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GRANTEE EXPERIENCE REPORT

Indo-German Centre for Sustainabilty (IGCS)
IGCS Research Exchange, Grant Period 2023

research brief

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Research Brief from IGCS Grant Period 2023

IGCS Grantee

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Research Topic

Spatial Dimensions of Urban Agriculture in India and Germany: A Comparative Study Between Bengaluru and Aachen Cities

Starting/End date of the student exchange period

01.06.2023 – 30.08.2023

About the IGCS Grants

IGCS awards scholarships to students and researchers from India and Germany with excellent academic records, very good English, and intercultural communication skills. The scholarship consists of a mobility grant and an accommodation grant according to DAAD funding rates, as a rule. Learn more about the funding opportunities at IGCS here.

Research Brief from IGCS Research Exchange, Funding Period 2023

This study delves into the role of urban agriculture in promoting sustainable urban development, aligning with the 11th Sustainable Development Goal of the United Nations to create sustainable cities and communities by 2030. With 178 nations committed to this objective, the research focuses on the specific contexts of Bengaluru city, India, and Aachen city, Germany, to understand the dynamics of urban agriculture.

Examining two decades of land use data and seasonal agricultural calendars (2003–2023), the study compares Bengaluru and Aachen cities, revealing distinct agricultural patterns influenced by urbanization, culture, and climate. Bengaluru city, in a tropical climate, showcases year-round production of diverse fruits and vegetables to meet regional culinary preferences. Aachen city, with a temperate climate, specializes in temperate crops, aligning with customary seasonal changes.

The socioeconomic characteristics of urban agriculture practitioners in both cities were analyzed, revealing diverse age groups, educational backgrounds, occupations, and income levels. Despite this diversity, common motivations for urban agriculture emerged, including revenue generation, environmental sustainability, community development, and food availability. Notably, most participants reported profitability or minimal losses, indicating the viability of urban agriculture in both locations.

The research findings have significant implications for sustainable urban development, emphasizing the importance of preserving green spaces, adopting sustainable agriculture techniques, and implementing smart land use planning amid increasing urbanization. Urban agriculture emerges as a practical solution to address nutritional challenges, enhance community resilience, and generate additional income in urban settings.

The study uncovers surprising connections between the pace and pattern of urban expansion in Bengaluru and Aachen cities. Bengaluru city experienced unprecedented urban growth, resulting in a substantial reduction in agricultural land and vegetation. In contrast, Aachen city exhibited measured and steady urban development with relatively mild losses of open space and agricultural areas. These differences underscore the need for flexible urban planning approaches tailored to specific metropolitan environments.

There exist certain scientific limitations when studying the spatial dimensions of urban agriculture in Bengaluru and Aachen cities. Bengaluru, with its expansive geographical area of 741 sq.km and a sizable population of 8,495,492, poses unique challenges compared to Aachen, which encompasses a smaller geographical area of 160.85 sq.km and sustains a lower population of 265,967. Additionally, Bengaluru, as a developing city, faces constraints concerning technological knowledge and environmental awareness in urban agriculture, unlike Aachen, a

developed city equipped with advanced technological advancements. Moreover, as a researcher, while I am an insider within Bengaluru city, I am an outsider in Aachen city. These interpersonal circumstances may significantly influence the study's outcomes. Nonetheless, efforts are made to mitigate these limitations to elevate the study's quality. Importantly, this comparative study offers valuable insights into urban agricultural practices, fostering knowledge exchange between developed and developing nations, facilitating technological transfers, and contributing towards achieving the Sustainable Development Goals (SDGs) through international partnerships.

Aligned with the UN Sustainable Development Goals, the research underscores the crucial role of urban agriculture in achieving sustainable urban development. The findings emphasize the necessity for inclusive and sustainable measures to ensure resilient and thriving cities and communities by 2030. Furthermore, they advocate for the integration of urban agriculture into urban planning frameworks as a key component of sustainable development strategies.

