

Responding to Climate Change: Conservation of Mangrove Forest in Bangladesh

(An initiative of Daffodil International University)



Daffodil International University

June 2021

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Preamble:

Bangladesh is one of the countries which are most vulnerable to natural disaster and environmental pollution as a consequence of climate change, because of its geographic location and population expansion. The demand for environmental scientists and those trained in disaster management and pollution control are, therefore, acute and DIU feels strongly that the University must be a part of the solution to environmental degradation and ensure sustainable development. To be a stakeholder of UN's efforts for achievement of SDGs and produce knowledgeable graduates for responding to climate change and sustainability, DIU established an academic Department titled ***Environmental Science & Disaster Management (ESDM)***.

Daffodil International University (DIU) undertakes several research projects aligned with the Sustainable Development Goals in collaboration with local and foreign institutions. One of these research projects is implemented by the Department of Environmental Science and Disaster Management (ESDM) in collaboration with the U.S. Partner Demetrios Gatziolis.

DIU always focuses on social and environmental sustainability in the first instance which is aligned with implementation of SDG 13 (Climate action) for reducing carbon emission out of all of its activities around the year.

Unmanned aerial systems-based assessment of tree cover and deforestation dynamics in Bangladesh

The project team was formed comprised with the Principal Investigator Dr. A.B.M Kamal Pasha of Daffodil International University and the U.S. Partner Demetrios Gatzliolis for implementation within a duration of a four years from December 2017 - December 2021. Dr. Demetrios Gatzliolis is a member of The United States Forest Service.

The main advantages of photogrammetry based on unmanned aerial vehicles (UAVs) compared to traditional aircraft imaging campaigns are low cost and flexibility. In addition, aircraft-based image acquisition usually requires months of planning and must cover a substantial area to justify the cost. UAVs can be deployed at a moment's notice and require practically no maintenance. They can also be deployed at easily customizable above-canopy altitude, camera orientation, trajectory, and speed. They are thus ideal for imaging small areas of forests, such as over individual tree stands, management units or inventory plots (Gatzliolis et al., 2015). Most developing countries do not yet have the capacity or knowledge base to support modern forest inventories and typically depend on satellite imagery and applications developed elsewhere to meet their needs, including the obligation to report on the status of their forests if they participate in the international REDD initiative. Satellite-based assessment is adequate in many instances—for example, to assess deforestation in the Amazon basin. It can be problematic and biased, however, when the anthropogenic interventions and ensuing disturbances are either gradual or have a spatial footprint much smaller than the resolution of the satellite imagery employed. The advent of novel, inexpensive technologies, including UAVs, and the development of affordable software capable of performing complex photogrammetric tasks hold promising potential into assisting the assessment of forest resources in developing countries and facilitating their verifiable participation in efforts to mitigate the effects of deforestation and forest degradation.



Mangrove forests in the Sundarbans, Study area (red oval) in the Sundarbans forest of Bangladesh.

In this project, the PI and his team will devise and optimize a fully-automated UAV-based image acquisition protocol compatible with generating comprehensive (gap-free), high-density, precisely geo-referenced point clouds representing forest canopies for areas centered on selected locations in the Sal and Sundarbans forest types that host national forest inventory plots of the Bangladesh Forest Department (BFD). The researchers will generate canopy surface and canopy height rosters for each selected inventory plot and its surroundings, as well as estimates of canopy cover for each subplot of every selected inventory plot, and compare them to those obtained by inventory personnel during field visits. Using the data, they will gather; they will develop forest type-specific models of forest biomass and outline a framework for forest change detection and quantification based on periodic satellite imagery and incorporating UAV-derived information over selected areas. Methodologies, findings, and results will be shared with the United Nations Food and Agriculture Organization, representatives of the U.S. Government technical cooperative program SilvaCarbon in Bangladesh, BFD officials, and ultimately the public.

Project updates

During January - March 2021 period, as planned, the PEER team resumed planning for the expedition to collect data in the Sundarbans. The plots were carefully selected to encompass all three saline zones of the Sundarbans' forest, and trip logistics were finalized with the help of USAID Bangladesh Mission. The expedition took place during the second half of February 2021. The team covered a wide range of different forest plots from Tambulunia, Horintana, Shapla, Kokilmoni, Dubla, Harbaria, Jhapshi, Nondobala, Moraposhur and Hiron point forest range. The team observed unexpected findings in terms of tree composition and variation. After the expedition, the team moved on to raw data processing in partnership with

Bangladesh Forest Department (BFD) with whom they now share data collection methods and hardware to conduct research.

