Climate change and food security

Climate change, however, may affect the physical availability of food production by shifts in temperature and rainfall, people's access to food by lowering their incomes from coastal fishing because of rising sea levels, or lowering a country's foreign exchange earnings by the destruction of its export crops because of the rising frequency and intensity of tropical cyclones.

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WORLD Food and Agricultural Organization's (FAO's) recent projections to 2030 suggest that globally the share of food in average household expenditure will continue to decline. However, recent trends, at least for some commodities, appear to be showing the reverse, with food prices increasing faster than incomes. Growing scarcities of water, land and fuel are likely to put increasing pressure on food prices, even without climate change. Additional pressures on these resources due to climate change, the introduction of mitigation practices that have the potential to create land use competition, and the attribution of market value to environmental services to mitigate climate change, also have the potential to cause significant changes in relative prices for different food items and an overall increase in the cost of an average food basket for the consumer.

According to FAO, food security exists when all people at all times have physical or economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life. To achieve food security all four of its components must be adequate. These are: availability, stability, accessibility and utilization. A food system is a set of dynamic interactions between and within biogeophysical and human environments that influence both activities and outcomes all along the food chain (production, storage and processing, distribution, exchange, preparation and consumption). Food security is the outcome of food system performance at global, national and local levels. It is often directly or indirectly independent or agricultural and forest ecosystem services, e.g, soil and water conservation, and watershed management, combating land degradation, protection of coastal areas and mangroves, and biodiversity conservation.

Around the world South Asian countries are more prone to food insecurity. The people in the regions of Indo-Ganges agricultural plains of Bangladesh, Pakistan, India and Nepal are characterized with high population growth, poverty and high dependency on agriculture to maintain their livelihood. South Asia has 22 percent of world's population (about 1.4 billion) including 40 percent of world's poor. More than half of the population of South Asia is directly dependent on Agriculture to maintain their livelihood and food security. IPCC5 claimed that climate change has a direct impact on the global food security, especially in the South Asia.

It has been projected that global mean annual surface air temperature by the end of this century will likely to be increased in the range of 1.8 to 4.0d C. Overall in South Asia the temperature will likely to be much higher in winter (robi crop season) than in monsoon (kharif season). It is very likely that heat waves, heavy precipitation events will become more frequent. The IPCC reported crop yields could decrease up to 30 per cent in Central and South Asia by the mid-21st century.

United Nations Framework Convention on Climate Change (UNFCCC) claims climate change as one of the causes of food insecurity. It presents some of the impacts of climate change on food production which are already visible and seem to be advancing at a higher rate than previously anticipated:

- Regional temperature rises at high northern latitudes and in the center of some continents;
- Increased heat stress to crop and livestock; e.g. higher night-time temperatures, which could adversely affect grain formation and other aspects of crop development;
- Possible decline in precipitation in some food-insecure areas such as southern Africa and the northern region of Latin America;
- Increased evapotranspiration rates caused by higher temperatures, and lower soil moisture levels;
- Concentration of rainfall into a smaller number of rainy events with increases in the number of days with heavy rain, increasing erosion and flood risks;
- Changes in seasonal distribution of rainfall, with less falling in the main crop growing season;
- Sea level rise, aggravated by subsidence in parts of some densely populated flood-prone countries, displacing millions;
- Food production and supply disruption through more frequent and severe extreme events.

Achieving food security and reducing poverty in Bangladesh has been a major challenge for both governments and development agencies due to vulnerability of Bangladesh agriculture. Currently, much more people in the rural Bangladesh are considered food insecure due to recurrent different events like flood, storm, river bank erosion, salinity intrusion, and drought. This unfortunate situation is the result of many factors, some of which are:

- The poor nature of soils due to intensive cultivation and cropping (most soils are now low in organic matter content, low in carbon and poor in different micronutrients);
- The rapid population growth, which has led to continuous cropping, expansion of agriculture to marginal areas and overgrazing;
- The low use of technologies such as improved varieties, fertilizers, mechanization and irrigation that have stimulated agricultural development; and
- The absence of adequate technologies and policies that take into account the specific needs of the small-scale farmers.

