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Rooftop gardening complexities in the Global South: Motivations, practices, and politics

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Abstract

An increasing number of urban residents in the Global South are turning to rooftop gardening, whether through soil or hydroponics, to cultivate their own vegetables, fruit, and herbs. In Hanoi, Vietnam's capital, rooftop gardening serves as an important alternative to traditional wet markets and more recently established supermarkets. In this paper, we examine the motivations, practices, and constraints of Hanoi's rooftop gardeners, along with the level of government support or disapproval for rooftop gardening. Our study is grounded in critical urban geography and urban political ecology and specific debates regarding informal life politics. Our findings reveal that Hanoi's rooftop gardeners feel confronted by a critical food safety crisis, emphasising their need to access safe, fresh, and affordable produce through rooftop gardening. Simultaneously, they express scepticism about the capacity and willingness of formal political institutions at both the municipal and national levels to address and resolve these concerns. We explore whether Hanoi's urban rooftop gardeners can be considered to be engaging in a form of everyday life politics and examine the dynamics emerging in this regard. We conclude by offering potential policy recommendations for Global South cities to support urban gardening communities.

KEYWORDS

critical urban geography; food safety concerns; Hanoi, Vietnam; informal politics; qualitative methods; rooftop gardening; urban political ecology

1 | INTRODUCTION

Amid geographers' critical scrutiny of urban environmental concerns, there is a growing focus on creating nutrition-sensitive, economically resilient, and environmentally conscious food systems (Goldfischer et al., 2020). Consequently, policymakers and academics are increasingly exploring urban gardening as a means to address these pressing needs. Rooftop gardens, especially in densely populated cities, have garnered particular attention (Hou, 2018). These gardens involve individuals growing vegetation on building rooftops using numerous possible methods such as containers, green roofs, or hydroponics (Aiholli & Bargavi, 2018). Such gardens can take the form of large-scale commercial ventures (Akaeze & Nandwani, 2020; Astee & Kishnani, 2010; Liu et al., 2016) or smaller, household or community gardens primarily for own consumption (Aiholli & Bargavi, 2018; Pham Thi Minh Khuyen, 2019; Weinberger, 2013).

This latter model of rooftop gardens is increasingly popular in Hanoi, the capital of the Socialist Republic of Vietnam, and includes both soil-based and hydroponic approaches. This popularity is partly due to the scarcity of available land for traditional ground gardens in Hanoi and other major Vietnamese cities such as Ho Chi Minh

City. In both cities, high population densities and land shortages are critical challenges. Moreover, there has been a rapid increase in the construction of high-rise housing units in these cities, which often lack sufficient green space. In theory, urban green spaces in Vietnam are encouraged by several policies, with the most recent, in 2022, aiming to create on average 6–8 m^2/capita by 2030 (Politburo of Vietnam, 2022). In reality, there is a critical lack of green space in Hanoi (Pham & Labbé, 2019), currently calculated at 2 m^2/capita (Môi trường và Đô thị, 2022). Tending a small rooftop garden is thus one of the few ways by which urban residents can access garden space.

As a group of four geographers intrigued by rooftop gardens and wanting to better understand this phenomenon, we engaged in initial informal discussions with Hanoi residents. Many revealed that they grow rooftop food due to food safety concerns. Given the increasing importance of food safety among urban residents in Vietnam over the past two decades (Ehlert & Faltmann, 2019; World Bank, 2017), we decided to conduct a more in-depth study. We hope to contribute valuable insights to the literature on urban rooftop gardens in Asia, which has tended to focus on high-income Asian countries (Diehl et al., 2020; Hou, 2018; Matthews, 2013) and overlooked residents' practices and motivations in low- and middle-income countries, and certainly in socialist states.[1]

The case of Vietnam's urban food systems also merits attention because of growing controversies over agro-chemical contamination in meat, fruit, and vegetables, stemming from inadequate regulations and monitoring. Distrust of local and regional food systems, especially those with ties to neighbouring China, compounds these anxieties (Mergenthaler et al., 2009; World Bank, 2017). Acknowledging a number of food safety problems and aiming to modernise the country's food systems, the Vietnamese government has promoted "modern" food supply sources such as supermarkets, while arguing that traditional wet markets are often unhygienic (Figuié et al., 2019; Wertheim-Heck et al., 2015). Yet, persistent food safety problems continue to heighten concerns among urban residents (Ehlert & Faltmann, 2019).

In recent years, some residents with higher socio-economic status have shifted to supermarket purchases, assuming these to be safer sources of fresh food than other options (Wertheim-Heck & Spaargaren, 2016). Other residents—of both higher and lower socio-economic standing—are deciding to grow their own "safe" vegetables, fruit, and/or herbs on rooftops or vacant spaces along road verges, railways, or canals (Dân trí, 2022; Kurfürst, 2019; Pham & Turner, 2020). While the local media sometimes reports on successful sites of rooftop production in Hanoi, explicitly linking this phenomenon to food safety concerns (Afamily.vn, 2021; Dân trí, 2021; VietnamNet, 2021), there is a lack of public policy support for urban rooftop gardens. This lack contrasts with over 25 policies governing home food gardens in Vietnam's rural areas (documented by Mulia et al., 2022) and dedicated rooftop gardening policies in other Asian countries such as Singapore and Taiwan (Diehl et al., 2020; Hou, 2018).

