


Paradigm of Eco-Urban-Agriculture for the Sustainable City: Integrating the Concept for Urban Dhaka

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ABSTRACT

 The geographical location of Bangladesh is gifted with enormous natural recourse: water, alluvial land, suitable climatic conditions for bio diversity and other natural assets. The capital, Dhaka, surrounded by rivers on four sides, was once a blue-green-built environment offering a healthy living atmosphere for its inhabitants. The city was dotted with huge and crisscrossed water bodies, a tolerable population density, and enough open spaces. Urban and peri-urban areas of the city complemented its food demand which subsequently maintained the environmental equilibrium. The modern concept of eco-urban-agriculture will definitely be beneficial in such a dense city which is rapidly losing its livability by insensitive urbanization. This paper will describe how a city could generate food, improve health, and utilize waste by furthering the established urban-agriculture concept. It aims to develop an understanding of this concept in Bangladesh, particularly in the dense urban fabric of Dhaka, by discussing the theoretical background of urban agriculture and practiced models of eco-urban-agriculture in urban settings around the world.

Keywords: *Urban-agriculture, Sustainability, Leftover spaces, Water-bodies, Beneficial land use*

INTRODUCTION

The accelerated crisis in urban areas has resulted in a raising awareness among the professionals of built environments towards sensitive handling of city elements. As a top priority, the professionals of urban planning are currently committed to creating ecologically sustainable built environments. As a basic agenda for ecological sustainability, it is important to live with nature and ensure proper space of all elements of the built environment with which it deals. Eco-urban-agriculture is one of these concepts which contributes to the sustainability of cities in various ways – socially, economically and environmentally.

Developing agricultural spaces within or near urban areas has great potential to integrate nature within built environment. This reduces food transportation costs and benefits the environmental effects, as well as provide opportunities for economic development and diminish the disparities in access to healthy foods (Smit, et al., 1995). In dense urban areas, as a precondition for any sustainable development, this technique should be given proper attention considering its social, economic and environmental impact. Elaborating on the scope, scale, opportunities, benefits, and constraints of eco-urban-agriculture is initiated to create a clear understanding of this concept. Architects, built environment designers and planners need to be

aware of its potential in applying its sustainability in any development. In this connection, it is also essential to explore various techniques of developing agriculture or farming in dense urban areas.

Due to the recent densification of urban areas and its consequential affects within the ecological setup, the emergence of eco-sensitive handling of living environments is a precondition for sustainable development. Current environmental degradation due to inadequate space for other natural elements, dependency on food coming from outside urban areas, transportation hazards generated by carrying food, and pesticides used in food production for the industrialized food system has contributed to an increased public awareness regarding ecological sustainability. Therefore, these trends have contributed to a growing public interest in establishing food production in urban and suburban areas.

Dhaka is the largest and fastest growing mega city in Bangladesh. The metropolitan city of Dhaka has an area of 306 km² with approximately of 9.3 million populations (Khatun, H., et al, 2015). Rapid population growth in Dhaka has created severe pressure on the land of the already overcrowded country. In recent times, Dhaka has been challenged by numerous difficulties like unplanned urbanization, extensive urban poverty, growth of urban slums and squatters, food insecurity, solid waste management and environmental degradation. For a better understanding of city's sustainability, agriculture coverage, food security and appropriate solid waste management is crucially being considered.

By being located in an area that has abundant natural resources, Bangladesh has the potential to integrate urban agriculture. Although Dhaka is very limited with minimal space for farming within the city, it should explore the opportunity for rebuilding ecological sustainability. The necessity or need for an urban agricultural program can be established through an in-depth analysis of the impact of urban agriculture on energy, economic, environmental, educational, and health benefits of agricultural production within the city. This analysis could be the basis for agricultural development for other cities of Bangladesh struggling with environmental degradation. The study will make the effort to identify and explore the necessity of urban framing and explore strategies to stimulate urban agricultural growth within the city by using leftover spaces, water bodies, rooftop and other useable spaces in and around the city.

