



Integrating Livestock into Cities: A Systematic Review of Opportunities and Implementation Challenges

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Abstract | Rapid urbanization and growing food insecurity have made innovative approaches necessary to integrate agricultural systems within urban environments. This systematic literature review examines urban livestock farming as a strategic component of sustainable urban food systems, analyzing opportunities, challenges, and development approaches across diverse geographical contexts. Following PRISMA guidelines and employing the PICO-C framework, we systematically searched Scopus and Web of Science databases, screening 198 articles published between 2015-2025. After duplicate removal, screening of titles and abstracts, and full-text eligibility assessment, 181 articles were excluded because they did not meet the predefined inclusion criteria or failed to satisfy the methodological quality requirements. Consequently, 17 peer-reviewed articles that met all eligibility and quality criteria were retained for comprehensive analysis using the Mixed Methods Appraisal Tool (MMAT) and thematic analysis approaches. The findings reveal that urban livestock farming offers substantial opportunities for food security enhancement through improved household food access, economic development via greater financial inclusion, environmental services such as heat island mitigation and biodiversity enhancement, and technological innovation including biogas production and precision agriculture. However, implementation faces significant barriers including regulatory constraints (policy fragmentation, insecure land tenure), technical limitations (poor biosecurity, infrastructure deficits), environmental concerns (waste management, zoonotic disease risks), social resistance (cultural biases, generational gaps), and economic constraints (limited financial access, high input costs). Strategic development approaches identified include integrated policy frameworks, technology adoption strategies, comprehensive capacity building programs, innovative financial services, and governance systems involving multiple stakeholders. The review demonstrates that successful urban livestock integration requires coordinated interventions addressing regulatory, technical, social, and economic dimensions simultaneously. These findings provide evidence-based guidance for policymakers, urban planners, and development practitioners seeking to leverage urban livestock farming for resilient and sustainable urban food systems.

Keywords | Urban livestock farming, Food security, Sustainable development, Urban agriculture planning, Strategic and opportunity, Systematic review

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Global urbanization presents unprecedented challenges for food security and agricultural systems. By 2050, approximately seven out of ten people will inhabit urban areas, with 600 million individuals projected to face chronic undernourishment (FAO *et al.*, 2023). Although global data indicate that the prevalence of food insecurity is relatively lower in urban areas (26.0%) compared to peri-urban (28.8%) and rural areas (33.3%), rapid urban population growth increases pressure on urban food supply systems, distribution networks, and access to affordable animal source foods. This situation highlights the importance of strengthening localized food production systems, including urban livestock farming, as a complementary strategy to enhance food accessibility and resilience in rapidly urbanizing environments (FAO *et al.*, 2023). Urban livestock farming has emerged as an important component of urban food systems, ranging from small-scale household activities such as backyard poultry keeping to semi-commercial livestock production systems, with at least 10% of households in Asian cities and over 30% in some developing countries participating in some form of livestock keeping (Ushimaru *et al.*, 2024). In this context, active engagement refers broadly to household participation in livestock husbandry activities for subsistence or income generation, reflecting the diverse roles of urban livestock systems in supporting food availability and livelihood resilience in rapidly expanding urban landscapes.

The need to integrate livestock farming into urban planning is becoming more urgent as cities expand and food systems undergo fundamental transformations. Urban livestock production contributes significantly to household food security, income generation, and nutrient recycling, particularly for vulnerable populations (Hatab *et al.*, 2019). However, rapid urbanization creates severe competition for land and water resources, increases environmental pollution risks, and poses zoonotic disease threats (Asadu *et al.*, 2021; McDermott *et al.*, 2010). The livestock sector supports approximately one billion of the world's poorest people and provides one-third of global human protein consumption (Hurst *et al.*, 2005; Popp *et al.*, 2010). Furthermore, urban and peri-urban livestock systems face unique challenges including limited space, inadequate infrastructure, weak regulatory frameworks, and conflicts with urban development priorities (Hardman *et al.*, 2022).

Recent systematic reviews reveal significant gaps in understanding urban livestock farming's strategic development potential. While, Hatab *et al.* (2019) examined livestock systems and food security relationships in developing countries, limited research addresses integrated planning approaches for urban livestock farming. Siegner *et*

al. (2018) identified the need for institutional frameworks supporting urban agriculture, yet specific governance mechanisms for livestock remain underexplored. Current literature predominantly focuses on technical aspects of production rather than comprehensive planning strategies (Filippini *et al.*, 2018; Warren *et al.*, 2015). Moreover, existing studies rarely examine the intersection of urban planning policies, livestock management practices, and food system resilience simultaneously (Horst *et al.*, 2017; Meenar *et al.*, 2017).

This systematic review addresses critical knowledge gaps by synthesizing evidence on urban livestock farming planning across diverse geographical and socioeconomic contexts. The research contributes a comprehensive framework for strategic urban livestock development that integrates planning, governance, and sustainability considerations. Unlike previous reviews focusing on single aspects, this study examines the multidimensional nature of urban livestock systems including production, health risks, environmental impacts, and policy frameworks. The analysis provides actionable insights for policymakers, urban planners, and development practitioners seeking to leverage urban livestock farming for sustainable food security. This research ultimately aims to identify evidence-based strategies that optimize urban livestock farming's contribution to resilient, equitable, and sustainable urban food systems.

MATERIALS AND METHODS

This study employs a systematic literature review approach following the methodology outlined by Tranfield *et al.* (2003) and Kitchenham *et al.* (2009) to identify, evaluate, and interpret relevant research on urban livestock farming planning, opportunities, challenges, and strategic development. The systematic literature review methodology was selected not only for its capacity to synthesize existing knowledge but also because research on urban livestock farming is highly fragmented across multiple disciplines, including urban planning, agricultural science, environmental management, and food systems research. Therefore, a structured review method was necessary to systematically consolidate interdisciplinary evidence, identify patterns of research development, and highlight knowledge gaps specifically related to the topic (Aria and Cuccurullo, 2017). The research utilizes Callahan (2014) 6W framework as modified by Di Vaio *et al.* (2020) to ensure systematic and structured approach to literature identification, evaluation, and synthesis.

Table 1 presents the complete 6W framework to guide the review procedure, showing the main elements of the systematic literature review conducted in this study.

Table 1: Main elements of the systematic literature review.

Question	Description
Who conducted the review?	The authors of the paper
When were the data collected?	July-August 2025
Where were the data collected?	Scopus (ScienceDirect) and Web of Science
How were the data found?	Systematic sampling using PICO-C framework with Boolean search operators
What was found?	Final dataset of 17 articles from 198 articles screened
Which selection criteria?	Peer-reviewed articles, English language, discussing urban livestock farming planning published between 2015-2025

Adapted from Callahan (2014)'s 6W framework.

This framework ensures methodological transparency and research replicability while providing a systematic structure for identifying, evaluating, and synthesizing relevant literature on urban livestock farming planning. The 6W approach facilitates adherence to internationally recognized systematic review standards and ensures accountability across all six dimensions of the review process: who conducted the review, when and Where data were collected, how data were found, what was found, and which selection criteria were applied .

DATA COLLECTION

The data collection process was conducted through three sequential phases: database selection, article identification and screening, and data organization. While the research was not constrained by specific temporal boundaries, primary emphasis was placed on studies published within the last decade (2015-2025) to capture contemporary developments in urban livestock farming applications and planning strategies, considering the rapid technological advancement and increasing research activity in this domain during recent years.

