

Land Quality and Sustainable Agriculture

Land is the basic substrate for many life support systems. Characteristics of land vary from region to region. Therefore, assessment and evaluation of land quality are important for agricultural development. Land quality evaluation is the process of assessment of land performance when used for a specific purpose. The study involves the conduct and interpretation of surveys and studies of landforms, soils, vegetation, climate and other aspects of land to identify and make a comparison of different kinds of land use in terms of applicable objectives of the evaluation.

Demand for food is increasing globally. Production of crops can be enhanced either by increasing the efficiency in the existing agricultural lands or by increasing the area under cultivation. In Kerala, availability of land is limited and the existing land has been put under intense use. A large area of land remains underutilized due to limitations like soil erosion, fertility and non-availability of water for irrigation etc. Therefore, better management of land and water resources is essential in Kerala to increase food productivity.

Despite much technological advancement, the agriculture in Kerala is still controlled mainly by physical factors. Terrain characteristics like



Additional District Collector, Kannur Sri.Sudbeer Babu inaugurates the workshop on Assessment and monitoring of Land quality for sustainable agriculture in Kannur district: A GIS based approach coupled with technology implementation. Dr. T. Radhakrishna, Director in Charge, CESS, Sri. B. Sukumar and Sri. V. Vasudevan, Scientists, CESS are also seen.

topography, slope, altitude, climate, soil, soil nutrients, surface drainage and ground water table are vital elements of agricultural activities and cropping pattern. Assessment and integrated analysis of these factors and monitoring the changes in GIS environment has been recognized to be very promising in the recent years. Results of these analyses coupled with appropriate technological interventions put into practice with the local

farmers' participation would boost agricultural productivity.

Under the above background, CESS initiated a project entitled "Assessment and monitoring of Land quality for sustainable agriculture in Kannur district: A GIS based approach coupled with technology implementation". It is a multidisciplinary project initiated by the involvement of scientists from different disciplines on experimental basis in Kannur district. The district is chosen for the study because it ranks number two among the districts in Kerala in terms of total cropped area, number three in net sown area, number four under the category of barren and uncultivable land area and very poor in area under irrigation.

In order to achieve the objectives, terrain information like relief, drainage, geology, landform, slope, aspect, soil, watershed/panchayat/block boundaries, agriculturally drought prone areas, landslide prone areas, flood prone areas and population maps are being prepared on 1:50,000 scale and evaluated for the suitability of agricultural activities. Agricultural drought prone areas were identified using middle infrared band of

Continued in page 2

Geospatial Digital Database for Munnar Region

CESS completed the creation of spatial and non-spatial database of Munnar, Chinnakkal and Pallivasal Panchayats of Idukki district in record time using latest tools in geoinformatics. The geo information data base made easy the implementation of developmental programmes in an eco-friendly and sustainable manner.

Cadastral/village maps, CARTOSAT I stereo PAN data and QuickBird satellite data (with spatial resolution of 0.60 metre Mx and 2.5 metre PAN) were used in conjunction with Dual frequency Global Positioning System for this purpose. QuickBird satellite data was precisely ortho-corrected using DGPS values and

the Cartosat stereo data. Various thematic layers such as land use/ land cover, road network, water bodies, settlements, building foot prints etc, were derived. Georeferencing of inter-estates were made for obtaining final mosaic of KDH Village. The mosaic image was then integrated with the ortho-corrected QuickBird image.

Vectorization of the cadastral maps was done and linked with the survey parcels. The spatial/non-spatial data was linked geodatabase in WGS84 Datum and UTM Zone 43 projection. The area of original and the vectorized cadastry was compared and accuracy level was assessed. The spatial and

Continued in page 2

Director Speaks



India is bestowed with a large stretch of coast line and Kerala state in the southwestern region of India represents a narrow stretch with a coast line of 560 km. Coastal zones extend for a few kilometres on either side of the shoreline, and present a complex dynamic web of natural and human related processes. They play a vital role as they account for nearly a quarter of all oceanic biological production supplying approximately 80% of the world's fish. About 60% of the human

population lives in the coastal zone, and around 70% of big cities are located in this narrow area. The coastal zone is continuously under the action of tide, waves, wind and currents. Because of this the land-water interface along the coastline is always in a highly dynamic state and nature works towards maintaining an equilibrium. At the same time, the hydrodynamic conditions influence the sediment transport in the coastal zones. The alongshore and cross-shore sediment transport constrains the sediment budget and the erosion/accretion in any coastal stretch. Human interference like construction of shore protection structures, development of ports and harbours, exploration and mining of mineral resources, tourism, etc also often makes the otherwise stable system unstable and some locations ultimately experience excessive erosion/accretion.

