

Urban Agriculture as an Adaptation Strategy in India: Assessing the Role of Policy and Planning Frameworks

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Abstract

Rapid urbanisation in India has intensified challenges related to food security, environmental degradation, climate change, waste management and urban livelihoods. Urban agriculture encompassing kitchen gardens, rooftop farming, community gardens, vertical farming, hydroponics and peri-urban cultivation has emerged as a viable strategy to address these interconnected challenges. This article examines the impact of policy frameworks on the practice of urban agriculture in India and analyses how policies shape adaptation practices in urban settings. It highlights the role of urban planning policies, food security initiatives, environmental and climate policies, livelihood programmes, and technology-driven Smart City missions in enabling or constraining urban agriculture. The study shows that policy recognition enhances adaptive capacity by improving access to land, water, institutional support and innovation, while restrictive zoning laws and regulatory ambiguities limit long-term sustainability. The article further demonstrates that integrated policies linking urban agriculture with waste recycling, water management, livelihood generation and technological innovation strengthen socio-economic and environmental resilience. Overall, the paper argues that coherent and inclusive policy integration is essential for mainstreaming urban agriculture as an effective adaptation strategy and for building sustainable, climate-resilient, and food-secure Indian cities.

Introduction

India is witnessing rapid urbanisation, with a growing proportion of its population residing in cities. This transformation has intensified challenges related to food security, environmental sustainability, waste management, unemployment, and public health. Urban agriculture, the practice of cultivating crops and rearing livestock within urban and peri-urban

areas, has emerged as a promising response to these challenges (Orsini *et al.*, 2013; Zezza & Tasciotti, 2010). It includes kitchen gardens, rooftop farming, community gardens, vertical farming, hydroponics, and peri-urban cultivation.

Climate change has a socio-political dimension with significant impacts on economies. The extent of damage associated with climate-induced events depends largely on social, political, and economic vulnerabilities of individuals and communities (Padgham *et al.*, 2015). For instance, devastation caused by floods is often more severe in populations with weak economic systems and inadequate policy frameworks related to basic social amenities (Thompson & Scoones, 2009).

Despite its potential, urban agriculture in India has historically remained outside formal policy frameworks. Urban planning policies have largely prioritised housing, infrastructure, and industrial growth, often neglecting food production systems within cities (Mukherji & Morales, 2010). However, in recent years, growing concerns over climate change, nutrition insecurity, and sustainable cities have encouraged policymakers to reconsider the role of urban agriculture. Government policies, urban development missions, environmental regulations, and livelihood programmes now increasingly influence how urban agriculture is practiced, supported, or constrained in India (FAO, 2016; Government of India, 2015).

1. Policy Recognition

Urban agriculture has long lacked formal recognition in city master plans and municipal regulations. Most urban development policies classify land strictly into residential, commercial, or industrial zones, leaving little room for agricultural activities (Mukherji & Morales, 2010). However, emerging policy initiatives, such as draft urban agriculture policies in cities like Delhi, seek to integrate food production into urban planning (Dubbeling *et al.*, 2010).

Impact:

- Lack of recognition restricts land access and tenure security for urban farmers (Zezza & Tasciotti, 2010).
- Policy inclusion enables allocation of vacant lands, rooftops, and community spaces for farming (Dubbeling *et al.*, 2010).
- Institutional recognition improves access to municipal support and technical guidance (FAO, 2016).

2. Food Security and Nutritional Outcomes

Urban agriculture policies play a crucial role in strengthening local food systems. Cities depend heavily on distant rural areas for food, making them vulnerable to supply disruptions and price volatility (Zezza & Tasciotti, 2010). Policy support for urban farming can shorten supply chains and enhance availability of fresh, nutritious food (FAO, 2016).

Impact:

- Improved access to fresh vegetables and fruits in low-income urban areas (Orsini *et al.*, 2013).
- Reduction in transportation losses and food waste (FAO, 2016).
- Support to school nutrition programmes and community feeding initiatives (Dubbeling *et al.*, 2010).