A recent study (Nasreen, et al. 2008) pointed out that climate change induced disasters and food insecurity affect both women and men but the burden of coping with disaster falls heavily on women's shoulders in Bangladesh. Women suffer more than men from poverty, hunger, malnutrition, economic crises, environmental degradation, health related problems, insecurity and become victim of violence and political crises. The gendered division of labour becomes critical as gender roles are often re-enforced and even intensifieddue to the additional work and changes in environment brought on by a disaster. It has been argued that violation of women's rights becomes more prominent during disaster. People have to depend on relief to cope with disaster, however, relief does not reach to those people who mostly need it. Women's own adoptive techniques and initiatives become crucial for their family sustenance and ensuring food security.

Right to food raises questions in Bangladesh about capacity to adaptation to attain food security because of the uneven distribution/allocation of resources and crop damages due to recurrent climatic events of floods, salinity and drought. The women and children among the poor and marginal people are the major victims who are trying to adapt spontaneously to such impacts but limited resources and vulnerability to natural disasters hindering them to solve their problem of food security. In Bangladesh in particular the poor and marginal people are expected to suffer most especially by flood and salinity.

There are specific programmes in Bangladesh Climate Change Strategy and Action Plan (BCCSAP, 2008, Ministry of Environment and Forests, GOB) under several themes, of which 10 themes are directly related to food security. Some of these are having specific programmes on food security including agriculture cropping, livestock and fisheries.

Since food insecurity depends more on socio-economic conditions rather than on agroclimatic ones, the ways in which climate change can affect people's access to adequate food is rather complex. Future food security will mainly depend on the interrelationships between political and socio-economic stability, technological progress, agricultural policies and prices, growth of per capita and national incomes, poverty reduction, women's education, trade and climate variability. Climate change, however, may affect the physical availability of food production by shifts in temperature and rainfall, people's access to food by lowering their incomes from coastal fishing because of rising sea levels, or lowering a country's foreign exchange earnings by the destruction of its export crops because of the rising frequency and intensity of tropical cyclones. Thus global food security should be ensured through addressing climate change from a wide range of perspectives, of which reducing its impact should be given high priority.

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CLIMATE REFUGEES

Search for higher ground

TAREQUL ISLAM MUNNA

IN the hilly hamlet of Hoaikong in southeastern Bangladesh, villagers are used to welcoming new residents on a weekly basis.

The once-sparsely populated jungle, home to only a handful of tribal families, houses some 2,000 people who have sought higher ground as the island where they once lived becomes increasingly submerged by the sea.

Ex-fisherman Jaber Ahmed, who has turned his hand to farming in his new environment, says there are two camps of thought among islanders as to why they have had to migrate inland. "Some of us think that the land is sinking. Others say the sea is rising," the 55-year-old says. "To be honest, I have no idea. All I know is we had to move our homes to survive."

Ahmed moved from the island 10 years ago, and has watched former neighbours follow his lead. "I was one of the first here when my home on the edge of the island disappeared. Slowly more followed. Now it's happening more and more and our old island is disappearing under the sea."

Ahmed's story is a familiar one along Bangladesh's southern coast, where locals and climate experts say that islands at the country's edge as well as its coastline along the Bay of Bengal are shrinking. Although the villagers say they do not know the exact cause of the problem, experts are more certain.

Scientists including those from the United Nations Intergovernment Panel on Climate Change (IPCC) -- say that the number of climate refugees will increase in Bangladesh in the coming years as rising sea levels devour low-lying coastal areas.

The plight of people like Jaber Ahmed has been at the top of the agenda for the Bangladeshi delegation during the climate change talks from December 1-12 in Poznan, Poland.

Professor Atiq Rahman, a highly acclaimed Bangladeshi climate specialist, is among those who attended the summit. He says richer nations will be forced to open their countries up to climate refugees as land becomes scarce in the densely populated nation.

