

Technology for Sustainable Development in Zimbabwean Community Gardens: Engaging University Students in Green Processing of Indigenous Plants

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Abstract

The main focus of this study was to explore the role of university students in promoting green processing of indigenous plants within Zimbabwean community gardens, with the broader aim of advancing Education for Sustainable Development. Indigenous plants are central to local health, nutrition, and economic resilience, yet their full potential remains underutilised due to limited value-addition and lack of appropriate processing technologies. Green processing technologies such as solar drying, bio-extraction, low-energy milling, and natural preservation techniques offer sustainable alternatives which preserve the nutritional and medicinal local plant resources. The study sought to establish the factors that influence the adoption of green processing methods in community gardens and to explore the interventions university students can implement to support such practices. By engaging in community-based projects, university students served as knowledge brokers, applying what they learnt in the classroom to real-world sustainability challenges. A qualitative descriptive survey research design was employed, using focus group discussions and semi-structured interviews to collect data from university students and community garden members. The study was conducted in selected community gardens linked to Zimbabwean universities. The findings established that community gardens are failing to thrive due to a lack of technologies for preserving the medicinal and nutritional vegetables. Lack of knowledge as well as failure to embrace technology were also identified as key challenges. The engagement of university students can assist in disseminating information and imparting technological knowledge and skills to the marginalised communities. Ultimately, the study underscores the transformative potential of student engagement in sustainable practices that bridge the gap between higher education and community resilience. It is recommended that all stakeholders mobilise resources to support green processing technologies that advance Education for Sustainable Development.

Keywords: Community Gardens; Green Processing; Indigenous Plants Analysis; Sustainable Development; Technology; University Students

1. INTRODUCTION AND BACKGROUND

The current study sought to establish the factors that influence the adoption of green processing methods in community gardens and to explore the interventions university students can implement to support such practices. By engaging in community-based projects, students serve as knowledge brokers, applying what they learn in the classroom to

real-world sustainability challenges. The study was guided by participatory learning and innovation diffusion frameworks, recognising the importance of collaboration, context-based learning, and indigenous knowledge system. Indigenous plants are central to local health, nutrition, and economic resilience, yet their full potential remains underutilised due to limited value-addition and lack of appropriate processing technologies (Nemapare, Mugadza, Gadaga & Jombo, 2024; Dube & Moyo, 2020). Green processing technologies such as solar drying, bio-extraction, low-energy milling, and natural preservation techniques offer sustainable alternatives that reduce environmental impact while preserving the nutritional and medicinal qualities of local plant resources.

Education for Sustainable Development promotes knowledge, skills, attitudes, and values necessary for individuals to contribute to a sustainable future. UNESCO (2020) defines Education for Sustainable Development (ESD) as a transformative learning approach that empowers learners to make informed decisions and take responsible actions for environmental integrity, economic viability, and a just society. University students in Zimbabwe are expected to contribute to the community during their learning space. ESD fosters critical thinking, systems thinking, and problem-solving skills essential for sustainable living. In higher education, ESD emphasises experiential learning, community engagement, and interdisciplinary collaboration (FSFS 2025; Mutandwa, Chikodzi & Muchena, 2020; Leicht, Heiss & Byun, 2018). Zimbabwe's Education 5.0 framework aligns with ESD by encouraging innovation, research, and community service through university curricular (Maphosa, 2021). Engaging students in the capacity of think tanks will assist the community to marry knowledge and skills. Communities in Zimbabwe are generally known as hard workers who have the potential of excelling given all the necessary support. The sustenance they require ranges from knowledge, resources and skills.

The community gardens in Masvingo are strategically related to the ESDs as they share the same goals. Community gardens are intended to sustain the local people in high density suburbs. The gardens are supervised by the city council and run by community committees which comprises of chosen members selected by the community. Most of the committee members are chosen for their knowledge of indigenous plants and locally available vegetables. Indigenous knowledge systems hold deep ecological wisdom and practices related to plant use for medicine, food, and livelihoods (Nyikahadzoi, Makurira & Mvura, 2020; Hoppers, 2002). In Zimbabwe, plants like *Mumveva* (Sausage tree) *Moringa oleifera*, *Mazhanje*, and *Mutsa* are used for their nutritional and therapeutic properties. However, this knowledge is often passed orally and remains underutilised in formal education and processing industries (UNESCO, 2020; Chanza & de Wit, 2016). Documenting and integrating indigenous knowledge with scientific innovation can enhance sustainability and community well-being (Nyikahadzoi, Makurira & Mvura, 2020). University students may also actively participate in documenting the research findings and making an analysis of the system. Involving the Strength, Weaknesses, Opportunities and Threats (SWOT) analysis is best done by students who have the relevant knowledge and easily accept self-reflection and criticism. The students may also use PESTLEG as a tool to come up with a SWOT analysis that is robust. There is a general belief that learned people accept constructive criticism easily as compared to the less educated. The rigorous process of making presentations and research prepares the students for reflective thinking. Community gardens, to keep abreast of technology, should be able to accept change.