3. Environmental Sustainability and Climate Policies

Urban agriculture aligns closely with national and municipal sustainability goals. Policies related to climate change, waste management, and green infrastructure directly influence its growth (Government of India, 2015). Integrating urban agriculture with composting and wastewater reuse policies promotes circular urban economies and climate-resilient cities (Padgham *et al.*, 2015).

Impact:

- Reduction in the urban heat island effect through increased green spaces (Orsini *et al.*, 2013).
- Recycling of organic waste into compost for urban farms (FAO, 2016).
- Enhanced biodiversity and improved air quality (Padgham *et al.*, 2015).

4. Livelihood Generation and Social Inclusion

Policies linked to urban livelihoods significantly affect the expansion of urban agriculture. When integrated with programmes such as the National Urban Livelihoods Mission (NULM), urban farming can generate employment and supplementary income, especially for women, migrants, and informal workers (Government of India, 2015; Zezza & Tasciotti, 2010)

Impact:

- Income generation through sale of produce and value-added products (Zezza & Tasciotti, 2010).
- Empowerment of women and marginalised groups (Dubbeling *et al.*, 2010).
- Strengthening of community bonds through collective farming initiatives (FAO, 2016).

5. Technological Innovation and Smart City Policies

Smart City initiatives and digital agriculture policies encourage the adoption of advanced technologies such as vertical farming, hydroponics, precision irrigation, and sensor-based systems (Government of India, 2015). These innovations allow efficient food production in space-constrained urban settings and enhance adaptive capacity to climate stress (Orsini *et al.*, 2013).

Impact:

- Higher productivity with minimal land and water use. (Orsini *et al.*, 2013).
- Promotion of start-ups and agri-entrepreneurship (FAO, 2016).
- Enhanced resilience against climate variability (Padgham *et al.*, 2015).

Analysis of link between Policy Framework and Adaptation Practices in urban Agriculture in India

Urban agriculture in India has emerged as an important adaptation strategy in response to rapid urbanisation, climate change, food insecurity, and environmental degradation (Padgham *et al.*, 2015). The effectiveness of urban agriculture as an adaptation practice is strongly influenced by the policy framework, which acts as either an enabler or a constraint (Dubbeling *et al.*, 2010).

1. Policy Recognition and Adaptive Capacity

Formal recognition of urban agriculture within urban planning and development policies directly enhances adaptive capacity by encouraging investment in rooftop gardening, community farming, and peri-urban cultivation (FAO, 2016). In contrast, lack of recognition keeps urban agriculture informal and limits innovation (Mukherji & Morales, 2010).

2. Land-Use Policies and Spatial Adaptation

Urban land-use policies determine access to land, which is critical for adaptation. Policies allowing the use of vacant land, public spaces, rooftops, and institutional premises support spatial adaptation to land scarcity (Dubbeling *et al.*, 2010).

3. Water, Waste, and Environmental Policies

Adaptation practices such as rainwater harvesting, wastewater reuse, and composting are closely linked to environmental policies. Integrated policy approaches promote climate-resilient urban agriculture by improving resource efficiency (Padgham *et al.*, 2015; FAO, 2016).

4. Livelihood and Social Protection Policies

Smart City and innovation-oriented policies promote adaptive technologies such as vertical farming and hydroponics, helping urban agriculture respond to space, water, and climate constraints (Government of India, 2015; Orsini *et al.*, 2013).

5. Technology and Innovation Policies

Smart City initiatives and innovation-oriented policies encourage adaptive technologies such as vertical farming, hydroponics, and precision irrigation. These technologies help urban agriculture adapt to constraints like limited space, water scarcity, and climate variability. However, limited policy support for affordability and training can restrict widespread adoption.

Conclusion

Policies play a decisive role in shaping the practice and potential of urban agriculture in India. Where urban planning, sustainability, livelihood, and technology policies align, urban agriculture contributes significantly to food security, environmental resilience, and social inclusion (FAO, 2016; Dubbeling *et al.*, 2010). However, challenges persist due to limited recognition, regulatory ambiguities, and weak institutional support. Strengthening policy integration, ensuring access to land and water, promoting innovation, and raising public awareness are essential to unlock the full potential of urban agriculture in building sustainable and resilient Indian cities (Padgham *et al.*, 2015).

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