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SOILLESS FARMING AND SUSTAINABLE URBAN LAND MANAGEMENT IN IBADAN, OYO STATE, NIGERIA

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ABSTRACT

Urbanization in Nigerian cities exerts growing pressure on land and food systems, highlighting the need for sustainable agricultural innovations. This study assessed awareness, adoption barriers, and perceived benefits of soilless farming among 350 urban farmers in Ibadan, Oyo State, using a purposive sampling technique**,** structured questionnaires, and descriptive and inferential statistics. Results indicate that 42% of respondents demonstrated high awareness of soilless farming principles, but only 32% reported practical engagement. Major adoption barriers include high setup costs (40%), limited technical knowledge (26%),restricted access to inputs (26%) and lack of government support (8%).Despite these constraints, 46% of farmers recognized productivity benefits, 56% acknowledged contributions to urban food security, and 48% expressed willingness to adopt soilless systems if adequately supported. The findings reveal that although awareness and perceived benefits of soilless farming are moderately established among urban farmers in Ibadan, actual adoption remains constrained primarily by financial and technical limitations, indicating that structural barriers rather than attitudinal resistance account for the low uptake of the technology.

Keywords: Urban agriculture, Soilless farming, Sustainable Land management, Adoption barrier

Introduction

Rapid urbanization in Nigerian cities increasingly exerts pressure on land and natural resources, creating challenges for food security and sustainable urban agriculture (Yusuf *et al*., 2015; Ikedigwe *et al*., 2024; Banfe *et al*., 2025). Soilless farming, broadly defined as the cultivation of plants without soil using nutrient-rich solutions or inert media, has emerged globally as an innovative response to these challenges of land scarcity, soil degradation, water limitations, and urban food insecurity(Khater, 2021; Mir *et al*., 2022; Gartmann *et al*., 2023 ;Elakrouch *et al*., 2026). Techniques such as hydroponics, aeroponics, and aquaponics allow controlled nutrient delivery, optimize plant growth, and reduce dependence on arable land and water resources (Gebreegziher, 2023). Globally, countries including Singapore, the United States, and the Netherlands have successfully integrated soilless systems into urban agriculture to enhance productivity, conserve water, and improve food security (Gonnella and Renna, 2021; Sun *et al*., 2022; Lakhiar *et al*., 2025; Lopez-Muñoz, 2025;). Aquaponics further combines fish production with plant cultivation, offering synergistic benefits for nutrient cycling, income generation, and sustainable urban food systems (Yuan *et al*., 2022; Bafort *et al*., 2024; Weingarten *et al*., 2024).

In Nigeria, urban agriculture is recognized as a key strategy for sustaining food production

and livelihoods, particularly in rapidly growing cities such as Ibadan (Opeagbe *et al*., 2025; Issifu *et al*., 2025). However, adoption of soilless farming remains limited, constrained by high initial costs, limited technical knowledge, insufficient access to materials, and minimal institutional support (Amusan and Adeleke, 2023; Ambayoen *et al*., 2024; Bello *et al*., 2024). Empirical studies have predominantly focused on traditional urban agriculture practices (Fadairo, 2023), leaving gaps in understanding farmers' awareness, perceptions, and willingness to adopt soilless technologies. Socio-behavioral factors, including education, experience, and exposure to practical training, are also underexplored, yet they critically shape adoption behavior (Balliu *et al*., 2021; Atherton and Li, 2023; Fuentes-Peñailillo *et al*., 2024).

This study is therefore timely and significant, addressing the knowledge gap regarding soilless farming in Nigerian urban contexts. Specifically, it aims to: (i) assess urban farmers' awareness and understanding of soilless farming; (ii) identify factors influencing adoption; and (iii) evaluate perceived benefits for vegetable production and urban food security. By focusing on Ibadan, Oyo State, this research provides empirical evidence to inform policymakers, extension services, and private-sector actors on strategies to promote sustainable, high-yield urban agriculture that integrates technological innovation with socio-economic realities.