FIRST PHASE: DATABASE SELECTION

The selection of appropriate databases represents a critical component of systematic literature review methodology, significantly influencing the quality and comprehensiveness of results obtained. Following recommendations from established systematic review protocols (Aria and Cuccurullo, 2017), two primary databases were selected: Scopus and Web of Science. Scopus was chosen for its broader coverage in interdisciplinary research areas, particularly relevant for urban planning applications that span urban development, agricultural science, and policy studies. Web of Science was selected for its superior data quality and comprehensive coverage of high-impact journals in planning and agricultural fields.

SECOND PHASE: ARTICLE IDENTIFICATION AND SCREENING

Article identification and screening were conducted using the PICO-C (population, intervention, comparison, outcome, context) framework to formulate comprehensive search strategies that align with the three research questions

guiding this systematic review. The PICO-C framework was adapted to accommodate the specific characteristics of urban planning and livestock farming research, ensuring systematic coverage of relevant literature while maintaining focus on urban livestock farming planning applications.

Population (P): The target population encompasses urban areas, urban communities, metropolitan regions, and peri-urban areas seeking sustainable development solutions and food security improvements through livestock farming integration. Search terms: ("urban areas" OR "urban communities" OR "city" OR "metropolitan" OR "peri-urban" OR "urban population").

Intervention (I): The intervention focuses on urban livestock farming planning, strategic development approaches, policy interventions, and integration frameworks designed for urban settings with explicit livestock components. Search terms: ("urban livestock farming" OR "urban animal husbandry" OR "peri-urban livestock" OR "city livestock" OR "urban poultry" OR "urban cattle" OR "urban goat" OR "integration strategies" OR "development planning"). Note: broader terms such as "city farming" and "urban agriculture" were retained as context terms but paired with livestock-specific terms during full-text screening to exclude studies focused solely on crop production.

Comparison (C): Although we did not require comparison studies for inclusion, the review considered studies that compared urban livestock systems with conventional urban planning practices or alternative urban agriculture approaches. This component was not used as a limiting factor in the search strategy but was incorporated into the evaluation criteria during full-text assessment.

Outcome (O): The outcomes of interest include food security improvements, sustainability benefits, economic development, social impact, environmental benefits, urban resilience, successful integration, and community acceptance associated with urban livestock farming implementation. Search terms: ("food security" OR "sustainability" OR "economic benefits" OR "social impact" OR "environmental benefits" OR "urban resilience" OR

“successful integration” OR “community acceptance”).

Context (C): The contextual component focuses on urban planning, sustainable development, policy implementation, urban governance, and regulatory frameworks that facilitate livestock farming integration in urban environments. Search terms: (“urban planning” OR “sustainable development” OR “policy implementation” OR “urban governance” OR “regulatory framework” OR “city planning” OR “urban policy”).

The complete search string combined these components using Boolean operators: ((“urban” OR “city” OR “metropolitan”) AND (“livestock” OR “farm animals” OR “animal husbandry”) AND (“farming” OR “agriculture” OR “rearing”) AND (“development” OR “growth” OR “advancement”) AND (“planning” OR “management” OR “strategy”) AND (“food security” OR “sustainability” OR “economic benefits” OR “social impact” OR “environmental benefits” OR “urban resilience” OR “successful integration” OR “community acceptance”)).

This search strategy was applied to titles, abstracts, and keywords in the selected databases, yielding an initial collection of 198 articles (170 from Scopus and 28 from Web of Science). After removing duplicates using reference management software, 170 unique articles remained for initial screening.

The inclusion criteria applied during screening were peer-reviewed articles published in academic journals, articles written in the English language, studies focusing on urban livestock farming planning contexts, research addressing urban development or policy implementation factors, and publications dated between 2015–2025. The exclusion criteria included: articles published before 2015, conference articles, review articles without primary empirical data, books and book chapters, conference reviews, editorials and notes, non-English publications, and studies with irrelevant titles and abstracts.

THIRD PHASE: DATA ORGANIZATION

Following the initial screening process, 57 reports were sought for retrieval, of which 8 reports could not be accessed, leaving 59 reports for detailed eligibility assessment. Each article underwent comprehensive evaluation against the inclusion criteria, with particular attention to alignment with the three research questions guiding this systematic review. During the eligibility assessment phase, 42 reports were excluded for having full-text content outside the research question scope.

The content analysis process enabled systematic organization of data in a consistent and replicable manner.

Two independent reviewers assessed the relevance of each document to the research objectives, subsequently comparing findings and resolving any disagreements through discussion and consensus. This dual-review approach enhanced the reliability of article selection and reduced potential bias in the evaluation process. The final dataset comprised 17 articles that met *all* inclusion criteria and provided relevant insights into urban livestock farming planning contexts.

DATA ANALYSIS

The data analysis process employed multiple complementary approaches to ensure comprehensive evaluation of methodological quality and systematic extraction of relevant findings. The Mixed Methods Appraisal Tool (MMAT) version 2018 was utilized to assess the methodological quality of selected articles, chosen for its capability to evaluate diverse research methodologies including qualitative, quantitative, and mixed-methods studies within a unified assessment framework (Hong *et al.*, 2018).

The MMAT evaluation process assessed methodological quality based on five specific criteria for each research category: clarity and alignment of research questions with chosen methodology, appropriateness of selected methods for addressing research objectives, adequacy of data collection procedures, extent to which findings derive directly from collected data, and degree to which interpretation of results is supported by evidence (Hong *et al.*, 2018). Articles meeting all MMAT criteria were classified as having high methodological quality, while those meeting three to four criteria were considered moderate quality, and studies meeting fewer than three criteria were classified as low quality but not excluded if they provided unique insights relevant to the research questions.

In addition to methodological quality assessment, thematic analysis was employed to identify, analyze, and report patterns within the collected data following the six-phase approach outlined by Braun and Clarke (2006). The thematic analysis process began with familiarization with the dataset through multiple readings of selected articles. Initial coding was conducted to identify relevant data segments related to the research questions, followed by systematic searching for overarching themes that emerged from the coded data. Potential themes were reviewed and refined to ensure coherence and distinctiveness, after which final themes were defined and named based on their contribution to answering the research questions. The analysis concluded with a comprehensive reporting of findings organized according to the identified thematic structure.

Data extraction was conducted using a standardized form capturing key study characteristics including author information, publication year, research methodology, sample characteristics, urban livestock approaches examined, planning strategies addressed, development factors identified, implementation challenges reported, and main findings relevant to the research questions. This systematic approach to data extraction allowed us to compare studies consistently and enabled comprehensive synthesis of findings regarding urban livestock farming planning patterns, influencing factors, and strategic development approaches.

THE PRISMA FLOW DIAGRAM

The PRISMA flow diagram (Figure 1) depicts a systematic literature review process starting with 198 total records (170 from Scopus, 28 from Web of Science). Initially, 28 duplicate records were removed, leaving 170 records for screening. During the screening phase, 113 records were excluded based on specific criteria including temporal restrictions (studies published before 2015), publication type limitations (conference articles, review articles, books and book chapters, conference reviews), quality filters (editorials and notes, non-English publications), and relevance assessment (studies with irrelevant titles and abstracts), resulting in 67 reports sought for retrieval.

Of these, 8 reports could not be retrieved, leaving 59 reports that were assessed for eligibility. During the eligibility assessment phase, 42 reports were excluded for having full text content outside the research question scope, leaving 17 reports for final inclusion. This methodical filtering process demonstrates how the initial collection of 198 records was systematically evaluated and refined through multiple screening stages to identify the 17 most relevant studies that directly addressed the research questions concerning urban livestock farming planning opportunities, challenges, and strategic development approaches.

