Lesson #3: Cultural norms must be respected in participation design; however, scope exists to challenge educational culture—this is best negotiated by culturally familiar local staff.

Lesson #4: Physical (garden tools, facilities, etc.) and structural (teacher time allowances, student-centred curriculum, and pedagogy) resources will enhance all actors' agency and participation.

Thompson (2013) asserts that building a participatory educational culture is best implemented through bottom-up, small-scale institutional relationships (e.g., a school garden) rather than top-down via government directives—a pattern born out in the cases. We argue that settings such as school gardens are an asset here. The novel location and swapping blackboards and desks for dynamic spaces can allow participative educational cultures and student voice to flourish, while teachers can retain authority and culturally appropriate adult agency as facilitators rather than absolute decision-makers. More awareness of wider and school culture nuance within some members of the PNG international implementing team would have made this balance more achievable. In any rebalancing of agency through participation, broader culture must be respected (Hart, 2008), and we commend the PNG syllabus's focus on global perspectives and new plant varieties/technologies alongside cultural relevance, vernacular language, traditional knowledge, and 'understanding and appreciation of the values, customs and traditions of Papua New Guinea (Department of Education Papua New Guinea, 2006).

Lesson #5: Members of garden-implementing agencies from other cultures should engage in their own cultural capacity-building before designing participatory processes (Tedmanson, 2012; Reed et al., 2018).

Lesson #6: School gardens and other non-classroom hands-on learning settings provide scope for sensitively changing educational norms while respecting broader cultural values.

We conclude by noting that these findings may not be applicable to other countries and cultures, particularly high-income countries where garden establishment will be markedly different. Due to the stage at which the projects are, this study focusses only on garden establishment, with limited data on longer-term outcomes, making provisional conclusions regarding motivation and ownership. Future research should investigate links between establishment and long-term outcomes in LMICs, along with how culture, pedagogy, youth participation, engagement typologies over time, and government policy and national initiatives affect such outcomes.

Data availability statement

The datasets presented in this article are not readily available because all data collected is reported in the case studies. Original interview data cannot be shared due to ethical issues. Requests to access the datasets should be directed to graham.walker@anu.edu.au.

Ethics statement

The studies involving humans were approved by the Australian National University Human Research Ethics Committee. The studies were conducted in accordance with the local legislation and institutional requirements. Written informed consent for participation in this study was provided by the participants' legal guardians/next of kin. Written informed consent was obtained from the individual(s), and minor(s)' legal guardian/next of kin, for the publication of any potentially identifiable images or data included in this article.

Author contributions

GW: Conceptualization, Funding acquisition, Project administration, Writing – original draft, Writing – review & editing. AV: Writing – original draft, Writing – review & editing. KM: Writing – review & editing. TS-I: Writing – review & editing. RA: Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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References

Amutabi, M. N. (2021). Competency based curriculum (CBC) and the end of an era in Kenya's education sector and implications for development: some empirical reflections. *J. Pop. Edu. Africa* 3, 45–66. doi: 10.46769/jopea.252328004413713081

Arnstein, S. R. (1969). A ladder of citizen participation. *J. Am. Plan. Assoc.* 35, 216–224.

Bhattarai, D. R., and Schreinemachers, P. (2020). "School gardens in Nepal: design, piloting, and scaling" in *Agrobiodiversity, school gardens and healthy diets: Promoting biodiversity, food and sustainable nutrition*. eds. D. Hunter, E. Monville-Oro, B. Burgos, C. N. Roel, B. M. Calub and J. Gonsalveset al. (London: Routledge), 77–85.

Bhattarai, D. R., Subedi, G. D., Acharya, T. P., Schreinemachers, P., Yang, R., Luther, G., et al. (2015). Effect of school vegetable gardening on knowledge, willingness and consumption of vegetables in mid-hills of Nepal. *Int. J. Hortic.* 5, 1–7. doi: 10.5376/ijh.2015.05.0020

Bourke, R. M. (2018). "Impact of climate change on agriculture in Papua New Guinea" in *Climate change: Our environment, livelihoods and sustainability. Climate change conference 2018*. ed. A. R. Quartermain (Papua New Guinea: University of Goroka).

Burt, K. G., Luesse, H. B., Rakoff, J., Ventura, A., and Burgermaster, M. (2018). School gardens in the United States: Current barriers to integration and sustainability. *American J. Public Health.* 108, 1543–1549.

