❖ CSSTEAP Newsletter ❖

Quarterly Newsletter of Centre for Space Science and Technology Education in Asia and the Pacific (Affiliated to UN)

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SPACE SCIENCES AND AGRICULTURAL DEVELOPMENT *

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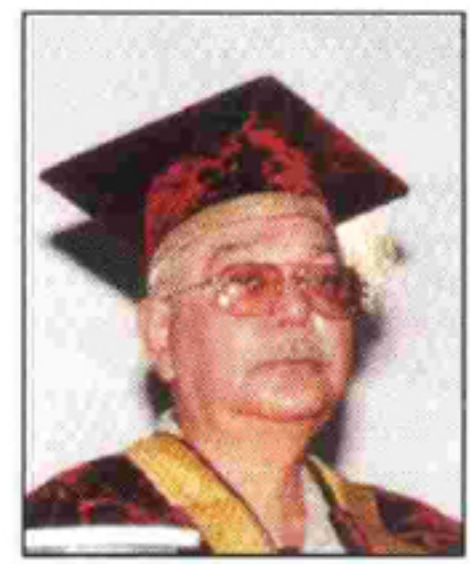
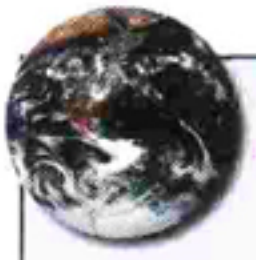


It is indeed a privilege to be invited here today to deliver the valedictory address to the participants of the Post-Graduate Course sponsored by the Centre for Space Science & Technology Education in Asia and the Pacific. It would be amongst one of the first set of courses to be given at the Indian Institute of Remote Sensing in the new millennium. I am also particularly pleased to be here in the company of *Dean Roy, Professor Saha* and my old friend *Professor Dr Karl Harmsen.* The leadership provided by these men of learning has made significant contributions to natural resources management systems by using the knowledge-based remote sensing and geographical information systems. They have guided the space science researchers and inspired the visiting scientists internationally by their vision, their wisdom and have combined their unique capacity to produce the best results of the space observed data with the practical methods of applying them to solve the problems facing agricultural development. These science leaders have firmly established the role of remote sensing technology for mapping and monitoring of natural resources on the one hand and utilising its products on operational basis in planning and decision making in various fields of resource management in agriculture, forestry, water management, rural development, disaster mitigation and infrastructural upgradation on the other. I am told that during their stay at this institute, the participants have already learnt the multiple uses of the new space-technological tools for human welfare. As we pass on the diplomas recognizing their excellence, let me philosophise on some of the newer challenges that the participants will meet in the years ahead and relate these to capacity building course that they have just successfully completed. Since I am trained in the area of earth sciences and ecology, I would challenge you to attach meaning to the important issues confronting our agricultural sustainability by means of the learnings of remote sensing and geographical information systems that you have acquired here.



Inside this issue

THE NEW CHALLENGES AND OPPORTUNITIES :

Dr. M. S. Swaminathan, the doyen of international agriculture, key-noted at the international conference on Managing Natural Resources for Sustainable Agricultural Production in the twenty-first century, held 14-18 February, 2000 in New Delhi, three areas for the way-ahead for sustaining our agriculture during the next decade or so. These areas are:

* *Summary of speech on the valedictory function of 6th RS & GIS Course at IIRS, Dehradun on June 30, 2002.*

- ***First, defending the gains already made*** and bridging the yield gap both in agriculture and forestry through technology foresight. India has made significant strides in agricultural and forest production systems during the paśt fifty years. The country today has a surplus stock of over sixty million tons of food grains. However, the gains of newer technologies via green revolution are not well spread even in the high potential areas. There is an urgent need to map high potential agricultural and forests development areas; and to demarcate their production potential and constraints ecozone by ecozone. Integrated natural resource management teams of workers drawn from agronomic and space scientific research institutions can combine the satellite based and collateral data in integrated natural resource management framework and prepare action plans to achieve about 80% of the potential yield by undertaking land care programs. In addition the impact of land degradation on agricultural productivity and the dangers of in-appropriate land management on soil quality and its resilience both for agricultural and forestry land uses should be assessed on eco-regional or watershed basis. Multi-temporal and multi-sectoral Landsat, IRS and more recent observed data can be used for this purpose.

- ***Second, extending the gains to dry farming systems :*** Over 60% of our agricultural lands and almost all of the forest areas are farmed under dry-or rainfed-farming systems. In all of these areas, the watershed development and water harvesting based soil and water conservation schemes should be interlinked with sustainable production. Topographic mapping of land, demarcation of drainage ways, location of water harvesting and storage structures can best be done by remotely sensed data and GIS. The information currently used by the departments of agriculture and soil-water conservation is fairly old, new surveys if mounted are time consuming and expensive and take a limited view of the catchment. Satellite imagery is temporal; it takes a holistic 3-D view of the landscape; it is catchment in scale and assesses land and its vegetation in its totality. Dr. Swaminathan recommends that an urban green belt movement should be initiated in all peri-urban areas to produce timber, fodder and both fresh and processed foods for the cities. The application of space technologies holds a particular promise in this regard.

