



American International University-Bangladesh (AIUB)

SDG Activity Report on

SDG 15: Life On Land



Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification and halt and reverse land degradation and halt biodiversity loss

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SDG 15: Life On Land

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Faculty Research and Publication

Tendency in the Transformation of Agricultural Land into Non-Agriculture: some selected areas in Bangladesh

Author: MOHAMMAD KHURSHED ALAM et al.

Brief Description:

The survey was conducted in the aim of estimation annual conversion of agricultural land to non-agriculture and consequent loss of crop production during ten year period of 2001 to 2010; to investigate into the present pattern of non-agricultural uses of the converted land; and suggest suitable policy measures towards protection of farm land in the country. Three upazila from Mymensingh district namely Mymensinghsadar, Bhaluka and Fulbaria and Narshindisada, Belabo and Polashupazila of Narshindi district were the local of the study. Data were collected from 18.01.12 to 10.03.12. The respondent were the household head. The total sample size was 180 of which 20 from each upazila. The data indicated that conversion of agricultural land with respect to total land owned in the year 2001 in the surveyed villages during the study period amounts to 4.23 percent or 0.42 percent per year. Information regarding non-agricultural uses of converted land indicates that more than half (55 percent) of the converted local was used in housing predominantly in urban villages (53 percent) as expected. The next two important uses were in the construction of roads and business enterprises covering 11 and 8 percent respectively.

Source: <https://zenodo.org/record/4409850>

IoT Based Solar Powered System for Smart Field Irrigation with Real Time Surveillance for Smart Agriculture in Bangladesh

Author: Nafiz Ahmed Chisty et al.

Brief Description:

Agriculture is the essential source of livelihood for people in Bangladesh. It plays major part in economy of the nation. In Bangladesh about 75% of population depends upon agriculture and one third of the country's income comes from agriculture. Issues concerning agriculture have been continuously ruining the improvement of the nation. But at present due to movement of individuals from countryside to urban there is obstacle in agriculture. On the other hand, the conventional methods need manual intervention. So, farmers need to go to field to monitor the field which is time consuming. If famers can save the monitoring time, then they would be able to invest the time in other works and can earn more. The only solution is smart agriculture to overcome the issues by modernizing the traditional method of agriculture. Subsequently the paper aims at making agriculture smart utilizing computerization and IoT based technologies. The highlighting structures of this project includes smart IoT based solar powered system to perform

tasks, soil moisture sensing, water level sensing, temperature sensing, humidity sensing, surveillance camera, birds and enemies scaring etc. Besides, it incorporates smart irrigation with smart control and cleverly decision making based on precise real-time field information. Monitoring of all these operations will be through mobile application or computer connected to internet and the system will be performed by interfacing sensors, camera and Wi-Fi module with Arduino and Raspberry Pi.

Source:

<http://ecc.journalpub.info/index.php?journal=JEPST&page=article&op=view&path%5B%5D=1409>

IoT Based Smart Home Automation and Security System Using Mobile App With Assistant Robot for Developing Countries

Author: Nafiz Ahmed Chisty et al.

Brief Description:

This paper discusses an IoT based home automation system through which home security, room air quality check, and emergency assistance can be obtained. This system can automatically provide home safety, but the user can also control the system manually if desired. The system uses the NodeMCU module as the mainboard and has a mobile application for remote monitoring. In addition to air quality detection, the system can detect CFCs used in the air conditioning system to avoid accidents. If any unwanted incident occurs, the system will immediately turn off the home's main power connection and send the house's status in the form of a notification to the user's mobile app. Also, an essential feature of the system is that the system is able to block the entry of any unwanted person in the house. There is also an assistant robot to prevent fire accidents initially.

Source: <https://ieeexplore.ieee.org/document/9369770>

An IoT Based Smart Irrigation System

Author: Nafiz Ahmed Chisty et al.

Brief Description:

This paper aims to deliver a smart and cost-effective irrigation system. The main objective of this paper is to integrate a real-time monitoring system, remote controlling and cloud computation of acquired data. The system operates on some designated parameter ratings. Depending on the parameter values, the system executes actions such as switching the motor on and off. Adding to that, this paper also offers a user-friendly experience with the help of the mobile application which enables the users to operate the system. A website has also been developed for the user

which contains various news and parameters related to agriculture in Bangladesh. Along with that it contains a manual guide of threshold parameter values for various crops. This will also help the user to Figure out if their surroundings are suitable enough for their desired agricultural system.

Source: <https://ieeexplore.ieee.org/document/9331092>

Early detection and warning system for possible elephant movements in localities

Author: Dr. Nadia Anam et al.