In terms of outreach and collaboration, the project team continue their partnership with the Bangladesh Forest Department. The PEER team shared with BFD their data analysis methods and helped BFD develop and train their drone patrol team, which recently commissioned a new drone for patrolling the Sundarbans with technical advice by the PEER team. According to Dr. Pasha, this was a huge milestone for BFD and for the PEER team ever since the drone regulation law was passed in Bangladesh in 2020, following the team's year-long efforts for passing of such legislation. As part of the ongoing partnership, PEER team continues to rely on BFD's commitment to give PEER team access to BFD's central remote sensing lab where the team can access the needed data and conduct post-campaign data processing and analysis.

Bangladesh's very first policy for UAV operation for research purposes is in the pipeline. The draft for this historic legislation evolved around operational aspects of UAV use, which the PEER team highlighted in their permit acquisition documents. This is a significant milestone, considering the already complex approval processes in Bangladesh. Furthermore, technical feedback the team gave during the meeting to representatives of the intelligence community and air defense experts in attendance have cleared a lot of aspects of UAV usage for research that had not been addressed before. This breakthrough is anticipated to have opened a window of opportunity for conducting UAV based research in Bangladesh in the future.



Patrick Meyer (USAID/Bangladesh), Lisa Patel (USAID) and Lina Stankute-Alexander (NAS) visit PI Dr. Pasha at DIU, Bangladesh, November 2019



The team enters Mangrove forest in the Sundarbans. Photo credit: Lina Stankute-Alexander (NAS) November 2019



Bangladesh Mission Director (MD) Derrick S. Brown and U.S. Ambassador Earl. R. Miller visit the Sundarbans site with the PEER team, January 2020. Photo credit: Dr. Pasha (DIU)



Drone launch in the Sundarbans. November 2019 NAS and USAID site visit

Link: https://sites.nationalacademies.org/PGA/PEER/PEERscience/PGA_181419

Daffodil Eco-friendly Agro Initiative

The Department of Nutrition and Food Engineering (NFE) of Daffodil International University (DIU) established the Daffodil Eco-friendly Agro Support Centre in 2017 targeting clean environment, conservation of nature, biodiversity, research, extension and development of different kinds of fruits, vegetables and medicinal plants. The innovative aspect of the initiative is that farming and plantation have been made possible in the barren and sandy soil which can be replicated as a model elsewhere in the world, especially in the sandy soil-based countries of Arab region to solve the problem of vegetables and plant cultivation easily.

Objectives:

- To conserve the fruit germplasm resources
- To maintain the germplasm center as a facility for education research and training
- To supply quality planting materials to various organizations and farmers
- To collect major and minor fruit varieties from home and abroad
- To develop improve variety through collection, conservation, evaluation and characterization
- To create new variety through conventional, mutational and biotechnological breeding methods
- To collect and carry out research on medicinal fruit plants
- To develop successful model and innovative technology for fruit tree managements
- To offer training for efficiency build-up of Govt., NGO's officials and farmers
- To create a great demand of different fruits all over the country and also contribution in the field of malnutrition and poverty alleviation
- To serve as a recreation center as a green space
- To the fulfilling the demand of planting materials of fruits

- Establishment of technical linkage and coordination with other government line agencies, research organizations and INGO/NGOs for implementing fruit development programs
- To provide technical support to the farmers and entrepreneurs for commercialization of fruit and vegetable development programs
- To develop and discriminate broad leaved and evergreen fruit trees for clean environment
- To establish one stop service for fruits and/or other agro products/inputs and services

The project has been solely funded by Daffodil International University, Dhaka, Bangladesh under Daffodil Group.

The project area is full of sandy soil. The NFE Department of DIU has been successfully able to grow different types of fruits, vegetables and medicinal plants with acceptable amounts of yields by following the organic farming systems. A team of faculty members and students of the department, headed by Prof. Dr. M A Rahim, an eminent agriculturist of the country has worked relentlessly to discover this innovative farming system in the barren and sandy soil. Students are directly involved with this project which facilitates their education, research and training. They localized the pit with cow dung and planted different types of saplings. With the intensive care through different intercultural operations, saplings were growing very fast which was unthinkable in the past. This model can be followed in fallow sandy land which is unutilized.