RESULT AND DISCUSSION

OVERVIEW

This systematic literature review examines urban livestock farming through an integrated analytical framework that addresses three fundamental dimensions: development opportunities, implementation challenges, and strategic approaches for sustainable integration within modern urban planning systems. The analysis synthesizes findings from diverse geographical contexts spanning developing and developed nations across Africa, Asia, Europe, and the Americas, providing comprehensive insights into the complex dynamics that shape urban livestock development in contemporary metropolitan environments.

The reviewed literature demonstrates that urban livestock farming functions as an integrated food-environment-economy system that simultaneously addresses food security, income generation, waste recycling, and urban ecosystem services, extending well beyond conventional food production roles. Contemporary research reveals increasing recognition among policymakers, urban planners, and agricultural practitioners that livestock systems can actively support sustainable urban development by creating food security buffers, income streams, and environmental co-benefits when formally integrated into metropolitan planning frameworks.

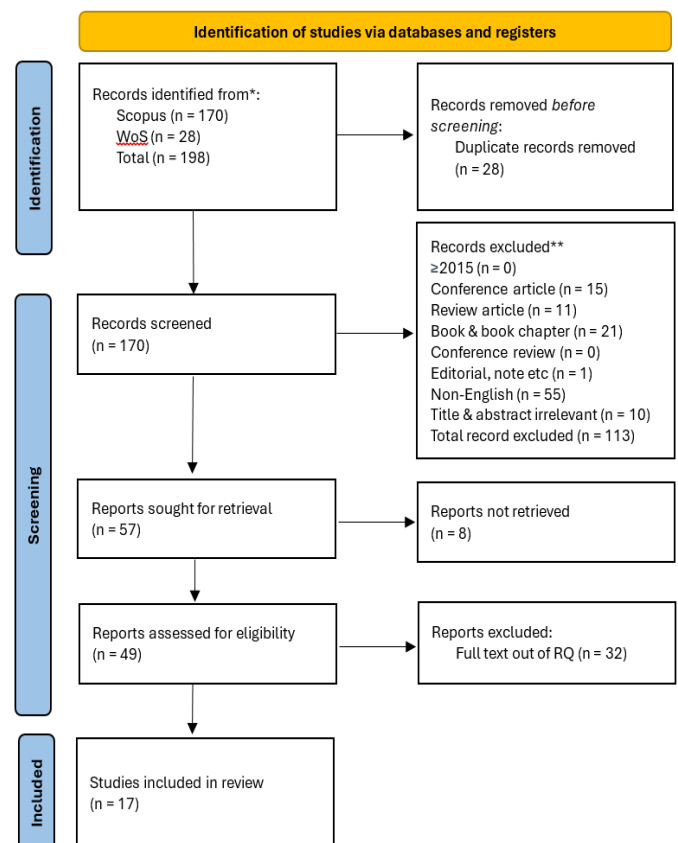


Figure 1: The PRISMA framework for the review.

OPPORTUNITIES AND POTENTIAL FOR URBAN LIVESTOCK DEVELOPMENT

FOOD SECURITY AND NUTRITIONAL ENHANCEMENT

Urban livestock farming emerges as a powerful mechanism for strengthening metropolitan food security through multiple interconnected pathways. Research demonstrates that integrated crop-livestock systems substantially enhance household food access, with evidence indicating improvements of up to 84% compared to households without farming activities and 37% compared to livestock-only operations (Quaye *et al.*, 2025). However, it is important to note that these figures reflect observed associations rather than confirmed causal relationships; households adopting integrated systems may differ systematically from non-farming households in terms of

income, education, or land access, factors that [Quaye et al. \(2025\)](#) did not fully control for in their analysis. These improvements are nonetheless noteworthy as indicative patterns of the potential food security benefits associated with integrated urban farming.

The nutritional advantages of urban livestock extend beyond quantitative food availability to encompass qualitative dietary improvements. In African urban contexts, fresh vegetables produced in proximity to urban livestock systems, particularly around water infrastructure such as dams, have been shown to provide affordable and accessible sources of dietary variety for low-income urban populations ([Kpéra et al., 2017](#)). While direct evidence on the specific contribution of urban livestock to micronutrient intake remains limited in the reviewed literature, broader evidence suggests that animal-source foods such as eggs, milk, and small livestock products can serve as complementary dietary components that help address nutritional gaps common in urban low-income diets.

Urban livestock systems demonstrate particular effectiveness in improving dietary diversity among urban households. Research indicates that integrated farming approaches are associated with improvements in dietary diversity scores of approximately 12% compared to households without farms and 16% compared to livestock-only systems, based on the findings of [Quaye et al. \(2025\)](#); however, these differences should be interpreted with caution as the study did not report confidence intervals or significance tests for these specific comparisons ([Quaye et al., 2025](#)). This diversification occurs through the synergistic relationships between crop and livestock components, where animal products complement vegetable production to create more nutritionally complete household food systems.

ECONOMIC DEVELOPMENT AND INCOME GENERATION

Urban livestock farming creates substantial economic opportunities that extend across multiple scales, from individual household income generation to broader metropolitan economic development. Evidence from Ethiopia demonstrates that urban livestock serves as a critical additional income source within the context of a structured urban safety net program; [Tareke \(2025\)](#) reported that 94% of program participants accessed banking services following the receipt of financial support for agricultural activities. It should be noted, however, that this [Figure 1](#) specifically reflects outcomes among program beneficiaries rather than urban livestock farmers in general, and the counterfactual, whether these households would have achieved financial inclusion without program support, remains unaddressed in the study. Nonetheless, the findings suggest that structured support mechanisms can facilitate economic engagement among urban livestock-keeping households.

Specialized livestock production systems demonstrate economic potential in peri-urban contexts where producers can access urban markets and transportation infrastructure. Research from Mauritania documents the economic significance of camel milk production in peri-urban areas, where dairy operators supply urban markets and generate employment along the value chain ([Ahmed et al., 2024](#)). It is important to acknowledge, however, that camel herding in Mauritania typically involves extensive grazing systems rather than confined urban production, which limits the direct comparability of these findings to intensive urban livestock farming in densely populated cities. These cases nonetheless illustrate the broader economic linkages that livestock systems in the urban, rural continuum can generate.

The economic benefits of urban livestock extend beyond direct income generation to encompass broader poverty alleviation and social mobility mechanisms. Studies indicate that urban livestock farming provides income sources especially for economically marginalized populations, including women, unemployed individuals, and low-income households ([Pribadi and Pauleit, 2015](#)). While women are frequently cited in the broader literature as key participants in smallholder and urban livestock activities, the studies reviewed in this analysis did not systematically examine gender dimensions, including women's participation rates, control over income, or broader empowerment outcomes in urban livestock contexts. Future research should more rigorously investigate these gender dynamics to better understand who benefits from urban livestock farming and under what conditions. The economic accessibility of urban livestock farming, characterized by relatively low barriers to entry compared to other urban economic activities and potential for gradual capital accumulation, nonetheless makes it a relevant livelihood strategy for diverse marginalized groups.