CGIAR. (2021). A new dawn for agriculture with the reintroduction of 4K clubs in Kenyan schools. Available at:https://www.cgiar.org/news-events/news/a-new-dawn-for-agriculture-with-the-reintroduction-of-4k-clubs-in-kenyan-schools/

Constant, N., and Roberts, L. (2017). Narratives as a mode of research evaluation in citizen science: understanding broader science communication impacts. *J. Sci. Commun.* 16, 1–18. doi: 10.22323/2.16040203

Demeke, M., Kariuki, J., and Wanjiru, M. (2020). Assessing the impact of COVID-19 on food and nutrition security and adequacy of responses in Kenya. Available at:https://evidencefrontiers.com/wp-content/uploads/2020/05/Policy-Brief_Assessing-the-Impact-of-COVID_19-on-Food-and-Nutrition-Security-1.pdf

Department of Education Papua New Guinea. (2006). Agriculture lower secondary syllabus. Available at:https://www.education.gov.pg/TISER/documents/curriculum/syllabus-lower-secondary-agriculture.pdf

Diaz, J. M., Warner, L. A., Webb, S., and Barry, D. (2019). Obstacles for school garden program success: expert consensus to inform policy and practice. *Appl. Environ. Educ. Commun.* 18, 195–206. doi: 10.1080/1533015X.2018.1450170

Grace, K., Davenport, F., Funk, C., and Lerner, A. M. (2012). Child malnutrition and climate in sub-Saharan Africa: an analysis of recent trends in Kenya. *Appl. Geogr.* 35, 405–413. doi: 10.1016/j.apgeog.2012.06.017

Hart, R. A. (1992). *Children's participation: from tokenism to citizenship*. UNICEF Innocenti Essays, Florence, Italy

Hart, R. A. (2008). "Stepping Back from 'the ladder': Refl ections on a model of participatory work with children" in *Participation and learning: developing perspectives on education and the environment, health and sustainability*. ed. R. Jensen (Dordrecht: Sage), 19–31.

Hoover, A., Vandyousefi, S., Martin, B., Nikah, K., Cooper, M. H., Muller, A., et al. (2021). Barriers, strategies, and resources to thriving school gardens. *J. Nutr. Educ. Behav.* 53, 591–601. doi: 10.1016/j.jneb.2021.02.011

Hurney, M. (2017). Short changed: The human and economic cost of child undernutrition in Papua New Guinea. Available at:https://www.savethechildren.org.au/__data/assets/pdf_file/0009/228492/PNG-Nutrition-Report.pdf

International Food Policy Research Institute. (2016). *Global nutrition report - from promise to impact: ending malnutrition by 2030*. Washington, DC.

Jovchelovitch, S., and Bauer, M. W. (2000). "Narrative interviewing" in *Qualitative researching with text, image and sound: a practical handbook*. eds. M. W. Bauer and G. Gaskell (London: SAGE Publications), 58–74.

Kigaru, D. M. D., Loechl, C., Moleah, T., Macharia-Mutie, C. W., and Ndungu, Z. W. (2015). Nutrition knowledge, attitude and practices among urban primary school children in Nairobi City, Kenya: a KAP study. *BMC Nutr.* 1, 1–8. doi: 10.1186/s40795-015-0040-8

Korfiatis, K., and Petrou, S. (2021). Participation and why it matters: children's perspectives and expressions of ownership, motivation, collective efficacy and self-efficacy and locus of control. *Environ. Educ. Res.* 27, 1700–1722. doi: 10.1080/13504622.2021.1959900

Langellotto, G. A., and Gupta, A. (2012). Gardening increases vegetable consumption in school-aged children: a meta-analytical synthesis. *HortTechnology* 22, 430–445. doi: 10.21273/HORTTECH.22.4.430

Lundy, L. (2007). "Voice" is not enough: Conceptualising article 12 of the United Nations convention on the rights of the child. *Br. Educ. Res. J.* 33, 927–942. doi: 10.1080/01411920701657033

Lyons, G., Dean, G., Tongaiaba, R., Halavatau, S., Nakabuta, K., Lonalona, M., et al. (2020). Macro-and micronutrients from traditional food plants could improve nutrition and reduce non-communicable diseases of islanders on atolls in the South Pacific. *Plan. Theory* 9, 1–15. doi: 10.3390/plants9080942

Muzaffar, H., Metcalfe, J. J., and Fiese, B. (2018). Narrative review of culinary interventions with children in schools to promote healthy eating: directions for future research and practice. *Curr. Dev. Nutr.* 2, nzy016–nzy010. doi: 10.1093/cdn/nzy016

OECD. (2005). The Paris declaration on aid effectiveness: five principles for smart aid. Available at:http://www.oecd.org/dac/effectiveness/45827300.pdf

Rabinowitz, G. (2015). *Overseas Development Institute Report 2: Literature Review on aid ownership and participation*. London.

