Sher-e-Bangla Agricultural University

SDG Activity Report
on

SDG 11:
Sustainable Cities And Communities

Contents

Faculty Research and Publications

Does the adoption of homestead gardening increase dietary diversity in climate-vulnerable coastal areas? Evidence from Bangladesh

Author: Md. Sadique Rahman, Mofasser Rahman

Year: 2024

Abstract:

Coastal areas are not conducive to cultivating a variety of crops due to the occurrence of natural disasters. Therefore, homestead gardening has the potential to increase food production and consumption in coastal households, thereby enhancing climate resilience. Adopting homestead gardening as an adaptation measure for climate change can improve food security in climate-vulnerable areas. This study identified factors associated with the adoption of homestead gardening and their impacts on dietary diversity in coastal areas of Bangladesh. A total of 750 coastal households were surveyed. To analyze the data, descriptive statistics, household dietary diversity score, endogenous switching regression model, and propensity score matching method were applied. According to the results, only 14.26% of coastal households adopted homestead gardening. The likelihood of adoption was increased by factors, such as age, spousal education, own cultivable land size, salinity perception, and mobile phone ownership. Results of the endogenous switching regression model indicated that the adopters of homestead gardens had a 13-point greater mean probability of a higher household dietary diversity score than the non-adopters. Results of the propensity score matching also showed a nearly identical finding. A strong extension service that uses modern information technology is required to disseminate homestead gardening technology in coastal areas. Climate change awareness initiatives are recommended to raise households cognizance on the negative effects of climate change, which in turn helps increase the adoption of homestead gardening as an adaptation measure.

Unveiling microplastics pollution in a subtropical rural recreational lake: A novel insight

Author: Mir Mohammad Ali

Year: 2024

Abstract:

While global attention has been primarily focused on the occurrence and persistence of microplastics (MP) in urban lakes, relatively little attention has been paid to the problem of MP pollution in rural recreational lakes. This pioneering study aims to shed light on MP size, composition, abundance, spatial distribution, and contributing factors in a rural recreational lake, 'Nikli Lake' in Kishoreganj, Bangladesh. Using density separation, MPs were extracted from 30 water and 30 sediment samples taken from ten different locations in the lake. Subsequent characterization was carried out using a combination of techniques, including a stereomicroscope, Fourier transform infrared spectroscopy (FTIR) and field emission scanning electron microscopy (FE-SEM). The results showed a significant prevalence of MPs in all samples, with an average amount of 109.667 ± 10.892 pieces/kg3 (dw) in the sediment and 98.167 ± 12.849 pieces/m3 in the water. Small MPs (<0.5 mm), fragments and transparent colored particles formed the majority, accounting for 80.2%, 64.5% and 55.3% in water and 78.9%, 66.4% and 64.3% in sediment, respectively. In line with global trends, polypropylene (PP) (53%) and polyethylene (PE) (43%) emerged as the predominant polymers within the MPs. MP contents in water and sediment showed positive correlations with outflow, while they correlated negatively with inflow and lake depth ($p > 0.05$). Local activities such as the discharge of domestic sewage, fishing waste and agricultural runoff significantly influence the distribution of

polypropylene. Assessment of pollution factor, pollution risk index and pollution load index values at the sampling sites confirmed the presence of MPs, with values above 1. This study is a baseline database that provides a comprehensive understanding of MP pollution in the freshwater ecosystem of Bangladesh, particularly in a rural recreational lake. A crucial next step is to explore ecotoxicological mechanisms, legislative measures and future research challenges triggered by MP pollution.

Pre-emergence herbicides widely used in urban and farmland soils: fate, and potential human and environmental health risks

Author: Aney Parven, Islam Md Meftaul
Year: 2024
Abstract:

