In spite of significant technological advancements revolutionizing food production and distribution the world over, millions of people, including a large number of urban poor, continue to suffer from acute hunger and malnutrition. According to United Nations Secretary General Ban Ki-moon, at the three-day summit on World Food Security in Rome in 2009, six million children die of hunger each year, which is about 17,000 per day\(^1\). Even in a developed country like the USA, millions of urban poor cannot afford adequate food to maintain good health. Further, the rich-poor divide in today’s urban societies denies equitable access to food, thus aggravating the problem of food insecurity. Hunger and malnutrition adversely affect the well-being of the urban poor across the world. There is thus enough reason to be concerned about food security. The production, distribution, and consumption of food along with subsequent management of waste thus generated should be done in a sustainable manner so as to ensure that the needs of future generations are in no way compromised.

A resurgence of urban food production is witnessed in many countries, resulting in increased urban food security for the urban households. This is a reality that an increasing number of governments and development authorities are recognizing. These developments point towards better management and promotion of urban food production. It is necessary that in the 21st century, production and consumption of urban food manifests in formulation of strong urban land use and agricultural policies to create a special economic sector through proper utilization of waste recycling and urban agriculture. The landless agricultural labourers, who have been evicted due to the spread of urbanization, can be gainfully employed and their indigenous skills utilized, in this sector. Here, it is important to realize that all activities on earth have a spatial implication. The urban food system planning has got direct spatial implication on urban planning. But the question is: Is the land for practising agriculture in the urban areas available? Land in the peri-urban fringes, river and canal banks, peripheral land of schools, colleges, private and government establishments, community and municipal plots and roof-tops are commonly utilized. Further, waste water can be channelized towards low-lying areas where it can be recycled for producing fishes. The dumping ground can be developed to grow vegetables.

Over 800 million people across the world are associated with urban farming\(^2\). It is

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\(^1\) edition.cnn.com/2009/

\(^2\) www.ruaf.org/node/513
important to preserve the water bodies, wet land, and low-lying agricultural land within the city to prevent flooding. Peri-urban agriculture can even be used as an effective tool for delimiting the city or metropolis. There are also derelict and vacant lands in and around the city, open spaces such as peripheral areas around municipal parks, educational institutions, institutional buildings and offices, hospitals, jails, etc., which can be effectively utilized. New York City created ‘Plan NYC 2030’ to encourage the residents develop roof-top gardens\(^3\). Sixty percent of Shanghai’s vegetables are grown in urban and peri-urban areas (Zeeuw, 2004). Cuba and Brazil have demonstrated how vacant lands, including the dumping spaces in urban areas can be used to produce food to mitigate urban hunger while greening and upgrading the environment.

By 2050, when 80 percent of the world’s population is expected to reside in urban areas, governments will face a huge challenge to feed this population in a sustainable way. In India, 31.18 percent of the population lived in urban areas in 2011, an increase of 3.35 percent over 2001 (Census of India, 2011). Besides addressing the huge demand for food in the expanding urban region and increasing the efficiency of the National Food System, urban agriculture can generate employment, reduce the impact of global warming, improve the quality of air, develop a healthy ecosystem, and manage waste and land.

FOOD SYSTEM PLANNING AND URBAN FOOD SECURITY

Food system comprises the inter-connected activities that enable the food to travel from the farm to the plate. In fact, it includes production (growing), processing, distribution and logistics (movement of food), acquisition (acquiring food), consumption (eating) and waste disposal/recycling as fertilizer in the farm (Cassidy & Patterson, 2008). The food system planning process has direct spatial implication on the urban planning process, including transportation, land use, environment, and economic development. A proper land inventory to identify urban land for current and potential food production needs to be carried out. The key to a successful community food system is to encourage local food production through identifying and transforming certain areas like low-lying land, waste dumping sites, etc., into economically viable agricultural land use zones.