Rarau, P., Guo, S., Baptista, S. N., Pulford, J., McPake, B., and Oldenburg, B. (2020). Prevalence of non-communicable diseases and their risk factors in Papua New Guinea: a systematic review. *SAGE Open Med.* 8:205031212097384. doi: 10.1177/2050312120973842

Reed, M. S., Vella, S., Challies, E., de Vente, J., Frewer, L., Hohenwallner-Ries, D., et al. (2018). A theory of participation: what makes stakeholder and public engagement in environmental management work? *Restor. Ecol.* 26, S7–S17. doi: 10.1111/rec.12541

Roothaert, R., Mpogole, H., Hunter, D., Ochieng, J., and Kejo, D. (2021). Policies, multi-stakeholder approaches and home-grown school feeding programs for improving quality, equity and sustainability of school meals in northern Tanzania. *Front. Sustain. Food Syst.* 5:621608. doi: 10.3389/fsufs.2021.621608

Saweri, W. (2001). The rocky road from roots to rice: a review of the changing food and nutrition situation in Papua New Guinea. *P. N. G. Med. J.* 44, 151–163.

Schreinemachers, P., Baliki, G., Shrestha, R. M., Bhattarai, D. R., Gautam, I. P., Ghimire, P. L., et al. (2020a). Nudging children toward healthier food choices: an experiment combining school and home gardens. *Glob. Food Sec.* 26:100454. doi: 10.1016/j.gfs.2020.100454

Schreinemachers, P., Bhattarai, D. R., Subedi, G. D., Acharya, T. P., Chen, H., Yang, R. Y., et al. (2017). Impact of school gardens in Nepal: a cluster randomised controlled trial. *J. Dev. Eff.* 9, 329–343. doi: 10.1080/19439342.2017.1311356

Schreinemachers, P., Yang, R., Bhattarai, D. R., Rai, B. B., and Ouedraogo, M. S. (2020b). "The impact of school gardens on nutrition outcomes in low-income countries" in *Agrobiodiversity, school gardens and healthy diets* (London: Routledge), 115–125.

Schweisfurth, M. (2011). Learner-centred education in developing country contexts: from solution to problem? *Int. J. Educ. Dev.* 31, 425–432. doi: 10.1016/j.ijedudev.2011.03.005

Shier, H., and Train, P. Á. (2001). Pathways to participation: openings, opportunities and obligations. *Child. Soc.* 15, 107–117. doi: 10.1002/chi.617

Shrestha, A., Schindler, C., Odermatt, P., Gerold, J., Erismann, S., Sharma, S., et al. (2020). Nutritional and health status of children 15 months after integrated school garden, nutrition, and water, sanitation and hygiene interventions: a cluster-randomised controlled trial in Nepal. *BMC Public Health* 20, 1–19. doi: 10.1186/s12889-019-8027-z

Ssekyewa, C., Kudamba, C., Mwine, J., Emurwon, O., and Kasekende, J. (2007). Vegetable gardening in primary schools and its impact on community livelihoods in Uganda. *J. sustain. dev. Afr.* 9, 149–163.

Tedmanson, D. (2012). "Whose capacity needs building?" in *Against the grain: Advances in postcolonial organization studies*. eds. A. Prasad and J. P. Olsen (New York: Samfundslitteratur Press), 249–275.

Thompson, P. (2013). Learner-centred education and 'cultural translation'. *Int. J. Educ. Dev.* 33, 48–58. doi: 10.1016/j.ijedudev.2012.02.009

United Nations. (1989). *Convention on the rights of the child*. New York.

Walker, G. J., Vos, A., Monjero, K., Sikas-lha, T., and Alders, R. G. (2022). *Participation and agency in school garden food security interventions: comparing case studies from Kenya and Papua New Guinea. Australian Aid Conference – Food Security and Rural Development*, vol. 24. Canberra.