"Bangladeshis are already being displaced because of climate change. It's not happening in the distant future. It's happening now," he says. "Being displaced is just one of the problems of rising sea levels. People will lose their livelihoods, food security will be under threat and so will water security." Impoverished Bangladesh, says Rahman, is one of the lowest emitters of harmful carbon dioxide, but one of the worst affected by climate change.

The Nobel prize-winning IPCC, which Rahman was a member of, says there will be 20 million people like Jaber Ahmed by 2050 because of an increase of extreme weather conditions caused by climate change.

James Hansen, director of the US-based Nasa Goddard Institute for Space Studies, says Bangladesh's entire population will become environmental refugees by the end of the century because its entire landmass will be under water.

In September, the Bangladesh government launched a campaign against rich countries, saying that they needed to cough up billions of dollars to help it, one of the poorest nations in the world, fight climate change.

Britain, the only country to respond thus far, pledged £75 million, and called on all nations to thrash out a new global warming agreement.

About 8,000 delegates from 190 countries attended the Poland talks to discuss UN commitments beyond 2012, when pledges under the Kyoto Protocol expire, to be ratified in Copenhagen, Denmark next year.

The remote jungle of rural Bangladesh is a long way from the Polish capital, but farmer Jaber Ahmed says he hopes the world's leaders know about the problems people like him have faced.

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Green Plot Ratio: Environmental planning of cities

Rather than looking for modern technologies to combat the effects of climate change or global warming significant concentration should be put on enlightening ideas and innovations regarding green revolution in the architecture and planning starting from an individual building scale to a city scale.

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WEEKS ago I went through the article 'Blazing Dhaka: An urban heat island' written by one of my departmental fellows in The Daily Star. It should undoubtedly be a great concern for the urban experts. The UHI is the worse outcome of urban metabolism process (exchange and transformation of material and energy flow) and is very much explicit in most of the densely built urban environments. But most of the economically developed countries are totally dependent on artificial air cooling system to get rid of the uncomfortable local climatic situation which again discharges waste energy in the atmosphere attributing to the global warming. Dhaka, unless address and takes proper initiatives to attenuate the impact of UHI, the city life will be really very much miserable and not unlikely that the city becomes abandoned while also facing other environmental issues as majority of city dwellers are not so rich to own AC and AC in every house in congested localities simply unbearable environmentally.

In this article such a tool has been discussed which can be used as a very strong indicator for greening the urban development. This is not to mention that there are several benefits in increasing the amount of greenery in citiesenvironmentally, aesthetically, and recreationally. From supplying oxygen, food and most of the necessary commodities the extent of services rendered by the plants and trees are multifold: pollution control, heat reduction, ecological habitat restoration, increasing scenic beauty etc. Diverse researches are being carried out to integrate environmental and ecological thinking in urban architecture and design to improve local climatic situation in terms of temperature reduction and attenuating the effect of UHI as well as conserve the existing greenery or compensate the green loss by culturing green above the ground.

Whitford et.al (2001) identified four performance indicators also linked with green spaces: climate, hydrology, carbon storage and sequestration, and biodiversity. The above strategic and multi-dimensional usefulness of greenery in urban built environment called for using a common metrix that can be used as a sustainable indicator for urban design. Therefore, based on the famous planning tool namely, Building Plot Ratio (in our country which is used as Floor Area Ratio) and a biological parameter named Leaf Area Index (LAI), the tool called Green Plot Ratio(GPR), developed and successfully used in many urban designs by a famous landscape architect of Singapore, Dr. Ong Boon Lay who is also a faculty of National University of Singapore.

Building Plot Ratio is just a simple measurement of maximum allowable building development on a site; usually this tool is used to regulate building heights as well as zoning during master planning phase of any area. A site with a BPR of 2:1 can have a building that has a total useable

floor area twice that of the site. The distribution of this floor area can be in the form of a two storey high building which covers the site entirely, a building that is four-storey high which covers only half of the site, or combinations of different arrangements. As the site coverage reduces, the building can be taller and have additional floors therefore the building density is also likely to be increased.