THE CONCEPT OF ECO-URBAN-AGRICULTURE

An eco-city is a human settlement modeled on the self-sustaining resilient structure and function of natural ecosystems. The eco-city provides healthy abundance to its inhabitants without consuming more (renewable) resources than it produces, without producing more waste than it can assimilate, and without being toxic to itself or neighboring ecosystem (Rob Roggema, 2017) (Figure 1). Eco-urban-agriculture is one the essential components for a sustainable eco city, which invents a new way to reduce dependency on external food supply along with other enormous positive benefits. Proven to both save energy and costs, green cities within the umbrella of an eco-city accommodates urban agriculture, which can then create and expand markets for fresh, local products and services. From a social perspective, green cities promote healthier and more comfortable outdoor environments and have positive aesthetic benefits. Furthermore, from an environmental perspective, green cities are a win-win model as they help to reduce the impact of global warming, reduce waste, improve air quality, reduce the city heat island effect and promote a healthier living environment (Susan Evans, et al, 2012) (Figure 1).

The condition of city-life is such that many urbanites are never aware of the complex relationships between humans and the earth. Days spent in compact apartment towers, crawling traffic and crowded supermarkets do not facilitate an understanding of the extent to which city dwellers depend on a hidden, external agricultural system. Urban agriculture is beginning to be viewed as an alternative with enormous potential, and not merely as a contradiction in terms. Today's cities suffer from a broad range of problems which are symptomatic of the underlying failures in a progressive-industrial society. Urban agriculture can address some of these difficulties, and can work towards building socially, economically, and environmentally sustainable cities (EPA).

Urban agriculture is an important source of environmental and production efficiency benefits. The integrated farming systems protect soil fertility and stability, prevent excessive runoff, provide habitats for a widened diversity of flora and fauna, reduce the emissions of CO₂, increase carbon sequestration, and reduce the incidence and severity of natural disasters such as floods and landslides.

Decorative or scenic agricultural landscapes, waterways, and buildings provide numerous benefits including recreational activities, scenic views, and open space qualities. These positive benefits often merit assistance to producers such as technical and financial and other public support (EPA).

Furthermore, agriculture in cities plays an important role in the residents' health, local economies, and community development wherever it flourishes. Besides these, agriculture in urban and sub-urban areas can also convert huge urban waste into a useful byproduct, productively utilize vacant and leftover spaces and at the same time establish nature within a concrete urban environment. City and suburban agriculture takes the form of backyard, roof-top and balcony gardening, community gardening in vacant lots and parks, roadside urban fringe agriculture, water bodies and water edges, wetlands, vacant spaces, and spaces produced through adherence to building by laws.

THE SCOPE AND SCALE OF URBAN AGRICULTURE

An eco-city is considered to be a society that cares for sunlight, air, water, land, greenery and other natural blessings; a society that restrains the mass consumption of resources and energy and generation of waste to minimize the burden on the environment. The goal is that the eco city will be so proficient at recycling that it will

ultimately achieve a zero-emission society, a society in which all resources are completely reused and no waste generated (Mowla, 2009).

For a sustainable city, it requires creating a closed loop between the elements of built environment, its uses, wastes and reuses (Figure 2). Furthermore, it should also follow the ecological moral talk of taking the least from and dumping the least into the environment. To face the current and coming challenges rising from urban areas, it is essential for cities to transform themselves into self-regulating, sustainable systems – this extends to social, economical, as well as environmental development. Eco-urban-agriculture has a great potential and scope to the make the city sustainable in terms food generation, waste management, land management, environmental-economical-ecological factors.

It is recognized that cities currently use too many natural resources and produce too much waste. The ecological footprints of cities are stamping out the habitat of many species. The cities' impact stretches far beyond its physical boundaries. Moreover, cities are confronted with an increasing number of people and therefore, an increasing number of mouths to feed. Along with other initiatives and activities, urban agriculture therefore has an important role in contributing to the future sustainability of cities.

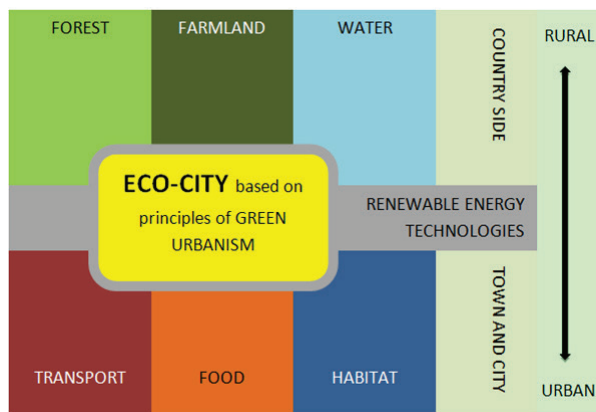
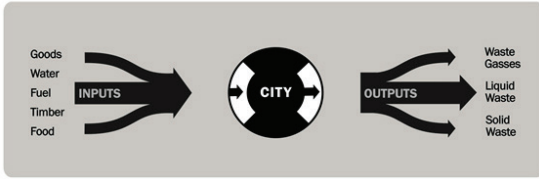


Figure 1: The holistic concept of Eco-City: A balanced relationship between the urban (city) and the rural (countryside) (Left); The pillars of Green Urbanism in an eco-city (Right) (Source: Steffen Lehmann, 2011.)