Methodology

This study examines the perception, awareness, and adoption potential of soilless farming among urban farmers in Ibadan, Oyo State, Nigeria. Ibadan metropolis (Figure 1), the capital of Oyo State, is located in southwestern Nigeria between latitudes 7°20'N and 7°50'N and longitudes 3°50'E and 4°00'E, covering an area of approximately 3,080 km². As one of the largest urban centers in sub-Saharan Africa, Ibadan comprises a mix of urban and peri-urban settlements with residential, commercial, and agricultural land uses. The city's terrain is undulating, with occasional hills and low-lying plains, influencing drainage and soil fertility. Ibadan experiences a tropical wet and dry climate, with annual rainfall ranging between 1,200 mm and 1,400 mm and temperatures from 21°C to 32°C. Vegetation is primarily derived savanna, though urbanization has fragmented natural landscapes, limiting available agricultural land. Soils are largely tropical ferruginous, suitable for crop production but increasingly constrained by erosion, compaction, and urban encroachment.

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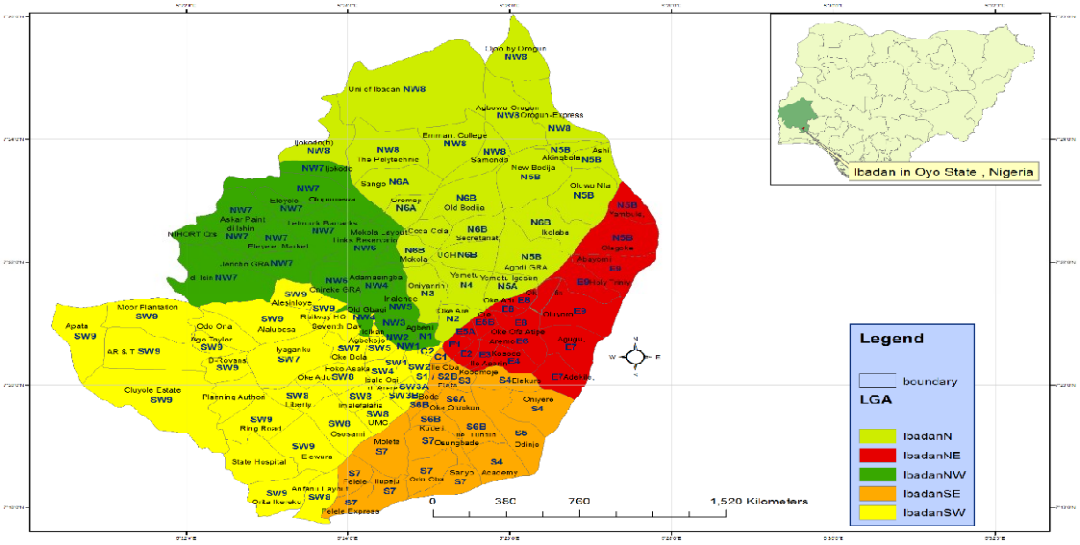


Figure 1:Study Area – Ibadan Metropolis and Its Local Government Areas

Source, Autor's Map Production

The metropolis has a population exceeding three million, creating high demand for vegetables, fruits, and other locally grown crops (Macrotrends, 2025 estimate). Urban agriculture is widely practiced, especially in peri-urban areas, with farms ranging from less than one hectare to three hectares. Commonly cultivated crops include tomatoes, peppers, and leafy vegetables. However, rapid urban expansion, land scarcity, environmental degradation, and changing climatic conditions increasingly limit traditional soil-based farming, highlighting the relevance of alternative approaches such as soilless farming. This socio-economic and environmental context makes Ibadan an ideal setting to examine awareness, perceptions, and adoption potential of soilless farming technologies.

Primary data were collected using a structured questionnaire administered to adult urban farmers aged 18 years and above across five local government areas in Ibadan. A purposive sampling technique was employed to ensure representation of vegetable farmers likely to consider or adopt soilless systems. Respondents varied in educational background, age, and farming experience. The final sample comprised 350 respondents, selected based on housing density and farming activity concentration. Sample size was determined using Taro Yamane's formula (Yamane, 1967):

$$n = N / (1 + N(e)^2),,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,1$$

where n is the sample size, N is the estimated population of urban farmers, and e is the margin of error (0.05). The calculated population-based sample size was approximately 400, making 350 respondents acceptable with a marginal increase in the error rate (~5.4%).The questionnaire comprised five sections: (i) demographic and socio-economic characteristics (age, gender, educational attainment, years of farming experience, farm type, and farm size); (ii) awareness and understanding of soilless farming techniques such as hydroponics,

aquaponics, and aeroponics; (iii) factors influencing adoption or rejection (cost, access to materials, technical knowledge, government support); (iv) perceived impacts on environmental sustainability, food security, income generation, and urban agricultural systems; and (v) adoption potential and challenges.