Green processing refers to eco-friendly methods of transforming raw plant materials into usable forms while minimising environmental impact. Technologies include solar drying,

low-energy milling, fermentation, cold-press extraction, and natural preservatives (Nemapare et al., 2024; Ghosh, 2019). Such methods reduce carbon emissions, retain nutrient content, and extend shelf life. Universities play a crucial role in innovating and disseminating these technologies through student research, laboratory work, and field trials (Tadesse, Gebre & Eshetu, 2021). In Zimbabwe, some universities have piloted projects that integrate green processing in agriculture and food science education. University students are vital agents of change when engaged in meaningful community-based projects. Community gardens provide experiential learning platforms for applying sustainability knowledge, particularly in agro-processing and ecological management (Mutandwa, Chikodzi & Muchena, 2020). Through such engagement, students co-create solutions with communities, build leadership capacity, and foster mutual learning. This participatory approach aligns with Kolb's experiential learning theory and supports the goals of ESD by reinforcing action-oriented and contextually relevant education (Sterling, 2014).

It is against this background that the study sought to address the following objectives:

- To establish the key factors influencing the adoption and application of green processing technologies for indigenous plants.
- To explore how university students can contribute to community-based initiatives that promote green processing of indigenous plants through sustainable garden projects.

2. LITERATURE REVIEW

Indigenous knowledge plays a critical role in plant processing by providing time-tested, context-specific practices that enhance sustainability, food security, and cultural continuity. Indigenous Knowledge Systems (IKS) encompass accumulated wisdom about selecting, harvesting, processing, preserving, and preparing local plants, often adapted to local climates and ecosystems over generations. For example, rural farmers in Zimbabwe use indigenous knowledge to dry, ferment, or juice wild edible fruit that include practices that not only extend shelf life but also maintain nutritional value and cultural food ways (Nemapare et al., 2024; Mutandwa, Chikodzi & Muchena, 2020). Indigenous knowledge is crucial for sustainable transformations of food systems but often remains marginalised in policy and practice. Controversies surrounding the 2021 United Nations Food Systems Summit have highlighted this issue. These practices reflect deep ecological understanding and are increasingly recognised as foundational to resilient food systems, especially, in marginalised rural contexts where formal technologies and infrastructure may be limited (Frontiers in Sustainable Food Systems, 2025; Vijayan et al., 2022).

Marginal rural contexts in Zimbabwe such as high density suburbs were experiencing persistent failure of nutritional gardens due to lack of finances, technical skills and appropriate technology. Green processing technology brings machineries that are user friendly and produce better products in a short space of time. Fear of the unknown is another challenge that causes community gardeners fail to embrace the new technology. University students are pivotal in assisting the gardeners to embrace the new technology through information dissemination. The students will interpret and shade light on how friendly the machines are. They may also create confidence in gardeners as they feel supported and find immediate help when need arises.

In addition to practical processing techniques, indigenous knowledge contributes to bio-cultural heritage and sustainability by integrating cultural values with ecological

management. Indigenous food systems involve holistic approaches that link seed selection to preparation, ensuring that plant processing is embedded within broader cultural, nutritional, and environmental frameworks. Scholars argue that recognising and empowering this knowledge improves food sovereignty and supports sustainable plant use, but it faces threats from industrial agriculture and loss of traditional knowledge transmission (Shava, Krasny, Tidball & Zazu, 2022; Swiderska et al., 2022). By incorporating indigenous practices into broader research and policy efforts, such as curriculum development for appropriate technologies or co-production with scientific methods and communities can sustain plant processing traditions while advancing innovation and resilience (Timire & Dube, 2025).