Key insights

Urban rooftop gardening is gaining popularity among urban residents in the Global South. This paper delves into the motivations, practices, and constraints of Hanoi's rooftop gardeners, alongside assessing the degree of government support. Our study is grounded in critical urban geography and urban political ecology, and in debates related to everyday informal life politics. Hanoi's rooftop gardeners face pressing food safety concerns while expressing doubt in formal political institutions' ability to address these anxieties. We reflect on whether these gardeners engage in everyday life politics, before providing policy recommendations for supporting urban rooftop gardening in Global South cities.

The aim of this paper is to understand the motivations, practices, and constraints affecting urban rooftop gardeners in Hanoi, Vietnam. To do so, we draw on a conceptual framework informed by critical urban geography, urban political ecology, and informal life politics, outlined in Section 2. We then provide context by briefly reviewing Asia-specific literature on rooftop gardening and hydroponics, examining perceptions and policy initiatives in the region in Section 3. Then, after describing our methodology in Section 4, our results (Section 5) focus first on gardener motivations, then on gardening practices, and finally on constraints. Subsequently, in Section 6, we interpret the degree to which Hanoi's urban rooftop gardeners engage in everyday informal life politics and the specific ways this appears to be occurring. In the conclusion (Section 7), we offer potential policy recommendations for supporting urban gardening communities in Global South cities, which can also inform future research agendas.

2 | CONCEPTUAL FRAMING

Inspired by the work of critical geographers focusing on urban agriculture (McClintock, 2014, 2018; Tornaghi, 2014), our conceptual framework brings together debates from critical urban geography, urban

political ecology, and informal life politics to understand the power relations and the possible exclusions and injustices produced by or occurring within urban agriculture practices (Brenner, 2009). Critical urban geographers and urban political ecologists share common interests with regard to understanding cities as complex socio-economic and environmental systems. Both are concerned with social and environmental justice, paying attention to power relations and investigating questions related to spatial analyses (Chen & Shin, 2019; Heynen, 2014; Heynen et al., 2006).

Starting in the mid-1990s, scholars within geography, including but not limited to Neil Smith (1996) and Erik Swyngedouw and Nik Heynen (2003), along with researchers from other disciplines, have drawn on urban political ecology to analyse and critique how socio-environmental conditions are shaped in urban environments, often to the advantage of specific groups. Heynen et al. (2006, p. 2) note that the "central message that emerges from urban political ecology is a decidedly political one. To the extent that cities are produced through socio-ecological processes, attention has to be paid to the political processes through which particular socio-environmental urban conditions are made and remade." Particular thought is thus paid to capitalist and especially neoliberal capitalist urban development schemes and processes (Keil, 2003, 2005). Furthermore, urban political ecologists are concerned with how urban environments are often manipulated and controlled to serve the interests of the elite, frequently at the expense of marginalised populations (Swyngedouw & Heynen, 2003).

A relatively new strand of urban political ecology draws attention to how postcolonial, Indigenous, antiracist, queer, and feminist theories can help inform a heterodox urban political ecology to analyse the embodied processes of unequal urbanisation (Heynen, 2018; Lawhon et al., 2014). Of particular note for this Hanoi case are the ways by which Lawhon et al. (2014) have drawn on a postcolonial approach to highlight the situatedness of urban political ecology. They underline three analytical principles: everyday practices (material flows through people-as-infrastructure); diffuse forms of power (discursive, knowledge claims, identities); and the scope for radical incrementalism.

A growing body of research in Asia and Africa demonstrates how critical urban geography and urban political ecology reveal the painstaking negotiations and power relations involved in securing space and resources for urban gardening (McLees, 2011; Pham et al., 2023). Central to these works is a focus on urban governance at different spatial levels and on how urban agricultural practices either align with or challenge official policies and plans (McClintock et al., 2021; Zhu et al., 2020). Moreover, these works delve into the ways by which gardeners navigate political discourses and societal norms to have access to or to create garden spaces (Montefrio et al., 2020; Neo & Chua, 2017; Wagemakers et al., 2009). Critical urban geographers and urban political ecologists also underscore the importance of understanding the social construction of urban spaces (Tornaghi, 2014). Their work reveals the capacity and constraints of urban agriculture to address sustainability and justice concerns. It also points to the need to investigate how specific visions of urban nature—such as the Vietnamese state's wish for "clean and green cities"—become produced and legitimised in specific ways.

Additionally, it is crucial to understand the impacts of these processes for those wishing to maintain rooftop gardens (Doshi, 2017; Heynen, 2016, 2018). To better understand such impacts and residents' responses, we also draw on Tessa Morris-Suzuki's (2017a) conceptualisation of "informal life politics" or "living politics" (see also Morris-Suzuki, 2018). Following efforts by James Scott and Ben Kerkvliet to chart and illuminate less visible "forms of political action embedded in everyday life," Morris-Suzuki (2017a, p. 2) similarly posits that the sphere of formal and semi-formal political institutions represents only a small part of politics "in the full meaning of the word."[2] Also in line with Scott and Kerkvliet, she highlights the importance of broadening conventional understandings of "the political" so as to "conceive of the full range of ways in which people act politically in the contemporary world" (Cliff et al., 2018, abstract).

In particular, Morris-Suzuki (2017a) urges scholars to attend to less visible forms of political engagement that she has observed throughout East/Northeast Asia. These particular forms of everyday politics seem to emerge under two conditions: first, when groups of people are confronted with what they perceive as an important economic, social, and/or environmental problem or crisis and, second, when these same people deem formal political institutions of local, national, or international actors unable or unwilling to deal with the problem or crisis. Morris-Suzuki (2017a, p. 1) draws attention to the "small experiments in 'politics from below'" through which groups of people respond to these problems/crises. She coins the expressions "informal life politics" and "living politics" to refer to the "locally generated practical responses to crises" (p. 6) through which groups of people "try to *act out* aspects of the change they seek in their everyday lives, through autonomous collective responses" (p. 2; emphasis added). The key idea here—and that which is most relevant to our case study—is that groups practicing informal life politics do not *advocate* for change. Instead, they *enact or perform* the change they seek "according to their own hopes and visions" (Morris-Suzuki, 2017b, p. 278). We draw on these enactments of change to interpret the motivations and objectives of Hanoi-based rooftop gardeners.