Data were collected electronically via Google Forms, ensuring efficient distribution, management, and secure storage. Respondents were provided with instructions and follow-up reminders to maximize response rates, following best practices in survey research (Al-Tarawneh, 2019). Ethical considerations included obtaining informed consent, ensuring anonymity, and informing participants of their right to withdraw.Quantitative data were analyzed using SPSS (Statistical Package for the Social Sciences). Descriptive statistics (frequenciesand percentages) summarized demographic characteristics, awareness, and perceptions.Multiple regression analysis explored the influence of socio-economic characteristics, awareness, and resource access on willingness to adopt soilless farming:

$$Y_i = ß0 + ß1\ X1 + ß2\ X2 + \ldots + ß□X□ + \epsilon_i,,,,,,2$$

where Y_i represents the dependent variable (adoption likelihood or perception score), X1 , X2 , … X□ are independent variables, ß0 is the intercept, ß□ are regression coefficients, and ϵ_i is the error term. Hypotheses were tested at $p < 0.05$.

Result and Discussion

Demographic and Socio-Economic Information

The demographic composition of respondents provides an essential context for interpreting the study findings (Table 1). The majority of urban farmers in Ibadan were middle-aged adults (31–50 years), accounting for 78% of participants. This reflects the segment of the population most actively engaged in urban agriculture, balancing farming with other income-generating activities, and aligns with observations by Bishibura *et al.*, (2025), who reported that economically active adults dominate urban farming in southwestern Nigeria.

Table 1: Demographic and Socio-Economic Characteristics of Respondents

Category	Subcategory	Percent (%)
Gender	Male	44
	Female	56
Age Group	18–30	22
	31–40	34
	41–50	44
Educational Attainment	None/Primary	22
	Secondary	28
	Tertiary	28
Years of Experience	1	24

Category	Subcategory	Percent (%)
	2	18
	3	26
	4	32
Farm Size	<1 ha	36
	1–3 ha	44
	>3 ha	20

Gender distribution showed a slight female predominance (56%), consistent with studies highlighting women's central roles in vegetable production, post-harvest processing, and urban food security initiatives (Amusan and Adeleke, 2023). Educational attainment was fairly evenly distributed, with secondary and tertiary education each representing 28% of respondents, while 22% had no formal education. This variability suggests differences in literacy levels that may influence comprehension and adoption of innovative practices such as soilless farming, with less-educated farmers likely benefiting from simplified training and hands-on demonstrations (Banfe *et al.*,2025).

Farming experience among respondents was moderate, with 32% reporting four years of experience and 24% reporting just one year. More experienced farmers may rely on traditional methods and exhibit caution toward innovative systems, whereas less experienced farmers could be more open to adopting hydroponic, aquaponic, or other soilless farming techniques. These patterns are consistent with the Diffusion of Innovation Theory, which posits that early adopters are often less experienced or more risk-tolerant individuals (Mesa Manzano and Esparcia Pérez, 2023).Farm sizes were predominantly small to medium, with 44% cultivating 1–3 hectares and 36% operating less than 1 hectare. The predominance of smaller farms underscores potential spatial constraints that could influence the adoption of soilless farming, which typically requires controlled environments. Previous studies have noted that urban farmers with limited land are more likely to adopt intensive, space-efficient techniques to maximize productivity (Fadairo, 2023; Ikedigwe *et al.*, 2024).

The demographic and socio-economic profile of respondents indicates a population that is predominantly middle-aged, slightly female-skewed, moderately educated, and largely engaged in small- to medium-scale urban farming. These characteristics suggest both opportunities and challenges for the adoption of innovative farming practices, highlighting the importance of targeted awareness campaigns, training programs, and practical demonstrations to enhance uptake of soilless farming in Ibadan.

Lastly Figure 2 depicts the distribution of urban farmers across Ibadan metropolis, with respondents represented by white circles. The majority are concentrated in LGAs such as Ibadan North and Ibadan South West, indicating higher engagement with soilless farming. In contrast, areas including parts of Ibadan North East and South East show little to no respondent presence. Since purposive sampling was employed, the distribution reflects targeted selection rather than random sampling, explaining the uneven spread. This pattern indicates that soilless farming awareness or adoption is more prominent in

certain areas, likely due to factors such as accessibility, urban infrastructure, or prior exposure to agricultural initiatives. The absence of respondents in some regions highlights the need for broader outreach and education to encourage adoption across the metropolis.

