Sher-e-Bangla Agricultural University

SDG Activity Report
on

SDG 13:
Climate Action

Contents

Thermochemical and physical characterization of agricultural biomass for sustainable energy in Bangladesh

Author: Debu Kumar Bhattacharjya
Year:2024
Abstract:
The United Nations Sustainable Development Goals (SDGs) prioritize affordable, clean energy solutions to tackle global issues like poverty, climate change, and environmental degradation. In Bangladesh, agricultural biomass residues present a renewable and underutilized alternative to fossil fuels. This study systematically characterizes the thermochemical and physical properties of key agricultural residues—rice husk, rice straw, wheat straw, sugarcane bagasse, jute stick, dhaincha, and water hyacinth—to assess their potential for sustainable energy production. Key analyses include higher heating value (HHV), proximate composition (volatile matter, fixed carbon, ash), and elemental makeup. Volatile matter content ranged from 71.52 % in rice husk to 90.83 % in sugarcane bagasse, while fixed carbon varied between 7.00 % in sugarcane bagasse and 16.45 % in dhaincha. Ash content was highest in rice straw (15.05 %) and lowest in sugarcane bagasse (2.17 %). The HHV ranged from 19.65 MJ/kg for dahincha to 11.95 MJ/kg for water hyacinth, highlighting dahincha's high energy potential. However, elevated potassium in rice straw (1.62 %) and water hyacinth (2.84 %) suggests risks of slagging in thermal conversion systems. These findings underscore the value of region-specific biomass data in informing energy policy and advancing renewable energy initiatives. By identifying high-potential feedstocks and conversion needs, this study supports targeted biomass applications, contributing to cleaner energy solutions and reduced dependency on fossil fuels. Advanced conversion technologies and ash management strategies are recommended to optimize the energy efficiency of these residues, particularly in regions with abundant agricultural waste. The insights provided serve as a foundation for sustainable biomass utilization in Bangladesh, with potential replicability in other agrarian countries facing similar energy and environmental challenges.

Do climate-smart agricultural practices impact the livelihoods of vulnerable farmers in the Southern part of Bangladesh?

Author: Mohummed Shofi Ullah Mazumder
Year:2024
Abstract:
Efforts to reduce food insecurity must include building resilience in rural farmers to shocks. One way to achieve this is through climate-smart agriculture (CSA). This paper analyzes the impact of CSA on farmers' livelihoods. Data were collected in two phases in 2010 and 2018 from a study (CSA practitioners) and control group (CSA non-practitioners) of climate-affected farmers (240 farmers in each group) using a quasi-experimental survey design considering all possible biases. Descriptive statistics, variance inflation factor analysis, multiple regression, path analysis, FE-IV, and propensity score matching models were applied. Practicing CSA technologies improved food security and the incomes of the farmers through increased agricultural productivity. The impact of CSA technologies differed based on farmers' understanding of technologies, the time and amount of financial support, availability of extension staff, the provision of technical and other logistical support, and CSA practitioners' experience, such as knowing how to enhance plant resilience. Specific policy interventions, including financing of CSA, would benefit rural farmers. CSA provides a path towards sustainable livelihood development and food security. These findings will be useful for policymakers, planners, administrators, and development workers.

Climate-smart agriculture and food security in climate-vulnerable coastal areas of Bangladesh

Author: Monoj Kumar Majumder, MdSadique Rahman, Ripon Kumar Mondal, MstShopna Akter
Year:2024
Abstract: The issue of global climate change is increasingly worrisome, particularly for countries heavily reliant on agriculture. To reduce the negative impact of climate change on agriculture, farmers of Bangladesh started adopting different climate smart agriculture (CSA) practices. The CSA sustainably increases productivity, resilience, and food security, which can contribute to the achievement of a number of sustainable development goals (SDGs). However, the adoption of CSA is low especially in the climate-vulnerable coastal areas of Bangladesh. Therefore, this study was conducted to identify the factors affecting the adoption of CSA and its influence on coastal household's food security. A total of 327 sample farmers from three coastal districts of Bangladesh were interviewed. The collected data were then analyzed by using the binary probit and ordered probit model. The findings indicated that highest 65 % of farmers adopted early planting of rice as one of CSA practices. The adoption of CSA practices positively affected by the household annual income, extension services and awareness regarding CSA practices. Moreover, the adopters of CSA were more food secure than non-adopters. For instance, adoption of one additional CSA practice leads to an increase in the likelihood of being food secure by 4.3 %. In terms of policy perspective, the adoption of CSA in the coastal areas can be increased through creation of employment opportunities, increasing access to extension services, and broadcasting of CSA-related programs on mass media.