Given the socialist context in which Hanoi's urban rooftop gardeners are positioned, we want to explore the degree to which gardeners' possible informal life politics might come to represent elements of three analytical principles of a situated urban political ecology outlined by Lawhon et al. (2014). These principles include everyday practices, diffuse forms of power, and the scope for radical incrementalism. For example, can everyday practices of rooftop gardening in Hanoi be thought to involve "people as infrastructure" (as defined by Simone, 2004), with these practices being steps towards a more radical reclamation of power?

3 | ROOFTOP GARDENERS IN ASIA

Although rooftop gardening has long been a household practice in many Asian cities, such gardens have proliferated in recent years as awareness of their value and benefits has grown (Matthews, 2013; Yamada & Yabu, 2007). Scholars have highlighted the positive social outcomes of rooftop gardens, including enhanced urban resilience through greater food security and community development (Hsiao, 2021; Hui, 2011). These gardens also offer health benefits by providing access to safe, nutritious food and improving physical and mental well-being (Aiholli & Bargavi, 2018; Weinberger, 2013). Rooftop gardens can also increase household economic resilience by reducing expenditure on groceries and potentially generating income (Akaeze & Nandwani, 2020; Pham Thi Minh Khuyen, 2019). From an environmental perspective, rooftop gardens can help mitigate urban heat island effects, manage storm water runoff, encourage waste reuse through practices such as rainwater harvesting and composting, and reduce the energy expended on food transportation (Carandang et al., 2016; Hamzah et al., 2016; Hui, 2011). Especially notable in the context of rapidly urbanising Asia, such gardens can increase and preserve rapidly disappearing green spaces (Hamzah et al., 2016; Son, 2018).

Given such benefits, municipal governments in several Asian countries have promoted rooftop gardens. For example, in an attempt to increase Taipei's food security and climate change resilience, the municipal government has created the "Garden City Initiative" (Hou, 2018). This initiative supports the establishment of community, rooftop, and school gardens while involving numerous actors and organisations across public and private sectors and civil society. It has also sought to complement the top-down establishment of gardens with bottom-up, community-driven approaches.[3] Meanwhile, the "Greening of Seoul" initiative subsidised up to 70% of rooftop garden construction costs, resulting in 550 new rooftop gardens on residential, public, and commercial buildings from 2002 to 2013 (Matthews, 2013). However, studies in Iskandar, Malaysia (Maryanti et al., 2014), and Dhaka, Bangladesh (Hossain et al., 2019), point to insufficient government incentives and support for limited green roofs in their cities. These findings hint at the potential benefits and challenges Hanoi's rooftop gardeners face, and emphasise the role of strong governmental support to encourage positive change and citizen participation.

Several studies focusing more specifically on the perceptions and motivations of urban household rooftop gardeners have identified factors that support or inhibit gardeners' goals. In Thái Nguyên city, Vietnam, key reasons for rooftop gardeners to adopt this practice included they wanted to consume fresh and safe produce, had adequate knowledge and time, and found gardening compatible with their lifestyle. Yet, a lack of knowledge and time restricted other residents from participating (Pham Thi Minh Khuyen, 2019). A comparable study in Bangalore by Aiholli and Bargavi (2018) yielded similar results, with additional limitations including lack of space, rental restrictions that precluded rooftop gardens, and structural limitations of roofs. Meanwhile, investigating communal rooftop gardens on apartment buildings in Tokyo, Kimura et al. (2008) have found that residents' enthusiasm to contribute to a building's rooftop garden through membership of gardening clubs was strongly related to the degree to which they sought greater levels of social interaction.

Urban hydroponic gardens are often viewed as an important strategy to address food supply challenges in Asian cities (Benke & Tomkins, 2017). They can enhance household food security and nutrition by providing a cash-saving approach and an additional income source (Islam & Siwar, 2012; Muhammad et al., 2020). Moreover, hydroponic systems require as little as 10% of the water used for traditional agriculture (Taylor et al., 2012) and produce higher yields with less labour inputs than soil-based farming (Astee & Kishnani, 2010). However, the substantial initial investment required for hydroponics remains a major obstacle to widespread adoption in the region (Wood et al., 2020), as seen in Selangor, Malaysia, where that cost was identified as the primary deterrent to residents' willingness to engage in this practice (Hamdan et al., 2021). Meanwhile, in Singapore, the limited availability of technical training, installation support, and incentives has hindered broader adoption of hydroponics (Wong et al., 2010), while in Kuala Lumpur, the extent of participation in hydroponics was linked to people's confidence levels and satisfaction with the practice (Ahimaz et al., 2021).

4 | METHODOLOGY

This paper is based on in-depth interviews conducted in 2021 with 20 urban residents in Hanoi who have

established rooftop gardens. The interviews were completed by the third author, a long-term Hanoi resident. She used a semi-structured interview guide designed and piloted by the first and second authors. Our interview guide focused on themes including how the respondents were introduced to their current gardening practices; their motivations; approach (including strategies, materials, and costs); challenges and constraints; assistance received (including government support); and future gardening plans. Respondents were recruited using a snowballing approach, specifically targeting household rooftop gardeners. Research ethics approval was granted by the first author's university, and all respondents provided informed consent. Respondents were financially compensated for their time according to local standards, with this token of appreciation disclosed after the interview was completed.