Attention towards food system planning has not figured in the urban planning agenda in India. The emphasis has been on sectoral planning namely, residential, commercial, institutional, transportation and other infrastructural development activities. India’s conventional system of planning is not long-term, holistic, or comprehensive in nature and is in fact rather haphazard, essentially based on land use development control regulations, zoning, etc., as per the Town and Country Planning Act, 1979. In view of the fearful stature urban hunger and poverty are assuming in India, it was high time the food system planning attracted the urban planners’ attention, and was pursued actively in the planning curriculum. It is indeed very important that our cities become self-sufficient regarding food supplies and reduce dependence on hinterland. The challenge of urban hunger and unsustainable urban development are to be fought by finding a synergy between intelligent public policy, innovative urban planning, and agricultural techniques and through sustainable technology and community participation. Food system is more pronounced in the rural setting - the crop getting ready for harvest, livestock, grain storage - reflect mostly a rural image. The urban food system, on the other hand, brings to mind the image of food supermarkets and grocery stores or city eateries and fast-food chains. Seldom does it suggest the instance of urban food production and processing in the form of municipal garden or agricultural land or green belt in the peri-urban fringe (Pothukuchi & Kaufman, 1999).

The concept of urban agriculture with considerable green verge in the peri-urban areas should supplement the urban food requirement. This will not only bring about ecological balance to overcrowded grimy cities, but also provide employment to the urban poor, a lot of whom are continuously migrating from the hinterland. In fact, urban agriculture with horticulture development, fisheries, poultry and livestock development should be made mandatory in cities and adjacent areas to not only provide food security and mitigate nutritional deficiencies of the urban poor, but also for enterprise development and environmental enhancement with land and waste management potential to improve their overall sustainability.

SCOPE OF THE PAPER

The aim of this paper is to examine how urban agriculture can aid in the food production process and optimize

\(^3\) www.nyc.gov
SOME EXAMPLES OF BRAZIL AND CUBA

Brazil: Curitiba

The city of Curitiba, the capital of the state of Parana in Southern Brazil, is spread over an area of 430.9 sq. km. The city has a population of 1.76 million while the Curitiba Metropolitan Area consisting of 26 municipalities has a population of 3.2 million. Curitiba is often cited as an example of urban sustainability.4

Behind Curitiba’s success lies the vision of one person, Jaime Lerner, who is an architect and urban planner and former mayor of Curitiba for three decades. For analysing Curitiba’s model, it is important to know the definition of a sustainable city. According to Wikipedia, The Free Encyclopedia, “a sustainable city should be able to feed itself with minimal reliance on the surrounding countryside, and power itself with renewable sources of energy. The crux of this is to create the smallest possible ecological footprints, and to produce the lowest quantity of pollution possible, to efficiently use land; compost used materials, recycle it or convert waste-to-energy, and thus the city’s overall contribution to climate change will be minimal, if such practices are adhered to.”5 Jaime Lerner’s vision of a sustainable city coincides with the above definition.

Today, Curitiba is known beyond Brazil’s national boundary as the best place to live in Brazil. In 2010, the city had been awarded the Global Sustainable City award. That the city has excelled in sustainable and healthy urban development is a widely acknowledged fact. Presently, Brazil is about 80 percent urban, with majority of residents living in urban areas having left rural areas about two generations back. Brazil’s success in general and that of Curitiba’s in particular, lies in the strong political will, attitude, and leadership of the former Brazil president, Luiz Inacio Lula da Silva. Today, Brazil is on track to achieve the Millennium Development Goals, particularly the MDG-1, i.e., to eradicate extreme poverty and hunger by 2015. Urban hunger is being eradicated by attacking the root cause of hunger, namely food shortage, through initiatives to stimulate food production, provide employment opportunities, thus resulting in poverty reduction. Food security has been strengthened through providing food assistance to the needy and augmenting availability of locally produced food. Applying Lula da Silva’s strategy in Brazil to improve environment, reduce hunger, generate employment, and reduce waste and pollution through urban agriculture and waste recycling has proved successful.