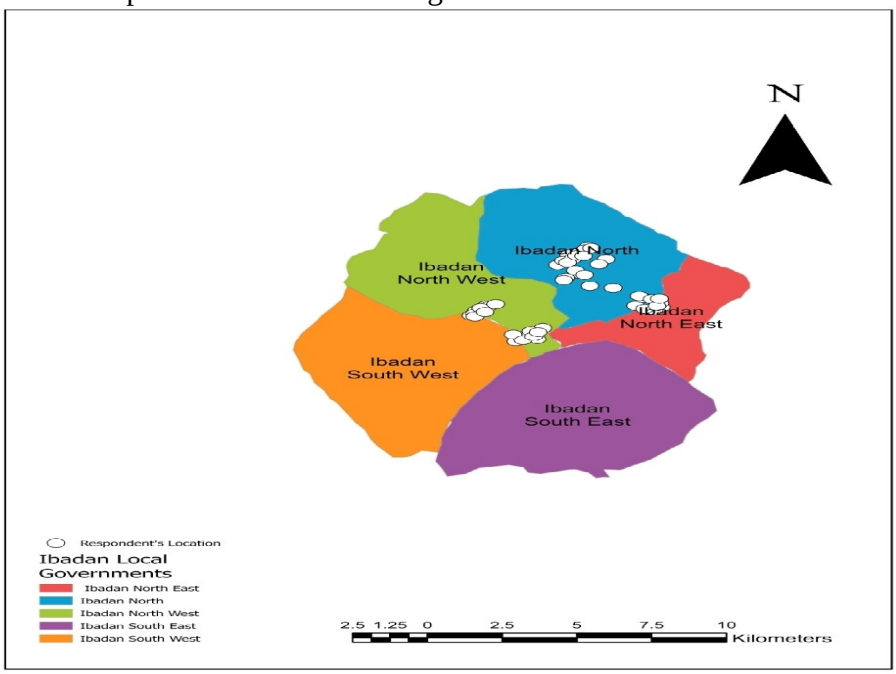


Figure 2: Locations of Respondents across Selected LGAs in Ibadan Metropolis

Awareness and Understanding of Soilless Farming

The assessment of respondents' awareness and understanding of soilless farming in Ibadan reveals a moderate level of familiarity with the practice (Figure 3). Approximately 30% of respondents reported high or very high familiarity, while a substantial 40% remained neutral, indicating limited confidence in their grasp of soilless farming techniques. This suggests that, although the concept is somewhat recognized in urban farming communities, widespread understanding is still developing. Awareness of the basic principles of soilless farming scored slightly higher, with 42% indicating high or very high understanding. However, 36% of respondents reported low or very low knowledge, highlighting persistent gaps in theoretical comprehension.

