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Hands-on harvest: Participatory organic farming education on campus

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Abstract

Organic farming is a sustainable practice that uses mechanical, biological, and agronomic techniques to improve agro-ecosystem health, biodiversity, and eliminate artificial off-farm inputs. It involves converting land to organic management, managing biodiversity, using alternative nutrients, managing weeds and pests, and maintaining livestock in harmony with organic concepts. Contemporary youth, mainly in developing nations, are crucial for agriculture, but attracting and retaining them in organic farming is essential for food security and employment. The study is significant for its focus on promoting sustainable practices, experiential learning, interdisciplinary education, community engagement, health and wellness, economic benefits, research and innovation, and policy and advocacy. This study investigates the role of student participation (arts and science colleges) in organic farming initiatives on campus and its impacts on learning outcomes and personality growth. The study uses organic pedagogy as a framework for participatory learning in organic farming, focusing on student engagement, competency development, social commitment, and promoting sustainable food systems. The findings show that active engagement in organic farming enhances students' understanding of sustainable agricultural practices, fosters critical thinking, strengthens community bonds, and cultivates essential skills like teamwork, problem-solving, and environmental stewardship. The research advocates for the integration of organic farming practices into academic curricula to promote holistic learning and a culture of sustainability among students.

Keywords: Campus life, Drip irrigation, Environmental stewardship, Mulching, Organic farming, Organic pedagogy, Participatory learning, sustainable agricultural practices.

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Contents

Contribution of this paper to the literature
The study highlights the benefits of experiential learning in higher education, promoting sustainable practices, fostering interdisciplinary learning, and improving health and wellness. It provides practical insights for integrating experiential learning into curriculums, highlighting the role of organic farming in promoting sustainable agricultural practices. The study also emphasizes the potential for entrepreneurial skills development and contributes to applied research in organic farming.

1. Introduction

Organic farming is a sustainable, eco-friendly method [1] that minimizes the use of artificial chemicals, pesticides, and growth-controlling chemicals, thereby preserving land fertility, reducing environmental pollution, and promoting human health and land quality [2-4]. This method promotes sustainable agricultural production by reducing costs and improving soil health. Studies have shown that organic farming can lower the quantity of hazardous chemical residues in products, hence reducing health risks for humans and animals. So, in addition to being a great substitute for health risks causing large farm agricultural products containing hazardous chemicals and pesticides, it also helps communities and the environment. Organic crops satisfy people's nutritional and financial demands with little external inputs. But its promotion is hindered by a lack of awareness, public participation, marketing, technical and financial services, quality inputs, and policy support, even in the face of increasing demand.

Thus, youth involvement in agriculture, particularly organic farming, grows more essential, as does training and persuading the current generation of farmers to adopt sustainable techniques. There are 1.2 billion young people between the ages of 15 and 24 in the world, and about 88% of them reside in developing countries, especially in rural and suburban regions. Youth have a huge impact on agriculture because they can increase food production, change regional food systems, and create economies that help entire communities escape poverty. Involving youth in agriculture is essential to bolstering regional food systems, supplying communities with food, and offering lucrative job opportunities to the world's rapidly growing youth population. Young people still find agriculture unappealing since they have little access to or understanding of farming methods when they are in school or on campus. If students were given the opportunity to participate in farming activities while in college or university, it would help to instill an agricultural culture in young people.

Educational institutions, especially schools, colleges, and universities, should develop innovative projects and programs to encourage young people to engage in agriculture, change negative attitudes towards farming, promote sustainability and healthy eating habits, strengthen local participants, and increase stakeholder interest to ensure environmental sustainability and healthy food products through organic agriculture. Moreover, in recent years, the significance of sustainable agricultural practices has gained increasing recognition in the context of environmental degradation, food security, and health. Among these practices, organic farming stands out as a viable alternative that emphasizes ecological balance, biodiversity, and the reduction of chemical inputs. As educational institutions play a crucial role in shaping future leaders and innovators, integrating organic farming into their curricula through participatory learning approaches can significantly impact students' understanding and commitment to sustainability. This article delves into the principles of organic pedagogy and its application in campus-based organic farming initiatives, focusing on participatory learning as a transformative educational experience.