Our analysis was primarily conducted by the first author, employing thematic and axial coding. This process drew from both *a priori* themes in the interview guide and our previous literature review, as well as *a posteriori* themes that emerged as coding progressed. While participant validation (Turner & Coen, 2008) was not feasible due to Covid restrictions in Vietnam, in 2023, the first author discussed our initial findings with four additional Hanoi residents engaged in rooftop gardening and two local academics. Their feedback and perspectives corroborated our initial findings.

Of the 20 Hanoi respondents, 12 maintained soil-based rooftop gardens, while eight practiced hydroponics. All gardens were 40 m^2 or smaller, except for three hydroponic gardens that were far larger (300 m^2) and located on commercial premise rooftops to which the gardener had access. Sixteen respondents were women. This gender imbalance may have been due to the third author undertaking the interviews being a woman, the snow-ball sampling approach we employed, and/or the fact that we did not purposefully sample for gender-parity (since our primary interest lay in understanding the motivations, processes, and constraints associated with rooftop gardening). However, it is noteworthy that a number of respondents mentioned cultural beliefs and traditions that place responsibility for household cooking on women, potentially contributing to the higher participation of women in home gardening.

While we do not claim to represent all rooftop gardeners in Hanoi, existing academic literature on rooftop gardening in Hanoi is limited, with only Wertheim-Heck and Spaargaren (2016) briefly touching on the topic within a broader analysis of food safety dynamics in the city. Given the absence of focused work on rooftop gardening in Hanoi, we hope to contribute to enhancing understandings of this sustainable urban agriculture approach increasingly embraced by Hanoi residents.[4]

5 | ROOFTOP GARDENERS IN HANOI: MOTIVATIONS, PRACTICES, AND CONSTRAINTS

5.1 | Gardener characteristics and motivations

The urban rooftop gardeners we interviewed in Hanoi ranged in age from 26 to 70 years old, with the subgroup undertaking hydroponics aged from 33 to 60. They represented diverse employment backgrounds including the government, military, education, health, and private sectors. They included, for example, a primary school teacher, veterinarian, health care worker, and retired engineer, with just under one-third of respondents being retired. The majority were married with children. Their rooftop gardening experience ranged from a few months for a 39-year-old woman to over 11 years for a 42-year-old woman. Respondents who had been rooftop gardening the longest were typically engaged in soil-based gardening, with the most established hydroponic gardener using this method for 5 years.

Respondents lived in various housing types, ranging from small apartments to detached houses. Just over half were apartment or home-owners while the others rented, and they resided across Hanoi with no specific spatial clustering. All respondents gardened on their own rooftops except three who had access to commercial or community buildings, as noted earlier. One of the latter respondents explained: "Our garden is actually the hospital's open corridors on the second floor and third floor where the air-conditioning condensers are." Those in apartments typically had access to the rooftop of their building, often residing on the top floor. The majority of respondents engaged in rooftop gardening because they lacked access to suitable land, although a few noted that rooftop gardens gained better sunlight. Figure 1 portrays a well-established soil-based, rooftop garden in the city.

Motivating all 12 soil-based respondents was the fact that they could control the quality of the produce they consumed. These gardeners noted that they wanted pesticide-free produce and were apprehensive about the food-safety of retail produce. A 46-year-old woman, rooftop gardening for 3 years, succinctly put it: "I do this gardening because buying food from outside isn't safe, but it's a lot of work." A 62-year-old woman, rooftop gardening for 2 years, added: "Food is so complicated these day, it's hard to control the quality and origin. We're trying our best to avoid consuming toxic substances just like everybody else." This concern was reiterated by a 31-year-old woman, rooftop gardening for a year: "Everyone would like to have clean food for their families. Naturally, we feel safer about the food we grow ourselves. When we buy food from outside and vendors claim it's clean, we don't get to see how

FIGURE 1 Watering a well-established, soil-based rooftop garden in Hanoi, with plants growing in polystyrene boxes. *Source*: Photo taken by third author.

cleanly it's grown with our own eyes, so we don't fully trust its origin."

The second most discussed motivation (gardeners could provide more than one during interviews), for just over half the soil-based gardeners, was to maintain their health through the exercise that gardening provided. For retired gardeners, this was also closely linked to maintaining a hobby. A retired, 62-year-old man, gardening for 5 years, explained: "This is a hobby of mine, planting a small number of vegetables for convenience. In terms of time, now I'm retired so I'm not so busy." Five gardeners also related their gardening back to their childhood, as a 54-year-old woman, gardening for 5 years, reflected: "It's my passion. I come from a farming background, so this helps me reminisce about those days."

Three gardeners mentioned the importance of educating future generations about gardening and that this motivated them to continue. Nonetheless, a 45-year-old woman, gardening for 6 years, noted the challenges of this motive: "It's about educating children. Theoretically that's simple but it's actually difficult! They don't listen to us. We teach them all sorts of skills, but they live very superficially." Three other gardeners highlighted the broader environmental benefits of their gardening practices. For instance, a 46-year-old woman, gardening for 3 years, summarised her goals: "Educating your children for them to know what it's like to work and save is very important; protecting the environment also matters. However, if I have to choose one most crucial objective of gardening then I'd pick food safety."

The eight hydroponic gardeners we interviewed primarily chose this method to produce cleaner vegetables (such as those displayed by a respondent in Figure 2). Respondents believed hydroponics offered more control over water sources, chemicals, nutrients, bacteria, and pests, compared to soil-based rooftop gardening. Six respondents added that the hydroponic system itself was a sanitary and orderly way of growing produce. A

FIGURE 2 A lush hydroponic garden on a Hanoi resident's rooftop. *Source*: Photo taken by third author.