Green processing technologies refer to innovative, environmentally responsible methods for transforming plant materials and food products that prioritize energy efficiency, reduced chemical use, lower water consumption, and minimised waste. These technologies often harness physical, biological, or hybrid mechanisms such as microbial inactivation, extraction of valuable compounds, or modification of food structure without degrading nutritional quality or increasing environmental burdens (Nowosad et al., 2025; Sterling, 2014; Rogers, 2003). By operating under milder conditions and reducing reliance on fossil-based solvents or high temperatures, green processing helps preserve thermolabile phytochemicals in plant foods and aligns with broader sustainability goals such as reduced energy footprint and enhanced resource circularity in line with the United Nations Sustainable Development Goals for responsible consumption and production.

One of the most studied green processing approaches is green extraction, which replaces traditional solvent-intensive techniques with methods like ultrasound-assisted extraction (UAE), microwave-assisted extraction (MAE), pressurized liquid extraction (PLE), enzyme-assisted extraction (EAE), and supercritical fluid extraction (SFE) (especially with CO₂) (Swiderska et al., 2022; Gebre & Eshetu, 2021). These technologies significantly cut solvent use and extraction times while boosting yield and preserving bioactivity of plant antioxidants, polyphenols, and other high-value compounds that facilitate valorisation of agricultural residues and supporting circular economy practices (Díaz-de-Cerio & Trigueros, 2025; López-Padilla et al., 2025). Moreover, integrating green processing with process intensification and life cycle assessment frameworks enables industries to evaluate sustainability performance systematically and scale up solutions that reduce environmental impact across the plant processing value chain.

Theoretical Framework

This study is underpinned by two complementary theoretical perspectives: Bandura's Social Learning Theory and Rogers' Innovation Diffusion Theory. Together, they offer a lens through which to understand how university students engage in green processing of indigenous plants and how such engagement can foster sustainable development within communities.

Bandura's Social Learning Theory (1977) emphasises that learning occurs through observation, imitation, and modelling, particularly within a social context. Central to the theory is the idea that individuals acquire new behaviours and knowledge not only through direct experience but also by observing others (Koutroubas & Galanakis, 2022; Bandura, 1986). In the context of this study, university students serve both as learners and role models within community gardens. By participating in green processing activities and demonstrating sustainable techniques, they influence the knowledge, attitudes, and

practices of community members. This interaction fosters reciprocal learning where students also gain deeper insights into indigenous knowledge systems. The theory supports the ESD goal of empowering learners to take responsible action by reinforcing learning through active participation and social engagement (Nabavi, 2012; Medlin, 2001).

Rogers' Innovation Diffusion Theory (2003) explains how new ideas and technologies spread within a social system. It identifies key elements that influence adoption: the innovation itself, communication channels, time, and the social system (Sahin, 2006; Rogers & Shoemaker, 1971). In this study, green processing technologies are considered innovations introduced into community gardens through student-led initiatives. Students act as change agents, facilitating the adoption of eco-friendly methods such as solar drying or natural extraction. The theory helps explain the varying rates of adoption among communities and provides insight into the challenges and enablers of integrating sustainable innovations in traditional settings (Gourville, 2005).

Together, these theories frame university students as active contributors to knowledge exchange and innovation, aligning with the transformative aims of Education for Sustainable Development. Their engagement with communities not only enhances the uptake of green technologies but also promotes mutual learning, empowerment, and long-term behavioural change.

3. METHODOLOGY

This study adopted a descriptive qualitative survey research design within an interpretivist paradigm to explore how university students can contribute to green processing of indigenous plants in Masvingo (Zimbabwe) community gardens. The qualitative approach was chosen to capture the in-depth experiences, insights, and reflections of participants regarding sustainable practices, innovation, and community engagement. This approach aims to understand social phenomena from the participants' own viewpoints, rather than imposing the researcher's preconceptions (Hennink, Hutter & Bailey, 2020; Given, 2008).

The study targeted university students, academic staff and community members engaged in community garden projects affiliated with selected two universities in Masvingo, Zimbabwe. According to Creswell (2014) and Neuman (2014) a population consists of potential participants who have the relevant information for the subject under study. Purposive sampling technique was used to select university students and community members with relevant experience in green processing or community-based sustainability projects. The researcher established the committee of the community for each garden and chose the participants basing on relevance of the people to the garden. Purposive sampling was chosen because not all residents were involved in community gardens. Combining purposive and convenience sampling have the advantage of getting primary data and real experiences (Gerring, 2017). In addition, convenience sampling was employed to recruit student participants available and willing to share their experiences. The sample comprised forty participants: ten university students from each of the two universities (1 to 20), sixteen community garden members from two gardens, and four lecturers or project supervisors from the two universities. The age range was between 20 and 65 years and for gender balance participants were 20 males and 20 females. Qualitative samples are in most cases small to allow for thorough investigations (Silverman, 2020).