Research Questions:

1. How the spatial pattern of urban agriculture varies in Bengaluru and Aachen cities?
2. How the temporal pattern of urban agriculture has been dynamism in Bengaluru and Aachen cities?
3. How far the comparative analysis of urban agriculture in Bengaluru city and Aachen city provides insights to enhance sustainability of urban communities?

The specific objectives/aims of the present study are:

1. To compare the spatial pattern of urban agriculture in Bengaluru and Aachen cities.
2. To analyse the temporal dynamics of urban agriculture in Bengaluru and Aachen cities.
3. Compare and contrast the characteristics of urban agriculture in Bengaluru and Aachen cities towards sustainable cities and communities.

Project developments – including deviations from the original plan, failures, and problems encountered with project organization or technical execution.

The original plan outlined a comparative study of urban agriculture practices in India and Germany. However, challenges arose swiftly, notably with time constraints and language barriers hindering the collection of primary data in Germany. Consequently, I opted to focus on a single city in each country to navigate these limitations effectively.

Moreover, technical difficulties emerged during the installation of necessary GIS software on my laptop, prompting a shift in my study approach. Seeking guidance from both Indian and German supervisors, extensive discussions led to the overhaul of my proposal. Through their invaluable insights, I refined my research objectives and revised the title to accommodate these adjustments.

Ultimately, I pivoted towards conducting an in-depth review of urban agriculture literature. Subsequently, I conducted field research in Bengaluru city, India, and Aachen city, Germany. This phase involved engaging with stakeholders, community members, subject experts, and local farmers to gather comprehensive primary data, aligning with the modified research direction.

Results and discussion of the research situation in this context, potential perspectives for application, and conceivable follow-up research.

1. Comparative analysis of urban agriculture in Bengaluru and Aachen cities.

- *Spatial Patterns and Study Locations:*

Bengaluru's decentralized urban agriculture encompasses diverse spaces like terraces, yards, and balconies, fostering community-driven initiatives for promoting nutritious food. In contrast, Aachen adopts a centralized and business-oriented model, with community and allotment gardens serving as primary cultivation spaces.

- *Composition, Types, and Seasonal Patterns:*

A seasonal calendar delineates cultivation periods, highlighting the impact of climate on planting, mid-season, and harvesting. Aachen's April-November cultivation aligns with milder temperatures, whereas Bengaluru's tropical climate allows year-round agriculture.

- *Comparison of Crops:*

Climate disparities result in diverse crops; Aachen cultivates temperate vegetables and fruits like zucchini, fennel, and apples, while Bengaluru focuses on tropical produce such as bitter gourd, mangoes, and guavas. Both cities cultivate common crops adaptable to regional climates.

- *Factors Influencing Cultivation:*

Climate, soil quality, and cultural preferences dictate crop choices. Aachen's temperate climate favors apples, while Bengaluru's warm environment supports tropical fruits. Soil conditions and cultural inclinations also impact crop selection, along with agricultural techniques and resource availability.

- *Seasonal Calendar Overview:*

Bengaluru's tropical climate allows year-round agriculture, ensuring a consistent food supply, while Aachen's seasonal approach aligns with its temperate climate, necessitating strategic planning for successful cultivation during warmer months.

Conclusion:

This comparative analysis underscores how climate, culture, and local preferences significantly shape urban agriculture. Bengaluru's continuous cultivation contributes to a diverse food culture, while Aachen's seasonal approach fosters community engagement and healthy lifestyles. The comparison emphasizes agriculture's adaptability to regional factors, showcasing the diversity emerging from aligning agricultural practices with unique environmental and cultural contexts.

2. Analyse the temporal dynamics of urban agriculture in Bengaluru and Aachen cities.

- *Overview of Temporal Dynamics in Urban Agriculture:*

The study assesses the temporal shifts in land use from 2003 to 2023 in Bengaluru city, India, and Aachen city, Germany, employing satellite imagery to categorize land into distinct types. The focus lies on "Built up," "Agriculture," "Vegetation," "Water," and "Others," highlighting significant trends impacting urbanization, agriculture, and environmental sustainability.