NOW: LINEAR METABOLISM



FUTURE: CIRCULAR METABOLISM

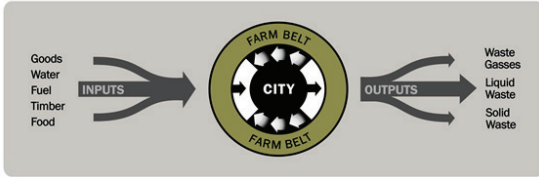


Figure 2: Future sustainable city with circular metabolism through farming from no-sustainable linear metabolism. (Source: Girardet, Herbert., 1999.)

An ecological footprint analysis assumes that every category of energy and material consumption and waste discharge requires the productive or absorptive capacity of a finite area of land or water (Wackernagel & Rees, 1996). By establishing the ecological footprint of different life styles, infrastructure, consumption patterns and certain densities separately, it

is possible to develop strategies to reduce environmental impacts and the depletion of natural resources (Susan Evans, et al, 2012).

In an analysis cities are required to list activities that reduce the ecological footprint, while at the same time increasing the quality of life for the inhabitants. Food supplies to cities are an important component of the footprint and a key issue in this context. Furthermore, cities that import large amounts of food create a huge negative environmental impact through energy consumption for food production, food processing and transportation. In this regard, urban by-products, such as wastewater and organic solid waste, can be recycled and transformed into resources for growing food products in urban areas. Additionally, urban agriculture can also reduce energy consumed by transportation, processing and storage.

Finally, urban agriculture has a huge impact through upgrading the quality of the environment. This upgrading is facilitated by providing absorptive surfaces in hard concreted cities and providing a protective utilization of idle open spaces. (Figure 3). Urban agriculture therefore contributes to the sustainability of cities in various ways – socially, economically and environmentally.

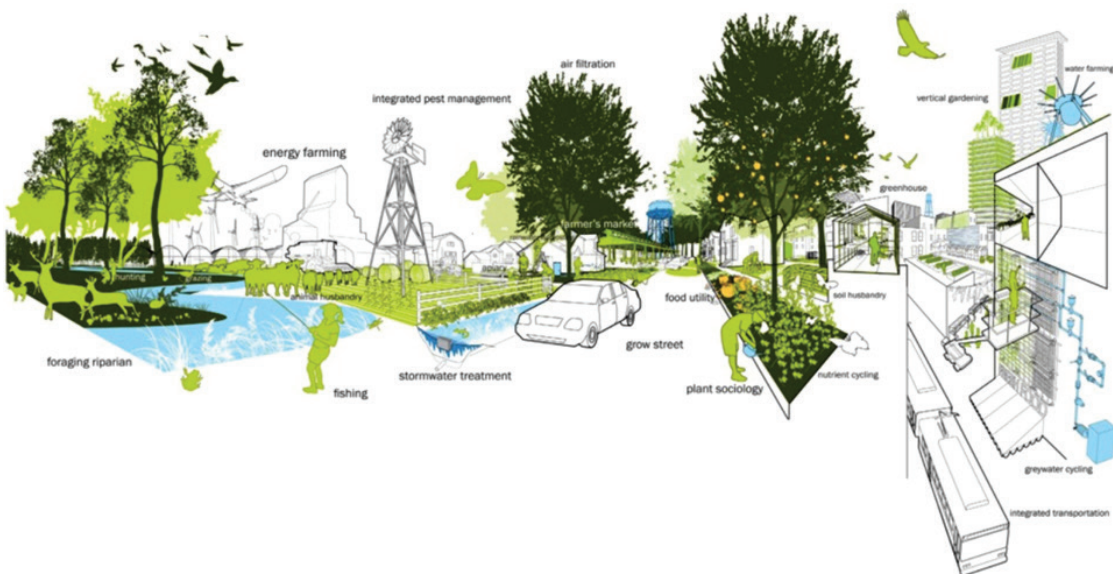


Figure 3: Different scale and extent of urban agriculture (Source: Fayetteville 2030)

UTILIZING UNDERUTILIZED URBAN LAND AND WATER BODIES FOR AGRICULTURE

Most cities, particularly in the developing countries, are urbanizing, leaving no space for open land, greenery and agricultural use. Agriculture and urbanization are confrontational positions rather than being integrating. Limited open land and shortage of water bodies tends to be a strong constraint for urban agriculture. But for sustainable built environments, a city requires equilibrium between its hard and soft environments. Urban agriculture is an important component of a soft sustainable element that can be integrated with the harsh built environment. Intelligent, integrated and economic use of limited urban spaces can be used for agriculture.