Partitioning water footprints of rice for assessing their implications in the face of climate change in Bangladesh

Author: Mostafijur Rahman
Year:2024
Abstract:
To improve rice yields while conserving water and minimizing environmental impact, a lysimeter experiment was conducted at Bangladesh Agricultural University's field irrigation laboratory in Mymensingh. This study, spanning 2018–2020, aimed to measure the water footprint (WF) of the Aman-Boro-Aman rotation, considering green water footprint (GWF; rainwater) and blue water footprint (BWF; irrigation water), with a focus on climate change implications. Various irrigation methods, including rainfed and several interval-based irrigations (I9D–irrigation applied after nine days of ponded water disappearance, I6D, I3D, I3D + NP–I3D with no percolation allowed, and I1D), were evaluated. Results showed rainfed treatments had higher GWF (1155–1575 L/kg) due to reliance on inconsistent rainfall, while irrigated ones had lower GWF (375–1084 L/kg) but increased BWF, notably I1D with the highest BWF (2675 L/kg). This contrast highlights significant water usage differences among irrigation methods. The total water footprint (TWF) varied, with rainfed methods showing 1460–1960 L/kg and I1D the highest at 3603 L/kg. The consumptive water footprint ranged from 734 L/kg (I3D + NP) to 1097 L/kg (rainfed), indicating the efficiency of no-percolation strategies in water conservation. This also led to improved nutrient availability, resulting in higher plant height and rice yield. Seasonal variations in TWF were also observed, with the Aman season showing greater variability than the Boro season due to differences in rainfall and irrigation practices. The study underscores the importance of managing irrigation frequency, timing, and percolation for optimizing rice water footprints under changing climatic conditions.

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.

Salinity negatively correlates with the production and immunity of chicken: A molecular insight for food security and safety issues

Author: Subrato Biswas, Md Abdul Masum, Sujan Kumar Sarkar, Basant Saud, Rupa Akter, K.B.M. Saiful Islam,Shah Jungy Ibna Karim, Maksuda Begum

Year:2024

Abstract:

Salinity intrusion into the freshwater system due to climate change and anthropogenic activities is a growing global concern, which has made humans and domesticated animals more susceptible to diseases, resulting in less productivity. However, the effects of salinity on domesticated and wild birds, especially in terms of production and immunity, have not been fully elucidated yet. Therefore, this study was designed to examine the effects of salinity on the production and immunity of birds and the mechanisms by which immunity is compromised. Broiler chicks were subjected to different concentrations of salty water (control = normal water, treatment = 5 g/L, treatment = 10 g/L, and treatment = 15 g/L). The collected blood and organs from different groups of broilers were biochemically and histopathologically examined. Birds in salt-treated groups consumed significantly less feed than the control group, while the feed conversion ratio (FCR) was significantly higher. Body weight gain was significantly lower in salt-treated groups compared to control. Serum analysis revealed a lower systemic antibody titer in the salt-treated groups compared to the control. Primary lymphoid organs (thymus and bursa of Fabricius) were reduced in size in the salt-treated group due to cellular migration and depletion from these organs. Importantly, most of the parenchyma of lymphoid organs was replaced with fibrotic tissue. Gut microbes, Escherichia coli (E. coli) and Salmonella spp., from salt-treated groups, showed less viability but developed antibiotic resistance. Levels of salinity were significantly and negatively correlated with feed intake, body weight gain, antibody titer, lymphoid organ size, and viable count of gut microbes, while FCR, fibrosis of lymphoid organs, and antibiotic resistance were significant positively correlated. In conclusion, increased salinity is a possible threat to food security and safety as it decreases body weight gain, reduces immunity, and influences the development of multi-drug resistance in gut microbes.