30-year-old woman who had been practicing hydroponics for 1 year detailed both perceived benefits:

> Growing vegetables like this is very clean, while planting with the Styrofoam boxes is really dirty because water seeps out of the box and makes a mess. When harvesting, the vegetables are also hygienic, there's no dirt. I just soak the vegetables in cold water, then they're ready to be cooked and served.

Five respondents also found hydroponic gardening more productive, while three noted that it was less labour intensive than soil cultivation. Additionally, some mentioned its suitability for small spaces. However, two hydroponic gardeners acknowledged that hydroponically grown produce could taste bland but suggested ways to enhance flavour. A man in his 40s, with 2 years of hydroponics experience, explained: "Some would say that these vegetables are bland, but it depends on the growers. In hydroponics you can miss certain micro-nutrients that soils have, but that can be added by us as well."

Of all the rooftop gardeners, only one sold some of their harvest (beansprouts), with the other 19 growing for their household's consumption. Yet, gardeners shared any surplus harvests with family, friends, and neighbours. While most gardeners were generous and shared with a number of people, others were more protective of the time and skills they had invested. A 46-year-old woman, gardening for 3 years, explained:

> I don't have enough vegetables to share with many relatives, so I only share them with one older brother and one older sister. I told my sister that I'd put a lot of effort into these, and I let her know that these are very valuable! I only gift them to those closest to me. A bundle of these vegetables is worth much more than some bundle purchased outside!

Finally, a number of respondents noted that they appreciated the birds that their soil-based or hydroponic gardens attracted, while some also grew specific plants for their fragrances. Interestingly, cultural beliefs also played a role with regard to which plants to grow, as a 62-year-old man, gardening for 5 years, noted:

> When I went to Cô Tô island [off the coast of northern Vietnam] I bought two Buddhist pine trees to handle ghosts. Someone suggested that if these two trees are planted in front of the house there will no longer be any ghosts because they're scared of that tree. So, I bought two for the front of my house and two more for my rooftop.

In sum, the motivations for rooftop gardeners to garden with soil or hydroponic approaches were overwhelmingly linked to food safety concerns and the desire to access produce that respondents were confident was clean. Other motivations such as exercise, maintaining a hobby, supporting the environment, or remembering their childhood were also extolled, but remained secondary.

5.2 | Gardening practices and information sources

Respondents grew a wide range of crops for consumption, with some also growing plants to cool their houses and/or for decoration. With regard to food crops, gardeners selected varieties of fruit, vegetables, and herbs based on the appropriate season (about which they demonstrated thorough knowledge), the level of care the plants required, and the plants' suitability for a rooftop garden. A 46-year-old woman, gardening for 3 years, listed the range of plants she grew, which was fairly representative of the species other respondents also mentioned:

> I have a wide variety of crops in my garden. It's not just vegetables but also spices, everything really. We have celery, leeks, tomato, green onions, chives, vine spinach, jute, different kinds of watercress, mugwort for chicken hotpot. I also plant sweet melon, cucumber, winter melon, and bitter melon.

Meanwhile, a 42-year-old woman, gardening for 11 years, explained the importance of seasonal knowledge: "We must grow according to the season; for each season, we only grow the corresponding plants. If we plant cabbages this season, then we can't consume them because they'll be covered with spotty disease."

Respondents identified several factors influencing harvest quality, including gardener skills, fertiliser type, and the quality of seeds, water, and soil (for soil-based gardeners). Eight of the 12 soil-based rooftop gardeners had acquired these skills as a child, having been exposed to gardening practices while growing up in peri-urban villages or nearby rural provinces. Among the remaining four, one had learnt from a friend, one from watching YouTube videos and television shows, one from joining an online gardening group, and one from participating in an in-person gardening club. Conversely, the eight hydroponics respondents relied more on internet-based knowledge than childhood experiences. Six had learned about hydroponics from online platforms such as YouTube, specialised e-commerce sites, university programs, or through gardening stores. Only two had learned from family and friends.

The rooftop gardeners bought seeds from a variety of sources including markets, specialty stores, and, for a few, the Vietnam National University of Agriculture. Some respondents were also gifted seeds by friends and neighbours, while others harvested, stored, and propagated their own seeds. For gardeners using soil, respondents either purchased soil, transported it from their families' farms in the nearby countryside, or obtained it from construction sites within the city. One gardener also mentioned, in hushed tones, that she had "stolen wonderful, rich soil" from nearby rice fields in the past, but added that with the city's continued urban expansion, that land had been converted to a condo tower, so she had reluctantly started to purchase soil instead.

Respondents employed highly diverse and creative strategies to fertilise their gardens. Several used "green manure," namely, decomposed vegetable stalks, although opinions were divided over this approach. One 45-year-old woman gardener elaborated: "green manure is good but smells horrible, so I'm not doing that." Others preferred chicken, cow, buffalo, or silkworm manure or used human urine, fish and shrimp heads, and/or rice husks to fertilise their gardens. It was also common for respondents to water their gardens with "rice water," the liquid from rinsing rice before cooking. Those using animal manure often relied on family village connections to obtain it. A 54-year-old woman gardening for 5 years explained: "We get the fertiliser from our countryside village, from cow and buffalo manure. We dry it and package it in layers of plastic bags and have it delivered by Văn Minh trucks [a delivery company] here." She added: "It doesn't smell because it's already dried and packaged in many layers of bags before being shipped. These fertilisers are very valuable gifts." A mix of water and urine was also commonly used, with a 62-year-old woman, gardening for 2 years, rather graphically detailing its application:

> I mix clean water and urine. I also utilise water used to clean meat and bones. I leave the mixed water in a bucket with a lid for one day until it stinks; that's when I spray it onto the plants. I don't have any diseases so I can just make use of my piss as well as the kid's. I ask them to pee into a potty and I leave that there for a few days, then I mix it with the water. That's very good for the plants. In fact, it's very clean.