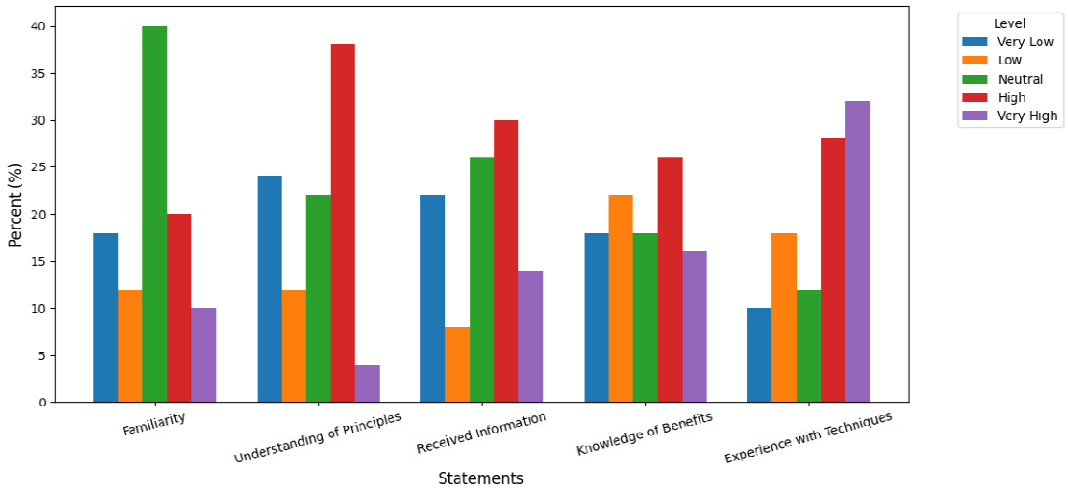


Figure 3: Respondents' Awareness and Understanding of Soilless Farming

Exposure to practical training emerges as the most experienced knowledge indicator, with 60% reporting some experience with soilless farming techniques. Nevertheless, 28% of respondents had little to no hands-on exposure, reflecting structural limitations in access to practical learning opportunities. The descriptive statistics further corroborate these findings, with mean scores ranging from 2.67 for experience to 3.49 for understanding of principles on a 5-point Likert scale. The relatively high standard deviations (>1) suggest considerable variability in both awareness and practical engagement, underscoring uneven knowledge distribution across the urban farming population.Correlation analysis between educational attainment and familiarity with soilless farming revealed a weak positive relationship (r = 0.173, p = 0.231) (Table 2), suggesting that higher education slightly increases awareness but is not a strong predictor. This finding highlights the importance of non-formal knowledge channels, such as training programs and demonstration plots, in promoting awareness (Rogers, 2003; Mesa Manzano and Esparcia Pérez, 2023).

Table 2: Correlation Between Educational Attainment and Familiarity with Soilless Farming

Variables	Educational Attainment	Familiarity with Soilless Farming
Educational Attainment	1.000	0.173
Familiarity with Soilless Farming	0.173	1.000
Significance (2-tailed)	—	0.231
N	350	350

Interpretation: Weak positive relationship; not statistically significant.

These results align with previous studies in Nigerian urban contexts, which indicate that while awareness of hydroponic and other soilless systems exists, practical adoption remains limited due to barriers such as lack of technical knowledge, inadequate extension

services, and limited access to resources (Joshi *et al.,* 2022;Nwanojuo*et al.,* 2025). Similarly, global literature on urban agriculture emphasizes that conceptual awareness often precedes practical adoption, with exposure to hands-on training being critical for bridging the knowledge-practice gap (Mir *et al.,* 2022; Fussy and Papenbrock, 2022).

From a theoretical perspective, these findings resonate with the Diffusion of Innovation Theory (DOI), which posits that awareness is a critical first stage in the adoption process. The high proportion of respondents in the neutral or low awareness categories indicates that soilless farming is still in the "knowledge" and "persuasion" stages of innovation adoption. Without deliberate interventions to enhance understanding and provide practical experience, widespread adoption may remain limited. Similarly, the Technology Acceptance Model (TAM) suggests that perceived usefulness and ease of use are central to technology adoption. Limited practical exposure may reduce perceived self-efficacy among farmers, constraining the perceived ease of adopting soilless techniques.

The policy implications of these results are significant. First, the observed gaps in awareness and hands-on experience underscore the need for targeted educational and extension programs that not only disseminate knowledge but also provide practical demonstrations of hydroponic, aquaponic, and aeroponic systems. Policymakers could partner with urban agricultural extension agencies, local universities, and NGOs to organize workshops, demonstration farms, and training modules tailored to different experience levels.Second, access to resources and technical support must be enhanced. Even motivated urban farmers may struggle to adopt soilless systems without affordable inputs (nutrient solutions, grow media, equipment) and guidance on installation and management. Subsidies or credit schemes for small-scale soilless systems could incentivize adoption, particularly among younger or resource-constrained urban farmers.Third, integrating soilless farming into urban food security and climate resilience policies is critical. As cities like Ibadan face increasing land scarcity, erratic rainfall, and soil contamination challenges, soilless systems provide a sustainable alternative for vegetable and herb production. Promoting awareness and understanding can thus contribute not only to individual livelihoods but also to broader urban sustainability objectives.

Finally, the variability in knowledge revealed by the high standard deviations' points to the need for tailored interventions that address different knowledge levels within urban farming communities. While some farmers may only need advanced technical training to optimize production, others require foundational awareness and basic skill acquisition.