Leftover and setback spaces

Many buildings in urban areas leave their surrounding spaces vacant as the byproduct of building regulations. These spaces often remain un-utilized. Collective and intelligent placement of buildings on plots can produce useable chunks of open space for urban farming. Proper positioning of the farming plot that takes into consideration the microclimate and building location can contribute to fruitful production and other environmental opportunities for occupants and residents.

Idle public spaces

Though limited in number, every city has its own open public spaces, parks and idle land. If reviewed from a sustainability point of view, cities might have huge sources of land which remain idle. They include: land surrounding airport runways, university areas, military blocks, hospitals, public building premises, road sides, parks and spaces for other public gatherings. These areas have a great potential for food production, waste composting and uses that enhance the environment. Utilizing these lands by the respective users or leasing to nearby inhabitants for agriculture purposes can ensure food production and ecological diversity.

Non-suitable built-up area

In every geographical location, there are some lands which are not suitable for constructing buildings; earth quake prone areas, steep slopes, or marshy lands. Converting these lands into built up areas is costly, both economically and ecologically. Therefore, incorporating urban agriculture into these areas can help safeguard them from natural disasters and at the same time keeping them as permanent, un-built areas. This can be done while generating food cultivation and providing an environmental equilibrium for the built environment. Agriculture in these non-suitable areas prevents further degradation of the land, land subsidence, erosion, and landslides.

Community lands, building surfaces, balconies, roof tops

Every residential community has its own collectively shared open lands; parks, playground, road edges, and water bodies. Interested participants gardening or farming together can generate urban food production. Involving the elderly in such activities may help give purpose to their idle time by contributing to society. Additionally, children may also be involved with elderly citizens and learn about the native agriculture, plants and species. Besides strengthening community bonding through collective farming, this initiative also helps to protect open spaces from being built up in dense urbanized cities. In dense urban areas, there are few vacant lands in relation to crowded building blocks. The constructed building itself can be used for small scale farming. Roof top, balconies, wall surfaces have potential to grow food for household uses. These will not only ensure small scale food supply for the citizens but reduce the energy consumption of building.

Water bodies, lowlands

Some cities maintain water bodies, lowlands, or wetlands for its environmental sustainability but these bodies often remain used in a mono or limited capacity. Besides being used for recreational,

transportation or retention purposes, these water bodies can be used for biological water purification, floating agriculture, aquaculture, constructed wetland for biodiversity, or intense farming in lowland. The edges of water bodies, permanent lowlands, and seasonal wetlands can be utilized for location specific agricultural products throughout the year.

URBAN WASTE AS RESOURCES

As part of the urban life footprint cities generate a huge amount of waste without extensive recycling management. These by-products of urban areas are just dumped into nature; from landfills to accessible water bodies. This dumping causes an enormous environmental degradation and threats to ecological sustainability. The generated urban waste, namely waste water and solid wastes, creates a huge burden for ecology. Urban agriculture can help to utilize these wastes, particularly the organic waste by converting it into food and fuel, thus lowering the size of the city's ecological footprint. For example, sewage sludge from treatment plants can be added to other organic byproducts such as leaf litter, garden trimmings, and food scraps. When composted, this mixture yields a rich mulch which can be used as fertilizer to nurture the growth of quality organic edibles in urban gardens (Laurence, 1996).

Waste water

The direct use of recovered wastewater for food production in cities can also improve the efficiency of water usage. The wastewater stream from residential buildings passing through the constructed wetland represents a potential resource (water and nutrients) that can be used for urban food production. Rain water in monsoon regions can directly be used for agricultural irrigation, fish farming and other aquatic crops. Using small biological treatments of sunlight, time, intermediate plants, the rain water from storm drains could be used for farming. But reusing waste water with chemical contamination, particularly discharged from industries, requires significant separation and treatment of chemical particles before using for urban agriculture.

Solid waste

The byproduct of solid waste generated by urban life is an essential input for eco-urban – agriculture.