In the light of above, analysis and successful prediction of sediment transport and understanding the coastal processes have great commercial, aesthetic, social, and scientific relevance for both sustainable development of the coast and coastal zone management. Waves, tides, offshore topography, bedrock geology, sediment supply and sea-level changes are the controlling factors of the coastal processes which define the set of mechanisms that operate along a coastline bringing about various combinations of erosion and deposition that in turn influence the geomorphic form and evolution of the coast. Deep involvement of CESS in these studies has resulted in making significant advancement in understanding the processes operational along the Kerala (and parts of Karnataka) coast. CESS established four coastal laboratories in Kerala, provided the much needed database of hydrodynamic conditions and drew many inferences on coastal processes. CESS is also involved in the national program for developing database under Coastal Ocean Monitoring and Prediction System to identify ecologically sensitive zones. A few other major achievements include the step-ladder model to explain long-shore and cross-shore sediment transport, development of numerical models for shallow water wave transformation, shoreline evolution and shallow water wave spectrum, suggesting offshore source of mud and a conceptual model for the mud bank, a new type of coastal flooding 'Kallakkadal' due to remote forcing, characterising 2004 tsunami run-up and inundation along Kerala coast, bringing out inter-relationship between meteorological parameters, hydrodynamics and beach processes along the Kerala coast and deduction of the mechanisms of transportation and concentration of heavy mineral deposits.

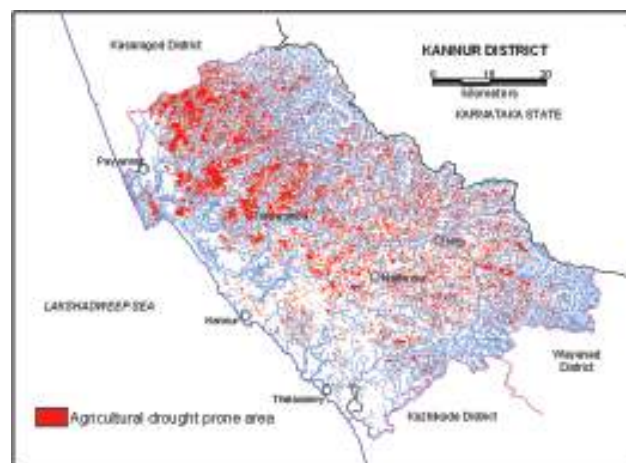
With the above mentioned advancements, CESS has contemplated to hold a national conference on coastal processes, resources and management in the early part of 2010. The conference proposes to review the current status and to discern new frontiers of future research for better understanding of coastal processes and to formulate sustainable coastal zone management plans.

Dr. T. Radhakrishna

Continued from page 1

Land Quality and Sustainable Agriculture

Landsat ETM data of 2002 (drought year). It covers an area of 446sq.km (14.9 percent of the total area). Soil samples were collected from one third of the district and soil geochemistry analysis were undertaken to prepare a soil geochemical Atlas.



The geochemical maps will be integrated in the GIS environment to identify critical areas on watershed basis and detailed investigation will be carried out to optimise the agricultural productivity. A questionnaire survey is being carried out to get the actual perception and problems of agriculture in the district.

A half day user interaction workshop was conducted in the Collectorate conference hall, Kannur district on 19th January 2010. Director-in-charge and the investigating scientists of the project from the Centre, representatives from farmers of the district, NGO's and officials from various line departments participated in the workshop. Additional District Collector, Sri. Sudheer Babu inaugurated the workshop and presided over the workshop/function. The details of the project and the maps prepared by the project team were presented before the participants. An interactive session was conducted to take note of suggestions.

B. Sukumar

Continued from page 1

Geospatial data base.....

non-spatial information thus derived were integrated with cadastre in 1:3960/1:5000 scale and plot level area covered by different categories of land use were computed. The database was integrated as per the original number of estates recorded in the original cadastre. The land board data was also integrated to the digital database and the area corresponding to the original cadastry was compared.

An Information System with query facilities to extract and visualize both spatial and nonspatial information on single or multiple themes has been designed. The database and report was submitted to the Government.

Visits Abroad

On an invitation from ITC Netherlands, Sri. Sankar G, Scientist, CESS visited the Post Graduate Institute of Sciences (PGIS), University of Peradeniya, Kandy, Sri Lanka from 19 October to 30 October 2009 and participated in the Refresher Course on 'Innovative approaches to multi scale landslide hazard and risk assessment'. The course was organized by the ITC Netherlands in association with United Nations University. The course covered spatial prediction modeling of landslides, knowledge driven landslide susceptibility modeling, Data driven modeling of landslide susceptibility, evaluating the performance of a landslide, Dynamic modeling using PC RASTER etc. A field visit was also conducted in the landslide affected regions of the Central province of Sri Lanka.