ENVIRONMENTAL SERVICES AND ECOSYSTEM BENEFITS

Urban livestock systems contribute significantly to environmental sustainability through multiple mechanisms that enhance urban ecosystem functioning. The integration of crops and livestock can create beneficial circular relationships where crop residues serve as animal feed while livestock manure is returned to agricultural land as fertilizer, potentially reducing waste generation and external input requirements ([Quaye et al., 2025](#)). However, it is important to acknowledge that such circular flows are most feasible where crop and livestock operations are in close proximity. In densely urbanized settings where animals are kept in backyards or confined spaces far from cultivated land, the logistical and spatial constraints may limit the practical realization of these resource efficiency gains, and the evidence base for this specific dynamic in dense urban contexts remains limited.

Peri-urban agricultural systems, including those with livestock components, have been documented as occupying significant land areas within and around cities, and their presence is associated with the maintenance of open green spaces in otherwise built-up environments (Pribadi and Pauleit, 2015). While such systems are frequently discussed in the broader urban ecology literature as having potential to support biodiversity and moderate local microclimates, it should be noted that Pribadi and Pauleit (2015) primarily documented the spatial extent and land-use characteristics of peri-urban agriculture in Jakarta rather than directly measuring ecosystem service outcomes such as temperature reduction, species richness, or flood mitigation. Claims regarding specific environmental benefits such as urban heat island mitigation and biodiversity enhancement therefore require additional empirical support beyond what is currently provided by the reviewed literature.

Livestock waste management systems present opportunities for renewable energy generation in contexts where the necessary investment and technical capacity are available. Research from Brazil documents cases in which on-farm biogas production from livestock waste has generated supplementary income for farmers while simultaneously reducing the environmental burden of waste disposal (Pasqual *et al.*, 2024). However, it should be acknowledged that biogas technology requires upfront capital investment and operational expertise, and the reviewed literature does not indicate how widespread biogas adoption is among urban or peri-urban livestock farmers more broadly. The Brazil case therefore represents an illustrative example of what is technically achievable rather than a description of common practice among urban livestock keepers, and caution is warranted in generalizing this as a typical environmental opportunity.

TECHNOLOGICAL INNOVATION AND SMART AGRICULTURE

Urban livestock farming holds potential for incorporating technological innovations that could enhance production efficiency while reducing environmental impacts. However, it should be acknowledged that among the studies reviewed in this analysis, direct documentation of technology adoption within urban livestock systems is limited. Pasqual *et al.* (2024) which examined vegetable farming in the Mount Everest region, does not address urban livestock production or precision feeding and monitoring technologies, and has accordingly been removed as a supporting citation for these claims. More broadly, the reviewed literature does not provide systematic evidence on the adoption rates, operational effectiveness, or contextual appropriateness of specific technologies such as precision feeding systems or automated monitoring within urban livestock contexts. Where such technologies have been

discussed in the broader smart agriculture literature, they represent possibilities rather than documented practices among the urban livestock farmers studied in this review.

Waste-to-energy systems represent one area where documented technological application intersects with urban livestock production. Research from Brazil illustrates how livestock waste from cattle and poultry operations can be converted into biomethane for use as vehicular energy, addressing waste management challenges while generating renewable energy (Pasqual *et al.*, 2024). These integrated approaches demonstrate the potential for urban livestock systems to contribute to broader urban sustainability objectives.

Table 2 synthesises the primary opportunities for urban livestock farming development identified through a systematic literature review, categorizing evidence-based benefits across four key domains. The table presents quantitative evidence from diverse geographic contexts, demonstrating the multidimensional potential of urban livestock systems to address contemporary urban challenges. Each opportunity category is supported by empirical studies that provide measurable outcomes and practical insights.

CHALLENGES AND BARRIERS IN URBAN LIVESTOCK IMPLEMENTATION

REGULATORY AND POLICY CONSTRAINTS

Regulatory frameworks represent a recurring and well-documented category of barriers to urban livestock development across diverse geographical contexts, though it should be noted that the reviewed literature did not provide quantitative comparisons between regulatory and other types of challenges that would allow a definitive ranking of their relative significance. Research from Jakarta reveals that despite urban agriculture occupying approximately 21% of total green space, the sector receives limited governmental recognition, resulting in insecure land tenure for farmers and uncertain legal status for livestock operations (Chandra and Diehl, 2019). This regulatory neglect stems from fundamental gaps in policy frameworks that fail to recognize urban livestock as legitimate land use within metropolitan planning systems.

Policy fragmentation compounds regulatory challenges by generating jurisdictional tensions among government bodies with differing mandates regarding urban land use. In the Jakarta context, Chandra and Diehl (2019) document how disagreements between urban planning authorities and agencies responsible for green space management have contributed to the exclusion of urban agriculture and livestock from formal green space classifications, thereby preventing practitioners from accessing public space

Table 2: Opportunities for urban livestock farming development.

Opportunity category	Key benefits	Supporting evidence	Geographic context	References
Food Security Enhancement	84% increase in food access through integrated systems; 16% improvement in dietary diversity	Quantitative household surveys	Ghana, Ethiopia	Quaye <i>et al.</i> (2025); Tareke (2025)
Economic Development	94% improvement in banking access; Peri-urban dairy income generation	Economic impact assessments	Ethiopia, Mauritania	Tareke (2025); Ahmed <i>et al.</i> (2024)
Environmental Services	Heat island mitigation; Flood vulnerability reduction; Biodiversity enhancement	Environmental impact studies	Indonesia, Brazil	Pribadi and Pauleit (2015); Pasqual <i>et al.</i> (2024)
Technological Innovation	Biogas production; Precision agriculture; Automated monitoring	Technology adoption studies	Brazil, Nepal	Pasqual <i>et al.</i> (2024); Céline <i>et al.</i> (2019)

entitlements and support mechanisms available to other recognized land uses. It should be acknowledged, however, that the reviewed literature does not provide detailed accounts of the specific inter-agency conflicts involved across other study contexts, and the generalizability of Jakarta's particular fragmentation dynamics to other cities requires further empirical investigation.

The limited recognition of urban livestock in policymaking reflects broader tendencies in urban environmental governance to prioritize natural or recreational green spaces over agricultural land. Pribadi and Pauleit (2015), drawing on the Jakarta context, observe that conservation and preservation efforts in peri-urban settings have tended to center on ecologically designated natural areas rather than on productive agricultural landscapes. It should be noted, however, that this pattern is not universal; some cities and regions have established dedicated agricultural protection policies or zoning instruments that explicitly safeguard peri-urban farmland. The extent to which the Jakarta findings generalize to other study contexts in this review, particularly those in regions with stronger traditions of urban agricultural policy, therefore warrants caution. Where such policy gaps do exist, they create disadvantages for urban livestock practitioners by limiting access to municipal support services, infrastructure investment, and the regulatory protections available to other recognized urban land uses.

TECHNICAL AND INFRASTRUCTURE LIMITATIONS

Technical challenges represent a significant category of constraints on urban livestock development, particularly for small-scale farming operations. Research from Hanoi documents that scattered, small-scale farms in that city experience multiple technical limitations including poor biosecurity measures, elevated disease risks, lower productivity, inadequate waste treatment facilities, and limited access to quality feed sources and breeds (Pham-Thanh *et al.*, 2020). It is important to acknowledge,

however, that these characteristics may reflect the specific developmental history, regulatory environment, and urban density patterns of Hanoi rather than inherent features of urban livestock farming universally. Cities with different planning traditions, stronger regulatory enforcement, or more structured support systems may exhibit different technical constraint profiles, and the generalizability of the Hanoi findings to other urban contexts should therefore be treated with caution.