The best management of solid waste separates it into organic and inorganic components. Both of the organic and inorganic wastes are useful for urban agriculture but organic wastes are at the top of list. Composted food waste, street waste from trees and grasses, some manufacturing waste which use organic sources as raw materials such as paper mills, sugar mills could be used as soil enhancing agents and fertilizer for urban farming. Besides this, inorganic construction waste, like debris, might be used for shaping the ground. Reprocessed wood or plastic containers could be used as planter containers, cut plastic or glass bottles can be used to grow plants in walls/fences.

BENEFITS OF URBAN AGRICULTURE

There are several advantages and opportunities to improve the environment and ecology of cities through agriculture practices. Urban farming can help to create an improved microclimate and to conserve soils, to minimize waste in cities and to improve nutrient recycling, and to improve water management, biodiversity, the O₂ - CO₂ balance, and the environmental awareness of city inhabitants.

Urban agriculture can play a critical role as productive green urban infrastructure

For the ecological sustainability of a city the following can be generated and utilized: green plantations in the remaining open spaces of urban areas, water bodies and their edges, towering roofs covered with soft plantation, green roadside with appropriate agriculture within the urban areas. Vast agricultural production in suburban areas can serve as a green urban infrastructure. Urban agriculture can serve as a critical environmental service to the city through storm water runoff mitigation, soil remediation, and energy use reduction, block the transmission of urban noise, clear the air by producing oxygen and absorbing carbon dioxide, and control temperatures via shade and transpiration (Laurence, 1996). As well, they provide resting points for migratory birds and long-term habitats for hundreds of species of insects. These green practices in and around the city also address some of the problems inherent in an urban environment and “replace some of what the urban systems destroy” (Nugent, 1997).

Urban agriculture can play an important role in community development

Building a sense of community and cohesive neighborhood of civic-minded people are essential in the development of sustainable cities and urban agriculture has important contribution in these aspects. Community ties are created and strengthened when people come together for a common purpose in oases of natural beauty, openness, and security. These characteristics are especially important for inner city residents who live in cramped apartment buildings. In urban community gardens- people share a plot of land, share seeds and products, tools and skills, time and knowledge and in such a way they develop a nature of sharing. Furthermore, urban farmers could target their produce to the growing niche market which demands organic, local, and environmentally friendly foods. These types of small businesses would integrate well into the new community development models which are being investigated as alternatives to urban sprawl and decay. Urban agriculture can also be a means of transforming underutilized or neglected space into a public resource, providing opportunities for social interaction, greater community cohesion and self-sufficiency, and engagement for young people in underserved neighborhoods.

Contribute to the food demand

Families on a restricted budget can give themselves an option by growing their food in their own or shared production on the grounds or on roof tops. This small-scale agriculture not only relieves a significant financial burden, but it can also help to foster a sense of self-sufficiency and accomplishment.

Less dependency on food transportation from rural area

Food demand of city basically depends on the food production in the rural areas which requires transportation cost and time, chemical processing for preservation, energy consumption for transportation and storage. But agriculture in and near urban areas trims the dependency for food produced in rural areas and provides fresh, chemical free healthy food while saving energy and time. The convergence

of producer and consumer which occurs with localized food production also reduces the need for intakes from the larger resource stream, lowers the amount of pollution generated by long-distance transportation, and conserves energy normally lost to the system (Barrs, 1999). This is achieved when the processing, packaging, transporting, and storing activities of the traditional agricultural model are bypassed for the growing and harvesting of produce in a single location by a few individuals (Nugent, 1997).

Waste and land utilization

Efforts for waste reduction require three different approaches: reducing the amount of waste, re-using what can be re-used, and recycling the remainder. Urban agriculture can play an important role in all three approaches by taking waste as input for its production. The relation between urban agriculture and waste management is most pronounced in the use of organic wastes.

Water management

Agricultural activities in cities can indirectly improve urban water management, because green spaces with permeable land surfaces allow rainwater and runoff to drain through the soil. This is important because the growing areas of hard-covered surfaces in cities (e.g. streets, roofs and paved areas) leads to increased volumes of runoff during storms with risks of floods, water logging and landslides. The need for costly mechanized storm water sewers and drainage can be minimized when enough green space is available. Utilizing natural canals, water bodies for stormwater conveyance, wastewater drainage, rain water harvesting, water retention and thereafter incorporate agriculture in those areas not only provide food production but ensure entire water management of the watershed.