Data were collected through focus group discussions (FGDs), in-depth semi-structured interviews, and field observations. The use of the three data collection tools catered for triangulation and improve on authenticity of the findings (Creswell & Plano Clark, 2018). Three FGDs were conducted with student groups of five to explore their roles, challenges, and innovations in green processing practices. This implies that 15 students were involved in focus group discussions (2 groups and 1 group from the two universities) while 5 from one university were interviewed. Focus Group Discussions were chosen for their advantage of collecting large amounts of data from discussions. The five students who were interviewed indicated that they were more comfortable with interviews. Interviews with lecturers and community members provided deeper insights into institutional support, indigenous knowledge integration, and community perceptions. Field observations enabled the researcher to document the actual use of green technologies (e.g., solar dryers, manual extractors) and students' involvement in processing activities. All sessions were audio-recorded after participants' consent and transcribed for analysis. Notes and photographs were also taken to supplement qualitative data and to help in capturing views of participants. Qualitative researchers emphasise capturing the genuine perspectives and experiences of participants, often through methods like in-depth interviews, observations, and open-ended surveys (Hennink, Hutter & Bailey, 2020; Kothari, 2004).

Data were analysed using thematic analysis, allowing for the identification of key patterns and meanings across narratives. Codes were developed based on recurring themes such as sustainability awareness, technology adoption, knowledge transfer, and innovation challenges. Emerging themes were coded in relation to the objectives of the study as suggested by (Creswell & Plano Clark, 2018; Bryman & Bell, 2015).

Ethical clearance was obtained from the two universities' research ethics committees. Informed consent was secured from all participants who were assured of confidentiality, anonymity, and their right to withdraw at any time. All the 40 participants were given numbers, that is, from 1 to 4 (lecturers), 5 to 20 (gardeners) and 21 to 40 (university students) to cater for anonymity. The participants were asked to pick numbers from their boxes labelled their status, for instance, four lecturers picked from a box labelled lecturers with only four numbers. Researchers have the duty of observing ethical issues in order to protect participants (Yin, 2018; Given, 2008). Data were securely stored and used solely for academic purposes, strategic planning and for a way forward.

4. RESULTS AND DISCUSSION

Factors that influence adoption and application of green processing technologies

The findings of this study revealed that all participants were appreciating the project and the supposed benefits but there were factors that negatively impacted the effectiveness and production of the gardens. Despite their enthusiasm of applying green processing technologies, students and gardeners encountered several challenges that included lack of funding for prototypes or materials and funding of projects. Students also struggled to access essential resources such as raw materials, technical tools, laboratory supplies, and fabrication equipment (Veidemane, 2022). This also limited the overall project development and significantly restricted student innovation and participation in hands-on learning (Díaz-de-Cerio & Trigueros, 2025; Mhlanga & Nyamupangedengu, 2022). More than sixty percent of students submitted that the idea is very promising in improving livelihood of the general populace if enough support was available. Without adequate support, Lecturer 1 and

Student 29 said that, *shortages, reduced opportunities for experimentation, problem-solving, and applied learning*. As a result, the learning process became largely theoretical, weakening skills development in areas such as design thinking, engineering processes, and technological innovation.

The findings revealed that project funding challenges also hindered collaboration with industry, community partners, and academic institutions that could otherwise strengthen learning and research outcomes. Gardeners 5 and 15 indicated that *when universities and technical programmes lack stable financial resources, students may fail to participate in larger projects, field trials, or community-based innovations that require sustained investment*. According to Chikodzi and Mutanga (2021), inadequate project funding often leads to incomplete research activities, limited data collection, and reduced opportunities for knowledge dissemination. Lecturers 2 and 3 added that *poor funding impacts lecturers' ability to supervise complex projects or integrate modern technologies that support ESD*. Therefore, lack of funding not only restricts project completion but also undermines the broader goals of developing competent, innovative, and industry-ready graduates.

Most of the participants agreed that limited access to green processing machinery significantly constrains students' ability to engage in practical, sustainable innovation activities within community garden projects. Without equipment such as solar dryers, bio-extractors, low-energy grinders, or eco-friendly processing units, students were unable to apply theoretical knowledge of green technologies to real-world plant processing tasks (Nowosad, Jadhav et al., 2025; Tadesse, Gebre & Eshetu, 2021). This lack of hands-on exposure reduces opportunities for skills development and inhibits the creation of value-added products that support Education for Sustainable Development. Research indicates that inadequate access to appropriate technologies in learning environments limits students' capacity to develop environmentally responsible solutions (Chikoko & Dube, 2023; Mhlanga & Nyamupangedengu, 2022). Consequently, the absence of green processing machinery becomes a critical barrier to fostering practical competencies and advancing green entrepreneurship among university learners and community gardeners.