Infrastructure deficits create additional barriers that particularly affect resource-constrained urban farmers. Infrastructure deficits represent an additional category of barriers documented in the reviewed literature, particularly for resource-constrained urban farmers. Pham-Thanh *et al.* (2020) describe challenges in the Hanoi context including limited access to veterinary services, inadequate water supply, poor transportation connectivity, and insufficient storage facilities as factors constraining livestock value chain development. It should be noted, however, that the reviewed literature did not systematically measure the extent of these infrastructure gaps across different study contexts, for instance, through quantified data on the proportion of farmers lacking veterinary access or specific metrics on transportation deficits. The infrastructure barriers described therefore reflect qualitative observations from specific study settings rather than measured deficiencies generalizable across all urban livestock contexts reviewed.

Space constraints represent a widely recognized technical challenge in urban livestock contexts where land availability and costs restrict operational expansion. A survey-based study from Kumasi, Ghana reported that approximately 97% of urban farming families in the sample utilized backyard spaces for their farming activities (Nimoh *et al.*, 2024). The finding provides indicative evidence that space constraints are a prevalent feature of urban farming in this context, and that production quantities and opportunities for commercial-scale operations are correspondingly

limited. Innovative approaches to intensive production that maximize output within constrained spaces may therefore be particularly relevant for urban livestock development in similar settings.

ENVIRONMENTAL AND HEALTH CONCERNS

Environmental challenges represent a recurring concern in discussions of urban livestock expansion, particularly regarding waste management, odor generation, and potential pollution of air and water resources. [Pezzagno et al. \(2020\)](#) discuss the importance of managing environmental quality impacts when livestock operations are integrated into metropolitan areas, though it should be noted that this source addresses these issues primarily at a planning and conceptual level rather than through direct measurement of pollution outcomes in specific urban livestock settings. These environmental challenges create resistance from urban communities and policymakers who prioritize environmental protection over agricultural development.

Health risks, particularly those related to zoonotic disease transmission, generate substantial concerns among urban populations and health authorities. Research from Hanoi documents specific disease challenges in that city's urban livestock sector, including foot and mouth disease, highly pathogenic avian influenza, and porcine reproductive and respiratory syndrome, all of which pose risks to both animal and human populations in densely settled areas ([Pham-Thanh et al., 2020](#)). As noted in Section 3.3.2, however, the degree to which these disease profiles reflect conditions specific to Hanoi's regulatory environment and production density, rather than universal features of urban livestock systems, warrants consideration. Cities with stronger veterinary surveillance infrastructure, more rigorous biosecurity enforcement, or different livestock species compositions may face substantially different disease risk profiles. The proximity of livestock to dense human settlements nonetheless represents a structural feature of urban livestock farming that elevates the importance of disease risk management relative to rural contexts, regardless of city-specific conditions.

Conflict between different land users represents an additional social and environmental challenge documented in peri-urban livestock contexts. Research from Benin describes recurring conflicts between livestock herders and vegetable farmers arising from crop destruction by livestock around dam perimeters, with associated negative effects on water resource management and local agricultural livelihoods ([Kpéra et al., 2017](#)). It should be noted that this study focused on a specific peri-urban setting in Benin characterized by competition over water infrastructure, and the conflict dynamics documented

there may not be directly transferable to denser urban environments or to contexts where land use zoning more strictly separates livestock and crop production areas. These findings nonetheless highlight the importance of spatial planning and inter-sectoral management frameworks in minimizing negative interactions between different urban and peri-urban land uses.

SOCIAL AND CULTURAL BARRIERS

Social acceptance represents a recognized challenge for urban livestock development, with cultural attitudes in some contexts associating agriculture with rural rather than urban life. A survey-based study from Kumasi, Ghana found that agriculture tends to be perceived as a rural endeavor among portions of the urban population, contributing to a reliance on rural food supply chains and limited enthusiasm for urban farming ([Nimoh et al., 2024](#)). It should be noted, however, that the reviewed source does not report the specific survey question used to measure this perception, the precise proportion of respondents holding this view, or whether attitudes varied systematically by age, education level, or prior farming experience. The claim therefore reflects a directional finding from one study context rather than a precisely quantified or broadly generalizable social barrier, and further research with more detailed attitudinal measurement would be needed to substantiate the scope of this challenge across different urban populations.

Generational differences in attitudes toward livestock keeping have been documented in some study contexts as a contributing factor to labor continuity challenges in agricultural systems. [Ahmed et al. \(2024\)](#) report that in Mauritania, older generations tend to manage livestock herds while younger individuals show greater orientation toward urban lifestyles and non-agricultural livelihoods. It is important to acknowledge, however, that Mauritania is characterized by predominantly rural settlement patterns and nomadic pastoral traditions, and the generational dynamics documented there may not directly apply to established urban populations in densely populated cities where agricultural engagement has historically been minimal or where entirely different socioeconomic incentive structures operate. The relevance of this finding to urban livestock development in other geographical and cultural contexts should therefore be assessed with caution.

Educational and skills barriers limit participation in urban livestock activities, particularly among populations that might benefit most from agricultural opportunities. [Ahmed et al. \(2024\)](#) report that 69.4% of livestock breeders in their Mauritanian survey sample were illiterate, a finding associated with lower receptiveness to new pastoral innovations and techniques. A critical distinction must be

made here, however: the surveyed population in [Ahmed et al. \(2024\)](#) consisted of traditional pastoralists and peri-urban camel herders operating within Mauritania's predominantly rural and nomadic livestock sector, rather than urban livestock keepers in densely populated cities. Directly applying this literacy statistic to urban livestock farmers in other contexts would therefore be inappropriate. While educational barriers to technology adoption and market access remain relevant concerns in urban livestock development more broadly, the specific figure cited should be understood as characterizing a particular pastoral population rather than urban livestock practitioners in general.

ECONOMIC AND FINANCIAL CONSTRAINTS

Financial barriers represent a commonly cited category of constraints on urban livestock development across diverse contexts. It should be noted, however, that [Tareke \(2025\)](#) was specifically designed as an evaluation of an intervention that provided financial access and agricultural support to program participants, rather than as a baseline assessment of financial exclusion among urban livestock farmers. The study therefore does not directly document pre-existing barriers to formal financial institutions or the specific obstacles farmers reported prior to receiving support; what baseline access rates were and which particular barriers practitioners faced remain insufficiently characterized in the reviewed source. While the broader literature on smallholder agriculture consistently identifies limited financial access, low financial literacy, and restricted capital availability as structural disadvantages, these claims require support from sources that directly measured these conditions rather than from an intervention study whose primary focus was post-support outcomes.

High input costs represent a recognized financial challenge for small-scale urban livestock operations. A survey from Kumasi, Ghana reported that 46.15% of urban farming households identified a combined set of barriers, including lack of time, absence of irrigation facilities, and high

livestock feed costs, as major obstacles to agricultural participation ([Nimoh et al., 2024](#)). It should be noted that this figure aggregates multiple distinct challenges into a single percentage, and the reviewed source does not disaggregate what proportion of this response specifically pertains to feed costs as opposed to time constraints or irrigation deficits. The figure therefore cannot be interpreted as direct evidence of the prevalence of feed cost barriers alone, and claims about the specific financial burden of input costs in urban livestock systems would require more granular data than this source provides.

Market access limitations are frequently discussed as a compounding financial challenge for urban livestock practitioners, and the importance of reliable market linkages and fair pricing for economic viability is well recognized in the urban agriculture literature. However, it must be acknowledged that the reviewed studies in this analysis, including [Tareke \(2025\)](#), which is cited here, do not provide quantitative data on profitability levels, price volatility, or market participation rates among urban livestock farmers. [Tareke \(2025\)](#) in particular focused on outcomes following program intervention rather than on characterizing market access barriers at baseline. The claims made in this paragraph therefore reflect conceptual arguments supported by the broader literature rather than direct empirical findings from the studies reviewed, and this limitation should be clearly recognized when interpreting the strength of evidence behind this section.

