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Original Research

Exploring the Feasibility of Urban Agriculture in Context of Delhi City

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Abstract
As urban issues are on a rise, urban agriculture seems like an alleviating measure to an extent in theory. This has been successfully incorporated in some of the Indian cities albeit in a small scale. Delhi, being the capital of India, does not live up to an environmental mark with its population density, resource scarcity and high degree of pollution. This paper explores the context within a specific study area in Delhi and analyses the existing shortcomings that are not allowing the urban agriculture to happen and further identifies that there is strong possibility of urban agriculture in Delhi if incorporated at a policy level and at commercial level.

Keywords:urban agriculture, Delhi, urban gardening, urban farming

Introduction

As noted by the United Nations Environment Programme in a recent report, there are several health, social, and economic benefits of promoting urban agriculture in cities. It can help combat climate change, biodiversity loss, pollution, and waste. Urban farming produces foods closer to consumers, thus reducing carbon emissions tied to transport and storage, improving access to nutritious foods, and enhancing resilience in food systems(UNEP, 2022).

The adoption of circular practices by food systems and in cities at large is plausible where effective governance ensures health care for people and security from environmental effects.

According to Census of 2011, India's population rose to 1.21 billion people over the last 10 years — an increase by 181 million. Urbanization is taking place at a faster rate in India. Population residing in urban areas in India, according to 1901 census, was 11.4%. This count increased to 28.53% according to 2001 census, and crossing 30% as per 2011 census, standing at 31.16%(Census-2011, 2011). As the human population is gradually increasing, there is a growing need for sustainable practices, especially within agriculture. People are migrating towards urban areas posing a major concern on city and its agriculture production.

Agriculture is a major component of the Indian and Delhi economy. It accounts for 17% of the National GDP and 50% of the workforce(MoAFW, 2017). India spends approximately $10 billion each year on malnutrition (World Bank Group), and even then, the government of India cannot provide the everyday nutritional requirements to everybody in India. Resources are limited everywhere. Thus, unless we can develop a technology that would enable us to live on just one grain of wheat, the population increase remains a serious problem in India especially in terms of agriculture and availability of food.

A solution for this issue is being found in the form of Urban Agriculture (UA) i.e. producing food in accessible spaces of an urban city. In India UA is being practiced in a few urban communities including Hyderabad, Mumbai, Kolkata, Bengaluru and Chennai under the administration of government and private offices as well as on domestic scale(Zimmermann-Loessl & Rai, 2022). Ministry of Human and Urban Affairs is helping individuals achieve urban agriculture. Delhi, however, is way behind in adapting even the baby steps towards urban agriculture. This paper brings forward a solution based approach towards incorporating UA in Delhi through a methodology of mixed methods which consequently led to the identification of lacunae,

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scope and potential that confirmed that urban agriculture is clearly a practically feasible option in the context of Delhi.

Methodology

Study design: A descriptive, cross-sectional survey was used to gather data. The study was undertaken during September 2020 during the COVID 19 lockdown in India.

Study setting: The residents of an area within a common type of urban context of Delhi is chosen in this regard. This area is within the yellow boundary as shown in the figure below and is known as the Bala Sahib Gurdwara Complex.This chosen complex is adjacent to the DND road in Siddharth Nagar Area of New Delhi roadand is used as a backdrop to understand the community opinions and willingness to propose urban agriculture. In this regard, several pertinent parameterssuch as that of natural and infrastructure resource, community skill and knowledge were established from grey literature. The same is detailed below.

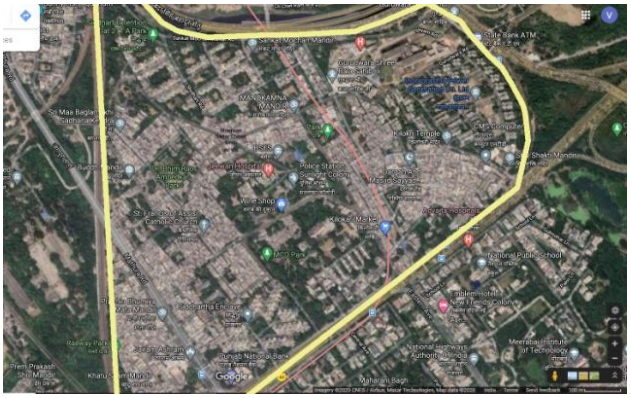

Figure:1 Bala Sahib Gurudwara Complex (area within the yellow line of demarcation). Source Google Earth

The area enclosed within the yellow line is the Bala Sahib Gurudwara complex. More than 70% of the site area has been constructed and the only open space is available in the form of parks which exist in small pockets and are required for recreational activities. There is no pattern to the built-open spaces and a large area to conduct any form of agriculture activity is not available consistently. The only way to do agriculture activity is by incorporating it in the existing built infrastructure.