Sri. C.K.Sasidharan presented a paper entitled 'Ecotourism for inclusive growth: A case study of Ashtamudi lake' in the 13th World Lake Conference held during 1-5, November 2009, in Wuhan (China). His presentation was adjudged the best in the session and was given a memento. The conference was jointly organized by the Chinese Society for Environmental Sciences (CSES), Chinese Research Academy of Environmental Sciences (CRAES) and Wuhan Municipality. More than 1000 stakeholders from all over the world attended the conference that presented the latest strategies on lake protection and the sustainable application of these strategies, facilitating the sharing of best practices in the field.



Exhibition

CESS participated in (1) the Science and Technology Exhibition, 'Swasraya Bharat-09' at Ernakulam during 12-16 June 2009 organized by the Swadeshi Science Movement, (2) the exhibition organized to commemorate the contributions of Dr. C. V. Raman at the Sree Narayana Central School, Nedungolam Kollam during 19-21 November 2009 and (3) the All India Co-operative Exhibition at Kanakakkunnu Palace Thiruvananthapuram during 30 November -9 December 2009.

Seminar / Meeting / Workshop

Sri. Sukumar, B., attended Annual Conference of Maritime History Society and presented a paper on 'Historical and geomorphological evolution of Korkai in Tamil Nadu' at Mumbai during 8-9 October, 2009.

Sri. Shravankumar, V., attended National seminar conducted by the Department of Environmental Sciences, University of Kerala and presented a paper titled 'Impact of climate change on drinking water sources in Thiruvananthapuram district, Kerala' during 8-9 October 2009 and also has co-chaired a session.

Dr. Srikumar Chattopadhyay attended 31st Indian Geography Congress at Rani Durgabati University at Jabalpur from 19-21 November, 2009 and co-ordinated the Young Geographer's contest session.

Sri. Sukumar, B., Ahalya Sukumar, Diji, V, Jyothirmayi, P., Divya, U. M., Deepthi, P., Savitha Vijayan and Sulfikkar, M., attended the International Conference on Disaster Management and Mitigation ICDMM-2009 during 16-18 December, 2009 at PSNA college Dindigal and presented the following papers

'Application of Geomatics in Disaster Management and Mitigation' (Sukumar B)

'Urban flooding and Mitigation in Kozhikode town: a GIS base approach' (Diji, V, Sukumar B and Ahalya Sukumar)

'Mitigation and Management of hazard prone areas- Valapattanam River Basin, Kannur District, Kerala using Geospatial tools' (Jyothirmayi P, and Sukumar B)

'Mitigation measures for agricultural drought prone areas in Palakkad District, Kerala using Satellite imagery and GIS' (Divya U M, Deepthi P and Sukumar B)

'Mitigation and Management of Landslide prone areas in Iritty blocks of Kannur District, Kerala using GIS and Remote Sensing' (Savitha Vijayan, Sulfikkar M and Sukumar B)

Training Programmes

CESS conducted 'Awareness Training Programmes on CRZ' for the officials of the coastal panchayats of Thiruvananthapuram and Kollam districts on 18 December 2009 at Thiruvananthapuram and for the officials of Alapuzha and Ernakulam districts on 30 December 2009 at Town Hall, Ernakulam.

Membership in Committees

Sankar G, Scientist, CESS was nominated as a member of the special team constituted by the Government of Kerala for preparing the River Basin Master Plan for Chaliyar river, Kozhikode.

New arrivals in CESS library

Kantha, Lakshmi H. and Clayson, Carl Anne. Numerical models of oceans and oceanic processes. Academic Press, San Diego, California, 2000.

Indian Tide Tables 2010. Surveyor General of India, 2009.

Balagurusamy E. Programming with Java: A primer. Tata McGraw Hill Publishing Ltd., New Delhi, 2009.

Tripathi, S.C., Tandon S.K. and Bhattacharya A.R. (Eds.). Advances in Earth Sciences. Satish Serial Publishing House, Delhi, 2009.

Lebrun, Jean-Luc. When the scientists presents: An audio and video guide to science talks. World Scientific, Chennai, 2010.

Earth Science Forum Lecture



Prof. M. Santhosh, Department of Natural Environmental Science, Faculty of Science, Kochi University, Kochi, Japan delivered a talk on 'The Evolving Earth'.