Evaluation of five gridded precipitation products for estimating precipitation and drought over Yobe, Nigeria

Author: Ranjan Roy

Year:2024

Abstract: Ground observations are often considered as the most reliable and precise source of precipitation data. However, long-term precipitation data from ground observations are lacking in many parts of the world. Gridded precipitation products (GPPs) therefore have emerged as crucial alternatives to ground observations, but it is essential to assess their capability to accurately replicate precipitation patterns. This study aims to evaluate the performance of five GPPs, NASA POWER, TerraClimate, Climate Hazards Group Infrared Precipitation with Climate Data (CHIRPS), GPCC, and Climate Research Unit (CRU), in capturing precipitation and drought patterns from 1981 to 2021 in Yobe, Nigeria. The results indicate that GPCC had good performance at both monthly and annual scales, with high correlation coefficients and low error values. However, it tends to underestimate precipitation amounts in certain areas. Other products also exhibit satisfactory performance with moderate correlations with ground observations. Drought analysis indicates that GPCC outperforms other products in standardised precipitation index-6 calculations, while NASA POWER demonstrates inconsistencies with ground observations, particularly during the early 1980s and mid-2000s. In conclusion, GPCC is the most preferable GPP for precipitation and drought analysis in the Yobe State in Nigeria.

Oxygen declination in the coastal ocean over the twenty-first century: Driving forces, trends, and impacts

Author: Mir Mohammad Ali
Year:2024
Abstract: Oxygen declination in coastal oceans has accelerated drastically in recent decades, both in terms of severity and spatial extent, and such disappearance of oxygen leads to dead zones where life can't survive. This phenomenon is mainly attributed to nutrient pollution and climate change due to intensified anthropogenic activities. The annual statistical oxygen mean concentrations showed the current deoxygenation trends based on (WOA_2001–2018) data comparison of 200 m below the surface water from the first two decades of the 21st century. A relatively similar significant oxygen loss of 0.5–3 ml/L was indicated in the first decade (2001–2009) over the water of continental shelves (200 m) in the tropical oceans and the areas of subtropical Pacific, Atlantic, and southern Indian oceans gradually started to fall from their moderate oxygen concentrations 4–5 ml/L between 2005 and 2009. Consequently, in the next decade (2013–2018), the negative oxygen trend persisted at a similar depth in the global oceans, and its expansion to more regions suggested that this trend of oxygen loss will continue in the future. This is a serious threat that has to be made more widely known since declines in oxygen levels in coastal oceans could have a wide range of negative impact on marine life, biogeochemical cycles, coastal habitats, economies that run on the sea, and ultimately humans. Therefore, it is crucial to investigate and put into practice management alternatives in order to lessen the effects of continuous deoxygenation on marine life and the supply of services by marine ecosystems.

Techno-economics and environmental sustainability of agricultural biomass-based energy potential

Author: Nazmin Sultana
Year:2024
Abstract: This paper explores the viability of utilizing agricultural biomass-based energy potential, employing mathematical, engineering, and economic modeling techniques. Moreover, the potential of a biogas-based co-digestion (CD) system, integrating its techno-economic performance and environmental sustainability in terms of electricity generation, has also been studied. In this investigation, the categorization of 25 different plant species into two groups: arable field crops (AFCs) and horticultural plants (HPs), was performed. Data was collected during the 2021-–2022 cropping season in Bangladesh from various sources, including literature reviews, governmental, and non-governmental organizations. The

findings revealed that the available agricultural biomass residues, totaling 1,02,585.75 KT, have the capacity to generate 1,33,815 million m3/year of biogas. This energy potential corresponds to 291,125.85 TJ/year or 9231.60 MW of electricity, which can fulfill 88% of the national total energy demand. In terms of levelized cost, the proposed approach is more competitive and shows a greater promise compared to other technologies. Furthermore, it demonstrates environmental friendliness by reducing CO2 emissions by 156 tons at a cost of $7/ton while earning $1092 annually from the potential carbon-credit market. This approach presents a potential solution to address Bangladesh's energy crisis. The payback period of the system ranged from 2.93 to 3.75 years, with and without the inclusion of a slurry, respectively. The recommended methods hold significant promise for meeting national energy demands. A case study was provided as a proof-of-concept (PoC) to validate the approach. This study is the first of its kind, providing valuable insights into the renewable energy potential in Bangladesh. The results will assist policymakers in formulating sustainable energy policies.