The project can supply quality planting materials to various organizations and farmers. However, it will be fulfilling the demand of planting materials of fruits, vegetables and medicinal plants and it can be established as a one stop center for fruits and other agro products/inputs and services.

Initially, the team faced some problems like frequent irrigation/watering and pest control in organic methods which were gradually overcome by following the proper method and care.

Major activities done by the project team are as follows:

- Transforming the barren sandy soil into fertile soil
- Fruit Production
- Fruit saplings production and distribution
- Fruit rootstocks and mother stock production
- Ornamental sapling production and distribution
- Nursery establishment with all modern facilities

- Collaborative study, trial and technology development
- Germplasms/variety collection and conservation
- Technical service to farmers
- Farmers' training program

Most of the fruit plants are broad leafed and evergreen which absorb more CO₂ and release more O₂ which consequently ensures a clean and healthy environment. So, the impact of the project can be divided into two parts:

- i) Utilization of the barren and fallow sandy soil for organic farming and plantation
- ii) Contribution towards reduction of carbon emission and generating more oxygen

The project has a plan to replicate a similar model at DIU permanent campus, Ashulia. A preliminary discussion has been made with the Director General of Bangladesh Academy for Rural Development (BARD), Government of Bangladesh to promote and institutionalize a similar model in different areas of Bangladesh through the network of BARD.

Partial view of Daffodil Agro-support center:



Zero Emission Vehicle Policy Implemented

The Zero Emission Vehicle Policy of DIU has been implemented with the aim of reducing carbon emission (SDG 13) from all the vehicles used by the university with the proper coordination with the relevant stakeholders. The objective of the Zero Emission vehicle Policy of Daffodil International University is to support the environment by reducing the

carbon emission and improving the air quality in Dhaka city by adopting Zero Emission Transport (ZET) and to ensure a healthy and sustainable atmosphere for the next generation.

Examples of Zero emission vehicles use in campus and initiatives to reduce carbon emission



Movement of electric car in campus (Zero emission vehicles)



Bi-cycle competition and movement to encourage zero emission vehicles use in campus



Charged Parking (Discourage car entry in campus)



Shuttle Bus service to ensure reduction of private transport movement (GHG emission reduction program)

Policy link: <https://sustainability4d.daffodilvarsity.edu.bd/zero-emission-policy>

DIU's Positive Impact on Carbon Footprint

The Carbon Footprint by organizations is one of the key components of bad effects of climate change and global warming. The carbon emission and carbon footprint have been reduced by Daffodil International University due to the reduced use of energy during COVID 19 pandemic and regularly maintaining proper servicing of the car engines, change of fuels, replacing the old ACs with energy saving & environment-friendly ACs, regular servicing of AC and other energy consuming appliances along with the setting up and use of energy saving and efficient appliances.

Examples of some initiatives towards reduction of carbon emission:



Motion Sensor based LED lights and use of reminder regarding energy efficiency



Energy Efficient LED Lighting is used in classrooms and other rooms





Rooftop Solar panel at main campus and city campus to reduce grid electricity consumption



Most of the classrooms use natural ventilation with sun light which ensures energy saving