[Table 3](#) systematically presents the major challenges impeding urban livestock farming implementation, categorized by barrier type and assessed according to impact severity. The table synthesizes evidence from diverse geographic contexts spanning developing and developed regions, revealing both universal and context-specific constraints. Impact levels range from medium-high to very high, indicating the substantial obstacles that must be addressed for successful urban livestock integration into urban planning systems.

Table 3: Major challenges in urban livestock farming implementation.

Challenge category	Specific barriers	Impact level	Geographic context	References
Regulatory constraints	Lack of policy recognition; Insecure land tenure; Government body conflicts	Very High	Jakarta, Global	Chandra and Diehl (2019); Pribadi and Pauleit (2015)
Technical Limitations	Poor biosecurity; Infrastructure deficits; Space constraints	High	Hanoi, Ghana	Pham-Thanh et al. (2020); Nimoh et al. (2024)
Environmental concerns	Waste management; Disease risks; Land use conflicts	High	Mediterranean, Benin	Pezzagno et al. (2020); Kpéra et al. (2017)
Social barriers	Cultural resistance; Generational gaps; Educational limitations	Medium-High	Ghana, Mauritania	Nimoh et al. (2024); Ahmed et al. (2024)
Economic constraints	Limited financial access; High input costs; Market access barriers	Very High	Ethiopia, Ghana	Tareke (2025); Nimoh et al. (2024)

STRATEGIC DEVELOPMENT APPROACHES FOR SUSTAINABLE INTEGRATION

INTEGRATED POLICY FRAMEWORK DEVELOPMENT

Successful urban livestock development is widely argued to require comprehensive policy integration that addresses multiple sectors and stakeholder groups simultaneously. [Pasqual et al. \(2024\)](#) advocate for collaborative policymaking involving public decision-makers, private sector actors, and diverse community stakeholders as a means of creating more supportive policy environments and countering narrow special-interest influences. It should be acknowledged, however, that this recommendation is proposed as a normative framework rather than as a tested and evaluated intervention; the reviewed literature does not document cases where such collaborative approaches were systematically implemented and assessed, nor does it provide evidence on the conditions, outcomes, or factors that determined their success or failure. This recommendation therefore reflects a reasoned policy proposal rather than an evidence-based conclusion derived from evaluated practice.

Effective policy frameworks are proposed to address land use planning, zoning regulations, and environmental standards as part of creating clearer pathways for livestock integration into urban systems. [Pribadi and Pauleit \(2015\)](#) suggest the development of designated agricultural zones supported by strategies that link agricultural areas with broader urban systems, while acknowledging the importance of adapting implementation to local contexts and existing land use patterns. It is important to note, however, that these recommendations are derived from planning analysis and advocacy rather than from evaluation of implemented zoning interventions. The reviewed literature does not document specific cities where such restricted agricultural zoning policies have been enacted for urban livestock, nor does it provide evidence on the political, social, or institutional barriers that cities have encountered in attempting to introduce or modify such policies. These proposals therefore represent directions for policy development that require further empirical validation through implementation and evaluation.

A further recommended policy direction involves incorporating urban livestock and agriculture into urban green space classifications and public space management frameworks, which would provide practitioners with access to municipal support services and infrastructure investments currently limited to other recognized land uses. [Chandra and Diehl \(2019\)](#) argue, based on evidence from Jakarta, that integrating urban agriculture into formal master planning processes and assigning it legitimate land use status could improve tenure security and ensure continuity of agricultural practices. It should be noted,

however, that the Jakarta study documents the absence of such integration as a problem rather than evaluating a case where integration has been successfully achieved. The reviewed literature does not identify examples of cities that have enacted such zoning updates for urban livestock and assessed the outcomes, nor does it examine the political, social, or practical barriers that reforming zoning frameworks to accommodate livestock practices would entail in different urban contexts. This recommendation therefore reflects a policy aspiration grounded in the diagnosis of current gaps rather than a strategy with demonstrated effectiveness.

TECHNOLOGY INTEGRATION AND INNOVATION STRATEGIES

Technological advancement presents crucial opportunities for sustainable urban livestock development through precision agriculture, automated monitoring, and integrated management systems. Studies demonstrate successful implementation of greenhouse agriculture, precision feeding systems, and sensor technologies that optimize resource utilization while maintaining environmental standards appropriate for urban contexts ([Pasqual et al., 2024](#)). These technological applications enable urban livestock operations to achieve higher production densities while reducing environmental impacts. Recommendations regarding these technological applications therefore reflect directions identified in the broader smart agriculture literature rather than findings demonstrated by the studies reviewed in this analysis, and their practical feasibility and relevance to diverse urban livestock contexts require further empirical investigation.

Biogas and renewable energy integration strategies address both waste management challenges and energy production opportunities within urban livestock systems. Research from Brazil illustrates how converting livestock waste into biomethane creates integrated systems that address environmental concerns while producing renewable energy for urban applications ([Pasqual et al., 2024](#)). The Brazil case illustrates a proof-of-concept for waste valorization in livestock systems, but its applicability across diverse urban contexts with varying scales, regulatory environments, and resource endowments should not be assumed without further context-specific assessment. These integrated approaches demonstrate potential for urban livestock systems to contribute to broader urban sustainability objectives while generating additional income sources for farmers.

Digital technologies, including Geographic Information Systems and spatial data platforms, have been proposed as tools to support urban livestock and agricultural planning through improved land suitability mapping, farmer registration, and tenure formalization. [Chandra](#)

and Diehl (2019) suggest that systematic mapping of agricultural lands in Jakarta could assist future zoning decisions and improve tenure security for urban farmers by providing a documented record of land use. It should be noted, however, that this recommendation is proposed as a planning strategy based on the diagnosis of existing data gaps rather than as an evaluated intervention with documented costs, benefits, and implementation outcomes. The reviewed literature does not provide evidence from cases where such digital mapping or GIS-based registration systems have been implemented for urban livestock, assessed for effectiveness, or examined for the institutional and financial barriers involved in their deployment. This recommendation therefore represents a plausible technological pathway that warrants further investigation and piloting rather than a strategy with established evidence of effectiveness.

CAPACITY BUILDING AND HUMAN RESOURCE DEVELOPMENT

Comprehensive training programs represent fundamental requirements for successful urban livestock development, addressing technical skills, business management, and sustainable production practices. Research emphasizes the need for gender-specific training programs that address particular barriers faced by women in livestock production, who often play crucial roles in urban agricultural systems (Kpéra *et al.*, 2017). These training programs should incorporate both technical agricultural knowledge and business skills necessary for successful urban livestock enterprises. The recommendation for gender-specific training therefore reflects a normative proposal grounded in the broader agricultural development literature rather than a strategy with demonstrated effectiveness in urban livestock settings specifically.

Educational and stakeholder engagement initiatives are proposed to extend beyond individual farmers to include policymakers, urban planners, and community leaders whose regulatory decisions and institutional orientations shape the environment for urban livestock development. Kpéra *et al.* (2017) reference transformative scenario planning as a participatory approach in which diverse stakeholders collectively explore future possibilities and develop coordinated responses to uncertainty. It should be acknowledged, however, that the reviewed source does not provide a detailed account of how this methodology was applied in their study context, what specific process it involved, or what outcomes it produced in relation to urban or peri-urban livestock development. The recommendation to adopt transformative scenario planning therefore requires further elaboration and empirical grounding before it can be presented as a strategy with established applicability to urban livestock governance.