2. Theoretical Context and Review of Literature

The study is based on various educational theories and frameworks, including experiential learning, social constructivism, and sustainability education. The study aims to highlight the transformative potential of participatory organic farming as a pedagogical tool that promotes sustainability, critical thinking, and community engagement among students. Key theoretical perspectives include David Kolb's Experiential Learning Theory, which emphasizes knowledge construction through experience [5] Lev Vygotsky's Social Constructivism, which emphasizes collaborative learning [6] and Paulo Freire's Critical Pedagogy, which encourages students to challenge societal norms and injustices through education [7]. Sustainability education, which focuses on systems thinking, ecological literacy, and the interconnectedness of social, economic, and environmental dimensions, is also relevant to the study. Participatory organic farming on campus serves as a form of place-based education, connecting students to their local food systems and communities, and enhancing their understanding of environmental stewardship.

Todaro [8]; Breuer, et al. [9]; Crandall, et al. [10]; Ramesh, et al. [11]; Virto, et al. [12] and Das, et al. [13] others believe that the average output of agriculture is below ideal levels due to the influence of uncertainty and pesticides and fertilizers have a detrimental effect on the environment and can cause health issues. Because of its potential, organic farming is growing in popularity, but it needs assistance from research, agricultural extension services, and subsidies. Gradually switching to organic farming calls for plans to guarantee a sufficient supply of organic fertilizer and a sophisticated distribution system. Numerous agricultural sectors can profit from climate forecasts and decision-making techniques, but successful adoption requires an awareness of the different kinds of heuristics farmers employ and their inferential processes.

Bhavsar [14]; Biernbaum, et al. [15]; Kucińska, et al. [16]; Gupta and Dikshit [17]; Shinogi [18]; Francis [19]; Apine, et al. [20]; Giller, et al. [21]; Kumar and Murugan [22]; Farooq, et al. [23] and Möhring, et al. [24] any others believe that organic farming in India is a good idea, and they want to find new research directions. Because organic farming has the potential to increase food security in India, educational institutions should instil a positive attitude toward farming among the younger generation. To completely comprehend its influence, more research is necessary. Studies show cognitive involvement and participatory work enhance farming attitudes, with knowledge derived from education and experience contributing to economic and cognitive potentials. These studies highlight the necessity of long-term treatments through participatory programs that involve students in organic farming. They also highlight the need for study on social and economic factors and their efficacy. It also urges more research contrasting conventional and organic farming methods.

3. Methodology

This study investigates the role of student participation in organic farming initiatives on campus and its impacts on learning outcomes. Three chosen Arts and Science colleges from the Alappuzha district of Kerala state participated in a five-year case study designed to investigate the idea of organic pedagogy as a framework for participatory learning in organic farming within campus environments. Strong National Service Scheme units with committed program officers are present in these colleges. Through the integration of hands-on training and theoretical knowledge, NSS regularly implements organic pedagogy on campus, with a special emphasis on enabling students develop a deeper understanding of sustainable farming methods. A sample of 30 students from each collage, including both boys and girls, high and low academic achievers, and students studying science, the humanities, commerce, and business studies, is selected annually using the snowball sampling method. There were 450 samples across a five-year study period.

The study outlined its objectives and is looking at the benefits, challenges, and outcomes of implementing participatory organic farming projects on college campuses. It also looks at the significance of targeted student participation, skill development, and the development of micro-level sustainable food systems through participatory organic farming. Employing a mixed-methods approach, the study analyses quantitative data from surveys assessing students' knowledge, skills, and engagement levels before and after involvement in organic farming activities. Additionally, qualitative interviews provide insights into student's experiences and perceptions regarding their participation. The study's hypothesis states that students who actively engage in organic farming improve their critical thinking abilities, fortify their bonds with the community, and acquire a more profound comprehension of sustainable farming methods. They also acquire critical life skills like problem-solving, cooperation, and environmental stewardship, as well as constructive cognitive ability.