While two-thirds also used NPK fertiliser (a mix of nitrogen, phosphorus, and potassium), the other third noted that they tried to avoid nitrogenous fertilisers as much as possible.

The eight hydroponic gardeners explained the flexibility of these systems, which could be installed on windowsills, balconies, rooftops, or empty floor space, as long as there was sufficient sunlight and a reliable water supply. Key components included a suitable water pump, filtration system, tubes, containers, seeds, and fertilisers. Two practiced aquaponics, raising fish in small ponds combined with hydroponic gardening, on industrial rooftops. These gardeners noted that while the initial investment in hydroponic or aquaponic systems was high, the subsequent expenses were low. Smaller systems were less expensive however, with a 30-year-old woman, gardening for 1 year, explained that her husband had built their structure himself, based on internet research, for about VND2 million [USD85]. The trays used for hydroponically grown vegetables were typically made of inexpensive polystyrene or plastic, sometimes scavenged from local rubbish sites or from local hardware stores with discarded off-cuts.

Hydroponic gardeners emphasised the precise amounts of different nutrients that they needed to add to water, with these ratios often changing as plants grew. Disinfecting the hydroponic system following each crop's harvest was also important. A 37-year-old woman, gardening for 7 years, but practicing hydroponics for a year, explained: "After each crop we must spray some American-made disinfectant. We let it flow through the pipes to clean away any mould or pests. My husband's very careful in terms of sanitation and he cleans everything very well. We also use those disinfectants to clean our fruit and food."

On the whole, gardeners were familiar with a wide variety of possible crops and their needs, including specific seasonal constraints. They also revealed precise knowledge regarding fertilisers, soil types, or hydroponic options and detailed resourceful channels to gain access to the materials they needed. Their gardening skills came from a broad variety of sources, although for three-quarters of the gardeners, their knowledge was rooted in childhood experiences.

5.3 | Gardening constraints

Four main constraints or problems were raised by gardeners: difficulties to access rooftop space and a preference for ground access for gardening instead; expenses of this form of gardening; garden pests; and a lack of government support. While one might think that a rooftop garden would provide easy and quick access, that was not always the case. One 54-year-old woman, gardening for 5 years, noted: "Initially I wasn't too keen on climbing the stairs to the roof, but if we're gardening downstairs there's no sunlight, meaning plants won't grow as strongly. There was a normal [bamboo] ladder at first but then we upgraded it to stainless steel." Similarly, a 45-year-old woman, gardening for 6 years, explained: "Because I don't have land, I must garden this way. If I had land I'd garden on the ground, I wouldn't bother climbing all the way to the rooftop."

Few gardeners kept close track of their expenses, but many explained that growing clean produce was more expensive than buying produce from markets or small stores. Several respondents also complained of snails and other pests invading their gardens, with most catching such pests by hand. A few had also experimented with different combinations of ginger, chilli, onion, and garlic to deter pests. None spoke of using pesticides, as a 42-year-old woman gardening for 11 years, explained: "There's moth larvae that have to be caught by hand; I don't use any types of pesticides; none at all." Three hydroponic gardeners thought that insects/pests were less of a problem than when they had gardened with soil. However, the other five thought that all forms of gardening attracted pests, with the quantity of pests depending far more on the level of care one invested. Hydroponic gardeners also noted additional challenges including temperature control, pollination, and obtaining the right balance of rain and sun.

All the gardeners expressed a strong desire for more support and encouragement from the municipal government for rooftop gardening. None had received any assistance, such as financial support, information, or other resources, from Hanoi's municipal authorities or other government agencies. The gardeners were only aware of a handful of paid courses provided by a local university as the sole form of professional guidance, with no knowledge of any explicit government support for urban gardening in Hanoi, included hydroponics.

Both within and beyond Vietnam, such a lack of support has been identified as an important barrier to more residents taking up urban agriculture, as noted by Maryanti et al. (2014), Hossain et al. (2019), and Pham Thi Minh Khuyen (2019). One respondent pointed out that the Singapore government was actively encouraging rooftop gardening, suggesting that the Hanoi

municipal government should do the same. This 55-year-old woman who had recently retired and started rooftop gardening explained: "In Singapore there's virtually no [ground] agriculture, so they devised a law and support people doing this … soon they'll no longer have to import vegetables. The government should do that here! It also helps protect the environment." Respondents were also quick to propose specific ways the municipal government could assist, including offering free and detailed information and training on gardening approaches and providing access to resources and equipment. They also suggested that government agencies could facilitate connections between residents and owners of unused commercial or state-owned rooftops and encourage gardening there.

6 | URBAN ROOFTOP GARDENING AS A FORM OF INFORMAL LIFE POLITICS?

We return here to our conceptual framing and particularly to the importance of recognising the "situated understandings of the environment, knowledge and power" when focusing on urban processes (Lawhon et al., 2014, p. 498). It is clear that these respondents are maintaining specific material flows of soils, seeds, water, fertilisers, and crops, through their rooftop gardening practices. Here, we see human labour compensating for the failures of the Vietnamese state and private suppliers to provide urban residents with assurances that store-bought food will be safe and healthy. These gardeners have thus taken up rooftop gardening to substitute for inadequate urban infrastructure to provide healthy fruit and vegetables (Addie, 2021; Simone, 2004). Quietly, these gardeners work to regain a degree of autonomy within the food system.