The site is the combination of various different land uses. The commercial complex consists of ground floor shops over which people have built their houses over the years. The service sector comprises of a secondary police station, hospital, fire station, BSES office, Delhi Jal Board and few banks and a government school. The school is the only space where urban agriculture can be incorporated while all the spaces need the open area for clear movement and the terraces have been utilized for other purposes that have immerged over the years such as storage or additional room space.

Figure: 2 Urban zones within study area . Figure generated by Vidushi Agarwal

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The government residential colony is a four floor RCC building with terraces available for urban agriculture activities. Many terraces though have been converted into small rooms and given up for rent. The illegal construction colony is a five floored building with zero to none building gap. People live even on terraces and the balconies are not more than 2sq.m at any place. There is no fixed building height for the housing as people have built continuous floors over the years without following any rules and norms so many have enclosed balconies and turned them into rooms, small rooms have been built on the terrace and either have been merged with the floor on lower level or have been given away for rent.

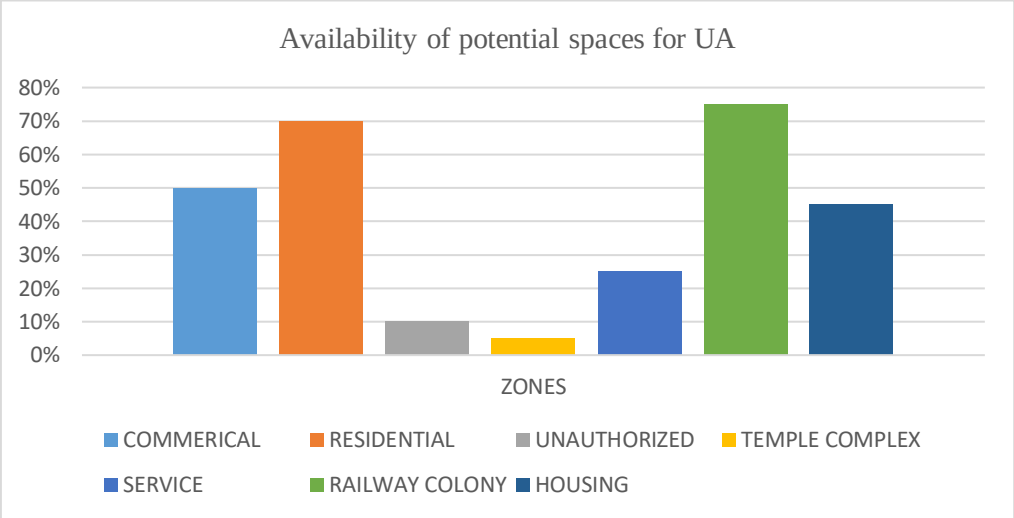

Figure 3 Availability of potential spaces for Urban Agriculture within the study area. Figure generated by Vidushi Agarwal

Availability of water in the premises of households living in planned colonies is reported at 78% compared to just 51% in slums(USAID, 2016). This suggests that water supply sources are being shared among households in the slums(USAID, 2016). Observations during the field study confirmed this, showing community level taps shared between 10 and 30 households(USAID, 2016). Water was observed to be available for 1 to 2 hours of water supply(USAID, 2016). It takes 35% of households more than one hour daily to fetch water, sometimes extending up to 3 hours. The majority of respondents spend 30-60 minutes daily(USAID, 2016).

The water supply is irregular throughout the complex. While it is consistent in the residential government zone and the railway colony for the residents being available throughout the day. However, there are certain conditions which are expected to be followed. Despite the 20 kilolitre free water scheme which is prevalent since 2013(Board, 2024), thisquantity of waterfalls short after a while easily within a month therefore most residents try to limit themselves within the given capacity. The case is completely different for the housing sector and the unauthorized construction. They received water on very specific timings and they store it in tanks for their usage throughout the day. The service complex too receives a continuous supply of water but the demand quotient is also very high in these places. Therefore, there is an irregular distribution of water and the supply is just enough to meet the demands in most of the cases.