Under the ‘Hunger Zero Program’, with support from the federal government, municipal governments have formally adopted urban agriculture as a vital initiative. Besides ensuring availability of locally produced food on urban plates, urban agriculture in Brazil includes objectives like promoting community spirit, providing pedagogical tools for schools, preserving food habits, transforming waste into resources, generating employment, and mitigating urban hunger.

Urban Planning in Curitiba

The urban planning practice of Curitiba is comprehensive in nature, the master plan being initiated by Jaime Lerner in 1965. The basic purpose of urban planning was to provide for ‘public welfare’, inclusive of all economic strata. Lerner realized that urban planning was for the people, of the people, and by the people. Urban system is part of a larger eco-system and the environment has got a significant role to play in urban development. Curitiba adopted a clear, systematic, and inexpensive methodology. Urban planning for Curitiba considers the following aspects:

- Political attitude, willingness and vision
- Curitiba’s Master Plan for urban development
- Creation of IPPUC (Research and Urban Planning Institute of Curitiba)
- Public-friendly traffic and transportation
- Urban agriculture and waste-recycling

The biggest challenge for Curitiba was to guarantee quality life for its citizens on a long-term basis. Social inclu-
sion of the poor and homeless, accessibility to public amenities, urban food production/supply, and environmental sustainability for the city have been ensured. The creation of IPPUC has played a key role in implementing the eco-friendly, inexpensive and citizen-centric plan and maintaining its continuity. However, in this paper, only urban agriculture and waste recycling aspects are highlighted, considering their efficacy in the development of urban poor.

Urban Agriculture in Curitiba

The city of Curitiba itself has 280 hectares under urban agriculture producing 3,000 tonnes of food products (leafy vegetables, herbs, carrots, corn, beans, medicinal plants, etc.), benefiting about 7,000 people in 2005 (Rocha, 2005). The role of local government included making available public space and providing inputs (fertilizer, seeds, etc.) and technical/farming assistance (soil preparation and planting techniques). The technical assistance was provided to the citizens of Curitiba who came forward to practice agriculture in the city. The municipal authorities also monitored the implementation. In propagation of urban agriculture, the municipal government of Curitiba had involvement in the following areas:

- Using municipal mechanism for identifying public land for urban agriculture
-Providing technical assistance with inputs, seeds, seedlings, fertilizer, etc.
-Providing basic education on how to prepare soil and how to plant and providing free education on environment
- Monitoring and implementing the project for one year.

The political attitude, willingness, and leadership have supported the strategy to improve environment, fight hunger, reduce and recycle waste, and generate employment in Curitiba. Social inclusion of the poor and the homeless, urban food supply and environmental sustainability of the city had to be ensured. The action plan of the Municipality involves undertaking a series of economically viable strategic integrated projects in all aspects of urban planning, including social, economic, and environmental programmes, involving its citizens.

The introduction of urban agriculture in Brazil has a double-edged mission - to implement a ‘twin-track strategy’ of strengthening the social safety net to put the food on the table for the most needy people, while attacking the causes of hunger with initiatives to stimulate food production, increase employment, and reduce poverty. Urban agriculture along with waste recycling or “Green Exchange Programme” were the two programmes identified for the social inclusion of the rural migrants, who bring with them the indigenous skills of agriculture. The overall food availability, especially food assistance to the needy is achieved by adopting the method of local food production with the help of local people.

Waste Recycling — Nothing to Waste

For combating the problem of rising city slums and for cost-effective social inclusion of slum dwellers as well as creating employment and reducing garbage, Curitiba has introduced the “Green Exchange” employment programme. It particularly benefits the low-income families living in shanty towns which are unreachable by trucks. These poor people bring their garbage to the neighborhood centres or regional centres, where they exchange the trash bags for bus tickets, food, and health services. Interestingly, Curitiba has included the members of the younger generation in this programme. Children can exchange garbage for sweets, toys, entertainment, and school equipments.