Chronic drought decreased organic carbon content in topsoil greater than intense drought across grasslands in Northern China

Author: Md. Shahariar Jaman
Year:2024
Abstract: Grasslands are expected to experience extreme climatic events such as extreme drought due to rising global temperatures. However, we still lack evidence of how extreme drought influence soil organic carbon (SOC) content in grassland ecosystems. We experimentally imposed extreme drought in two ways – chronic drought (66 % reduction in precipitation from May to August) and intense drought (100 % reduction in precipitation from June to July) to measure the effects of these two drought types on (SOC) content across six grassland sites that spanning desert steppe, typical steppe and meadow steppe in northern China. The experiment followed a randomized complete block design with six replicates of each treatment at each site. Our results showed that both chronic and intense drought decreased SOC content in the topsoil (0–10 cm) and the loss was higher in arid grasslands (desert steppe and typical steppe). Chronic drought decreased SOC content more than intense drought, with the effect again being strongest in arid grasslands. Furthermore, the response of SOC content to extreme drought was linked with the response of net primary productivity. Specifically, the response of SOC content was negatively correlated with drought sensitivity of above-ground net primary productivity (ANPP) but positively correlated with drought sensitivity of belowground NPP (BNPP). Overall, our results suggest that shifts in grassland SOC content with future drought will depend on the types of drought as well as the productivity responses and local climatic conditions such as precipitation, temperature, and aridity. The differential extreme drought impacts described here may facilitate predictions of climate change impacts on ecosystem carbon cycling.

Salicylic acid and chitosan mitigate high temperature stress of rice via growth improvement, physio-biochemical adjustments and enhanced antioxidant activity

Author: Sujat Ahmed, Mohammad Issak
Year:2024
Abstract:
Sustainably increasing rice (*Oryza sativa* L.) becomes more challenging due to environmental stresses. High temperature stress resulting from global warming impact of climate change is highly damaging as it can cause growth and yield reduction of rice via cellular and physio-biochemical impairments. Application of either salicylic acid or chitosan can possibly increase plant's tolerance to different abiotic stresses; however, their combined mitigation effects remained inadequately explored. Thus, the objective of the

current study was to evaluate the mitigation potential of combined salicylic acid and chitosan against high temperature stress of rice. The experiment was conducted in a factorial combination of two temperature regimes (optimum temperature [control] and high temperature); two salicylic acid levels (−SA: 0 mg L−1 and +SA: 140 mg L−1); and two chitosan levels (−Ch: 0 mg L−1, +Ch: 100 mg L−1) following a completely randomized design. High temperature impaired rice growth and productivity by negatively influencing all tested parameters; however, salicylic acid and chitosan could significantly mitigate those impairments. The mitigation on growth and yield contributing parameters was recorded at best 11 %, 21 %, 12 %, 75 %, 61 %, 46 %, 27 %, and 43 % for plant height, leaf area, shoot dry matter, pollen viability, effective tiller percentage, filled grain percentage, 1000-grain weight, and grain yield respectively. Highest alleviation in physio-biochemical parameters was also found at best 35 %, 68 %, and 67 % for leaf greenness, net photosynthetic rate, and stomatal conductance respectively with 28 % and 60 % respective increase in transpiration rate and proline concentration. Superoxide dismutase, catalase, ascorbate peroxidase and peroxidase activity were also boosted as high as 1.6-folds, 1.4-folds, 1.9-folds, and 2.6-folds respectively with subsequent reduction of 32 % lipid peroxidation and 34 % hydrogen peroxide concentration. For all tested parameters, the best positive effects were observed under combined salicylic acid and chitosan treatment. Individually, salicylic acid was found more effective than chitosan; however, their combined application resulted in significantly better alleviation responses over their individual application for most studied parameters. Our findings would contribute in present understanding of high temperature stress and would also help in strategizing better-suited management practices toward sustainable rice productivity.