Infrastructure:The availability of an independent open space for urban agriculture was unavailable. Therefore, the only solution was to find a way to incorporate it into the buildings in the most effective manner. One way of doing this could be by installing mud pots that are conventionally used in the households. According to the superintendent of Environmental Nursery of Delhi at Indraprastha Estate, Delhi, as per his observations and practical experience in the plants of Delhi, on an average the weight of a potted plant varies from 400g to 5kg. to get a quantifiable amount of produce for any agriculture consumable crops the minimum pot size one needs is at least 1mX0.5m which will weigh minimum 3-4kgs minus the crop growth. One needs to install at least 20-30 of such plants to get a produce large enough to cater to a certain percentage of food production and be of actual use of the consumers and people involved on it. This means:

- Plant weight: 4kg
- Additional weight: 3kg (soil, water, seeds etc.)
- Total weight over one plant: 7kg
- Total number of plants required: 25
- Therefore, net weight: 175kg or more.

This data is largely influenced by the space available, more the space more the number of pots and more the additional weight which will be added onto the building. The conventional method requires the usage of large number of resources as well such as water and soil. This information was derived from interview.

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The availability of space is also very asymmetric. While the roofs are planned in certain zones rest everything is a cluster.

Figure 6 Source Google Earth

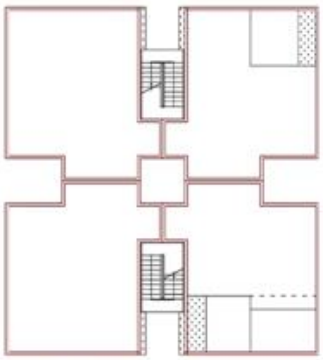

Figure 5 Source Authors

Figure 4 Source Google Earth

Figure 6 shows the spatial planning system of the housing area. There are no open spaces or huge parks to play. The balcony sizes are small and therefore most people are dependent on the roof for their activities. Many people live on these roofs and conduct their daily activities there therefore having a space large enough to do urban agriculture is not available.

Figure 5 shows the organized planning system adopted by the government colonies and the railway colonies. The building has well light balconies and breathing spaces and the roof is clear of any form of water storage or any other form of tanks. This gives us a good amount of clear space to do urban agriculture in these colonies.

Figure 4 shows the planning of unauthorized construction colony. The balcony sizes are very small and the building gaps are narrow limiting the penetration of light this also makes its residents vulnerable to using roofs for carrying out activities. Also, these roofs are partially covered with water storage tanks and temporary houses that have been built upon it.

Skills: Agriculture, gardening or horticulture demands a certain set of knowledge and time to carry out. There are various factors involved in the selection and growing of crops. Different plants have different requirements with their water and various other resources that if not met can lead to the failure of the entire system.

Questionnaire

A questionnaire consisting of 10 quantitative items (closed questions including multiple choice, and Likert scales) was designed. The questionnaire was in English and Hindi language both.

Sampling

Purposive sampling technique was used where 4 local grocery store owners were contacted to distribute 2 questionnaires each per household. These 4 grocery stores were delivering grocery items to the residents during this period due to COVID 19 lockdown reasons and their delivery personals were the best available resource to distribute and collect the questionnaires. They were trained to intimate the respective delivery collectors of the households with a condition for the forms to be filled in by 2 adults of the houses with 1 being the head of the family and the other, preferably his/her spouse. 4 delivery personnel, 1 each from each grocery store, were given the duty of distributing the questionnaires to 30 households. That the data would be utilized for academic non-commercial reasons was communicated in the Questionnaire form itself.

Data collection

The forms were distributed within the 1st week of September 2020 and collected up till 1st week of November 2020 (10 weeks). From the outset, purpose of the study, quarantine care assurance, anonymity, confidentiality of informationofpotential participants were assured to the potential participants. They were providedwith information concerning the academic non-commercial research purpose, assurance of anonymity, andwere informed that by completing and submitting the survey they were consenting to participate.

Data analysis

For the 08 qualitative items, descriptive statistics were used to describe, synthesise, and summarisethe data. Answers to the 08qualitative items were analysed using descriptive qualitativecontent analysis. Data analysis was led by the first author and confirmed by the second author.

Results

120 participants completed the survey. Because this survey was anonymous, no information was obtained regardingnon-responders. The purposive online survey was conducted to understand the interests of the community selected towards the idea of urban agriculture and to analyse their knowledge towards different variables associated with it.

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A summary of respondents' demographics and practice contexts is presented below, andmain results are presented under the heading of each research question.