Factors Influencing Adoption of Soilless Farming

The assessment of respondents' awareness and understanding of soilless farming in Ibadan revealed moderate familiarity with the practice (Figure 4). About 30% of respondents reported high or very high familiarity, while 40% remained neutral, indicating limited confidence in understanding soilless farming techniques. Awareness of basic principles scored slightly higher, with 42% indicating high or very high understanding; however, 36% of respondents reported low or very low knowledge, highlighting persistent gaps in

theoretical comprehension. Exposure to practical training emerged as the most experienced knowledge indicator, with 60% reporting some hands-on experience with soilless systems, yet 28% had little or no exposure.

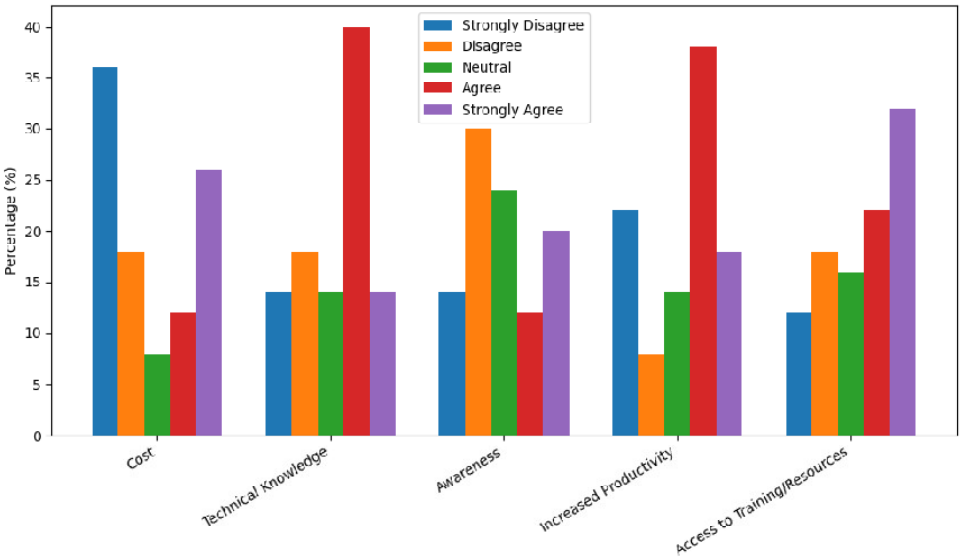


Figure 4: Respondents' Perceptions of Factors Influencing Adoption of Soilless Farming

The variability in responses, reflected in relatively high standard deviations, suggests that knowledge and experience are unevenly distributed across the urban farming population. These findings are consistent with previous studies in Nigerian urban contexts, where awareness of hydroponic and other soilless systems exists, but practical engagement remains limited due to inadequate training and technical support (Oladimeji *et al.*, 2020; Opeagbe *et al.*, 2025). From a theoretical standpoint, these patterns align with the Diffusion of Innovation Theory, which emphasizes that awareness is only the initial stage in the adoption process. Without targeted interventions to enhance understanding and provide practical exposure, the progression from knowledge to adoption may remain slow. Similarly, the Technology Acceptance Model suggests that perceived usefulness and ease of use influence adoption; limited hands-on experience may reduce perceived self-efficacy and hinder uptake. Policy implications are clear: structured educational programs, practical demonstration sites, and partnerships with extension agencies, universities, and NGOs are needed to strengthen both theoretical understanding and practical skills. Access to affordable resources, inputs, and technical guidance should complement awareness campaigns, particularly in light of urban land scarcity and the potential for soilless farming to enhance sustainable food production.

Several factors were found to influence the adoption of soilless farming. Cost was a polarized factor, with 26% of respondents strongly agreeing that setup expenses are a barrier, while 36% strongly disagreed, reflecting variability in financial capacity among urban farmers. Technical knowledge

was acknowledged as a significant challenge, with 40% reporting it as a limiting factor, consistent with literature emphasizing that hydroponic systems require specialized skills in nutrient management, system maintenance, and plant physiology (Shreejana *et al.,* 2022; Nishanth *et al.,* 2025). Interestingly, awareness alone did not appear to drive adoption, as 30% disagreed that lack of knowledge prevents uptake, suggesting that practical demonstration and resource accessibility are more critical than conceptual understanding alone. Access to training and resources emerged as the most important driver, with 32% strongly agreeing that availability of inputs and technical support encourages adoption. Perceived productivity gains also served as motivation, with 56% agreeing or strongly agreeing that higher yields encourage adoption. These results are in line with previous studies showing that resource availability and tangible economic benefits significantly influence the adoption of innovative urban farming practices (Yusuf *et al.*, 2015; Wahab *et al.*, 2018).

