Changes of land use and soil properties and their impact on rice yield in Dacope upazila of Khulna district

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Abstract:

Polder 31 and polder 32 of Dacope Upazila in Khulna district was selected for the study as it was severely affected by the cyclone Aila 2009 which is observable through the changes of land use and soil properties. The specific objectives of this study are to detect the changes of land-use in the study area of different time periods, determine the change in soil properties due to different land uses and estimate the impact of soil properties changes on rice yield. To identify the land use changes over time in the study area satellite images i.e. Landsat 5 images of 1988, 1996, 2009, 2010 and Landsat 8 image of 2014 were used and supervised classification method was applied to understand the changes. Six classes were delineated i.e., water, forest, bare land, shrimp land (gher), agricultural land and inundated area based on spectral signatures which showed varying degrees of areal extent with time. Each class’s areal percentage was also calculated using image processing software to see the actual changes of land uses. Three field visits were conducted from January 2014 to November 2014 in both polders for field verification and soil sample collection. Different physical and physicochemical properties of soil e.g., soil texture, pH, EC, OM, CEC, total N, K, Ca, Mg, P, and S were determined from the SRDI laboratory. Aman and boro production records of ten years from 2004-05 to 2013-2014 were collected from Khulna agricultural office. Other necessary information regarding changes in the study area was collected using different Participatory Rural Appraisal (PRA) tools. Observed dominant land use patterns in the study area were bare land, shrimp cultivation and agricultural land. Major land use practices were shrimp cultivation and bare land in 1988 and 1996; shrimp cultivation, bare land and agricultural land in 2009; agricultural land and bare land in 2014. Bare land in 1988, shrimp cultivating land in 1996 and agricultural land in 2014 were the highest in the study area which means that economically profitable shrimp cultivation has been reduced and agricultural practice is beginning to flourish for last few years. Although local people had already started limited crop production after 2000’s as they wanted to go back to agriculture from shrimp cultivation, two deadly cyclones namely SIDR (2007) and Aila (2009) hit the study area and led to many problems, especially cyclone Aila did much damages to the study area which delayed this ongoing shift. Soil and environmental degradation following these two cyclones discouraged local people to continue mass scale shrimp cultivation and forced them to start practicing rice and other agricultural crops. Soil samples of the study area are mostly silty clay forming fine textured soil which is common in any tidal delta. pH of soils in the study area falls under neutral class. Average EC value of the year 1995 and 2014 are 21.35 dS/m and 6.09 dS/m, respectively, which means soil salinity had come down by more than two third. OM content is very low in 2014 compared to that of 1995. Aman is the major rice crop produced in the study area. Yield of aman was low during shrimp cultivation period because of soil salinity, which even after rain-wash remain in the clayey soil. After ceasing of shrimp cultivation practice, aman yield is gradually increasing. Average yield of aman and boro are 2.19 ton/ha and 3.4 ton/ha respectively. The yield of boro is comparatively high though it is being cultivated in very limited and scattered scale mostly because of unavailability of irrigation water. Regular soil health check system should be ensured to keep track of soil’s fertility by the GOs and/or NGOs. To increase organic matter content in soil organic matter inputs like livestock manure have to be added in the soil. Reduction of tillage and controlling of soil erosion are required for soil management.
nonsaline area at Dacope Upazila of Khulna district of Bangladesh. In total, 240 farmers were randomly selected for the study among which 120 from saline area and rest 120 from nonsaline area. Descriptive statistics, activity budgets, Cobb-Douglas production function model were employed to achieve the objectives of the study. were positive and had significant impacts on gross returns of T. Aman rice production in saline area. Key words: T. Aman rice; Saline; and Economic and comparative analysis.

Introduction. Bangladesh's overall agricultural policy objective is to expand and diversify agricultural production and to maintain food security, especially with regard to sustaining near self-sufficiency in rice. Aman is one of the main crops in Bangladesh.