In biological science, LAI is defined as the single-side leaf area per unit ground area. It is a dimensionless number, with many other uses that is vigorously used to predict the plant metabolic processes e.g. photosynthesis, evapotranspiration, respiration and uptake of mineral from the air and ground, the most benefits which we gain from plants. Dry deposition of pollutants and particulates are also dependent on the total leaf area of the plant and its leaf characteristics. For better understanding, LAI can be considered simply as the ratio of leaves to ground covered. GPR is defined as the average LAI of the greenery on the site.

GPR is defined as the average LAI of different plants and also can be defined in the similar way as the ratio of the single-side leaf area of the planted landscape to the plot or site area. The LAI value is determined in terms of the total surface area of leaves of a particular group of plants exposed to the sun as well as ability to tap the transmitted light through the upper layer of translucent leaves. Considering the above criteria and based on previous research data Dr. Boon Lay suggested the value of LAI for grass, bushes and matured trees of dense canopy as respectively, 1, 3 and 6 to 10; the last figures dependent on the density of the matured trees e.g. the density of matured trees varying from dense natural forest to planted matured trees. Therefore one piece of land when covered with grass, corresponding GPR would be 1:1, for bush/shrub or matured trees this would be 3:1 and 6:1 to 10:1;

These values are very much helpful in determining to compensate the amount of green loss due to new development. Suppose, a new mixed development has been proposed in an area which is naturally vegetated and a portion of that vegetation may undergo destruction during development. So we can easily estimate how much LAI we are losing and how we can compensate by planning plantation in the form of vertical gardening, roof gardening and re-plantation.

For example, for the proposed development on an area of 500 SqM , 30 SqM of grass land, 50 SqM of shrub land and 20 SqM of matured tree are needed to be destroyed so during planning phase we can compensate the loss by intellectual design in the form of allocating green provision on the building top, wall, vacant place or maintaining green patches within buildings like park connector or greenways planning and in these way even more GPR or LAI can be achieved than the existing. But it is true that the compensated green will not be same like the existing one in terms of its ecological values and services. Because at the roof level the maximum LAI value of 3 (shrub, bush) (Fig-1) can be achieved and cripplers that are used as the vertical gardening or roof gardening replicate grassland.

Again in a virgin land another type of green patches may exist which is called 'scrubland' that is interspaced with shrub, grass and matured trees, in that case the calculation of GPR depends on the local condition and the planners' sense. So based on GPR calculation in an urban planning a proposed urban built area may be like Fig-2 which is solely depend on the intelligent architecture and design.

A new termskygardenhas been introduced to refer to planted landscapes built above the ground: in intermediate floors of high-rise buildings or at the rooftop. It is true that a roof garden cannot be equivalent to a similar sized garden on the ground as well as a high-rise building wrapped with green cripplers on its roof facades may not be effective as a mature tree of similar size that is lost due to the development but in face of fast urbanization and consequent loss of natural vegetated green lands achieving high GPR in the above form undoubtedly will contribute to a large extent to reduce the effect of habitation loss, worse environmental effect etc.

Therefore rather than looking for modern technologies to combat the effects of climate change or global warming significant concentration should be put on enlightening ideas and innovations regarding green revolution in the architecture and planning starting from an individual building scale to a city scale.