New UV-VIS Spectrophotometer

A new UV-VIS Spectrophotometer, SHIMADZU UV-1800 has been procured and installed in Chemical Sciences Division. The instrument enables the colorimetric estimation of nutrients, fluoride and trace metals that form coloured complexes as well as turbidimetric estimation of Sulphate etc. The instrument is operational between the wavelengths 190nm and 1100nm and its photometric system is Double beam optics. Light sources are Deuterium and Tungsten lamp.



French Scientists visit CESS

Dr. Mirellie Perrin, Dr. Jean Marie Dautria and Dr. Patric Monie, the Principal and joint Collaborators of the on-going project



Drilling for collecting oriented core samples for palaeomagnetic study in South Islands of the St. Mary's islands during a joint fieldwork by the Indian and French Collaborators.

'Palaeointensity and Reunion/Marion plume activity in India' sanctioned by the Indo-French Centre for Promotion of Advanced Research (IFCPAR) have visited India. The French collaborators along with Dr.T. Radhakrishna and Mr.G.Balasubramonian, the Principal and joint collaborators of the Project from CESS in India have carried out a joint fieldwork for about a month during August – September, 2009. During the fieldwork, they have examined the dolerite dyke and Ezhimala gabbro–granophyre complex exposures in north Kerala and collected samples from a few sites for the study of palaeomagnetism, geochemistry and Ar – Ar geochronology. As the dolerite dykes were not good enough to obtain palaeointensity record, further work has been mainly concentrated on Deccan volcanic region expecting that the fine grained nature of the

basalts could be potential candidates for palaeointensity experiments. The youngest flows of Dassur and Panhala Formations, in the Belgaum – Kolhapur sector and the alkaline and tholeiitic flows of Rajpipla, which are regarded to be the older flows have been the main target of this study. Several samples from different sites were collected for palaeomagnetism, geochemistry and Ar /Ar geochronology.

Publications

Chattopadhyay S. and Mahamaya Chattopadhyay., (2009) 'Impact of terrain characteristics on catchment yield: A case of Kabbani river basin, Kerala. In: 'Perspective in Resource Management in Developing Countries', vol.4, Land Appraisal and Development, Ed. B. Thakur, Concept Publishing Company, New Delhi, pp.145-157.

Chattopadhyay S., (2009) 'Management of Ganges Delta: Some issues in the context of sustainable development. Monograph-I: Changing Scenario of Deltaic environment. Department of Geography, University of Calcutta. pp.62-72.

Sreejalekshmi, K. G., Anoop Krishnan, K. Anirudhan, T. S. (2009) Adsorption of Pb(II) and Pb(II)-Citric acid on sawdust activated carbon: Kinetic and equilibrium isotherm studies. *J. of Hazardous Materials*, 161 pp 1506-1513.

Udayakumar, P., Ajimon, V. J., Jean Jose, J., Narendra Babu, K. (2009) Hydrochemistry of Kavaratti lagoon waters, Lakshadweep Archipelago. *Eco-chronicle*, 4(3) pp 312-318.

Ouseph, P. P., Prasanthan, V., Abhilash, P. P., Udayakumar, P. (2009) Occurrence and distribution of some enteric bacteria along the southern coast of Kerala. *Indian J. of Marine Sciences*, 38 (1) pp 97-103.

Rainwater Harvesting and Groundwater Recharging - CESS initiatives at Chadayamangalam

Integrated Watershed development programme (*Hariyali*) is under implementation in the Chadayamangalam block in Kollam district, Kerala under the technical guidance of Centre for Earth Science Studies. Rainwater harvesting and groundwater recharge were attempted in twenty selected watersheds under this programme. Activities like harvesting rainwater from roof top, recharging shallow aquifer with deep pits, arresting surface flow using contour bunds, arresting stream flow in first order streams through check dams, enhancing groundwater recharge with percolation ponds, sub-surface dykes to arrest base flow to maintain elevated water table conditions etc. are planned for the study area. Domestic well recharge and recharge pits are used in elevated areas with deep laterite sections. Sub-surface dykes are planned in valley head region. A few model structures were made at the end of NE monsoon period have harvested the pre-monsoon showers and have shown positive results.

Retirement



Dr. Terry Machado, Scientist E 2, Marine Sciences Division, Centre for Earth Science Studies, retired voluntarily from the services of the Centre on 15 October 2009.

Christmas and New Year Celebrations



Photographs taken during the Christmas and New Year Celebrations of the CESS Recreation Club on 31 December 2009