Limited resources, curricular integration, student commitment, scalability, knowledge and skills, community and stakeholder participation, and research and development are some of the limitations of the study. Initiatives for organic farming may not be implemented or sustained due to a lack of finance, land, or equipment. Because traditional programs are so rigidly structured, it might be difficult to incorporate organic farming into current academic courses. Effective training and education programs are necessary because professors and students may be limited by a lack of prior knowledge and abilities.

4. Defining Organic Pedagogy

Organic pedagogy is an emerging educational approach that mirrors the principles of organic farming, emphasizing holistic, experiential, and participatory learning processes [25]. This pedagogical framework prioritizes the following elements:

1. Experiential Learning: Engaging students in hands-on activities such as planting, cultivating, and harvesting crops solidifies their understanding of organic farming practices.
2. Collaboration and Community: Encouraging teamwork among students fosters a sense of community and shared responsibility for the outcomes of their agricultural endeavors.
3. Critical Reflection: Providing opportunities for students to reflect on their experiences enhances their critical thinking skills and deepens their understanding of the broader implications of organic farming.
4. Sustainability Awareness: Through active participation, students develop a heightened awareness of sustainable practices and their importance in addressing global challenges.

This approach is being integrated into college curricula to teach organic farming, fostering a deeper connection between students, their food sources, and the environment. Key points include experiential learning programs, integration into academic curricula, community engagement and partnerships, transformative learning, and future-oriented education. Experiential learning programs allow students to engage directly with organic farming practices, while academic curricula incorporate organic farming principles. Community engagement and partnerships help students understand the broader impact of their work and the importance of sustainable practices. Transformative learning involves students developing a deeper appreciation for the environment and sustainable practices. Future-oriented education prepares students for future changes in farming and food systems, anticipating future trends and challenges. In short, organic pedagogy for participatory learning in organic farming among college students is a dynamic and evolving field that not only imparts knowledge but also fosters responsibility and stewardship towards the environment.

5. The Significance of Participatory Learning in Organic Farming

Sustainable development, environmental preservation, and health promotion are all greatly aided by organic food and veggies. Given the growing consumer demand for organic products, the environmental damage caused by conventional farming, and the health risks associated with chemicals in food, it is clear that organic farming needs to be promoted immediately among the next generation. So, participatory learning in organic farming involves students actively engaging in the farming process and contributing to decision-making [26]. This approach not only empowers students but also cultivates essential skills relevant to both agriculture and life. Key components of participatory learning in this context include:

5.1. Hands-On Experience

Students gain practical skills by participating in various stages of organic farming, from soil preparation to pest management. This experiential learning reinforces theoretical knowledge and allows students to witness the direct consequences of their actions.

5.2. Community Engagement

Campus-based organic farming initiatives often involve collaboration with local communities, extending the learning experience beyond the classroom. Students engage in outreach programs, workshops, and farmers' markets, fostering connections with local food systems.

5.3. Interdisciplinary Learning

Organic farming encompasses various disciplines, including biology, environmental science, economics, and social studies. Participatory learning encourages an interdisciplinary approach, allowing students to draw connections between theoretical concepts and practical applications.

5.4. Feedback and Adaptation

Participatory learning promotes a feedback loop where students can share their insights and experiences, leading to adaptive management of farming practices. This iterative process enhances learning outcomes and fosters a culture of continuous improvement.

On campus, participatory organic pedagogy improves community ties, sustainability, skill development, and student participation. It builds teamwork, encourages sustainability, and gets students ready for the workforce. Limited resources, intricate curriculum integration, student dedication, and scalability are obstacles, nevertheless. Notwithstanding these difficulties, organic pedagogy presents a special chance to improve students' comprehension of sustainable practices while cultivating critical thinking abilities and community involvement, all of which will have a major impact on their academic performance.