The findings also revealed that inadequate institutional support for sustainability-focused fieldwork presents a major barrier to students' meaningful engagement with real-world environmental practices. Lecturers 1 and 4 lamented that *when universities fail to provide essential resources such as transport, field equipment, safety gear, and logistical arrangements, student participation in community-based sustainability projects becomes limited in scope and skills*. Lack of support restricted opportunities for experiential learning, where students can apply green processing skills, observe ecological systems, and interact with local communities involved in sustainable agriculture. According to Mpofu and Chikuda (2021), insufficient institutional backing often results in shallow field experiences that do not fully develop students' competencies in environmental stewardship or practical problem-solving. Students 26 and 39 echoed the same sentiments and mentioned that *learners may struggle to connect theoretical coursework with the practical realities of sustainability work in community garden settings*.

Moreover, weak institutional support affects the continuity and long-term impact of sustainability-focused fieldwork initiatives said Lecturer 1 and Gardeners 13 and 19 participants. Field-based projects frequently require ongoing supervision, collaboration with community partners, and structured follow-up activities to ensure meaningful learning outcomes (Chikodzi & Mutanga, 2021). Students 21 and 33 mentioned that *when institutions*

do not allocate funding, staff time, or policy frameworks to sustain these activities, fieldwork becomes inconsistent, unsystematic and confusing. This limits students' ability to contribute to long-term sustainability efforts such as monitoring plant growth, evaluating green processing methods, or assessing the social benefits of community gardens. Research by Dube and Moyo (2020) highlights that without supportive institutional structures, universities struggle to cultivate a culture of sustainability, leaving students without the guidance and institutional commitment needed to engage deeply in environmental projects. Ultimately, inadequate institutional support undermines both student learning and the broader objectives of ESD.

Results also indicated that resistance from some community members who were unfamiliar with new technologies can significantly hinder the successful implementation of sustainability and green processing initiatives. Lecturer 4, Gardeners 10 and 17 submitted that *when community members lack understanding of how green technologies such as solar dryers, bio-extractors, or low-energy processing tools they do not understand their function, the community may perceive them as disruptive, risky, or incompatible with traditional practices.* This resistance often stems from limited exposure, misconceptions, or fear of losing cultural methods of processing indigenous plants. According to Ndlovu and Mbanje (2022), unfamiliarity with technological innovation can lead to scepticism and reduced participation in community-based sustainability projects, ultimately slowing down adoption and reducing project impact. Therefore, meaningful community engagement by students and lecturers through, awareness campaigns, and participatory training sessions are essential to build trust, enhance understanding, and promote acceptance of new technologies.

University students' contribution towards sustainable community gardens

Findings from the study revealed that many university students expressed a growing interest on sustainability and environmental responsibility, which they attributed to ESD-related modules and extracurricular initiatives. Students 25 and 36 highlighted that *indigenous plants such as Moringa oleifera, Mutsa, and Makoni tea held not only nutritional and medicinal value but also economic potential when processed sustainably.* The majority of participants viewed green processing not only as a method for preserving plant value but also as a means of promoting traditional knowledge systems and contributing to community wellbeing. As Students 24, 27 and 31 noted that they were not just learning to process plants, but were also learning to preserve culture in a sustainable way. These findings align with Bandura's Social Learning Theory, where learners internalise values and practices through active participation and community modelling. The integration of indigenous knowledge into sustainability education also reflects principles advocated by UNESCO (2020) and Hoppers (2002), of reinforcing cultural relevance and local applicability in ESD. In some cases, students designed and built small-scale prototypes using recycled materials and collaborated with engineering departments to refine them. These innovations illustrate Rogers' (2003) principles of innovation diffusion and particularly the role of change agents in introducing and adapting new technologies to meet local needs.