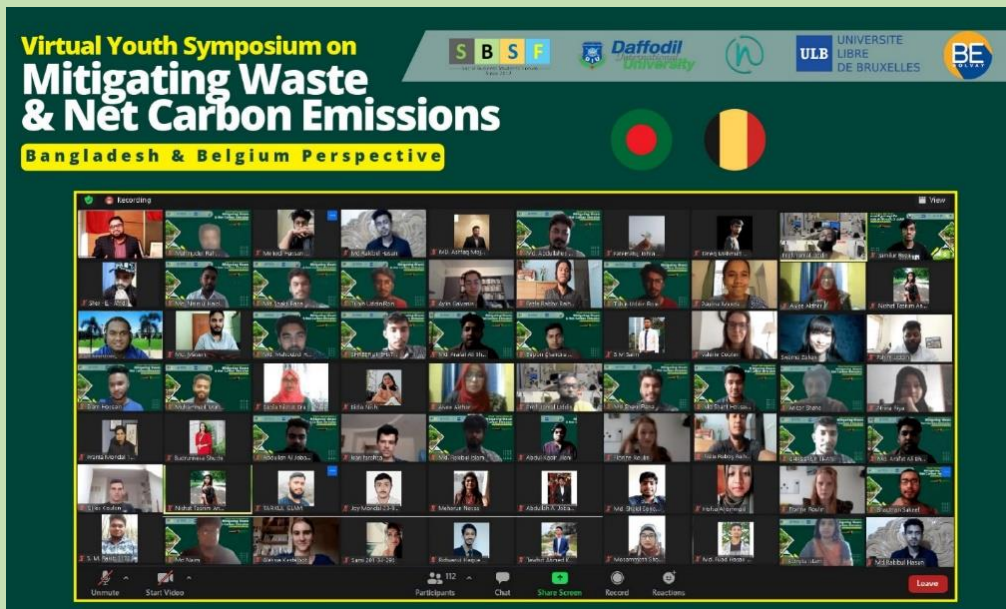


Energy Efficient Multi-commodity Solar Dryer used in Food Engineering Lab with no power and gas requirement

Climate Action Related Initiatives and Events by DIU

Virtual Youth Symposium on Mitigating Waste Management and Net Carbon Emissions

Virtual Youth Symposium on Mitigating Waste Management and Net Carbon Emissions was jointly organized by Social Business Students' Forum (SBSF), Bangladesh, and Nexense Social Business Club (NSBC), Belgium with the support of International Affairs, DIU.



After providing quality inputs through panel discussions of two major issues delivered by the local and foreign speakers- Fahim Uddin Shuvo, Founder and Managing Director, GARBAGEMAN, Bangladesh & Jérôme Meessen, International Expert, Energy & Climate Change Consultant at Climact, Belgium, the discussions ended with Question & Answering Sessions. The discussants from Bangladesh and Belgium who have been in the chair of panel discussions circulated in advancing discussions on "Sustainable Process of Waste Treatment" and "Race to Reach Zero Net Carbon Emissions" from the perspectives of respective countries.

The program was inaugurated by Prof. Dr. Mohammed Masum Iqbal, Convener of SBSF & Dean, Faculty of Business & Entrepreneurship, DIU as the Special Guest. The symposium was attended by more than a hundred participants from Bangladesh, Belgium, and other different countries along with organizers of this program.

Bi-Cycle Rally at Daffodil Smart City to Encourage Zero Emission Vehicles

To celebrate the 50th Independence Anniversary of Bangladesh, Daffodil International University organized Bi-Cycle Rally at Daffodil Smart City, Ashulia, Dhaka. This initiative was taken to encourage Zero Emission Vehicles in campus.



Tree Plantation Program at DIU



Daffodil International University is a green and environment-friendly university. It has covered a significant area containing planted trees, vegetation etc. Besides, it frequently organizes tree plantation program. To mark the world environment day, DIU organized a tree plantation program where the Vice Chancellor (In-charge) and Registrar of the university were present and inaugurated the program by planting a couple of fruits tree in the campus.

Green view of DIU with trees and planted vegetation





Conclusion:

The climate change problem was first addressed by the United Nations by establishing the United Nations Framework Convention on Climate Change (UNFCCC) in 1992 during the 'Earth Summit'. After that a lot of researches and initiatives have been taken to reduce the pace of climate change to save the earth and to keep the planet livable for the future generations. The Government of Bangladesh has also taken laudable initiatives in this regard and has shown better implementation and achievement of Millennium Development Goals (MDGs) that ended in 2015 and after that the Sustainable Development Goals were set by the UN to achieve a number of set targets in each SDG to achieve by the year 2030.

As a higher educational institute, Daffodil International University has also been contributing to the achievement of national SDGs goals and targets by taking numerous initiatives to reduce carbon emission, afforestation, environment-friendly sustainable

practices in campus, sustainable transportation (zero emission vehicle), low consumption of grid electricity, generation of solar and biomass energy in campus, use of energy efficient appliances, conducting environment and sustainability research projects, offering environment & sustainability related courses, implementing green building concept, etc. DIU is also committed and has been collaborating with the Government, private organizations and NGOs to combat climate change effects and environment-friendly policy advocacy through organizing various events in this regard.