As we analysed our interviews, we were struck by the degree to which these gardeners perceive that they are confronted by an important food safety and urban environmental crisis. At the same time, they feel that formal political institutions at the municipal and even national levels are unable and unwilling to deal with these dilemmas. These gardener concerns over food safety and environmental justice led us to consider how respondents were enacting or performing the urban ecology changes they wanted to see "according to their own hopes and visions" (Morris-Suzuki, 2017b, p. 278). We suggest that rooftop gardening in Hanoi is predominantly a form of grass-roots, self-help action that has arisen in response to everyday, tangible, life problems (Cliff et al., 2018). In this case, a perceived lack of access to safe, affordable, and healthy produce is paramount in respondents' minds, with most rejecting "modern farming" inputs like pesticides, herbicides, and chemical fertilisers. This self-help approach is supported in large part by inspiration and information from countryside farming traditions that respondents had partaken in while growing up or learned from family members. While in the case of hydroponic gardeners, they often independently seek information and guidance on the internet.

Morris-Suzuki and Wei (2018, p. 8) outline five key aspects of informal life politics that the urban rooftop gardeners we interviewed appear to relate to. First, *improvisation* "allows groups of people, in responding to political and economic challenges, to 'try, and see what happens'." In the case of Hanoi's rooftop gardeners, we find respondents readily embracing improvisation. Many are self-taught in their gardening practices and/or learning and adapting from a range of sources. They utilise a wide variety of physical materials, often gifted or scavenged and then innovatively modified, to establish and maintain their urban gardens. Second is *imagination*. We certainly find respondents to be creative and imaginative, setting up their gardens in urban areas with limited space (such as on difficult to access rooftop spaces) and utilising free resources (such as demanding family urine for fertiliser). Third is *small-scale*. The rooftop gardeners we interviewed are predominantly gardening for personal consumption or for family and friends, with only one respondent hoping to generate a small profit. Figure 3 reveals the fairly typical limited space that most gardeners juggled with. Fourth is *small but connected*. Although respondents tend to garden on their own or with their spouse, many remain connected to other gardeners who are family and friends or through online communities and in-person clubs. Fifth is *non-violence*. Urban rooftop gardening in Hanoi displays no elements of violence as a political practice.

More specifically, given that Hanoi's rooftop gardeners tend to rely on their previous knowledge, the internet, and/or family and friends for information and resources to establish and maintain their gardens, one could argue that this gardening is a possible form of community building and, in turn, a form of empowerment (see also Hsiao, 2021; Hui, 2011). For example, while discussing living politics in South Africa's urban "shacklands," Chance (2018) notes the everyday practices of community building that take place as residents illicitly connect to water and energy infrastructure. One could argue that some of Hanoi's gardeners mirror such actions when they collect dirt and gardening supplies from peri-urban fields, construction sites, and rubbish dumps around the city without permission. It is also interesting to note Chance's (2018, p. 17) discussion of how "living politics intersects with an emergent anthropological literature on the infrastructural imagination." She adds that living politics "emphasizes informally constructed domains, where residents make their material life and platform for politics by any means necessary" (Chance, 2018, see also Harvey & Knox, 2012). Similarly, urban rooftop gardening in

FIGURE 3 A fairly typical, limited-size rooftop garden in Hanoi. *Source*: Photo taken by third author.

Hanoi can be argued to become political as residents opt out of mainstream forms of consumerism, find innovative ways to source gardening infrastructure, and transform small pockets of the urban environment.

Informal life politics activities are about creation and construction, challenging the constrained circumstances through introducing alternative norms and practices to a community. They are therefore less about visible conflicts than about local communities' attempts to seek alternative ways of living in daily life. Such activities tend to be inward-looking and self-regulated, rather than actively seeking to expand and convert others to the cause (Morris-Suzuki & Wei, 2018, pp. 9–10).

Notably, Hanoi's rooftop gardens can be considered as political spaces given that residents are consciously avoiding or reducing their reliance on supermarkets and other food suppliers. They invest time, energy, and money in their gardens due to their distrust of industrial farming and government food safety regulations. Rooftop gardening thus provides residents with the agency to control what substances come into contact with their crops and what their families consume. Through self-education and sharing knowledge, residents become experts in safe food production. Such gardening is thus an everyday practice driven by concerns over consumer choice, health, and economics. By participating in urban rooftop gardening, residents are actively making empowering decisions: reducing supermarket purchases; dedicating time to gardening and education; and prioritising health over economic and time considerations. All told, the urban rooftop gardeners with whom we spoke seem to closely align with the fundamental principles of informal life politics.

7 | CONCLUDING THOUGHTS: POSSIBLE PRO-ROOFTOP GARDEN POLICIES

Hanoi's urban rooftop gardeners are quietly working to secure access to safe and healthy food, a goal that the

government has insufficiently addressed or regulated to date (see also Paik, 2018). For both soil-based and hydroponic gardeners, their primary motivation is food safety, with respondents wanting assurance that the produce they and their families consume is clean and healthy. While other motivations include exercise, having a hobby, or improving the environment, these remain secondary to food safety anxieties. Soil-based gardeners possess detailed knowledge, often through childhood experiences, of a number of crops and their requirements, as well as being able to discern the benefits of specific fertilisers, soil types, and so on. Hydroponic gardeners, meanwhile, draw on a broad array of information sources to experiment with their crops, physical materials, and nutrient balance. While remaining positive and upbeat about their gardening experiences overall, these gardeners face four main challenges: difficulties in accessing suitable rooftop space or a preference for ground gardens; the associated expenses; garden pests; and a lack of government support.