In urban areas, water percolation basically depends on the underground fresh water due to reduced surface water area by hard built area. Consequently, aquifer level is gradually descending with increasing fear of the land subsiding. Agriculture in the heard urban areas ensures enough green absorptive surfaces for water penetration into the ground and recharging the aquifer table.

Contribute to enhancing biodiversity

Urban agriculture can have a positive effect on increasing biodiversity. As the choice of food production depends on individual test and demand which provides varieties of food products. At the same time, the limited space available in the urban environment necessitates small scale farming allows more of a variety of production much easier than vast rural farmland. These varieties of agricultural production ensure a richer biodiversity in urban built environments. Additionally, such eco-friendly growing methods do not rely on large quantities of biocides or the genetic modification of crops. Therefore, locally adapted seed varieties can be planted which both preserve biodiversity and yield a healthy and chemical-free harvest (Laurence, 1996).

Microclimate improvement

If appropriately planned and integrated into urban designs, urban agriculture can contribute to the comfort of its citizens. Green spaces around apartment blocks and houses, as well as neglected spaces in the city, help to improve the physical climate because vegetation can help increase humidity, lower temperatures and introduce more pleasant odors to the city. It does this by capturing dust and gases from polluted air through deposition by the foliage of plants and trees, and soils. It also helps to break wind and intercept solar radiation, creating shadows and protected places.

Enhance traditional way of living

Many of the cities' residents, especially in the cities of east, migrate from rural areas. They are generally familiar with the origin of food production. Including areas of agriculture on urban land can facilitate a sense of belonging by allowing them a chance to participate in traditional practices, especially the elderly and adults of the family. Furthermore, future generations can also be encouraged to participate in a facet of a traditional lifestyle to strengthen their roots with nature.

Global warming and atmospheric pollution

Urban agriculture can help contribute to reducing the net discharge of CO₂ and other polluting gases

contributing to global warming, from activities in cities.

Environmental awareness

Urban agriculture can also change the perception of people in cities regarding food. By directly experiencing food production, residents can perceive the impact of food consumed from distant areas; energy-time-economic consumption. People can also relate these aspects to the natural food chain, thus making them conscious of the environmental impact of urban agriculture.

Development of oneness

The simple act of gardening can enhance the physical and spiritual health of individuals of all ages, abilities, ethnic backgrounds, and social classes. In other words, gardening can work to break down the artificially created barriers between humans and nature. People living their lives with this kind of awareness will begin to create a chain reaction of change which could alter current paths from one of ecological destruction to ecological sustainability.

EMERGENCE OF URBAN AGRICULTURE FOR THE SUSTAINABILITY OF DHAKA CITY

Dhaka city, the capital of Bangladesh, is situated in the world's largest delta system, the Ganges, Brahmaputra and Meghna basin. Due to this geographical location, the city is characterized by huge natural resources which are quite evident throughout the territorial landscape. Dhaka is surrounded by four major river systems; the Buriganga, Turag, Tongi and Balu. Topographically, the area is flat land and is mainly located on an alluvial terrace. Having rivers all around, Dhaka city has a rich system of water bodies, peripheral lowlands and vast fertile arable land (Figure 4 & 5). But, these unique hydrological landscapes are sustaining tremendous pressure due to urban densification. Dhaka now has a 9.3 million population in an area of 306 square kilometer and has become one of the world's largest megacities (Khatun, H., et al, 2015).



Figure 4:
Dhaka city within its natural settings
(Source: <https://geology.com/world-cities/dhaka-bangladesh.jpg>)

Dhaka is the largest and fastest growing city of Bangladesh. Rapid population growth in Dhaka has created severe pressure on the land of the already overcrowded country. Agricultural lands have given way to housing developments and roads in an agriculturally based economy. In recent times, Dhaka has been challenged by numerous difficulties like unplanned urbanization, extensive urban poverty, growth of urban slums and squatters, food insecurity, solid waste management and environmental degradation. For better understanding of city sustainability, the agriculture coverage, food security and appropriate solid waste management needs to be crucially considered.

According to Mohammad Nasir Uddin (2007), only 2.5% land is available for agricultural purposes within the city (Rahman & Siddiquee, 2012). Furthermore, Dhaka city has an extreme shortage of open spaces for its citizens. Against an acceptable standard of about 25% urban greenery, open spaces in Dhaka constitute less than 15 % of the city landscape. Old Dhaka has only 5% and new Dhaka has about 12% open space. The total amount of open spaces in greater Dhaka is about 17-18% of the city area.

