

Factors Hindering the Use of Urban Farming Techniques in Buildings: Architects' Perspective

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Abstract

Researchers and the government have advocated for the implementation of urban agriculture projects in Sri Lanka; however, the demand and supply of sustainable urban agriculture initiatives have been limited and are growing slowly. This study aims to explore the obstacles hindering the adoption of sustainable urban agriculture. The research employed a cross-sectional survey methodology using a questionnaire encompassing 19 barriers to the adoption of sustainable urban agriculture, administered to 34 professionals within the relevant industry. The study found that the key barriers inhibiting the uptake of sustainable urban agriculture in Sri Lanka are the lack of experience in implementing urban agriculture projects within the industry, challenges related to maintenance, insufficient technology for implementing, and the higher capital costs associated with sustainable urban agriculture compared to conventional practices. In light of the findings, it can be inferred that the advancement of sustainable urban agriculture hinges on factors such as technological innovation, effective policies, skill enhancement, increased awareness, improved homebuyer engagement, and cost considerations. The research concludes by presenting a comprehensive cycle of barriers that must be addressed to accelerate the adoption of sustainable urban agriculture practices.

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Introduction

In order to support the Sustainable Development Goals established by the United Nations, the Sri Lankan government has established a number of sustainable initiatives and development committees throughout the past ten years. Sustainability demands changing the behaviors, psychological models, and practices of the people, organizations, and institutions involved. Despite this, there hasn't been much research on the crucial component of sustainable planning known as urban farming integration into architecture. Due to issues with the food system, climate change, and urbanization, this strategy has drawn attention on a global scale.

Urban gardening has the ability to enhance community development, lifestyle, and health. Addressing problems with the industrial food system is becoming more and more crucial in both wealthy and developing nations. A more socially conscious and sustainable food system must be created by moving away from the commodity mentality of food and toward the human right to food.

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Urban agriculture has several uses in Sri Lanka, especially for its non-financial advantages including health and education. In order to encourage edible green spaces, architects play a crucial role in incorporating urban farming into architectural projects. Neglecting this factor may result in the depletion of resources, the loss of food diversity, and harmful environmental effects.

Investigating difficulties in using sustainable home construction is the study's main objective. It emphasizes the necessity of institutional support for micro-farming activities by incorporating urban agriculture. The intention is to offer guidelines for the construction of affordable housing that complies with international sustainability standards and benefits the government, businesses, the general public, and homeowners.

The Objective of the Study

With the goal of identifying both the obstacles that prevent urban farming from being widely adopted and the opportunities that could lead to its effective implementation, this study aims to analyze the complex link between urban farming and residential building. The study intends to contribute to the creation of a more thorough and practical strategy to integrating urban farming methods into the built environment by exploring these dynamics.

1. To classify the applicability in building designs and identify the main obstacles to urban farming.
2. To investigate the knowledge and understanding of urban farming practices among architects
3. To determine knowledge gaps that affect architects' readiness for integrating urban farming.

With the help of these goals, this study aims to close the gap between urban agricultural integration's theoretical potential and its actual practical use in the residential construction industry. The study seeks to contribute to the greater objective of building more sustainable and peaceful urban settings by exposing hurdles, examining opportunities, and offering practical insights.

Literature Review

Even though the term "Urban Farming" is used to describe agricultural activities carried out in urban areas and peri-urban areas and is a centralized operation that includes horticulture, animal husbandry, aquaculture, and other activities to produce fresh food or other agricultural products, it has been defined by many scholars. Greenhouses, hydroponics, rooftop farming, and other contemporary technology can all be used in urban farming (Medici et al., 2020; Mougeot, 2000; Orsini & D'Ostuni, 2022). It cannot rule out different UF kinds from its potential models of aggregation in Sri Lanka as a country that has made it a cultural priority to establish development models that prioritize sustainability and home gardening for decades (Gunawardena & Fernando, 2022).

An urban farming system is made up of a number of connected urban and agricultural elements, each of which contributes to the system's ultimate goal of sustainable development and functioning as a single entity in line with a set of general principles (Saverio Miccoli et al., 2016). And the expansion of urban areas and the enhancement of their quality of life are directly tied to the success of urban farming operations; the more favorable the conditions in the urban region where the agricultural activity is located, the greater the opportunities and benefits for farming (Farhana & Salim, 2020; Mason & Knowd, 2011). The actions and interactions of the key three macro-stakeholders in an agro-urban community make up the very minimum requirements for starting and implementing a UF. These macro-stakeholders include: the general public who are

not specifically involved in agricultural activities; users, or persons who are prepared to start and invest in urban farming businesses; owners of suitable land (van Tuijl et al., 2018).