It may be noted that under the ‘garbage that is not garbage programme’, more than 70 percent of the city’s waste gets recycled by its residents. Every week, a truck collects paper, metal, cardboard, plastic, and glass that have been segregated in the city homes. Merely through paper recycling, around 1,200 trees are being saved per day on a regular basis (Gupta & Gangopadhyay, 2012). Coupling the environmental benefits with social programmes, homeless people are engaged in many of these jobs. Street children are employed for tending gardens and green spaces. For the poor new entrants to the city, who often create unhealthy shanty towns, a healthy, eco-friendly, sustainable and socially-conscious environment has been created. Jaime Lerner said, “To make it happen is to propose a project that the majority of people find desirable. The city is not a problem, the city is the solution” (Ben-Tal, 2005).

Cuba

In Cuba, urban farming is more than two decades old. With the disintegration of the Soviet Union in the 1990s, exports and imports of Cuba collapsed, thus leaving it to meet its requirements for food by making use of all avail-
able domestic resources for production. Access to oil, tractors, chemical pesticides and fertilizers, and the inputs required for carrying out ‘industry’ type large scale agriculture suddenly ceased. Cuban authorities were forced to adopt organic agriculture in a much smaller scale to feed its households. Unique circumstances of economic hardship and isolation paved the way for development of urban agriculture in Cuba. In 2010, in urban areas, the vegetable and herbs yield was 1 million tonnes as against the national horticulture output of 2.2 million tonnes. This farming does not use chemical fertilizer or pesticides and depends on biological fertilizer and biological pest control methods. Urban agriculture is based on organic practices. Around 300,000 people are engaged in this sector and the products are sold to consumers directly without passing through intermediaries. Besides vegetables, livestock and poultry have also been included in urban agriculture initiatives. The authorities have adopted a policy of giving free land to people interested in farming.

With considerable experience in urban agriculture, Cuba, since 2007, has adopted the policy of bringing farming to the suburban areas around towns and cities to tackle the challenge of food security. According to Adolfo Rodriguez Nodals, head of the national urban and suburban agriculture movement, from the modest pilot projects covering 17 locations, all 169 municipalities comprising 600,000 hectares of available farmland would be covered by this initiative by 2010. This was also supposed to provide the ‘green lung’ for the cities, starting with Cotorro, a Havana suburb with a population of 79,000 and having around 4,000 acres of land for suburban agriculture (Koont, 2009).

Urban Agriculture in Havana

Urban agriculture has been very prominent in the capital city of Havana. To produce food locally for its population of over two million has been a difficult challenge for the city authorities. To achieve this goal, the National Urban Agriculture Group officially launched the Havana Agricultural Policy in 1998 (Inclusive Cities Observatory, 2010).

The Cuban authorities have shown how to implement a permanent policy which enables urban food production beyond times of crisis. The legal framework for the initiative is supported by ministerial resolutions, decrees, circulars, and laws and is financed by public funds. The global interest generated by the policy is evident from the fact that, over time, it has received funding from several international development agencies. Twenty-eight urban agriculture sub-programmes within the Urban Agriculture Programme, including vegetable, herb and ornamental flower cultivation, forestry as well as livestock farming, have emerged. These activities have been organized under various legal institutions like the UBPC (Basic Unit of Co-operative Production), state farms, etc.

The Department of Agriculture, the Department of Urban Agriculture, and the National Urban Agriculture Group actively promoted the creation of ‘new land’ for cultivation as a way of finding local solutions to food problems. The ‘new land’ included the existing fertile land lying as fallow in parks, vacant plots and institutional land, organoponicos (Birch, 2009) as well as patios and yards next to people’s houses. In the province of the city of Havana, over 35,000 hectares (87,000 acres) of such land are used for urban agriculture.