6. Implementation of Participatory Organic Farming, the Example

Through the use of micro-irrigation and mulching techniques, the National Service Scheme of St. Michael's College in Alappuzha, Kerala, successfully showed the implementation of participatory organic farming among UG students. During the organic pedagogy period, which lasted from 8 to 9 in the morning and from 4 to 6 in the evening, volunteers participated in a variety of farming tasks, such as field preparation, seeding, planting saplings, watering, plant care, and so forth, in accordance with a comprehensive plan and guidelines provided by the teachers and veteran farmers.

A bit early before the academic year, before the monsoon, the field preparation will begin. The first step involved a training program wherein seasoned farmers served as consultants, offering guidance on field preparation, fertilizer additions, mulching techniques, and drip irrigation system operation. After that, volunteers engage in a practical training session where they were divided into small groups and provides opportunities to practice the strategies they had learned. The entire field is divided into smaller sections based on the nature and makeup of the crops to be used, as well as the maturation and harvesting periods. Because it is practiced on campus and the farmers are students, the mixed cropping approach is typically employed. In order to utilize the fertilized soil and irrigation and to save the students' time and effort, 45-, 90-, and 180-day crops are planted simultaneously in each field.

Figure 1. Field preparations.

Figure 1 Organic Farming Field Preparation: Mixing Phosphate, Cow Dung, Ash, and Other Biofertilizer Compounds into the Soil.

Mulching is a technique in organic farming that uses organic materials to protect and promote crop growth. It includes organic mulching, which uses biodegradable materials like compost, straw, and wood chips, inorganic mulching, which uses synthetic materials like plastic film, reflective mulching, and living mulching [27]. Mulching improves soil health, manages weeds, conserves moisture, regulates temperature, increases crop yield, and promotes environmental sustainability [28].

Figure 2. Mulching with micro-irrigation.

Figure 2 Seeding the sapling into the prepared organic fertilizer-filled soil bed.

Micro irrigation, including drip irrigation, is a modern method that delivers water to plants through tubing and emitters [29] improving plant health and reducing water waste. It maintains soil moisture, reduces water use by 30-70%, and ensures a steady supply of water and nutrients. However, challenges include high upfront costs, lack of technology awareness, inconsistent water and electricity sources, small landholdings, and students' preferences. The campus farmers will receive sufficient training on how to keep filtering stations clean, cleans the tubes frequently, administered chlorine, and reduce obstructions.

Figure 3. Harvest and marketing.

Figure 3 Happy Harvest and Product Direct selling, Participant farm trainees in rice harvest, vegetable harvest, and selling products directly to consumers.

According to the agricultural officer's recommendations, campus farming completely avoids the use of synthetic chemicals and improves soil health by using natural fertilizers, herbicides, and weed and pest control techniques. The major fertiliser is compost, which is made from decomposed organic matter and feeds the soil with important nutrients. Worm castings, charcoal, and legume cover are also used to improve soil fertility. Common organic insecticides such as neem oil, pyrethrin, diatomaceous earth [30] and insecticidal soaps are prepared by volunteers under the supervision of professionals. Weed control strategies include cover crops, mulching, crop rotation, mechanical control, and conservation tillage. Pest control strategies include Integrated Pest Management (IPM), biological control, companion planting, physical barriers, and cultural practices. By integrating these methods, the participatory organic farming on campus inculcating sustainable and environmentally friendly agricultural practices among the youth.

Transforming 10 acres of barren land into a self-sufficient organic farm ; the story of a College Campus Farm

DC CORRESPONDENT
COCHI NOVEMBER 13

A visit to St. Michael, s College farm near Cherthala, Alappuzha, provides an inspiring example of the efforts made by National Service Scheme and the College Management to transform 10 acres of barren land into a lush green farm through the persistent efforts of creating a 50 cent wide and 10 feet deep pond, which has not only transformed the surrounding area, but has also helped in improving the water table in the surrounding village, besides helping in the development of a self sufficient organic farm and a fish farm.