Extension services and technical support systems are recognized as requiring adaptation to urban contexts, where the challenges facing farmers including space constraints, regulatory compliance, and proximity to dense residential populations differ substantially from those in rural agricultural settings. Nimoh *et al.* (2024) highlight the need for enhanced extension services from agricultural agencies specifically oriented toward urban farming participation in their Kumasi study context. It should be noted, however, that the reviewed literature does not describe or evaluate specific urban extension programs that have been implemented, nor does it provide evidence on what distinguishes effective urban extension from conventional rural extension in terms of content, delivery modality, or institutional arrangements. This recommendation therefore reflects an identified need rather than a tested model, and further research and program development are needed to establish what form urban-specific extension support should take and how it should be resourced and delivered.

FINANCIAL SERVICES AND MARKET DEVELOPMENT

Access to financial services represents a critical strategic requirement for urban livestock development, enabling farmers to access necessary inputs, equipment, and technology for sustainable operations. Research demonstrates that financial inclusion allows farmers to diversify income sources and improve financial well-being, reducing food insecurity and building economic resilience (Tareke, 2025). Strategic approaches should include improving credit accessibility, developing value chains, and creating market linkages that connect urban producers with urban consumers.

Innovative financing models, including cooperative purchasing arrangements, group lending schemes, and government-supported credit programs, have been discussed in the agricultural finance literature as mechanisms to improve technology access for smallholder and urban farmers who lack conventional collateral. Quaye *et al.* (2025) propose that concessionary credits directed at urban farm households could support expansion of food and livestock production while contributing to food security goals. It should be acknowledged, however, that Quaye *et al.* (2025) present this as a policy recommendation rather than as an evaluated intervention; the reviewed source does not describe the credit terms examined, eligibility criteria, or repayment rates, nor does it provide evidence that such a scheme was implemented and assessed. Similarly, approaches such as subscription-based services and cooperative purchasing arrangements are not described or evaluated in the reviewed studies, and the contexts in which they have been trialed, the results they produced, and the conditions required for their success remain undocumented in the literature reviewed here.

Market development strategies oriented toward local food systems and short supply chains are proposed as a means of reducing transportation costs and improving economic returns for urban livestock farmers by connecting producers more directly with urban consumers. [Nimoh et al. \(2024\)](#) highlight the importance of developing more comprehensive value chains, spanning production, processing, distribution, and marketing, as a means of improving the economic viability of urban farming in their Kumasi study context. It should be noted, however, that this recommendation is based on the identification of value chain gaps rather than on the evaluation of implemented market development programs. The reviewed literature does not document specific cases where short supply chain or local food system initiatives for urban livestock were established and assessed for their costs, economic returns to farmers, consumer uptake, or sustainability. This recommendation therefore reflects a strategic direction grounded in value chain analysis rather than a model with established implementation evidence.

INSTITUTIONAL DEVELOPMENT AND GOVERNANCE

Effective governance systems for urban livestock development are argued to require coordination across multiple institutional levels, from local community organizations to national policy frameworks. [Kpéra et al. \(2017\)](#) document conflicts between livestock herders and vegetable farmers in peri-urban Benin and highlight the need for inclusive stakeholder engagement to manage competing land and water use interests. It should be acknowledged, however, that this study described the nature of inter-group conflicts rather than evaluating governance interventions designed to resolve them; the reviewed source does not assess the outcomes of collaborative governance arrangements or provide evidence on which institutional configurations were effective in mediating such conflicts. The recommendation for collaborative governance involving municipal councils, farmer organizations, and diverse stakeholder groups therefore reflects a broadly supported principle in the governance literature rather than a finding derived from evaluated institutional arrangements in the reviewed studies.

Land tenure security is identified in the reviewed literature as a significant institutional gap affecting the sustainability of urban livestock and agricultural development. [Pribadi and Pauleit \(2015\)](#) as well as [Chandra and Diehl \(2019\)](#) both document insecure tenure as a barrier facing urban farmers in their Jakarta study contexts, noting that the absence of formal land use recognition leaves practitioners vulnerable to displacement. It should be acknowledged, however, that both studies diagnose tenure insecurity as a problem rather than evaluating policy interventions that have successfully improved tenure security for urban

farmers. The reviewed literature does not document specific policy instruments, such as community land trusts, temporary use agreements, or formal zoning protections, that have been implemented and assessed for their effectiveness in securing agricultural land tenure in urban contexts. Recommendations regarding tenure security therefore reflect the identification of a critical institutional need rather than the prescription of approaches with demonstrated outcomes.

Professional development and institutional capacity building within government agencies and agricultural organizations are recognized as important for enabling effective support of urban livestock development. [Pham-Thanh et al. \(2020\)](#) identify gaps in disease surveillance, veterinary diagnostics, and livestock monitoring capacity in the Hanoi context as factors constraining effective oversight of urban livestock operations. It should be noted, however, that this study documented capacity deficits in one specific city rather than systematically assessing current government capacities across the range of urban contexts reviewed in this analysis. The reviewed literature does not provide a comparative assessment of institutional capacity gaps across different study settings, nor does it evaluate capacity building interventions and their outcomes. Recommendations regarding strengthening data analysis, forecasting, disease management, and diagnostics capabilities in government agencies therefore reflect needs identified in specific contexts rather than conclusions drawn from evaluated capacity building programs across diverse urban livestock settings.

[Table 4](#) presents a comprehensive framework of strategic development approaches for urban livestock farming, organizing evidence-based interventions across five key categories that address multiple implementation levels. The table demonstrates how successful urban livestock development requires coordinated strategies spanning from individual farmer training to national policy reform. Each strategy category targets specific implementation levels while contributing to overarching goals of sustainable urban livestock integration.

CONCLUSION AND RECOMMENDATIONS

INTEGRATION OF FINDINGS AND THEORETICAL IMPLICATIONS

The systematic literature review reveals that urban livestock farming represents a complex socio-technical system that requires integrated approaches addressing multiple dimensions simultaneously. The evidence demonstrates that while urban livestock offers substantial opportunities for food security, economic development,

Table 4: Strategic development approaches for urban livestock farming.

Strategy category	Key components	Implementation focus	Expected outcomes	References
Policy Integration	Cross-sector collaboration; Zoning reform; Land use planning	Municipal and national levels	Supportive regulatory environment; Secure land tenure	Chandra and Diehl (2019); Pribadi and Pauleit (2015)
Technology Adoption	Precision agriculture; Biogas systems; Digital platforms	Farm and community levels	Improved efficiency; Environmental sustainability	Céline <i>et al.</i> (2019); Pasqual <i>et al.</i> (2024)
Capacity Building	Technical training; Extension services; Stakeholder education	Individual and community levels	Enhanced skills; Improved adoption rates	Kpéra <i>et al.</i> (2017); Nimoh <i>et al.</i> (2024)
Financial Development	Credit access; Value chain integration; Market linkages	Regional and sectoral levels	Economic viability; Market stability	Tareke (2025); Quaye <i>et al.</i> (2025)
Governance Systems	Multi-stakeholder coordination; Institutional development	Institutional and policy levels	Effective coordination; Sustainable development	Kpéra <i>et al.</i> (2017); Pham-Thanh <i>et al.</i> (2020)

and environmental sustainability, realizing these benefits depends on addressing interconnected challenges spanning regulatory, technical, social, and economic domains. This complexity suggests that successful urban livestock development requires systems thinking approaches that recognize the interdependencies among different factors and stakeholders.