Salt stress tolerance in rice (Oryza sativa L.): A proteomic overview of recent advances and future prospects

Author: Mohammad Shah Jahan

Year:2024

Abstract: Salt stress is one of the major impairments to agricultural soil that significantly reduces growth and productivity in rice (Oryza sativa L.) and other crop plants. The proteomic mechanisms underlying salt stress tolerance in rice have not been well established. Therefore, a comprehensive understanding of molecular mechanisms associated with salt signaling, salt-toxicity detoxification, and other metabolic mechanisms is essential for elucidating salt tolerance mechanisms in rice as well as ensuring global food security. Recent proteome studies have provided a global proteomic signature of rice cultivars. Integrative studies of proteomic, physiological, and molecular responses under salt stress have provided detailed mechanisms associated with salt stress tolerance in rice. This review explores the proteomic mechanisms with finely-tuned salt-responsive networks in this cereal. Several proteomic processes, including salt sensing and signaling, scavenging of reactive oxygen species (ROS) and stress defense, salt compartmentalization and homeostasis, alterations of cell wall components, modulation of the cytoskeleton, regulation of salt-responsive genes, transcription factors, and protein synthesis, protein folding and processing, protein degradation, and strategies of carbohydrate and energy metabolism for organ development, elucidate extensive molecular mechanisms linked to salt stress responses and tolerance in rice. Further, it is updated the prospects of salt stress tolerance in rice using multi-omics and CRISPR/Cas approaches. These finely-tuned molecular insights will be beneficial to rice breeders and farmers for developing high-yielding, salt-tolerant rice cultivars to achieve global food security.

Evaluating the effectiveness of CHIRPS data for hydroclimatic studies

Author: Muhammad Humayun Kabir

Year:2024

Abstract: Long-term gridded precipitation products (GPPs) are crucial for climatology and hydrological research to overcome the limitations of gauge observations. Climate Hazards Group InfraRed Precipitation

with Station data (CHIRPS) provides long-term daily precipitation data over the globe from 1981 to near-present, but its reliability varies across regions. This review aims to summarize the performance of CHIRPS from 123 research articles that mainly published between 2015 and 2021.The findings show that the number of CHIRPS validation studies has been increased dramatically in the past few years. These studies were primarily conducted in China, Ethiopia, Kenya, Uganda, and India, while a relatively few studies in North America, Central Asia, and Europe. The performance of CHIRPS varied depending on geographical location and climate condition, with greater performance in Africa. In contrast to other GPPs, CHIRPS is always not the best product, but it is considerably well in capturing monthly precipitation and is suitable for assessing drought. But, there are some common limitations such as less effectiveness across regions with sparse gauges and complex terrain and difficulty in detecting extremely high precipitation events. Future research directions on this topic should focus on (1) enhancing CHIPRS through bias correction and downscaling, (2) validating CHIRPS for extreme indices' calculations and relate to large-scale atmospheric circulations like ENSO, (3) evaluating the capability of CHIRPS in hydrological modelling, and (4) further validating CHIRPS under various topographical and climate conditions as well as other precipitation products. This review can act as a reference to scientists who wish to apply CHIRPS in their climatology analysis and hydroclimatic modelling as well as the developers to further improve the product.

Revisiting plant stress memory: mechanisms and contribution to stress adaptation

Author: Sumaya Parveen, Md. Zahidur Rahman, Jamilur Rahman
Year:2024
Abstract: Highly repetitive adverse environmental conditions are encountered by plants multiple times during their lifecycle. These repetitive encounters with stresses provide plants an opportunity to remember and recall the experiences of past stress-associated responses, resulting in better adaptation towards those stresses. In general, this phenomenon is known as plant stress memory. According to our current understanding, epigenetic mechanisms play a major role in plants stress memory through DNA methylation, histone, and chromatin remodeling, and modulating non-coding RNAs. In addition, transcriptional, hormonal, and metabolic-based regulations of stress memory establishment also exist for various biotic and abiotic stresses. Plant memory can also be generated by priming the plants using various stressors that improve plants' tolerance towards unfavorable conditions. Additionally, the application of priming agents has been demonstrated to successfully establish stress memory. However, the interconnection of all aspects of the underlying mechanisms of plant stress memory is not yet fully understood, which limits their proper utilization to improve the stress adaptations in plants. This review summarizes the recent understanding of plant stress memory and its potential applications in improving plant tolerance towards biotic and abiotic stresses.

