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RESEARCH ON PHOSPHORUS TREATMENT IN WASTEWATE MICROORGANISMS ISOLATED FROM CASSAVA STARCH PRODUCTION WASTE

Research article

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Abstract: In waste water, phosphorous (P) can exist in inorganic or organic forms. Depending on the concentration, P can cause eutrophication and severe environmental pollution. Microorganisms have the ability to use and accumulate P, so microorganisms are studied to treat P in waste water in general and wastewater from cassava starch processing plants in particular. Research results show that in the 20 samples of waste water and sludge of the plant has selected three strains of bacteria that can accumulate P in the form of granules in the cell. Among them, SHV22 has the highest P accumulation capacity, reaching $3.05.10^{-11}$ mg / cell, P removal efficiency in wastewater from cassava starch processing factory is 82.1%. The strain was identified as *Bacillus amyloliquefaciens.*

EFFICIENT USE OF CROP RESIDUES FOR PRODUCING ENERGY AND ENHANCING SOIL CARBON SEQUESTRATION AS CLIMATE SMART PRACTICES IN RURAL AREAS OF VIETNAM

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Abstract

[1] his article presents results of research on the efficient use of crop residues in energy production and land carbon fixation in Ha Tinh, Yen Bai and Bac Lieu. MHH-IAE 003 was a product designed and tested by IAE, suitable for many kinds of materials such as: rice husk, sawdust, peanut husk, maize corn, wood chips. Compared to similar stoves, MHH-IAE 003 stove was more effective on heat management and air pollution reduction. Biochar get high organic carbon and CEC. 'lhe biochar was applied to soil, combined with changes in mineral fertilizers in experiments in Ha Tinh, Yen Bai, Bac Lieu. 'lhe experiment in Yen Bai showed that use of 1.5 tons of biochar per hectare increased corn yield and decreased 20% of chemical fertilizer. Rice in Bac Lieu also reached the similar results. 'lhe peanut experiment sites in Ha Tinh, with the same amount of NPK applied but the greater amount of biochar also got more productive than the other formulas. In 3 experiments, biochar method led to increase the amount of organic matter. Cation exchange capacity (CEC) was proportional to the amount of organic matter. Apply biochar increased soil carbon higher than convention. 'Ihis research has initially led to a successful approach to changing farmer's crop residue treatment methods, using with a new, more efficient and sustainable way of reducing greenhouse gas emissions.

Keywords: Gasifier, biochar, crop residues, Yen Bai, Ha Tinh, Bac Lieu

CLIMATE-SMART PADDY RICE CULTIVATION PRACTICES DEVELOPED AND ADOPTED FOR ANHANECD RICE PRODUCTIVITY THROUGH C SEQUESTRATION AND GHG MITIGATION IN VIET NAM

Vu Duong Quynh, Phan Huu Thanh, Mohammad Zaman
International Symposium on Managing Land and Water for Climate Smart Agriculture

Abstract

Climate-smart paddy rice cultivation practices developed and adopted for enhanced rice productivity through C sequestration and GHG mitigation in Vietnam.

Content

Vietnam is among the countries that will be most seriously affected by climate change. At the same time total greenhouse gases (GHG) emissions in Vietnam were 266Tg of carbon dioxide (CO_2) equivalents in 2010 (including LULUCF) and are projected to increase to 466 million tons in 2020 and 760.5 million tons in 2030 (MONRE, 2014). Agricultural production activities emitted 88.3Tg CO2, accounting for 33.2 % of total national GHG emissions. Rice cultivation is considered to be the greatest source of agricultural GHG emissions, especially CH_4 and N_2O in Vietnam, with estimations that it emits 44.8Tg CO_2 equivalents, accounting for 50.5 % of total agricultural GHG emissions in 2010 (MONRE, 2014). Vietnam INDC aim to reduce 8% and 25% total National GHGs emission without and with international support for time period 2021 to 2030

In Vietnam, after harvesting rice, 80% rice residue (rice straw/ rice stubble) is usually burnt on the field. This poor farming practice lead to C loss via CO_2 emission to the atmosphere. However, if rice straw is converted to biochar then that C in rice straw is conserved which has the potential to increase soil fertility and retain C in soil. This practice reduces the activity of methanogenesis that produce CH4 and also reduces N_2O emission by absorbing $NH4^+$ and NO_3^- on biochar surface.