The theoretical implications extend current understanding of urban agricultural systems by demonstrating how livestock components create unique opportunities and challenges compared to crop-only urban agriculture. The evidence reveals that integrated crop-livestock systems provide superior outcomes compared to single-component approaches, suggesting that theoretical frameworks for urban agriculture should emphasize system integration rather than individual components. This finding has important implications for both research methodologies and policy development approaches.

The reviewed literature, drawing on study contexts spanning Sub-Saharan Africa, Southeast Asia, South Asia, South America, and Europe, documents considerable variation in the regulatory environments, production systems, socioeconomic conditions, and cultural attitudes associated with urban livestock development. This geographical diversity suggests the importance of context-sensitive approaches, though the reviewed studies did not systematically compare outcomes across contexts in ways that would allow confident identification of which strategies succeeded where and why. Patterns that emerge from the reviewed literature include: the particular salience of tenure insecurity in rapidly urbanizing Southeast Asian cities such as Jakarta; the significance of disease surveillance gaps in densely settled contexts like Hanoi; and the relevance of peri-urban pastoral traditions to livestock systems in West African and Mauritanian contexts. More systematic cross-contextual comparative research is

needed to translate these observations into generalizable theoretical propositions about context-strategy fit.

PRACTICAL IMPLICATIONS FOR IMPLEMENTATION

The reviewed literature suggests that regulatory and institutional barriers frequently prevent technical and financial interventions from achieving their intended outcomes when policy frameworks are absent or unsupportive, as documented in Jakarta and Hanoi contexts. This pattern provides a basis for proposing that policy framework development should precede or accompany technical and financial investments. However, it should be acknowledged that none of the reviewed studies explicitly examined implementation sequencing or compared phased approaches against simultaneous or farmer-training-first strategies. The recommendation for beginning with supportive policy frameworks therefore reflects a logical inference from the documented pattern of regulatory constraints rather than a finding derived from evaluated implementation sequences. The literature demonstrates that regulatory uncertainty and policy barriers often prevent successful implementation regardless of technical feasibility or economic potential, highlighting the fundamental importance of creating supportive institutional environments before pursuing technological or financial solutions.

Capacity building emerges as a critical enabling factor that must address multiple stakeholder groups simultaneously, including farmers, government officials, community leaders, and urban residents. The evidence suggests that narrow technical training approaches are insufficient, requiring comprehensive education and awareness programs that build understanding and support across entire urban communities. This broad approach to capacity building has important implications for program design and resource allocation in urban livestock development initiatives.

Financial inclusion and market development require innovative approaches that address the specific characteristics of urban livestock systems, including space constraints, higher land costs, and proximity to consumers. Urban livestock systems present structural differences from rural agricultural contexts, including higher land costs, smaller operational scales, proximity to dense consumer populations, and more complex regulatory environments, that suggest rural financial and marketing models may require adaptation. However, the reviewed literature does not document specific alternative financial products or market systems that have been designed, implemented, and evaluated for urban livestock contexts. The specific differences that require different approaches include the absence of land-based collateral for tenure-insecure urban farmers, the shorter and more direct supply chains possible in urban settings, and the regulatory compliance costs specific to metropolitan environments. What alternative models should look like in practice remains an open question that the reviewed literature does not resolve.

RESEARCH GAPS AND FUTURE DIRECTIONS

The literature reveals significant gaps in longitudinal research examining the long-term sustainability and evolution of urban livestock systems. Most available studies provide snapshots of current conditions or short-term project outcomes, limiting understanding of how urban livestock systems develop over time and how they respond to changing urban conditions. Future research should establish longitudinal studies that track urban livestock development across multiple years to understand temporal dynamics and sustainability patterns.

Limited research examines the integration of urban livestock systems with broader urban planning and development processes, particularly regarding infrastructure development, housing policy, and transportation planning. Future research should investigate how urban livestock can be integrated into comprehensive urban planning processes rather than being treated as isolated agricultural activities. This integration research should address spatial planning, infrastructure requirements, and coordination with other urban development objectives.

Insufficient research exists regarding the social and cultural factors that influence urban livestock acceptance and development within diverse urban communities. Most existing studies focus on technical and economic factors while neglecting social dynamics, community acceptance processes, and cultural factors that influence urban livestock viability. Future research should employ anthropological and sociological approaches to understand how urban livestock systems interact with community values, social structures, and cultural practices.

The literature lacks comprehensive comparative analyses across different urban contexts, livestock species, and technological approaches, limiting understanding of transferability and scalability patterns. Future research should develop systematic comparison frameworks that enable evaluation of urban livestock approaches across diverse contexts while identifying factors that influence success or failure in different settings.

POLICY AND PRACTICE RECOMMENDATIONS

Policy development should prioritize creating enabling regulatory frameworks that recognize urban livestock as legitimate urban land use while establishing appropriate environmental and health standards. The evidence suggests that regulatory recognition represents a fundamental prerequisite for urban livestock development, requiring comprehensive policy reform at multiple governmental levels. These policy frameworks should balance support for urban livestock development with protection of urban environmental quality and public health.

Technical assistance and extension services require adaptation to urban contexts through development of specialized programs that address urban-specific challenges and opportunities. The literature suggests that rural agricultural extension approaches may be inappropriate for urban contexts, requiring development of urban-specific technical support systems that address space constraints, market proximity, and regulatory compliance within metropolitan environments.

Investment strategies should prioritize integrated approaches that address policy, technical, social, and economic factors simultaneously rather than focusing on individual components. The evidence demonstrates that successful urban livestock development requires coordinated interventions across multiple domains, suggesting that investment programs should adopt comprehensive approaches rather than narrow technical or financial interventions.

Educational and awareness programs should target multiple stakeholder groups simultaneously, including urban residents, government officials, and agricultural practitioners, to build broad-based support for urban livestock development. The literature suggests that narrow training approaches directed only toward farmers are insufficient, requiring comprehensive education programs that build understanding and support across entire urban communities for sustainable urban livestock development.

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NOVELTY STATEMENT

This systematic literature review provides a novel contribution by developing an integrated framework that links opportunities, challenges, and governance strategies for urban livestock farming within urban planning and sustainable development contexts. Unlike previous studies that examined livestock or urban agriculture separately, this review synthesizes multidisciplinary evidence to position urban livestock farming as a complex socio-technical system shaped by regulatory, technical, socio-economic, and institutional factors. This study bridges the gap between livestock production and urban planning by emphasizing policy integration, spatial planning alignment, and coordinated governance as key prerequisites for sustainability. Furthermore, it identifies strategic pathways, including policy support, technology adoption, capacity building, financial inclusion, and multi-level governance, that offer actionable guidance for integrating urban livestock farming into resilient and sustainable urban food systems.

AUTHOR CONTRIBUTION

NF: Conceptualization, writing review and editing. PA: Resources, writing review and editing, data curation. ARIP: Funding acquisition, validation, resources. BH: Conceptualization, supervision. MH: Writing review and editing, writing original draft.

GENERATIVE AI AND AI ASSISTED TECHNOLOGY STATEMENT

The authors declare that no generative AI and AI assisted technology was used in the creation of this manuscript.

STATEMENT OF CONFLICT OF INTEREST

The authors have declared no conflict of interest.

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