The need to shift to urban agriculture became imminent as the close proximity of production and consumption sites reduced transportation and fuel requirement. Also smaller scale of urban crop production reduced the requirement of heavy agricultural machinery. Novel techniques of intensive agriculture in the form of ‘Organoponicos’ (rectangular construction of 30 meters by 1 meter, raised bed made of soil and organic compost), developed and adopted widely and quickly after its introduction in 1991, is now the backbone of vegetable cultivation in urban agricultural activities in Cuba (Birch, 2009). In 1997, this initiative was taken forward under the Urban Agricultural National Movement. Plots of land were given to co-operatives for propagation of this practice and in no time vegetable production increased significantly. In Havana, 40 percent of the households are involved in urban agriculture. On one hand, urban Cuba benefited from locally produced organic agricultural product, and on the other, it enhanced, along with urban reforestation, the greening of environment. Not only did the movement convert barren garbage-filled plots to productive land with greenery, but also provided significant employment potential for the young, women as well as retirees. The urban agricultural programme consisted of 27 sub-programmes (namely, in crop production, animal husbandry and support areas like manure, irrigation, seeds), which over the last 12 to 14 years, had created 3,50,000 jobs, benefitting the entire Cuban society. By 2006, the total area under urban agriculture was 70,000 hectares.
The yield for vegetables increased from 1.5 kg per sq.mt. in 1994 to 25.8 kg. per sq.mt. in 2001, in Havana as well as the rest of Cuba (Koont, 2009).

While the success of urban agriculture in Havana is pronounced, it may be noted that Havana accounts for only 3 percent of the urban agricultural land of Cuba and produces 6.5 percent of the total vegetable production (Koont, 2009). The annual production of vegetables in Havana is given in Table 1.

<table>
<thead>
<tr>
<th>Year</th>
<th>Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997</td>
<td>20.7</td>
</tr>
<tr>
<td>1998</td>
<td>49.9</td>
</tr>
<tr>
<td>1999</td>
<td>62.6</td>
</tr>
<tr>
<td>2000</td>
<td>120.1</td>
</tr>
<tr>
<td>2001</td>
<td>132.2</td>
</tr>
<tr>
<td>2002</td>
<td>188.6</td>
</tr>
<tr>
<td>2003</td>
<td>253.8</td>
</tr>
<tr>
<td>2004</td>
<td>264.9</td>
</tr>
<tr>
<td>2005</td>
<td>272.0</td>
</tr>
<tr>
<td>2009</td>
<td>285.2*</td>
</tr>
</tbody>
</table>

(Per capita availability 340 gms/day, which is higher than the minimum requirement of Food and Agriculture Organization (FAO) but lower than the Cuban average)

Source: Koonts (2009) (for all figures in the Table except 285.2*)

* Source: Inclusive Cities Observatory, www.Uclg-cisdp.org/sites/default/La%Habana_2010_final

Table 2: Urban Agriculture Work Force in Havana

<table>
<thead>
<tr>
<th>Year</th>
<th>Persons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>9,000</td>
</tr>
<tr>
<td>2001</td>
<td>23,000</td>
</tr>
<tr>
<td>2007</td>
<td>44,000*</td>
</tr>
</tbody>
</table>

* 12.5% of total Cuban urban agriculture workforce

Source: Koonts (2009).

Sixty percent of Havana’s produce is grown within five km from the city centre. As Havana is fast running out of cultivable unutilized land, a target programme to recover all wasteland/garbage dumps and convert it into plantation has been taken up. Havana is a role-model for urban agriculture that others may like to duplicate in their efforts to mitigate urban hunger and create jobs for the urban poor, as well as maintaining ecological balance. To replicate all factors that contributed to the success of Havana may be difficult.

In both the cases of Brazil and Cuba, a strong commitment, will, and participation of the government have paved the way for successful implementation of urban agriculture. In Cuba, agriculture has been transformed from a less productive, subsidized, high input ‘industrialized’ agriculture to a productive, greener, and sustainable agriculture that is devoid of any subsidies. Brazil in general and Curitiba in particular, displayed an urban planning process that transformed the city into a greener (52 sq.mt. of green space per person) and sustainable environment. Both the activities have resulted in enhanced food availability and employment opportunities among the urban poor. Sustainable practices that provide for organic waste recycling to produce organic fertilizers, reduction of pollution by cutting down food transportation trips, and optimizing transportation in general are common facets of both the examples.