Brief Description:

Our purpose is to design a system where people can be alert of elephant attacks. The project will be accomplished by designing a Finite Impulse Response (FIR) filter using a software tool where surrounding noises will be removed and only frequencies corresponding to the elephant's footsteps and/or voice will remain. A vibration sensor may be included in the system along with the FIR filter to collect the data of the footsteps. The data will be processed with a microcontroller and a warning signal will be sent through SMS to the forest officer, while a siren can be turned on in any surrounding localities. Hence, people can get sufficient time to avoid destruction. The human-elephant conflict is one of the most serious conservation problems in many parts of Asia and Africa. The involuntary confrontation of humans and elephants claims the lives of many animals and humans every year. The main aim of this project is protection for human beings because it reduces the damage of human properties and reduction in human-elephant conflicts. Consequently, it would help to properly redirect the elephants from living areas into forests.

Morphological Properties and Nutrient Status of Different Waste Derived Slow Pyrolyzed Biochars

Author: Md. Faruque Hossain et al.

Brief Description:

Slow pyrolyzed (500 ± 50 °C) ten different waste derived biochar viz. animal bone, corn stover, wood chips, sewage sludge, sugarcane bagasse, green coconut palms, nutshells, potato peels, water hyacinth and organic waste were analyzed to know their physicochemical properties and nutrient contents. Results provided the fact that water hyacinth biochar had the best nutrient status along with excellent physical properties like water holding capacity (509%) and CEC (300 cmolc kg⁻¹) whilst potato peel biochar was the second best among all categories. The average particle size of wood chips biochar 0.82 μm^2 was the largest along with the maximum pore depth. However, the region of this biochar occupied by remarkably small particles, which was 47.42%. The corn stover biochar, on the other hand, had the smallest average particle size (0.18 μm^2) and the lowest particle area (9.19%). Biochar wood chips (51.3%) and biochar potato peels (49.4%)

had the highest organic C value, while biochar nutshell had the lowest (15.31%), respectively. Nutrient content varies depending on the variation in the feedstock mostly N, P, K, and S in total content. Animal bone biochar (3.89%) and biochar nutshells (3.32%) exhibited the highest total N content. Total N biochar content derived from potato peel, water hyacinth, and organic matter had around 3 ppm, which was much higher than the remaining biochar content. In the analysis, high phosphorus concentrations resulted in biochar derived from animal bone feedstock (8.44%), whereas other biochars such as potato peel, water hyacinth, and organic waste were less than 1%. The biochar potato peel and the biochar water hyacinth had higher total K content than other biochars. All the biochars exhibited equal total S concentration. Biochar derived from animal bone (2.34%) and potato peel (2.72%) had a higher percentage of total K compared with other biochar. Biochar related wastes showed a very low concentration of heavy metals such as Cr, Pb, Cd, and Ni. The highest chromium content resulted in biochar sewage sludge (0.746 ppm). The concentration of total chromium was similar to that of both sugarcane bagasse biochar and nutshell biochar. The overall amount of lead and cadmium in all of the biochar was below the detection mark. In comparison, the biochar sewage sludge contained a high amount of nickel (1.06 ppm) relative to other biochars. This is perhaps due to the high amount of pollutants present in the sewage sludge feedstock.

Source:

https://www.researchgate.net/publication/345660967_Morphological_Properties_and_Nutrient_Status_of_Different_Waste_Derived_Slow_Pyrolyzed_Biochars

Soil Organic Carbon Pool and its Storage in Arial Beel Wetland Soils of Bangladesh

Author: Md. Faruque Hossain et al.

Brief Description:

The actual quantity of soil organic carbon (SOC) stored in wetlands can only be estimated within a broad range of uncertainty. An accurate assessment of the size and distribution of the SOC storages in wetland resources is very difficult to obtain, therefore, the proposed research objective is to measure SOC storage and its pool on wetland soils of Arial beel in Bangladesh. Initial results of Arial beel soil profiles indicates SOC concentrations are high in surface soils ranges from 1.67% to 1.95% but its concentrations are decreasing with depth whereas SOC stock in kg C m⁻² is increased with depth due to increase soil bulk density with depth. However, carbon in deeper layers may be more stable than that in surface soils due to difference in source, composition and environmental conditions. Soil organic C stored in the three different locations of wetlands soils to 1 m depth such as 16.47 kg C m⁻², 18.27 kg C m⁻² and 17.22 kg C m⁻², respectively with an average of 17.32 kg C m⁻². On the other hand, SOC stored in upland soils to 1m depth such as 11.24 kg C m⁻², significantly less than the wetland soils, which indicates that wetland soils serve as a major source of SOC. However, this SOC act as a conditioner to enhance fertility status while combating with climatic extremes, not only that it is a vital component of