Dhaka is also struggling to retain its last bodies of water and other water structures. An analysis done by Ashraf M.D. (2008) over DMA showed that, the city's built-up areas increased to about 344% in 2005 compared to 1960, whilst the increment of landfill/ bare soils was about 256% and about 18.72 km² of Rivers & Khals, 76.67 km² of wetland has lost during last 30 years from 1978 to 2009. That means, about 60% of existing wetlands and about 65% of Rivers & Khals have disappeared in last three decades in the Dhaka Metropolitan Area (Khan, S., et al., 2015) (Figure 6). Once structured with immense bodies of water which ensured a positive atmosphere, currently Dhaka has only 6% of the total area invested in bodies of water. At present, cultivable land, open spaces, bodies of water, and wetlands are all being reducing at an alarmingly rate due to increases in population. (Figure 7). This insensitive destruction of natural elements has generated an environmental imbalance and as a consequence the city faces huge natural disasters like flooding, water logging, extreme summer, and storms.

To overcome the present situation and tackle the coming environmental constraints, it is essential for



Figure 5:
Natural and agricultural landscape in and around the Dhaka city.
(Source: Author)

Dhaka to incorporate some eco sensitive techniques to ensure environmental sustainability. Introducing eco-urban agriculture within the built environment could be one method to ensure livability with the urban setting. Agriculture practices in the essential open spaces, water bodies, and vacant lands, on different scales, might restrict further land conversion to built up areas. This would entail the benefits of urban agriculture for built environment. (Figure 6 & Figure 7)

Furthermore, Dhaka is already covered by hard concrete surfaces-60% of the land surface is covered by roads and buildings (Mowla, 2010). About 80,220 hectares is covered by concrete as a continuous roof which is considered as 65% Dhaka's area (Rahman & Siddiquee, 2012). Therefore, if these vast areas can be covered with soft green through food production, it can contribute to the quality of life, energy consumption, economic contributions and additional food supplies.

According to the JICA (Japan International Cooperation Agency), per capita waste generation rate of Dhaka is found at 0.56 kg/capita/day (Rahman

& Siddiquee, 2012). The city authorities face serious problems in managing this waste which causes huge environmental nuisances. But if considered and utilize properly, this urban byproduct can be converted into bio-fertilizer for urban and near-urban agricultural production. By closing the loop between output and input of natural and manmade elements, urban agriculture can contribute for sustainability of urban life.

CONCLUSION

The world is becoming urbanized and city dwellers significantly impact the environment. The built environments of urbanization alter natural settings and create ecological crisis. To overcome this immense crisis, the concern bodies related to the built environment should search for the best and integrated solutions towards human needs. It has already established that sustainability of built environment depends on the environmental, economical and social balance of that development. This overall sustainably can be achieved through keeping in mind the ecological principles during