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Fig-1

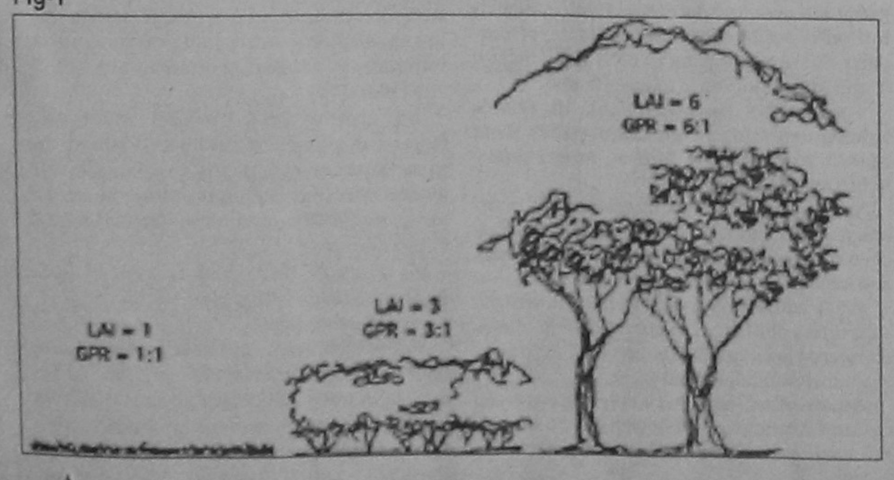
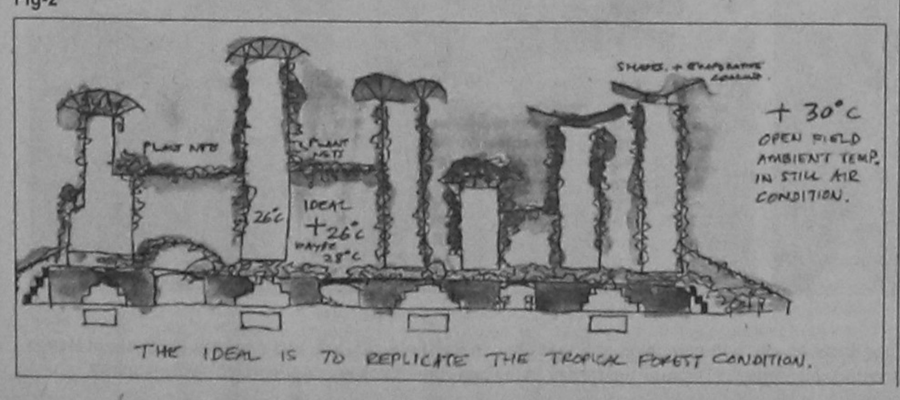


Fig-2



Rain gardens to help environment

Rain gardens exist primarily to filter rainwater. Rainwater landing on hard surfaces such as roofs, paved areas, driveways and paths is channelled through pipes into the rain garden, where pollutants are extracted from the water via natural means. The water can then be returned safely to the wider environment.

There are two main types of raingardens - classic 'biofiltration' rain gardens and 'infiltration' rain gardens. Both are enclosed areas of sand or soil surrounded by a barrier - often a wall made of stone or other masonry - and filled with plants.

In the classic biofiltration system the filtered water is directed out of the rain garden via a pipe that leads into storm-water drains, which then flow into natural river and creek systems.

"When rain lands it picks up all sorts of pollutants," says landscape gardener Dean Speldewinde from Hardart. Dean is a certified sustainable landscape gardener and a specialist in rain gardens. "Rain gardens filter the water of these pollutants, so when the water runs into the environment it is less likely to damage it."

Rain hitting hard surfaces washes all manner of pollution off and carries it away. Nutrient-rich bird droppings and heavy metals such as zinc and lead, along with elements like phosphorus and nitrogen, are picked up as the water moves across these surfaces, and these pollutants can harm the environment.

"Nitrogen and phosphorus encourage algal blooms in our waterways," says Dean. "The more of these things we can take out of the water before it re-enters the environment, the better."

So, to help the environment, raingardens extract heavy metals from the water as it moves downwards through the soil or sand. Plants that feed on phosphorus and nitrogen take these elements from the water. Other nitrogen-based compounds are broken down as they come into contact with composting carbon in the bottom of the rain garden.

Plants that extract phosphorus and nitrogen are best suited to rain gardens. Tussock grass like Tall Sedge (Carex appressa), paperbarks (Melaleuca), and rush grasses like Juncas amabilis and Juncas flavidis are some examples.

An infiltration rain garden has no lining and is designed to allow the filtered water to seep through into the soil below, benefiting the water table along with the garden more generally.

Raingardens are extremely attractive to look at, and can bring an unusual and interesting element to any garden. "They look a little bit like a pond without any water in it," says Dean.

So why not consider putting a rain garden in your outdoor spaces? Get the neighbours talking, add interest and individuality to your garden, and help the environment too.

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Source: Internet
Courtesy: Home