soil with important effects on the functioning of terrestrial ecosystems. For SOC pool, different extraction methods are used such as, highly labile fraction of SOC extracted with hot water (about 3-8% of total SOC), water soluble fraction of SOC extracted with water (about 1% of total SOC), labile fraction is extracted using CaCl_2 (about 1% of total SOC), moderately labile fraction extracted by pyrophosphate (about 4-10 % of total SOC), polyaromatic SOC is extracted using toluene + methanol (trace amount of total SOC), microbial biomass C extracted by K_2SO_4 (about 2-5%) and the resistant fraction remaining after extraction. However, the SOC concentration is high in surface layer but with depth concentration decreases. In addition, soil bulk density and thickness values increase with depth, as a result deeper layers stored more carbon than surface layer in Arial beel soils. There is increasing evidence from the results that wetlands have an important and under-estimated role in carbon storage and its pool the regulation of greenhouse gas emissions. Some types of wetlands play a particularly key role as C stores, these include forested wetlands and vegetated inter-tidal wetlands and hence, Sundarban mangrove forest and Tengarchar SOC stocks and pools measurement are an urgent issue for the Climate Change researchers and policy makers. Key Word: Wetland, Arial Beel, Soil organic carbon stocks, climate change policy, greenhouse gas emission, Bangladesh

Source:

https://www.researchgate.net/publication/343737309_Soil_Organic_Carbon_Pool_and_its_Storage_in_Arial_Beel_Wetland_Soils_of_Bangladesh

Air Quality Measurement at the Solid Waste Disposal of Matuail Landfill Site at Dhaka, Bangladesh

Author: Md. Faruque Hossain et al.

Brief Description:

An investigation was conducted to assess the air quality impact and possible health risk of solid waste disposal on surrounding environment of Matuail landfill site in Dhaka city. Three different locations were selected for soil and plant samples. Leachate samples were collected from active dumping area and fish samples from treated leachate pond. Seven different locations were selected for air quality and health risk assessments. It is found that Cu, Zn and Pb concentrations were high in the soil of dumping and abandoned areas that exceeded the permissible limits. The heavy metal concentrations in plant samples did not show any significant contamination except Cu, Zn and Pb that also exceeded the permissible limits. The concentrations of DO, BOD, COD and TDS of the untreated leachate were found 1.34 mg L⁻¹, 96 mg L⁻¹, 1343 mg L⁻¹ and 7120 mg L⁻¹, respectively that exceeded inland surface water standard but after treatment its concentrations were found within the permissible limits. The presence of heavy metals in leachate sample was not contaminated as it was below the toxic limits. The bioaccumulation of fish sample from treated pond is extremely high of Fe, Mn, Pb and Ni that exceeded the WHO's permissible limits. The air quality results showed that the Matuail landfill surrounding sites did

not have an adverse effect. The air pollutants such as NO_x, SO₂, SPM, PM₁₀, PM_{2.5} and CO contents are within national standard limits. Overall, the risk assessments demonstrated that potential air emissions from the Matuail Landfill site do not pose public health risks. It is clear that if the dumping landfill site is properly managed by segregating the waste according to their source, then this waste could be used as compost or organic manures. However, by maintaining disposal sites with controlled placement and proper treatment of the waste may reduce the possible adverse impact on air, human health and agri-environmental ecosystems. Further investigation on the impacts related to the final disposal of solid waste and the future landfill requirement at different composting and a comparative study is suggested.

Source:

https://www.researchgate.net/publication/337007373_Air_Quality_Measurement_at_the_Solid_Waste_Disposal_of_Matuail_Landfill_Site_at_Dhaka_Bangladesh

A Smart and Integrated Surface Water Monitor System Architecture: Bangladesh Perspective

Author: M M Mahbubul Syeed, PhD et al.

Brief Description:

Surface water constitutes water on the surface of continents, e.g., river, lake, ponds, or wetland. Measuring and monitoring surfacewater quality is one of the key concerns of the Government of Bangladesh. This is due to the fact that a large segment of the population, and the industrial buildup in Bangladesh heavily depends on the surface water, an apparent side effect of which is colossal water pollution. To develop a pragmatic system for water monitoring, requires exhaustive understanding of the surface water pattern and designing systems accordingly. This paper contributes the followings, defines the landscape of surface water monitoring systems in relation to Bangladesh, derives specific requirements for the same in Bangladesh, and proposes pragmatic architectural designs as a building blocks to develop the water monitoring system. Alongside, a detail validation and technical feasibility of the system design is presented.

Source:

https://www.researchgate.net/publication/340081206_A_Smart_and_Integrated_Surface_Water_Monitor_System_Architecture_Bangladesh_Perspective