Because of the compelling benefits, several governments have put policies in place to increase both the supply and demand for urban farming. However, the greatest obstacle inhibiting the acceptance, application, and practices of sustainability in the execution of urban farming is the lack of a thorough and clear framework. In addition to developing and implementing policies that have the industry's backing, research has been conducted to push for the adoption and implementation of urban farming in the construction sector.

Despite scientific research and implementation with the backing of industry organizations, the adoption of residential buildings for urban farming remains low. Prior study has also been qualitatively oriented and has not been explicitly focused on housing, but rather on the general buildings of the construction sector, which hinders systemic judgments and generalizability.

Methods

The study investigates challenges linked to integrating Urban Farming (UF) into residential architecture. Its aim is to understand these obstacles to promote wider UF adoption in residential designs. The 50 architects were randomly selected for the cohort, and questionnaires were distributed online. The design follows an inductive approach, ensuring data accuracy and objectivity. The questionnaire has two parts: Section A gathers demographic data with six questions, while Section B focuses on perceived hindrances to incorporating UF in Sri Lankan residential design, with twelve questions. The analysis addresses these inquiries specifically.

Online surveys were employed to reach building industry stakeholders. The survey ran from May to July 2023, assessing barriers to Urban Farming integration in Sri Lankan residential architecture on a Likert scale from 1 (not critical) to 5 (extremely critical). The highest-scored obstacle emerges as the most significant barrier to adopting sustainable residential construction practices. Positive phrasing prevents bias, and missing data isn't substituted. Respondents' demographic data analysis utilized the mode technique.

Results and Discussion

Despite the fact that urban agricultural concepts have been around for a while, many industry participants still find it difficult to understand what they really mean. Regarding their goals and viability, there are still concerns. However, this study is crucial because it emphasizes how important it is for experts in the construction industry to have solid knowledge and strong conviction. They will be better able to convince stakeholders and potential adopters of the benefits of urban agriculture as a result. It is significant that the emphasis now places a higher priority on maintenance costs rather than only focusing on original construction or procurement costs. This change has occurred as a result of clients and stakeholders taking into account a building's entire lifecycle. It is hardly surprising that maintenance has become the principal obstacle preventing Sri Lanka from implementing sustainable urban agriculture methods.

Table 01: Socio-demographic data of the respondents

Respondent's working experience	Years	Frequency	Percentage
	1 – 10	24	70.58
	11 – 20	4	11.77
	21 - 30	6	17.65
	Bachelors degree	16	47.05

Respondent's highest academic qualification	Masters degree	12	35.3
	Master of philosophy	4	11.76
	Doctor of philosophy	2	5.89
Respondent's current position	Junior architect	14	41.18
	Architect	5	14.70
	Chartered architect	8	23.53
	Intern	5	14.70
	Principal architect	2	5.89
Respondent's workplace type	Architectural firm	26	76.46
	Interior design firm	4	11.77
	Construction firm	4	11.77

The construction industry in Sri Lanka is aware of the difficulties in maintaining sustainable urban agriculture, but maintaining environmentally friendly housing is more difficult. The adoption of technologies like Integrated Building Systems (IBS), precast concrete solar technology, rainwater harvesting, and recycling is hampered by a shortage of technological resources, highlighting the need for tech enabling material supply. Construction has typically involved high material prices. Sustainable urban agriculture is hampered by a lack of skilled workers, technological limitations, and experience; this calls for specialized training for managing various green resources.

According to research, few prospective homeowners are aware of sustainable building practices. To improve comprehension, educational campaigns are essential. Low funding for research and development (R&D) prevents Sri Lanka from adopting sustainable construction practices (less than 1 percent of revenue). To verify the compatibility and viability of sustainable materials, thorough research is required.

The industry lacks strict rules for sustainable practices. Environmentally friendly building options are not required for homeowners. Although there are incentives, penalties are not enforced. There is a need for thorough quantitative research because qualitative research predominates and breeds distrust. Over 50% of people express displeasure, proving that government backing alone is insufficient for the adoption of sustainable buildings. Technology is essential for assuring the supply of sustainable materials.