1. Please select your gender
a. 60 male and 60 females completed the survey.
2. Please select is your age group
a. 23% of the respondents were in the age group of 25 years to 34 years
b. 16% of the respondents were in the age group of 36 years to 44 years
c. 52% of the respondents were in the age group of 46 years to 59 years
d. 09% of the respondents were in the age group of 61 years and above.
3. Do you like gardening or spending time with your plants at home?
a. 18% of the respondents agreed that they like spending time in garden and/or gardening
b. 82% of the participants denied enjoying gardening or spending time with plants
4. What kind of plants do you grow or prefer to grow in your balconies, terraces etc. that you would enjoy growing the most?
a. 36% of the respondents preferred flowering plants in their homes
b. A massive 43% had a preference for plants that provide herbs
c. 21% participants preferred to have a preference for vegetable plants
5. If there is an opportunity would you like to consume fresh herbs, vegetables and fruits that are grown in your balconies or terraces accessible you
a. A whopping 97% of the respondents showed interest in consuming fresh herbs, vegetables and fruits grown in their own balconies, terraces etc.
b. A 3% of respondents did not show any eagerness
6. After spending an entire week working at your respective places what are the activities that you enjoy to do on the weekends (under normal circumstances)? Please feel free to choose more than 1 option.

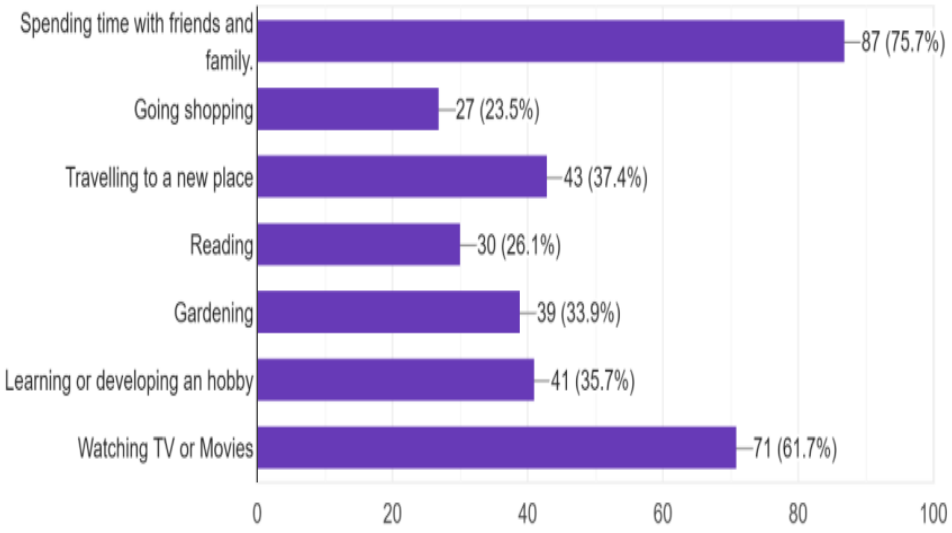

Figure 4 Response to item 6. Generated by author

a. 75.5% responsesclaimed they liked to spend their weekends by spending the time with friends and family
b. 23.5% responses stated preference of shopping during weekends
c. 37.4% respondents enjoyed travelling to new places during weekends
d. 26.1% responses were for reading during weekends
e. 33.9% preferences were towards gardening during weekends
f. 35.7% responses were in favour of learning or developing a hobby and
g. 61.7% responses showed that they enjoyed watching TV or movies
7. If you are asked to pay a certain monetary amount in order to have access to fresh fruits and vegetables grown in your balconies and rooftops how much amount would you be comfortable to pay on an average per month; where all the resources other than space and water are included?
a. 27% of respondents were willing to spend up-to Rs.500
b. 40% of the respondents were willing to spend up to Rs.1000 for enjoying a hassle free garden in their house on an average per month
c. 26% of the respondents were ready to spend up to Rs. 2000 for the same
d. A 7% of the participants were not interested in spending money on a garden or plants
8. Would you enjoy working under the sun covered in mud with plants in order to be able to consume fresh herbs, fruits and vegetables?
a. 52% of the respondents did not like to be involved in the physical pursuit of growing

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plants even if it allowed the benefits of consuming fresh produce

b. 45% of the people were willing to do the physical work of growing and maintaining plants
c. 3% were willing to do the physical work only under comfortable circumstances

9. How much would you rate your gardening abilities? (foreg: say a curry leaf plant has all dried up and leaves have fallen. Would you be able to identify if it can be revived if yes then what will be the technique used)?

a. 64% of the respondents admitted that they had only limited knowledge of plants and their maintenance
b. 26% of the respondents stated that they have good gardening abilities
c. 10% of the respondents were very confident of their gardening abilities

10. If given an opportunity would you like someone else to set up a garden and work for you in growing these plants while you enjoy the fresh produce grown?

a. 73% of the respondents admitted that they would like someone else to set up a garden and maintain it while they enjoyed its fruits; given the option while
b. 27% of the respondents did not like the idea

Analysis

Majority of people enjoyed gardening and the concept of urban agriculture which includes not just edibles but also flowers which is a normal part of many Indian households inclusive of for worship purposes.