The journey has been a long one and not without its share of challenges, but persistence and constant optimism and hard work to overcome challenges has reaped results in the last three years, informs Fr. Solomon Charanghatt, the Manager of the college. It is very difficult to believe that this was a land that was once uncultivable, when one sees the 10 acre lake filled with water and the lush green vegetation surrounding the pond. The St. Michael, s College farm is one of the largest organic farms in the area with cashew plantations spread across ten acres of land besides growing coconut, rice, jasmine, bananas, fish, fruits and vegetables.

Kerala, where farmers are faced with prospects of poor yield and low income, could well take cues from the success story of this campus who are earning a net annual income of Rs. 1.5 lakh from ten acres land by adopting integrative farm techniques and optimum resource utilisation.

School students visti at St. Michael's College Farm - Photo Nithin Thomas

Canadian Tourists visit

Figure 4. Success story.

Figure 4 News Line on Forth Estate, the campus organic farming initiative's success story.

As a result, the campus youth farmers grow 200 kg of various bananas, 50 kg of rice, and about 100 kg of essential vegetables seasonally. When harvesting, NSS volunteers market the products using their insights and knowledge of the benefits of organic vegetables. They set up shop along the national highway, close to the college entrance, and draw customers by promoting the advantages and quality of the products they offer. Customers will have questions about farming practices, organic cultivation, and its advantages when making purchases, so these volunteers will have an opportunity to share their practical experience with the community and inspire people to begin organic farming at home. As a result, the campus organic agriculture initiative will benefit everyone involved in a variety of ways. It teaches the next generation sustainable farming techniques, shares the best organic farming knowledge with students and the community, and develops marketing abilities.

7. Analysis and Results

The study's data evaluation and findings section highlight the significance participatory learning and organic pedagogy to educate sustainable agriculture. The data regarding students (NSS Volunteers) participating in organic farming projects from last five year is assessed with knowledge gain, skill development, motivation, and engagement levels before and after the project. The study collected quantitative data, including entry and exit scores, surveys, and interviews, to assess knowledge gain, engagement, satisfaction, and self-assessed skills in organic farming, and analysed using descriptive statistics. The results show a significant increase in knowledge scores and a positive correlation between time spent on the project and crop yield.

Table 1 Demographic Charecteristics,

Table 1. Participants' demographic characteristics (Primary data).

Characteristic	Frequency (n=450)	Percentage (%)
Boys	153	34%
Girls	297	66%
Year of study		
First year	165	36.7%
Second year	175	38.9%
Final year	110	24.4%

Because one of the participating colleges is a women's college and the enrolment of boys for under graduate courses is lower than that of girls in the other two, there is a gender imbalance in the organic farming project, with 66% of students being female and 34% being male. With a small bias toward the second year, the distribution of students across the several academic years is balanced. While the lesser number of final-year students suggests a dedication to capstone projects or internships in the primary academic discipline, the higher number of second-year students implies a concentration on practical experiences.

Table 2 Results of Student Engagement and Satisfaction.

Table 2. Student engagement and satisfaction survey results.

Statement	Mean rating (1-5)	SD (σ)
I felt engaged in the learning process.	4.2	0.8
The practical sessions enhanced my understanding.	4.5	0.6
Overall satisfaction with the course.	4.3	0.7

According to the findings, students were generally happy and involved with the organic farming project, especially appreciating the participatory learning. With a mean rating of 4.2, indicating that students felt generally engaged, the project achieved its objectives. Responses varied somewhat, though, which may indicate that some pupils were not as involved. With a mean rating of 4.5, the impact of the participatory experience was likewise quite favourable, suggesting that their efficacy was strongly regarded. With a 4.3 overall satisfaction rating, the project either met or beyond the expectations of the students. Strong appreciation for practical sessions underscores the significance of the project design, and the high mean ratings imply that it is successful in promoting engagement and satisfaction.