	Not critical	Somewhat critical	Critical	Very critical	Extremely critical	variance	mean	standard deviation
The initial cost is more than conventional construction	0	5	13	9	5	0.91	3.382	0.954
More expenses are required for research and development	0	11	19	2	0	0.34	2.706	0.579
Green buildings require more time to build.	5	10	9	9	0	1.08	2.647	1.041
Lack of reliable cost and performance information	0	4	17	4	8	0.98	3.5	0.992

Lack of interest from consumers in purchasing green homes	6	5	17	6	0	0.95	2.67 6	0.976
Technical challenges encountered during construction	8	0	13	10	0	1.32	2.88 2	1.149
Lack of knowledge of green building initiatives	0	12	18	3	0	0.38	2.73 5	0.618
Lack of green building laws and standards	0	6	18	5	3	0.67	3.14 7	0.821
Lack of technology in green building initiatives	0	5	20	3	3	0.61	3.14 7	0.784
Inexperienced labor in green structures	0	0	14	11	7	0.61	3.76 5	0.781
Lack of education and experience in green building initiatives	0	8	16	8	0	0.51	3.02 9	0.717
Lack of quantitative methods for evaluating environmental performance	0	13	5	13	0	0.85	3	0.921
Low availability of green components and materials	3	5	13	6	5	1.3	3.17 6	1.141
Additional accountability for maintenance of the building	3	0	16	4	9	1.41	3.52 9	1.187
Divergent interests; parties involved in building and design are not connected to users	0	3	14	12	2	0.55	3.41 2	0.743
Ineffective enforcement	0	6	12	14	0	0.56	3.26 5	0.751
Absence of government assistance	0	5	11	6	10	1.13	3.67 6	1.065
Inadequate public awareness	0	3	13	11	5	0.74	3.55 9	0.86
Weather circumstances	0	7	11	10	5	0.98	3.41 2	0.988

Conclusion

The significance of fulfilling sustainability requirements is widely acknowledged, motivating numerous stakeholders—including governmental entities, developers, contractors, and outside organizations—to start working toward these goals. The supply and demand for sustainable residential structures still differ noticeably, despite these attempts. The barriers preventing the deployment of sustainable home buildings are defined and quantified in this study. The lack of knowledge and creativity in the construction industry, which results in what is frequently referred to as the "cycle of barriers," can be summed up as the root cause of this seeming lack of widespread acceptance of sustainable buildings.

The difficulties of integrating environmentally sensitive methods in the construction sector are highlighted by the prospects and problems surrounding urban agriculture and sustainable building techniques in Sri Lanka. These ideas have been around for a while, but there are still a lot of obstacles to get through.

The importance of knowledgeable, committed professionals in the construction industry who can advance sustainable practices is highlighted by this study. Their capacity to persuade stakeholders and potential adopters of the advantages of urban agriculture and environmentally friendly architecture is crucial. Furthermore, an increasing appreciation of the significance of a building's whole lifecycle can be seen in the shifting emphasis toward prioritizing maintenance expenditures above initial construction costs. However, the fundamental problem in Sri Lanka continues to be the effective maintenance of sustainable urban agriculture techniques.

The difficulties the building sector faces are a result of both technological restrictions and a labor shortage. Due to these restrictions, specific education and technological resources are required, especially in fields like integrated building systems, solar energy, and rainwater collection. The implementation of sustainable methods is made more difficult by the onerously high material prices.

On the consumer side, there is a glaring ignorance about sustainable building practices among potential homeowners. This disparity emphasizes the need for educational programs to increase public comprehension and awareness.

Adopting sustainable construction methods in Sri Lanka is significantly hampered by a lack of money for research and development. Validating the compatibility and viability of sustainable materials requires extensive research.

The lack of stringent regulations and sanctions for disregarding sustainable practices impedes progress in terms of regulation and enforcement. Although there are incentives, they are not enough to promote widespread use. Comprehensive quantitative research is obviously required to foster trust and offer a strong base for long-term projects.

The building sector in Sri Lanka has a number of significant obstacles, including unskilled labor, a lack of government backing, poor public awareness, increased maintenance accountability, and early cost differences. They do, however, also give chances for development and advancement. The potential advantages of sustainable urban agricultural and construction methods can become more accessible and attainable for all stakeholders when the industry addresses these concerns through a concerted effort encompassing education, research, and legislative changes.

This collection of obstacles is made up of related problems that restrict the application of sustainable building techniques in more scenarios. This study contributes to the creation of a comprehensive framework meant to assist and promote the adoption of sustainable buildings throughout Sri Lanka by identifying and evaluating these obstacles. The research's insightful and forward-looking data, which has strategic and practical ramifications for achieving sustainable development goals, can be used by both the building sector and the government. The construction industry will be guided toward greater sustainability and environmental friendliness by this study, which ultimately serves as a tool for decision-making and action.

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