**SOME LESSONS FOR INDIA**

While India continues to debate on the definition of the poverty line, Brazil, during the first decade of the new century itself, has surpassed the United Nations’ millennium development goal of cutting hunger and poverty to half. The selection of the former president of Brazil, Luiz Inacio Lula da Silva (along with the former Ghana president, John Agyekum Kufuor) for the 25th World Food Prize was a recognition of the role political will played in ensuring food security. Lack of food security along with urban hunger and unemployment, are some of the primary factors that create unsustainable cities. Hence the challenge of urban hunger and unsustainable urban development are to be fought by finding a synergy between intelligent public policy, innovative urban planning, sustainable technology, and community participation.

India is rapidly urbanizing. From an urban population of 366 million in 2011 (31% of population), it is expected to rise to 459 million in 2021 (34%) and 800 to 850 million by 2050 (50%) (World Urbanization Prospects, 2010). How to provide urban food security to this large population is a major concern for the country. The majority of this additional 400 million plus population will fall under the urban poor category, as the growth of slum population and...
the population of urban sprawls in all metropolitan cities will far outpace that of the non-slum section, especially in the larger cities. What is the guarantee that an average person in the Indian cities will have access to adequate food? More urban people mean more food, more employment, more goods, and more services. It is time to develop appropriate strategies to ensure food security, nutrition, and livelihoods of the urban sector, before the impact of urbanization on food supply, food security, and consumption goes out of control. What does India do to face this major challenge in the context of serious constraints like depleting resources - agricultural land, water and forest/other resources? The huge urban influx will create expansion in the existing towns and cities, which will eat up agricultural land and forests. At the same time, this will impact urban food insecurity, employment, and living conditions that will make our cities increasingly unsustainable.

Urban agriculture can be one of the several approaches available for mitigating this threat of food insecurity for the urban poor in India. Not only will it improve food security, but will also provide better livelihood opportunities to the urban poor. It will also positively impact urban waste management. The experience of Curitiba can act as an inspiration to manage waste-recycling and practice urban agriculture in an innovative way.

Today, in India, government officials, urban planners, and city authorities neglect urban farmers. In many developing countries, urban agriculture is gaining recognition from governments as well as international organizations like the United Nations Centre for Human Settlements, the United Nations Conference on Environment and Development, the Food and Agricultural Organization and the Consultative Group on International Agricultural Research. Urban agriculture cuts across all income groups, though the majority of those practising urban agriculture are the urban poor. Not all of them are recent rural immigrants; instead, many are local residents with access to land, water and other resources. While practising urban agriculture, people can pursue other jobs simultaneously. This is also ideally suited for women who can combine urban agricultural activities with their household work.

Drawing from the Brazilian and Cuban experiences, following are a few suggestions for identifying immediate areas of action:

- Urban planning in India is essentially capital-intensive, contrary to the inexpensive, citizen-centric planning in Curitiba and Cuba. India should adopt the inexpensive sustainable planning process.
- Social inclusion of the evicted agricultural workers (due to the spread of urbanization and migration to the cities for better opportunities) to be accommodated in the city fringes for different types of jobs such as helping in waste-recycling and practising urban agriculture, as seen in the case of Curitiba. The biological transformation of organic waste to food and green is essential for sustainable cities. Many areas in a city, particularly the urban fringes, have the worst environmental conditions like presence of garbage, sewage, dust-packed earth, and unstable soil. Vegetable farming and planting of fruit trees are particularly feasible in these areas because of availability of low-cost labour. Benefits accrued not only serve the immediate community through livelihood opportunity and food access, but also to a lesser degree, the entire city.
- The squatters in the urban fringe have to be developed in an orderly and compact way with prior planning. The present shanty towns which are without basic sanitation and safe drinking water are to be upgraded in a planned manner.
- There will be less dependence on petrol and diesel as food will be produced locally - this is a reality in Cuba where fuel has become scarce and costly after the fall of Soviet Union.
- Every urban development authority in India should have an environment wing. Facility to provide free environmental education has to be provided. The environment department should be empowered to implement urban agricultural and waste-recycling project in conjunction with the local municipality, similar to the practice seen in Brazil and Cuba.
- India cannot afford to be a ‘throw away’ society, as land and other resources are scarce. Waste, through a sustainable approach should be converted into resource, as demonstrated by Curitiba.