Table 3 presents participant students entry level knowledge and the scores after completing the farming practices.

Table 3. Entry and exit knowledge score (Primary data).

Test type	Mean score	SD (σ)	p-value
Entry	65.5	10.2	<0.001
Exit	85.3	8.7	

After the analysis of 450 participants' entry and exit knowledge scores, the results suggest a significant improvement in knowledge, with the entry scores being much lower than the exit levels. The entry score's standard deviation was higher than the exit score's, indicating greater variability prior to the intervention and decreased variability following it. A statistically significant difference between the entry and exit scores is shown by a p-value of less than 0.001, which suggests that the educational intervention had a substantial effect on students' learning outcomes and that the gain in knowledge scores actually happened. The notable rise in knowledge scores indicates that the organic farming participatory learning strategy was successful, and educational institutions have to think about introducing similar experiential learning opportunities. The notable increase in knowledge scores indicates that the participatory learning approach in organic farming was successful.

8. Suggestions

The study makes several innovative recommendations to enhance the educational process and promote sustainable farming practices among youngsters. Sixty hours of mandatory social service activities must now be completed in order to graduate. Every youngster who has graduated will have the chance to engage in organic farming if participatory organic farming is established a required social extension activity.

Every year, National Service Scheme units throughout engage in incredible social service projects. The youth of the country will receive practical training in organic farming and its promotion if participatory organic farming is established as a flagship project for each NSS unit.

While mobile apps can offer real-time data on crop growth, weather, and soil health, Virtual Reality (VR) and Augmented Reality (AR) can be used to create immersive learning experiences. Promoting school gardens and forming alliances with nearby Community Supported Agriculture CSA programs can help to build a sense of community and economic sustainability. Students can gain knowledge about various agricultural techniques and cultural contexts through international partnerships and cultural exchange initiatives.

Introducing Hi-Tech Organic Farming in Arts and Science Colleges presents several challenges. These include lack of expertise, resistance to change, financial constraints, limited space and resources, regulatory and certification issues, labour and maintenance, and market and distribution. To overcome these, colleges can collaborate with agricultural offices, local resource centres, research institutions, and industry leaders to share knowledge and resources. Technology integration can be achieved through precision agriculture, Internet of Things IoT, and Artificial Intelligence AI, while educational programs can be developed to train faculty, staff, and students. Sustainable practices, such as composting, biofertilizers, and integrated pest management, can reduce environmental impact. Community engagement can be achieved through educational outreach, volunteer programs, and community-supported agriculture initiatives. By addressing these challenges with strategic solutions, arts and science colleges can successfully introduce and sustain hi-tech organic farming programs, contributing to both educational and environmental goals.

9. Conclusion

This study underscores the pedagogical value of experiential learning through organic farming, suggesting that such programs can effectively bridge theoretical knowledge and practical application in the context of sustainability education. Students' understanding of organic farming was successfully expanded by using participatory learning techniques, as seen by the notable increase in mean scores between the entry and exit score. High mean scores demonstrated that students were interested in and satisfied with the way the project was taught and structured. The value of practical experiences was demonstrated by the positive feedback received from the sessions. Ultimately, the research advocates for the integration of organic farming practices into academic curricula to promote holistic learning and foster a culture of sustainability among students.

Highlights

- Organic farming is a sustainable, eco-friendly method that reduces chemical use, promotes land fertility, and reduces environmental pollution.
- However, promotion is hindered by lack of awareness, public participation, and policy support.
- Organic pedagogy integrates holistic, experiential learning into college curricula, teaching organic farming and fostering a deeper connection between students, food sources, and the environment.
- The study highlights the significance of participatory learning and organic pedagogy in educating sustainable agriculture.
- The study recommends introducing experiential learning opportunities, mandatory social service activities, real-time data use, school gardens, and alliances with local CSA programs.

- Educational institutions should develop innovative projects to encourage youth involvement and integrate organic farming into curricula.

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