From a theoretical perspective, the findings align with the Diffusion of Innovation Theory, which identifies relative advantage and facilitating conditions as key determinants of adoption, and with Social Cognitive Theory, which emphasizes the role of environmental support and self-efficacy in influencing behavior. In terms of policy implications, these results highlight the need for targeted interventions to reduce entry barriers, including subsidies, microloans, and starter kits for small-scale farmers, as well as structured training programs to build technical capacity. Policies should also focus on improving access to necessary resources and promoting market linkages to reinforce the perceived productivity benefits of soilless systems. Integrating awareness campaigns with practical demonstrations and mentoring programs can bridge the gap between knowledge and adoption, ultimately fostering sustainable urban agricultural practices and enhancing food security in Ibadan.

Perceived Barriers to Adoption

The findings on perceived barriers to the adoption of soilless farming indicate that economic and practical constraints outweigh institutional factors in shaping adoption decisions among urban farmers in Ibadan (Table 3). High cost emerged as the most significant barrier, cited by 40% of respondents, underscoring the challenge posed by initial setup expenses, including infrastructure, nutrient solutions, and maintenance requirements. This finding aligns with existing urban agriculture literature, which consistently identifies start-up capital as a major deterrent to the adoption of hydroponic and other soilless systems, particularly among small-scale and resource-constrained farmers (Gartmann *et al.,* 2023; Atherton and Li, 2023). From a theoretical perspective, this reflects the economic rationality embedded in adoption behavior, where perceived financial risk reduces willingness to experiment with unfamiliar technologies, as suggested by the Rational Choice Theory and the Diffusion of Innovation Theory's emphasis on cost as a key attribute affecting adoption rates.

Table 3: Respondents' Perceived Barriers to Adopting Soilless Farming

Challenge	Percent (%)
High cost	40
Lack of awareness	26
Limited materials	26
Lack of government support	8

Lack of awareness and information was identified by 26% of respondents as a major barrier, indicating that while some farmers are aware of soilless farming in general, many lack sufficient, actionable knowledge to confidently adopt the practice. This supports earlier findings that awareness without depth of understanding limits progression from knowledge to persuasion and decision stages in the Diffusion of Innovation process (Rogers, 2003; Mesa Manzano and Esparcia Pérez, 2023). Similarly, limited access to materials, also cited by 26% of respondents, highlights the structural constraints affecting adoption, including difficulties in obtaining grow media, nutrient solutions, and appropriate equipment. These constraints resonate with the Technology Acceptance Model, which emphasizes that facilitating conditionssuch as access to inputs and technical infrastructure which are critical determinants of technology uptake. Without reliable access to materials, perceived ease of use declines, thereby discouraging adoption even among willing farmers.

Interestingly, only 8% of respondents identified lack of government support as a major barrier, suggesting that direct state intervention is perceived as less critical than practical and financial considerations. This finding implies that while policy support and institutional incentives are valuable, they may be insufficient unless accompanied by tangible interventions that address cost reduction, information dissemination, and input availability. Similar observations have been reported in Nigerian and other Sub-Saharan African urban agriculture studies, where farmers prioritize immediate, operational challenges over broader policy frameworks (Joshi *et al.,* 2022; Issifu *et al.*,2025). From a Social Cognitive Theory perspective, this underscores the importance of environmental enablers and resource accessibility in shaping behavior, as farmers are more likely to adopt innovations when supportive conditions are visible and directly beneficial.

The policy implications of these findings emphasize the need for practical, farmer-centered interventions rather than solely top-down policy measures. Reducing cost barriers through subsidies, microcredit schemes, or low-cost modular soilless systems could significantly enhance adoption. Expanding awareness through targeted training, extension services, and demonstration farms would help transform general knowledge into actionable competence. Additionally, strengthening supply chains for soilless farming materials through public–private partnerships could address access challenges and improve adoption outcomes. Addressing these core barriers holistically would not only accelerate the diffusion of soilless farming in Ibadan but also contribute to sustainable urban food systems and improved livelihood opportunities.