Protein biomarkers for root length and root dry mass on chromosomes 4A and 7A in wheat

Author: Tanushree Halder
Year:2024
Abstract: Improving the wheat (Triticum aestivum L.) root system is important for enhancing grain yield and climate resilience. Total root length (RL) and root dry mass (RM) significantly contribute to water and nutrient acquisition directly impacting grain yield and stress tolerance. This study used label-free quantitative proteomics to identify proteins associated with RL and RM in wheat near-isogenic lines (NILs). NIL pair 6 had 113 and NIL pair 9 had 30 differentially abundant proteins (DAPs). Three of identified DAPs located within the targeted genomic regions (GRs) of NIL pairs 6 (qDT.4A.1) and 9 (QHtscc.ksu-7A), showed consistent gene expressions at the protein and mRNA transcription (qRT-PCR) levels for asparagine synthetase (TraesCS4A02G109900), signal recognition particle 19 kDa protein (TraesCS7A02G333600) and 3,4-dihydroxy-2-butanone 4-phosphate synthase (TraesCS7A02G415600).

This study discovered, for the first time, the involvement of these proteins as candidate biomarkers for increased RL and RM in wheat. However, further functional validation is required to ascertain their practical applicability in wheat root breeding.

Climate-smart practice: level of effectiveness and determinants of Sorjan farming adoption in coastal Bangladesh

Author: Md. Hayder Khan Sujan, Monira Sultana
Year:2024
Abstract: Climate-smart agriculture stands as a promising solution to elevate cropping intensity and enhance food security in climate-vulnerable communities. Despite the evident potential, there is an existing gap in understanding the effects of climate change adaptation measures, with limited research explicitly focusing on adopting sorjan cultivation. This study seeks to address this gap by delving into the effectiveness and determinants of sorjan farming in the coastal regions of Bangladesh. Data was collected in three south-central districts, namely Patuakhali, Jhalakathi, and Pirojpur in 2022. A total of 222 farmers participated in the study, with 120 practicing plain land cultivation, while the remaining 102 were engaged in sorjan farming. Results show that the cropping intensity of farm households increased from 100–200% to 300–500% in sorjan farming. Farmers earned the highest net return by following the crop combinations of 'Bottle gourd-Potato-Sweet gourd-Indian spinach', 'Banana-Okra-Snake gourd-Bottle gourd', and 'Jujube-Stem amaranth-Indian spinach' under the sorjan method in Patuakhali, Jhalakathi, and Pirojpur districts, respectively. On average, farmers realized an additional net benefit of Tk. 55 for every Tk. 100 invested upon transitioning from plain land farming (benefit cost ratio, BCR = 1.25) to sorjan cultivation (BCR = 1.80). The results of the logit model found that household size, farming experience, and extension contact positively influenced the adoption of the sorjan method, while farmers' age and farm size had a negative influence. Further analysis of challenges in both types of farming revealed the advantages of sorjan over plain land cultivation, categorizing them into four distinct areas: environmental, management, input-related, and market issues. Government policies should prioritize holistic support systems and foster collaborative knowledge-sharing among stakeholders to enhance the adoption and diffusion of sorjan farming in coastal communities.

Clean energy transition in rural Bangladesh: Challenges in adoption and impact

Author: Md. Sadique Rahman, Md. Hayder Khan Sujan
Year:2024
Abstract: At the household level, the solar photovoltaic (PV) system is an off-grid clean energy source with significant poverty reduction potential, thereby contributing to the attainment of several sustainable development goals. Nevertheless, there has been limited adoption of renewable or clean energy technologies in Bangladesh. At present, renewable energy sources account for only 3% of the country's electricity generation. This study thus investigates the drivers of solar PV adoption and the impact of this on household income and poverty in Bangladesh. We present an econometric analysis of data from the International Food Policy Research Institute's Bangladesh Integrated Household Survey, 2020. Our findings indicate that only 5.51% of the sample households adopted solar PV, with the likelihood of adoption 3.8% higher in households with a mobile phone, 1.7% higher in households with internet access, and 2.8% higher among homeowners. However, the government's programs to expand the electricity grid made the delivery of solar PV by partner organizations less competitive. Our analysis reveals that the adoption of solar PV has a positive effect on household income of between 9.31% and 13.50%. The poverty gap is likely to decrease by around 20% to 26% due to adoption. These findings are pertinent to ongoing

policy development efforts targeted at increasing the adoption of renewable energy to meet the sustainable development goals. Solar PV information could be potentially disseminated through mass media and modern communication technologies that require internet access. Furthermore, increasing the installation of solar PV systems in rented houses may promote the adoption of solar PV. It is imperative to implement policies that provide incentives for the installation and utilization of solar PV.