We determined the distribution, fate, and health hazards of dimethenamid-P, metazachlor, and pyroxasulfone, the effective pre-emergence herbicides widely used both in urban and agricultural settings globally. The rate-determining phase of sorption kinetics of these herbicides in five soils followed a pseudo-second-order model. Freundlich isotherm model indicated that the herbicides primarily partition into heterogeneous surface sites on clay minerals and organic matter (OM) and diffuse into soil micropores. Principal component analysis revealed that soil OM (R2, 0.47), sand (R2, 0.56), and Al oxides (R2, 0.33) positively correlated with the herbicide distribution coefficient (Kd), whereas clay (R2, – 0.43), silt (R2, – 0.51), Fe oxides (R2, – 0.02), alkaline pH (R2, – 0.57), and EC (R2, – 0.03) showed a negative correlation with the Kd values. Decomposed OM rich in C=O and C–H functional groups enhanced herbicide sorption, while undecomposed/partially-decomposed OM facilitated desorption process. Also, the absence of hysteresis (H, 0.27–0.88) indicated the enhanced propensity of herbicide desorption in soils. Leachability index (LIX, < 0.02–0.64) and groundwater ubiquity score (GUS, 0.02–3.59) for the soils suggested low to moderate leaching potential of the herbicides to waterbodies, indicating their impact on water quality, nontarget organisms, and food safety. Hazard quotient and hazard index data for human adults and adolescents suggested that exposure to soils contaminated with herbicides via dermal contact, ingestion, and inhalation poses minimal to no non-carcinogenic risks. These insights can assist farmers in judicious use of herbicides and help the concerned regulatory authorities in monitoring the safety of human and environmental health.

USING TANNERY WASTES IN POULTRY FEED: A MATTER OF CONCERN FOR SAFE POULTRY PRODUCTION IN BANGLADESH

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Year: 2024

Abstract:

Nowadays tannery waste is a matter of concern because if it used as livestock feed, it could cause health hazards to humans. Therefore, this study was conducted to know the generation rates, utilization, disposal method of tannery solid wastes (TSWs), and inclusion level of it into the poultry feed. Moreover, this study determined the physical and chemical parameters of interest including moisture content, crude protein (CP) levels, and the presence of heavy metals such as chromium (Cr) and lead (Pb) in the poultry feeds that were sold in the studied area. For these purposes, a field survey was conducted with twenty tannery industries.

Broiler feed samples were procured from multiple farmers situated in the Savar area of Dhaka. The feed source was classified into two categories, namely registered and unregistered feed mills. According to the study, wet blue trimmings was generated in 3.84% that was used as an ingredient of poultry feed. In addition, 55% of tanneries landfilled their waste, while 30% of them sold it for poultry feed. The utilization of TSWs in poultry feed production in this country was limited to a maximum of 1.314% of the total annual production. Besides, the CP% was determined in the range of 24.24 - 13.32 % and 18.15 - 11.01 % for broiler starters and growers, respectively, where lower CP content was found only in unregistered feed mills. Trace amounts of Cr and Pb were identified in each of the feed samples at very low concentrations. In conclusion, it can be stated that the percentage of tannery solid wastes mixed poultry feed was generated in negligible amounts and the registered companies' feed was found normal in all aspects of the quality tested in the study. Keywords: Broiler feed, Feed mill, Heavy metal, Physical quality, Tannery solid waste

Assessment of As, Cr, Cd, and Pb in urban surface water from a subtropical river: contamination, sources, and human health risk

Author: Mir Mohammad Ali

Year: 2024

Abstract:

This work aimed to determine the level of some toxic elements (As, Cr, Cd, and Pb) in the water of the Rupsha River, Bangladesh, concerning their potential dangers to human exposure. The elemental concentrations (mg/L) were determined using Atomic Absorption Spectrometer and found to decrease in the order of Cr (0.041) > Pb (0.029) > As (0.004) > Cd (0.002). The level of elements in this river water surpasses various international limits, making it unfit for human consumption. Furthermore, the metal pollution index and contamination index indicated that the water was also unsuitable for this purpose. The elements chosen were persuasive to discern the hazard quotient of non-carcinogenic risk. Moreover, total targeted hazard quotient (TTHQ) values were found for adults and children within acceptable limits (TTHQ <1). The value of carcinogenic risk did not surpass the range (10−6 to 10−4) of the threshold limit. Due to their high-water consumption per unit of body-weight and physiological development, children were found to be more sensitive than adults. Multivariate analyses demonstrated that human activities were the primary origin of toxic elements in river water. According to the findings, urban and industrial effluents should be treated before being released into rivers. Development along the river bank must be carefully controlled to safeguard the river environment. In the end, this will improve the quality of the water and lower the chance that people will be exposed to metals.