

Mapping the Suitable Sites for Food Grain Crops Using Geographical Information System (GIS) and Analytical Hierarchy Process (AHP)

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Abstract : Progress continues in the fight against hunger, yet an unacceptably large number of people still lack food they need for an active and healthy life. Bangladesh is one of the rising countries in the South-Asia but still lots of people are food insecure. In the last few years, Bangladesh has significant achievements in food grain production but still food security at national to individual levels remain a matter of major concern. Ensuring food security for all is one of the major challenges that Bangladesh faces today, especially production of rice in the flood and poverty prone areas. Northern part is more vulnerable than any other part of Bangladesh. To ensure food security, one of the best way is to increase domestic production. To increase production, it is necessary to secure lands for achieving optimum utilization of resources. One of the measures is to identify the vulnerable and potential areas using Land Suitability Assessment (LSA) to increase rice production in the poverty prone areas. Therefore, the aim of the study was to identify the suitable sites for food grain crop rice production in the poverty prone areas located at the northern part of Bangladesh. Lack of knowledge on the best combination of factors that suit production of rice has contributed to the low production. To fulfill the research objective, a multi-criteria analysis was done and produced a suitable map for crop production with the help of Geographical Information System (GIS) and Analytical Hierarchy Process (AHP). Primary and secondary data were collected from ground truth information and relevant offices. The suitability levels for each factor were ranked based on the structure of FAO land suitability classification as: Currently Not Suitable (N2), Presently Not Suitable (N1), Marginally Suitable (S3), Moderately Suitable (S2) and Highly Suitable (S1). The suitable sites were identified using spatial analysis and compared with the recent raster image from Google Earth Pro® to validate the reliability of suitability analysis. For producing a suitability map for rice farming using GIS and multi-criteria analysis tool, AHP was used to rank the relevant factors, and the resultant weights were used to create the suitability map using weighted sum overlay tool in ArcGIS 10.3®. Then, the suitability map for rice production in the study area was formed. The weighted overly was performed and found that 22.74 % (1337.02 km²) of the study area was highly suitable, while 28.54% (1678.04 km²) was moderately suitable, 14.86% (873.71 km²) was marginally suitable, and 1.19% (69.97 km²) was currently not suitable for rice farming. On the other hand, 32.67% (1920.87 km²) was permanently not suitable which occupied with settlements, rivers, water bodies and forests. This research provided information at local level that could be used by farmers to select suitable fields for rice production, and then it can be applied to other crops. It will also be helpful for the field workers and policy planner who serves in the agricultural sector.

Keywords : AHP, GIS, spatial analysis, land suitability

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