Perceived Benefits of Soilless Farming

The results (Table 4) on perceived benefits of soilless farming indicate that urban farmers in Ibadan generally recognize the potential advantages of the technology, particularly in relation to productivity and food security. Nearly half of the respondents (46%) agreed or strongly agreed that soilless farming improves vegetable production, reflecting an appreciation of its capacity to deliver higher and more reliable yields compared to conventional soil-based methods. An even larger proportion (56%) acknowledged its role in supporting urban food security, which is especially significant in the context of increasing land scarcity, rapid urbanization, and rising food demand in cities such as Ibadan. These perceptions are consistent with global and Nigerian studies demonstrating that soilless systems can optimize limited urban space, enhance water-use efficiency, and enable year-round production of vegetables (Bello *et al.*, 2024; Banfe *et al.*, 2025).

The importance of institutional facilitation is also evident in the findings, as 52% of respondents agreed or strongly agreed that government support would increase adoption of soilless farming. This suggests that farmers view public-sector involvement as a catalyst that can reduce uncertainty and risk associated with adopting new agricultural technologies. From the perspective of the Diffusion of Innovation Theory, government support can function as a change agent by accelerating the transition from persuasion to decision and implementation stages. Similarly, the Technology Acceptance Model underscores the role of facilitating conditions, such as policy backing, subsidies, and extension services, in shaping positive attitudes toward adoption. The perceived role of government therefore extends beyond regulation to include capacity building, resource provision, and institutional legitimacy for soilless farming practices.

Farmer willingness to adopt soilless farming further reinforces the importance of support mechanisms, as 48% of respondents indicated readiness to adopt the technology if adequately supported. This highlights that reluctance is not necessarily rooted in resistance to innovation but rather in structural constraints, including cost, technical complexity, and limited access to inputs.

Table 4: Respondents' Perceived Benefits of Soilless Farming

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Improves vegetable production	18	20	16	36	10
Supports food security	16	10	18	40	16
Government support increases adoption	18	14	16	16	36
Farmer willingness with support	22	10	20	28	20

This finding aligns with Social Cognitive Theory, which emphasizes that behavior change is influenced by environmental factors and perceived self-efficacy; when farmers anticipate access to training, resources, and institutional backing, their confidence and willingness to adopt increase. Similar conclusions have been reported in urban

agriculture studies across Nigeria and other developing contexts, where adoption intentions rise significantly when financial and technical support systems are in place (Olorunnisola, 2021; Nwanojuo *et al.*, 2025).

Collectively, these findings underscore that although urban farmers in Ibadan demonstrate moderate awareness of soilless farming and recognize its benefits, adoption is strongly conditioned by practical exposure, access to resources, and supportive policy environments. The perceived productivity and food security benefits suggest substantial potential for soilless farming to contribute to sustainable urban agriculture. However, realizing this potential requires targeted interventions, including structured training programs, subsidies or credit facilities, and the establishment of demonstration plots to translate perceived benefits into actual practice. Such measures would not only enhance adoption but also strengthen urban food systems, improve livelihoods, and support broader sustainability goals in rapidly urbanizing Nigerian cities.

Conclusion

The study demonstrates that while urban farmers in Ibadan show some awareness of soilless farming, practical adoption remains limited due to structural constraints, including high setup costs, restricted access to inputs, and insufficient technical knowledge. Despite these challenges, farmers perceive clear benefits in terms of increased vegetable yields and contributions to urban food security, and many expressed willingness to adopt the technology if supported. This indicates that barriers are primarily resource- and capacity-related rather than attitudinal, highlighting the potential for wider adoption through targeted interventions.

To enhance the uptake of soilless systems, efforts should focus on improving practical knowledge through hands-on training, demonstration farms, and peer-to-peer learning. Financial constraints can be addressed by providing affordable microcredit, subsidies, or starter kits, while access to essential inputs should be strengthened through partnerships with private and public actors. Integrating soilless farming into urban agriculture and food security policies would provide institutional legitimacy and sustained support, ensuring that the technology contributes effectively to both livelihood improvement and sustainable urban land management. Expanding awareness and practical capacity in this way can help transform soilless farming from a niche innovation into a viable strategy for resilient and productive urban agriculture in Ibadan. Also, future research could explore behavioral and socio-cultural factors influencing learning and adoption, including peer influence, risk perception, and previous agricultural experience, in line with the Social Cognitive Theory (SCT), which emphasizes observational learning and self-efficacy in behavior change.

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