Optimum use of domestic resources, as done by Cuba in the post-Soviet Union era, will also include activities like rejuvenating and excavating the urban and peri-urban water bodies for promotion of pisciculture and rainwater harvesting. India is fast running out of cultivable vacant land; so, a goal should be set to recover all waste land and garbage dumps and trans-
form them into plantation. Both Brazil and Cuba have benefited through such initiative.

• Alternative ways to approach urban planning, urban employment generation, and ensuring food security in a sustainable way have to be implemented at three levels — federal (i.e., central), state, and municipal (involving citizens).

• Policy-making should be a joint venture of politicians, urban planners, and agricultural experts and there should be a synergy between intelligent public policy, innovative urban planning, and appropriate agricultural techniques, through adaptation of sustainable technology and community participation.

• Every city should have its own vision, and urban planning should be holistic, comprehensive, and long-term.

• Urban planning is a continuous and flexible process that has to be supported by adequate research, which is not present in India. Such research is required as it yields innovative planning and agricultural techniques such as development of ‘organoponics’ method of intensive vegetable cultivation and embedding it in the planning process for propagation of urban agriculture in cities in Cuba.

Urban agriculture is not a panacea for food insecurity, but can provide some access to food, which however small, can be of crucial importance, especially to the urban poor and women of the reproductive age and children - thus contributing towards food security. It reduces food insecurity by supplying low-priced fresh food to middle- and low-income families resulting in upgrading their health and nutritional standards. Social inclusion and livelihood of the disadvantaged households, effective urban waste-recycling, reduction of air pollution, improving of the micro-climate through urban greening will be the other positive fallouts of practice of urban agriculture.

As India moves towards a rapid urbanization phase with exponential population growth and the need for more sustainable cities becomes a reality, there is scope of creating environmentally and economically sound urban agricultural systems, including waste and waste water management that can be made an integral part of the urban planning process. Urban agriculture can create a diverse ecology with vegetable plantation, fruit trees, and fisheries to build an ecologically sustainable environment. In India, the concept is in a nascent stage and the awareness has to be increased along with government support through NGOs, municipalities, and co-operative societies to provide technical guidance and training as well as provision of inputs. Agriculture should be considered as a legitimate land-use in urban planning and policy-making.

In India, urban agriculture has made a beginning in some cities, such as composting and vermi-culture in Kolkata and Chennai, dairying/animal husbandry in urban and peri-urban Bengaluru and Kolkata, horticulture in Delhi, and urban agro-forestry in Hyderabad. Urban and peri-urban agriculture in India, though at an early stage and not as widespread and focused as in Cuba or Brazil, has the potential to be the benchmark for further urban agricultural projects. Some instances of urban and peri-urban agriculture in Kolkata will show how such initiatives can succeed in India too.

Examples of Kolkata Metropolitan Area

The wetlands in the eastern fringe of Kolkata Municipal Corporation (KMC), declared as ‘Ramsar Conservation Site’ presently covers 3,800 hectares. There is no sewage treatment plant (STP) in KMC. In an exemplary way, the eastern fringe of KMC is treating the drainage and sewage water without the help of STP. The agricultural labourers working there are taking the help of sunlight, algae, water hyacinth and using their indigenous skills. It may be noted that the power consumption of an STP is high, whereas ecological treatment of water not only saves money but also provides employment to about 26,000 people. The treated water is used for pisciculture (in lagoons). Also, the city’s organic solid waste is dumped in strips of land in the low-lying areas, where it is composted and used to grow vegetables. The naturally treated sewage water between two strips of garbage dumps is used for irrigation. The area covered by fisheries is 3,500 hectares and that by vegetables is 350 hectares giving a yield of 4 tonnes of fish and 370 tonnes of vegetable per hectare per year. Fish meets 15 percent of Kolkata’s demand, and mostly caters to the urban poor. The 26,000 urban poor working in this agri-aquaculture venture earn about ₹ 24,000 per worker per year (Gupta & Gangopadhyay, 2006).