Lecturer 2 and Gardener 11 said that *university students can also play a significant role in community-based initiatives by acting as knowledge bridges between academic research and local practice.* Through service-learning and community engagement programmes, students can work with local farmers, elders, and community groups to document indigenous knowledge related to plant cultivation and processing (Díaz-de-Cerio & Trigueros, 2025; Chikoko & Dube, 2023). Hence, Lecturer 3 and Students 33 and 35 echoed the same

sentiments by saying that introducing environmentally friendly methods such as composting, mulching, solar drying, and water-efficient irrigation systems also improve the quality of processed foods. Such collaborations encourage co-learning, where scientific knowledge and indigenous practices complement each other, leading to more culturally relevant and environmentally sustainable outcomes (Mavhura & Mushure, 2019; Shava et al., 2022). By participating in community gardens, students also gain practical skills while contributing to food security, biodiversity conservation, and sustainable livelihoods.

The results of this current study also established that university students can contribute by developing and applying low-cost green processing technologies for indigenous plants. In engineering, agriculture, and environmental science, students can design simple tools for drying, grinding, extracting, and preserving plant products using renewable energy sources such as solar or biogas. These technologies reduce dependence on firewood and fossil fuels, thereby minimising environmental degradation and carbon emissions (FAO, 2020; Maseko et al., 2021). Lecturer 4 and Student 30 suggested that *through participatory workshops and demonstrations in community gardens, students can train community members on the use and maintenance of these technologies, ensuring that green processing methods are adopted and sustained beyond the project period. Additionally, students may conduct training workshops for community members, thereby acting as knowledge brokers and enhancing community ownership.* This participatory process supports experiential learning and aligns with Zimbabwe's Education 5.0 policy, which emphasises innovation, industrialisation, and community engagement (Maphosa, 2021). Furthermore, students can support sustainable garden projects through awareness campaigns, research and entrepreneurship initiatives. By conducting action research in community gardens, students can assess soil health, plant diversity and processing efficiency, using findings to improve project outcomes and inform local policy and development programmes (Chikoko & Dube, 2023; UNESCO, 2020). Business and education can help students and communities to develop value-added products from indigenous plants, such as herbal teas, natural cosmetics, and nutritious food products, and assist with branding, packaging, and marketing in line with sustainability principles. This not only promotes green processing but also creates income-generating opportunities, strengthening community resilience and contributing to education for sustainable development. However, enablers included mentorship from faculty, support from NGOs promoting sustainable agriculture, and community elders who provided valuable indigenous knowledge. The importance of relational learning and institutional support echoes findings from Mutandwa et al., (2020) on community gardens and sustainability education. These dynamics highlight the need for policy and curricular frameworks that institutionalize ESD.

5. CONCLUSION

This study set out to explore how university students engage in the green processing of indigenous plants within Zimbabwean community gardens as a pathway to advancing Education for Sustainable Development. Students may play a role as innovators, facilitators, and knowledge brokers in promoting eco-friendly plant processing techniques that are both culturally rooted and environmentally sustainable. Through their active participation, students not only deepened their own sustainability competencies but also contributed to community resilience and the revival of indigenous knowledge systems. Green processing technologies such as solar drying, cold pressing, and the use of natural preservatives were introduced by students using creative, low-cost solutions. Despite facing challenges such as resource limitations and resistance to new practices, students demonstrated agency and adaptability,

supported by university mentorship and community partnerships. The integration of Social Learning Theory and Innovation Diffusion Theory helped frame this engagement as a dynamic process of knowledge exchange, behaviour modelling, and gradual adoption of sustainable innovations. Overall, the study underscores the potential of higher education institutions to act as catalysts for community-based sustainable development when student-led initiatives are nurtured and aligned with national and global sustainability goals.

6. RECOMMENDATIONS

- It is recommended that technical and design students through the help and support of non-governmental organisations may introduce a new variety of low-cost, eco-friendly technologies in their community garden projects. Technologies such as solar dehydrators for drying herbs and fruits, manual cold-press extractors for seed oils and natural preservatives such as lemon juice and moringa powder can be a brain child of design students.
- Universities should mainstream ESD principles across disciplines, ensuring that sustainability and community engagement are embedded in coursework, assessment and fieldwork.
- Universities should provide institutional and financial support for student projects. Thus, funding mechanisms, innovation hubs, and partnerships with NGOs and local authorities should be established to support green technology projects and community outreach activities.
- Universities and communities should collaborate to acquire or fabricate low-cost, sustainable processing equipment that aligns with indigenous plant-based industries.
- Universities should encourage reciprocal learning through structured community placements, workshops, and participatory research that value both scientific and indigenous knowledge systems.
- Universities should promote policy support and public awareness by engaging policymakers in supporting university-community initiatives and in recognising green processing as part of local economic and environmental sustainability strategies.

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