Conceptually, the case of rooftop gardens in Hanoi shows how the informal life politics framework can add nuance to urban political ecology conversations. While rooftop gardening in Vietnam can be considered a form of informal life politics and empowerment, the political context of an authoritarian regime coupled with a limited civil society means that such gardening is highly unlikely to result in a radical reclamation of power. Echoing a growing number of urban political ecology scholars (Doshi, 2017; Heynen, 2016; Lawhon et al., 2014), we thus underscore the importance of taking a post-colonial approach that acknowledges the local political context and situatedness of urban political ecology. In this case, recognising how socio-natural processes and people's everyday practices are intertwined with municipal and national political systems is especially important.

Practically, while keeping Hanoi's municipal and national political context front and centre, we still believe it is realistic to advocate for official support to encourage and expand rooftop gardens in Hanoi. This is especially because Hanoi's municipal authorities and the Vietnamese central government are proclaiming that Hanoi will become a trailblazing "sustainable city" for the Southeast Asian region in the near future (Leducq & Scarwell, 2018). Currently, Hanoi lags behind many other regional cities regarding the quality and quantity of green urban spaces and other sustainability initiatives, such as rooftop gardening. It would thus behove Vietnamese officials to replace government rhetoric with positive policy action.

Through this study, we have found the three main factors stalling an increase in rooftop gardens in Hanoi, which are as follows: insufficient training or information about rooftop gardening; the initial costs of establishing rooftop garden infrastructure; and access to enough suitable spaces. We thus propose three pro-rooftop garden policy elements that could—and we think should—be implemented by Hanoi's municipal government (and potentially throughout other cities in Vietnam). Since other Asian cities are already formally encouraging rooftop gardens through some of these policy elements (Hou, 2018; Matthews, 2013), we believe that it is realistic to encourage Vietnamese municipal authorities to take similar steps.

First, since our interviews revealed that gardeners had to rely on multiple different sources of information, it would be positive to centralise such expertise as much as possible. Municipal governments or relevant government ministries (Ministry of Agriculture, Ministry of Health, and the National Institute of Urban and Rural Planning) could create policy leverage, mirroring approaches already undertaken in Singapore (Diehl et al., 2020) and Taipei (Hou, 2018). These government entities could also financially support non-government organisations (NGOs) in Hanoi (such as HealthBridge with whom the authors are collaborating on this topic) to run information campaigns and training opportunities regarding rooftop and, more specifically, hydroponic gardening approaches. Second, given that infrastructure for rooftop gardening, especially hydroponics, can be costly or difficult to find, rooftop gardening could be further encouraged by subsidising hydroponic and other infrastructure needs for the less wealthy and/or offering small cash grants (such as for appropriate soil, seeds, fertilisers, water infrastructure). And third, rooftop gardening ought to be encouraged (preferably rent-free) on vacant rooftops of commercial buildings, educational institutions, and other government buildings. For both private and state-owned rooftops, these gardening rights could be for a pre-designated amount of time, as agreed upon by the building owners and urban gardeners.

Such official support for rooftop food gardens needs to be cross-sectorial, as is already the case in Singapore (Diehl et al., 2020). This approach helps ensure the multifunctionality of urban agriculture in general, and rooftop gardens in particular, including nutritional and health benefits, possible financial income, and broader environmental and sustainability benefits. The latter could include reducing Hanoi's ecological footprint, reducing non-sustainable food transportation, and working to improve urban environmental resilience (Hou, 2018; King, 2008). Local academic institutions, such as the Vietnamese Academy of Agricultural Sciences (VAAS), with whom we are also in discussions, could help persuade the Vietnamese Government of these possible benefits.

While suggesting pragmatic policy recommendations, we are highly cognisant of debates within critical urban political ecology that suggest that doing so fails to advocate for systemic change. However, we argue that entrenched patterns of political power in Vietnam

render the likelihood of "a full-scale urban revolution in our generation" highly unlikely (Pieterse, 2008, p. 131; see also Lawhon et al., 2014), while making even minor policy changes very protracted. It is because of this political context that the everyday practices of Hanoi's urban gardeners, which we have found to be imbued with informal life politics, are providing important alternative ways—at least in the meantime—of delivering safe and clean produce to household kitchen tables.

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CONFLICT OF INTEREST STATEMENT

The authors have no conflicts of interest.

DATA AVAILABILITY STATEMENT

The data are not publicly available due to privacy and ethical restrictions.

ETHICS STATEMENT

This study complies with the Canadian Tri-Council Ethics Policy and gained Research Ethics Board approval at McGill University.

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ENDNOTES

[1] Notable exceptions include work by Ahimaz et al. (2021), Hamdan et al. (2021), and Hamzah et al. (2016) in Malaysia and and Pham Thi Minh Khuyen (2019) and Pham and Turner (2020) in small Vietnamese cities.

[2] Her definition of politics draws on the work of David Runciman: "politics is about the collective choices that shape the way people live, and about the nature of the human interrelationships through which those choices are made" (Morris-Suzuki, 2017a, p. 1).

[3] For instance, the city provided nearly 1000 classes on gardening to over 50,000 residents to encourage citizen participation in the initiative (Hou, 2018).

[4] Elsewhere in northern Vietnam, Pham Thi Minh Khuyen (2019) focused on rooftop gardening in the nearby city of Thái Nguyên.

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