In the 1950s, the wetland area extended to over 8,000 hectares, out of which 4,700 hectares were dedicated to aquaculture. Over the years, human encroachment and urban sprawl have eaten up considerable area. Today, with the
area coming under the protection of Ramsar conservation, the government should consciously protect it and ensure livelihood to the poor people working in the area and also keep the ‘lung’ of Kolkata alive.

The other instance is that of the Mudiali Fishermen’s Co-operative Society, within the KMC, comprising a group of 300 families, who have leased 70 hectares of water area of the Kolkata Port Trust, into which waste water is released. The co-operative, through a series of anaerobic tanks, water hyacinth and other plants to absorb oil grease and metals, have turned the place into a fish farm and a nature park – ₹6.2 million worth of fish was sold by the co-operative in 2006 and a wage of ₹2.5 million was disbursed to its members. As this is also a nature park with boating facility, it attracts many visitors who pay to enter the park; in fact, during the peak season, the fee collection is as high as ₹60,000 per day.

**Bengaluru**

Magadi, a rapidly growing peri-urban town near Bengaluru, with a population of 28,000 people, has 46 percent of its area devoted to urban agriculture. The town is under great pressure for land acquisition for real estate development and urbanization from Bengaluru. Whether Magadi can retain its character as an ecologically sustainable centre for urban and peri-urban agriculture will depend on how the government handles the issue. Policymakers should re-examine all options available to them and proceed to integrate agricultural activities into urban development to bring about social, economic, and environmental sustainability and ensure food security. Further, it should be mandatory for any master plan to be comprehensive, long-term, and holistic in nature. Finally, it is important to note that urban planning is a continuous process, which needs to be reviewed and revised according to the situation.

Every city should have its own vision depending on its geographic location and terrain, demographic pattern and population growth, economic profile, natural resource base, availability of water, and existing built environment. For optimum implementation of urban agriculture and food security programmes, it is not only important to have strong commitment, will, and participation of the government, but also strong support and participation of the citizens and a supportive legal system in place at both central and local levels.

**REFERENCES**


Cassidy, A., & Patterson, B. (2008). The planner’s guide to urban food system. School of Policy Planning and Development, Centre for Sustainable Cities, University of Southern California.


Pothukuchi, K., & Kaufman, J. L. (1999). Placing the food system on the urban agenda: The role of municipal institutions in food system planning. Agriculture and Human Values, 16(Fall), 213-224.


Rahul Gupta has a B.Tech in Agricultural Engineering from IIT Kharagpur, a Post Graduate Diploma in Management with Specialization in Agriculture from IIM Ahmedabad, and a Master of Science in Applied Economics and Marketing, Rutgers, The State University of New Jersey, USA. He has worked in BOC India Ltd. in various capacities in sales and marketing and then since 2004 as a faculty member in ICFAI Business School, Institute of Engineering and Management, Kolkata. Since August 2012, he has been attached to Brainware Business School, Kolkata, as HOD Marketing, MBA Department. He has edited six books and published five articles in journals and magazines.

e-mail: rg1609@yahoo.com

Sumita Gupta Gangopadhyay has a B. Arch from Bengal Engineering College, Calcutta University, a Master in City Planning from IIT Kharagpur, and a Master of Science in Urban Planning and Policy Development, Rutgers, The State University of New Jersey. She has worked as a Research Associate in IIM Ahmedabad and finally, retired from state government services in November 2012, after serving for 30 years. She has edited three books and published 23 articles in journals and magazines. She is a Fellow of the Indian Institute of Town Planners and Associate Member of the Indian Institute of Architects.

e-mail: sg2908@rediffmail.com