Morphological and yield trait-based evaluation and selection of chili (Capsicum annuum L.) genotypes suitable for both summer and winter seasons

Author: Firoz Mahmud
Year:2024
Abstract: Chili (Capsicum annuum L.) is one of the most important vegetable cum spice crops grown throughout the world. Evaluation of genotypes based on morphological and yield contributing traits provides the opportunity to assess variability and select superior genotypes. The present investigation was carried out from April 2018 to November 2018 in the summer season and from December 2018 to June 2019 in the winter season in a net house and field, respectively, in the Department of Genetics and Plant Breeding, Patuakhali Science and Technology University, Patuakhali, Bangladesh. A set of 30 qualitative and 13 quantitative characteristics developed by Biodiversity International were recorded to evaluate the genotypes for morphological and yield-contributing traits. The estimated Shannon–Weaver diversity for qualitative traits ranged from 0 to 1.334, where the maximum diversity was recorded for fruit color at an intermediate stage, stem color after transplanting, fruit surface, stigma position, calyx margin shape, and fruit set, while the minimum diversity (H′ = 0) was observed for the traits corolla shape and anthocyanin spots, indicating no diversity of these traits. Thirteen quantitative traits were also analyzed for the selection of the genotypes with the greatest yield. The quantitative traits also exhibited a wide range of variability according to descriptive statistics and analysis of variance. Moreover, the present study revealed a high heritability for almost all of the quantitative traits, which was confirmed by the values of genotypic coefficient of variation, phenotypic coefficient of variation, h 2 b, and GA for both the summer and winter seasons. This suggests that these traits are predominantly governed by additive genes, making them highly amenable to effective selection. The heatmap analysis based on the morphological quantitative traits revealed five clusters for both the summer and winter seasons for the studied chili genotypes, four distinct clusters in the summer season, and three distinct clusters in the winter season for the parameters studied. Using the multi-trait genotype–ideotype distance index based on multiple trait information, the genotypes R-06, R-07, C0525-2, BARI (Bangladesh Agricultural Research Institute) Morich-2, Tengakhali, and Rcy 002 were selected as promising for both the summer and winter seasons. Hence, they are recommended for commercial cultivation or use as parent materials in future breeding for the development of new cultivars adaptable to climate change.

Farmers perspectives on options for and barriers to implementing climate resilient agriculture and implications for climate adaptation policy

Author: Shilpi Kundu
Year:2024
Abstract: The impacts of climate change in low lying coastal areas, such as Bangladesh, are adversely affecting food and livelihood security, requiring adaptation to build resilience. However, effective implementation is limited by a lack of local-level knowledge regarding the barriers that prevent adoption and up-scaling of climate resilient agriculture (CRA). Case studies in coastal Bangladesh provide novel

insights regarding barriers to planned and autonomous adaptation from the perspective of farmers facing multiple climate change impacts across seven key dimensions of CRA (agrometeorology services, water management practices, nutrient management activities, technologies and knowledge management activities, infrastructure development, socio-economic resilience, and institutions and good governance). Farmers generally perceive that adaptation actions increase resilience in crop production systems and their surrounding social systems, but also identify the important barriers that inhibit or constrain planned and autonomous adaptation opportunities. Planned adaptation actions are perceived to be limited by institutional arrangements and lack of implementation capacity. Autonomous adaptation was found to be dependent on income level, farm-holding size, access to input resources and services and peer/social influences. Planned and autonomous adaptation actions were both affected by specific social and geographic contexts and cultural factors. Recommendations are suggested to address key constraints and thereby promote CRA in coastal agricultural landscapes in Bangladesh and in other developing countries confronting similar challenges.