Rice farmer also applying urea (40-60% of total N fertilizer) for rice which increase N lost by different N form such as NH_3, N_2O. Using urease and nitrification inhibitors has the most potential to reduce NH_3/N_2O losses to the

atmosphere. However limited studies have been conducted in using these amendments in Viet Nam.

In the proposed study, we focus on developing Climate-smart-agricultural practices using nuclear and related techniques to enhance rice production with lower GHGs emissions, sequester C in soil to make soil resilient against climate change and determine C-budget in Vietnam.

This study aim to i) to determine CH_4 & N_2O emission (using static chamber technique), NH_3 lost (using chamber method) under the effect of urease and nitrification inhibitors and biochar, ii) to determine NUE of different nitrogen fertilizers using ^{15}N technique and iii) to develop guidelines of climate-smart agriculture practices for C sequestration, mitigation of GHG, improved N use efficiency to enhance crop productivity.

To obtain the above objectives, the field experiment is conducted in fluvisol in spring and summer paddy rice seasons of 3 continuously years (2021, 2022 and 2023) in Vietnam except spring season 2021. The field experiment will be layout by RCBD include 4 treatments with 3 replication for each of 4 treatments resulting in 12 plots. In which treatment 1: ^{15}N urea; treatment 2: ^{15}N urea + 2 tone of biochar; treatment 3: ^{15}N urea + n-BTPT; treatment 4: ^{15}N urea + DCD.

A LOW-COST APPROACH FOR SOIL MOISTURE PREDICTION USING MULTI-SENSOR DATA AND MACHINE LEARNING ALGORITHM

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Science of the Total Environment, 08/2022, (IF: *10.753*; SJR: Q1)

Abstract

A high-resolution soil moisture prediction method has recently gained its importance in various fields such as forestry, agricultural and land management. However, accurate, robust and non- cost prohibitive spatially monitoring of soil moisture is challenging. In this research, a new approach involving the use of advance machine learning (ML) models, and multi-sensor data fusion including Sentinel-1(S1) C-band dual polarimetric synthetic aperture radar (SAR), Sentinel-2 (S2) multispectral data, and ALOS Global Digital Surface Model (ALOS DSM) to predict precisely soil moisture at 10 m spatial resolution across research areas in Australia. The total of 52 predictor variables generated from S1, S2 and ALOS DSM data fusion, including vegetation indices, soil indices, water index, SAR transformation indices, ALOS DSM derived indices like digital model elevation (DEM), slope, and topographic wetness index (TWI). The field soil data from Western Australia was employed. The performance capability of extreme gradient boosting regression (XGBR) together with the genetic algorithm (GA) optimizer for features selection and optimization for soil moisture prediction in bare lands was examined and compared with various scenarios and ML models. The proposed model (the XGBR-GA model) with 21 optimal features obtained from GA was yielded the highest performance (R^2 = 0. 891; RMSE = 0.875%) compared to random forest regression (RFR), support vector machine (SVM), and CatBoost gradient boosting regression (CBR). Conclusively, the new approach using the XGBR-GA with features from combination of reliable free-of-charge remotely sensed data from Sentinel and ALOS imagery can effectively estimate the spatial variability of soil moisture. The described framework can further support precision agriculture and drought resilience programs via water use efficiency and smart irrigation management for crop production.

CIRCULAR BIOECONOMY FOR RESOURCE RECOVERY FROM WASTEWATERS USING ALGAE-BASED TECHNOLOGIES

Thu Thuy Nguyen, Huu Hao Ngo, Wenshan Guo

In the book series on Current Developments in Biotechnology and Bioengineering, Elservier

Abstract

The circular bioeconomy is emerging as a new concept within the scientific community, which is attempting to help create sustainable economic development. The general aim of circular bioeconomy is to obtain sustainability through reduction, reuse, recycling, and recovery practices using bio-based resources. Recovery of nutrients from secondary sources is a key way to address the increased demands on resources by an exponentially rising world population growth. Wastewater is a source of nitrogen, phosphorous, and other nutrients necessary for various industries. Microalgae when harnessed with technology are considered to enable to recover nutrients from wastewaters through processes of growth and biomass production. This chapter describes the overview of bio-circular economy using microalgae, the potential of using algae-based technologies for resource recovery from wastewaters and making a circular bioeconomy viable. Challenges and future perspectives of these technologies are also explained.