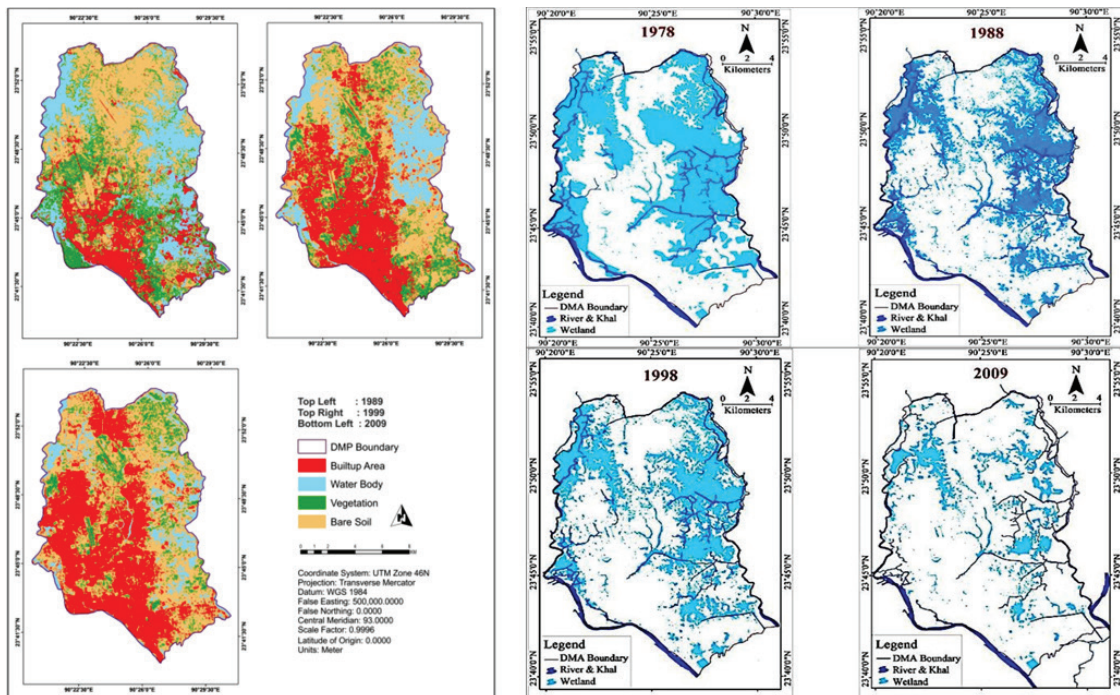


Figure 6:
Land cover change and wetland reduction map of Dhaka city
(Source: Ahmed, B., et al., 2013 & Khan, S., et al., 2015)



Figure 7:
Rapid conversion of natural open spaces, arable lands into built-up area.
(Source: Author)

development. Urban agriculture has a wide range of environmental, economic, and social advantages. Together with initiatives on energy efficiency, high resource productivity and policies for containing sprawl, urban agriculture has an important contribution to make towards shaping the cities for the future (Tjeerd & Herbert, 2011).

Hence, initiatives should be taken to incorporate urban agriculture within urban policy at the planning level for a sustainable city. Traditionally, agricultural policies – whether oriented towards export production or local food production – have focused on maximizing short-term profits rather than on long-term environmental management of local resources. Many urban managers and planners think of their city more in terms of housing, transport, commercial services and industry, rather than in terms of agriculture, which generates relatively low yields (Girardet, H., 1992).

The government of Bangladesh does not have any specific policy or provision that promotes urban agriculture. Until now, the present master plans of Dhaka and very recent Detail Area Plan of Dhaka

keep the provisions of large open space, retention pond, flood flow zone, sub-flood flow zone. But these open spaces and green areas are kept separate from built environments. By not being integrated within the built environment and the absence of regulatory mechanisms, these last open spaces are rapidly occupied by greedy land developers. To overcome these situations, the policy makers and other professionals related to the built environment should search for integrated and comprehensive approach to accommodate eco-design concept in the planning, policy and strategy levels. Integration of eco-urban agriculture within the built environment can contribute to an overall sustainability of the living environment. Urban agriculture can reduce the “ecological footprint” of cities when environmental goals are combined with an overall urban policy (Van Delft & McDonald 1998). Such overall urban policies would include raising environmental awareness and wide public participation in urban development.

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overcome this immense crisis, the concern bodies related to the built environment should search for the best and integrated solutions towards human needs. It has already established that sustainability of built environment depends on the environmental, economical and social balance of that development. And this overall sustainably can be achieved through the ecological principles in mind during development. Urban agriculture has a wide range of environmental, economic, and social advantages. Together with initiatives on energy efficiency, high resource productivity and policies for containing sprawl, urban agriculture has an important contribution to make towards shaping the cities for the future (Tjeerd & Herbert, 2011).

Hence, initiatives should take to incorporate urban agriculture within urban policy and planning level for a sustainable city. Traditionally, agricultural policies – whether oriented towards export production or local food production – have focused on maximising short-term profits rather than on long-term environmental management of local resources. Many urban managers and planners think of their city more in terms of housing, transport, commercial services and industry, rather than in terms of agriculture, which generates relatively low yields (Girardet, H., 1992). The government of Bangladesh does not have any specific policy or provision that promotes urban agriculture in the urban area. Till now, the recent master plans of Dhaka and very recent Detail Area Plan of Dhaka keep provision of large open space, retention pond, flood flow zone, sub-flood flow zone but these open spaces and greeneries are kept aside of built environment. Being not integrated with the built environment and absence of regulatory mechanism, these least open spaces are rapidly occupied by greedy land developers. To overcome these situation, the policy maker and other professionals in the built environment should search for integrated and comprehensive approach to accommodate eco-design concept in the planning, policy and strategy level. Integration of eco-urban agriculture within the built environment can contribute to overall sustainability of living environment of urban areas. Urban agriculture can reduce the “ecological footprint” of cities when environmental goals are combined into an overall urban policy (Van Delft & McDonald 1998). Such overall urban policies would include environmental awareness-raising and wide public participation in urban development.

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