- *Bengaluru City Land Use Evolution:*

In Bengaluru, a drastic surge in urban sprawl is evident as the "Built up" category expanded from 32.97% to 66.76% over two decades. Conversely, agricultural lands shrunk significantly from 45.05% to 13.88%, while vegetation decreased from 16.55% to 9.76%. This decline poses environmental concerns despite consistent "Water" bodies, accompanied by a notable rise in the "Others" category, indicating diverse land use challenges.

- *Urbanization in Aachen City:*

Similarly, Aachen city experienced considerable urban growth, with the "Built up" area increasing from 35.38 sq.km to 58.08 sq.km. Agricultural lands, vegetation, and water bodies also declined, emphasizing environmental implications. An increase in the "Others" category denotes varied land use changes, stressing the necessity for sustainable urban design in Aachen to balance expansion and ecological preservation.

- *Impact on Agricultural Lands:*

Both cities faced a decline in agricultural lands, impacting both percentage and total area. Aachen's agricultural lands reduced from 72.18 sq.km to 68.12 sq.km, while Bengaluru witnessed a substantial decrease from 319.32 sq.km to 98.38 sq.km. These trends pose threats to urban agriculture, emphasizing the study's focus on food security, local produce availability, and the resilience of urban food systems.

- *Role of Urban Agriculture in Sustainability:*

Urban agriculture contributes significantly to biodiversity, air quality improvement, and mitigation of urban heat island effects, promoting environmental sustainability. Additionally, it fosters community engagement, solidarity, and education on sustainable living practices. The analysis advocates for integrated urban planning strategies to preserve agricultural spaces within cities, encouraging policies supporting community and terrace gardens to counter negative urbanization effects on agricultural lands.

- *Urgent Need for Strategic Urban Planning:*

In conclusion, the study emphasizes the pressing need for strategic urban planning to safeguard agricultural spaces. Encouraging innovative urban agriculture practices becomes pivotal in ensuring food security, addressing environmental impacts, and building resilient urban food systems. The focus on policies supporting sustainable land use and agricultural practices serves to tackle challenges arising from rapid urbanization in both Bengaluru and Aachen cities.

3. Compare and contrast the characteristics of urban agriculture in Bengaluru and Aachen cities towards sustainable cities and communities.

- *Socioeconomic Dynamics in Bengaluru's Urban Agriculture:*

- Participant Diversity: In Bengaluru, urban agriculture involves a diverse participant spectrum, spanning professionals, housewives, and individuals from various industries, showcasing a broad societal engagement.
- Age and Gender Representation: Medium and senior adults dominate participation, with a smaller representation from the early adult category. Gender parity exists, albeit with a slightly higher male presence.
- Educational and Occupational Diversity : A vast array of educational backgrounds is observed, with 85% holding degrees. Occupations range from engineering to real estate and baking, demonstrating a varied professional landscape. Economic Insights
- Income and Investments: Monthly earnings among participants vary significantly, ranging from Rs. 46,000 to Rs. 1,50,000, reflecting a diverse socioeconomic spectrum. Initial investments range from Rs. 500 to Rs. 2,50,000.
- Savings and Expenses: Participants report monthly savings between Rs. 500 to Rs. 8000, with additional expenses ranging from Rs. 100 to Rs. 2000, indicating diverse economic impacts.

- *Terrace Gardening's Impact:*

- Health and Lifestyle Benefits:Terrace gardening positively influences mental and physical health, acting as a stress-reliever and enhancing lifestyle quality.
- Produce Quality and Lifestyle Enhancement: Homegrown produce is deemed superior in quality and taste, contributing to an improved lifestyle and energy levels among participants.