Gardening was a cherished hobby and the interest was more towards growing flowers or kitchen herbs such as curry leaves, coriander, mint etc. and not towards vegetables. Thereis keen interest towards consuming fresh herbs, fruits and vegetables especially if they are being grown under their personal knowledge or supervision within their space of residence.Yet, gardening as their choice of leisure activity that they would like to do weekends in not prominent. Spending time with family and watching movies are few activities that topped the charts. Gardening was not even the second most favoured activity that the community would like to do on the weekends.But contrary to their preferred activities during their free time where gardening does not feature as the most favoured, still the desire and preference for a thriving garden and a kitchen garden with is so strong that it defeats the sequence of their preference of weekend activities and 93% of the sample was willing to spend substantial amount of money on a weekly basis if, the establishment and the maintenance of the plants is not their complete liability.

A strong 53% of the respondents were not interested in looking after the plants or garden but under comfortable conditions 45% of the participants were willing to do the gardening work; this is considerable due to the composite climate of Delhi with harsh seasonal setting and also poor air quality owing to pollution. About one third of the respondents, that i.e., a strong majority iskeener towards enjoying a garden allowing them access to fresh herbs, fruits, flowers etc. within their residential premises provided that the responsibility of skills and maintenance considering the same is taken up by someone else.

Conclusion

The following points can be concluded from the synergized understanding of the literature, the context of the study and the survey

- There is a limitation of the conventional infrastructure required for urban agriculture such as space, built environment, infrastructure and skills.
- However, the community, which is important part of resource shows keen interest in having some form of a garden from which they can benefit from its edible, visual, physical and emotional traits.
- The community was very eager to enjoy the presence of plants especially if the responsibility of the plants are taken up by somebody else so much so that they are willing to pay substantial amount of money.
- The community definitely subscribes to the idea of urban agriculture.

Way forward

It could be summarised that the idea of beneficial plants within one's own residential space is a favoured idea and the willingness is limited to a monetary investment aspect majorly.

But with the incorporation of smart innovative urban agricultural practices and regular professional involvement, the concept of urban agriculture in the study area can be achieved with the help of community awareness and its desire to invest money.

If the community is given the encouragement of the authorities and options such as monthly urban agriculture subscriptions or quick commerce facilities for setting up and maintaining urban agriculture, it would be a success. This would not only have environmental and community benefits but would also bring in commercial success in the fast evolving ecommerce scene of India.

References

1. Board, D. J. (2024). *Water: Delhi Jal Board, Government of NCT of Delhi*. Retrieved from Delhi Jal Board, Government of NCT of Delhi: https://delhijalboard.delhi.gov.in/jalboard/water
2. Census-2011. (2011). *https://censusindia.gov.in/nada/index.php/catalog/42619*. Retrieved 2024, from Census Digital Library: https://censusindia.gov.in/nada/index.php/catalog/42619
3. DK, S. (2017). *7 Reasons for Low Productivity in India Agriculture*. Retrieved from Your Article Library:

DOI: 10.69605/ijlbpr_13.7.2024.137

https://www.yourarticlelibrary.com/agriculture/7-reasons-for-low-productivity-in-india-agriculture/42317

4. Meera, S. (2016). *Future of Urban Agriculture in India.* Institute for Respource Analysis and Policy, IRAP. Institute for Respource Analysis and Policy. Retrieved from http://irapindia.org/images/irap-Occasional-Paper/IRAP-Occasionalpaper-10.pdf
5. MoAFW, M. o. (2017). *State of Indian agriculture, 2017, Ch. (10), pp. 35-59.*
6. UNEP. (2022). *Leveraging urban agriculture to support cities, United Nations Environment Programme Report.* UNO. Retrieved from https://www.unep.org/news-and-stories/video/leveraging-urban-agriculture-support-cities#:~:text=Reusing%20urban%20resources%20and%20promoting,Environment%20Programme%20(UNEP)%20report.
7. USAID. (2016). *Drinking Water Supply For Urban Poor: City of New Delhi*. Retrieved from Issuelab.org: https://search.issuelab.org/resource/drinking-water-supply-for-urban-poor-city-of-new-delhi.html
8. Zimmermann-Loessl, C., & Rai, D. N. (2022). *Urban Agriculture and India.* Association for Vertical Farming. Retrieved 2024, from https://vertical-farming.net/blog/2022/01/25/urban-agriculture-and-india/