- *Motivation and Community Structure:*

- Inclusivity and Goals: Urban agriculture in Bengaluru fosters inclusivity and community engagement, driven by motivations like food security, self-sufficiency, and environmental sustainability.
- Community Interaction: A strong community structure is evident, facilitated by WhatsApp groups and events, enabling knowledge sharing and robust community interaction.

- *Socioeconomic Insights in Aachen's Urban Agriculture:*

- Recreational Focus: Aachen participants predominantly engage in urban agriculture as a recreational hobby, with a focus on community interaction.
- Age and Gender Distribution: A significant portion falls within the early adult category, followed by medium adults, with equal gender participation.

- *Economic Impacts and Community Engagement:*

- Income Diversity and Goals: Monthly incomes range between €2001 and €5000, emphasizing personal interest, community growth, and environmental sustainability as primary motivators.
- Emphasis on Community Gardens: Aachen's community gardening initiatives underscore strong community engagement and collaborations, fostering community solidarity.

- *Comparative Analysis Insights:*

- Socioeconomic Variances: Bengaluru's urban agriculture aligns with socioeconomic goals and income generation, while Aachen focuses more on recreational gardening and environmental sustainability.
- Common Goals and Engagements: Both cities demonstrate a commitment to sustainable urban development, with shared motivations for food security, self-sufficiency, and environmental responsibility.
- Community Dynamics: While Bengaluru leverages technology for community engagement, Aachen emphasizes physical community gardens and active initiatives.
- Economic and Motivational Differences: Bengaluru's participants engage in organic production for income generation, whereas Aachen's focus is more on hobby-based urban agriculture.

Concluding Insights:

- Diverse Contributions to Sustainability: Bengaluru and Aachen contribute uniquely to sustainable urban development through urban agriculture, showcasing diverse roles and motivations.
- Importance of Contextual Understanding: The comparative analysis emphasizes the influence of local context and socioeconomic factors in shaping urban agriculture practices, highlighting the need for tailored approaches in each locality.

Who has contributed to the results achieved by the project (national/international partners, project staff, etc.)?

- *National Contributions:*

Prof. Jayashree P (Department of Geography, Manasagangothri Campus, Mysuru): Played a significant role in the project's success within the geographical domain at a national level, likely providing valuable expertise, guidance, or research support.

- *International Contributions*

IGSC Fund Release: Offered support, potentially in terms of finances or resources, contributing to the project's achievements through international collaboration or funding.

Prof. Martina Fromhold-Eisebith (Chair of Economic Geography, Aachen, Germany): Made a noteworthy contribution to the Research outcomes, presumably offering expertise, guidance, or research support within the geographical domain, representing international involvement.

Qualification in the context of your project

As a faculty member in the Department of Geography at Bangalore University, I aspire to elevate my scientific expertise through a post-doctoral degree. In pursuit of this goal, I have chosen to collaborate with IGCS, Germany, for my post-doctoral research.

As a part of my post doctoral degree on “Spatial Dimensions of Urban Agriculture in India and Germany: A Comparative Study Between Bengaluru and Aachen Cities”, A porstion of my research work is carried out in Aachen city which facilitated to do comparitive study of Urban Agriculture in Delveoped Country like germany and Developing country like India.

Expected Research Publication Outcomes of the Post Doctorate Programmer

I have four forthcoming publications resulting from this post-doctoral program. These four manuscripts title follow:

1. Socio-Economic Characteristics of Farmers Engaging on Urban Agriculture in Aachen City, Germany and Bengaluru City, India. (this article mainly focused with qualitative interviews)
2. Urban agriculture: Composition, Characteristics, types and seasonal patterns in Bengaluru City, India, and Aachen City, Germany. (this article mainly focused with qualitative interviews)
3. The utilization of Space and time for Urban Agriculture: Comparative study between Aachen City, Germany and Bengaluru City, India. (this article mainly focused with qualitative interviews and secondary data sources)
4. Comparison of Urban agriculture Between Developing and Developed country: A Literature analysis between Bengaluru city, India and Aachen city, Germany. (this article mainly focused with Desk Literature Paper)