- ***Third : Making new gains :*** It is in this area that the space science tools will find maximal use because the new gains will come from the diversification of farming systems, and the introduction of precision agriculture. New knowledge and skills will have to be introduced in accord with the quality of the land, its productive capacity, its resilience to changes in land use and management. Application of counter measures to reverse the detrimental effects of 'modern' intensive agriculture management practices on deteriorating soil quality in terms of its fatigue and even decline in crop productivity, loss of soil organic matter, multiple nutrient deficiencies, spread of secondary soil salinity etc. The remotely sensed data could give early warning indications in quantifiable terms (eg. by land cover and land use - LAI) so that appropriate timely action to offset the ecological damage are taken.

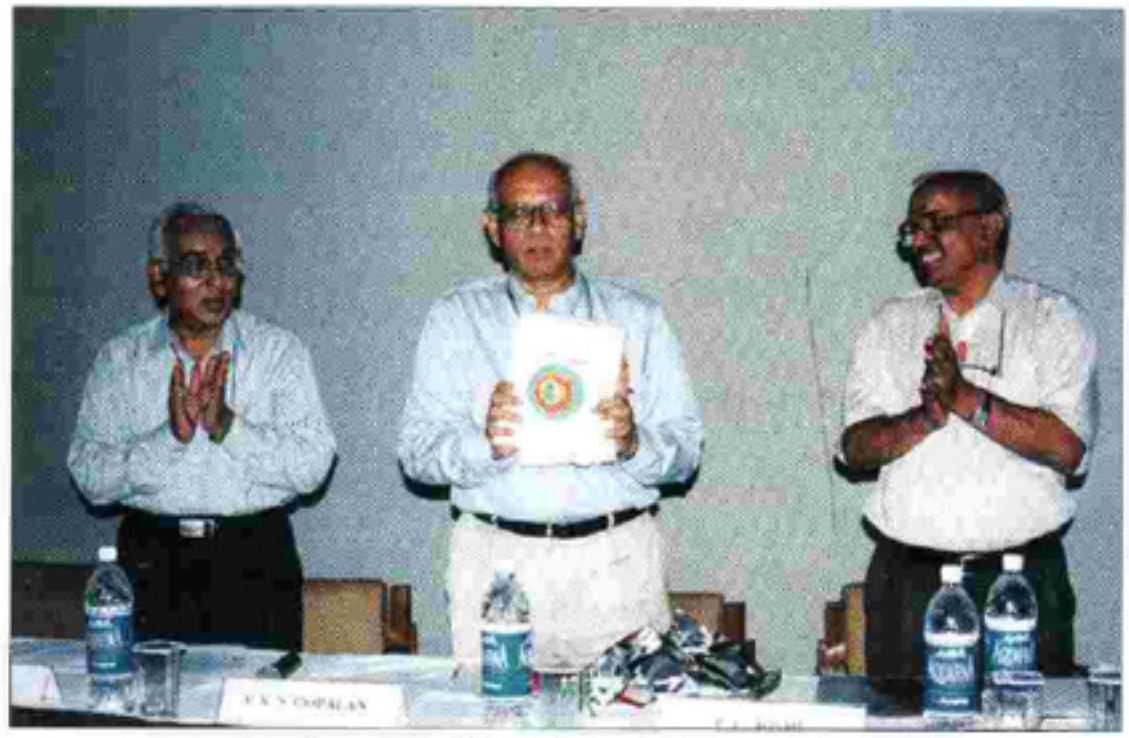
THE NEED FOR COLLABORATION

I believe, a collaborative effort in pooling agricultural natural resources information and expertise with the spatial and temporal data collected by remote sensing in a Computer-Aided Information Centre, which can be located at a convenient point in a given agro-ecological zone is essential to meet the future challenges to sustaining agricultural and food security. The Department of Space, Government of India (GOI) has already initiated such an initiative called ***'Fasal'*** which when net-worked across agro-ecozones could provide a basis for introducing knowledge -intensive precision agricultural methods which will be farmer- friendly and location specific at the same time. In the United States of America and elsewhere the farmers are already reaping the benefits of operational satellite-guided technologies like Remote Sensing and the Global Positioning System (GPS) for scheduling irrigation, fertigation and related crop management with great advantage. With the increased availability of trained manpower, let me enjoin with *Dr. K. Kasturirangan* in fore-seeing a greater use of space technologies in farming and forestry which will be both economically rewarding and intellectually stimulating. This is the central high-point of the GOI's space agenda enunciated for our food and water security in the new millennium. I trust and hope, that as you receive your diplomas of high achievement at the esteemed Indian Institute of Remote Sensing, you will give your fullest support to the 'Space Agenda' and work in a partnership mode with the natural resource management agencies of the Departments of Agriculture and Environment in your respective countries.

To end, let me once again thank *Dean Roy, Prof. Saha* and *Prof. Karl Harmsen* for inviting me to take part in today's function; and wish the participants of the course a successful future in the times ahead.

THIRD SATELLITE METEOROLOGY & GLOBAL CLIMATE COURSE

The third Nine-months CSSTEAP Course on Satellite Meteorology & Global Climate (SATMET-3) has commenced from August 1, 2002 at SAC, Ahmedabad. Twenty participants from 13 countries in Asia and the Pacific region have been selected to undergo this course. The countries are Bangladesh-2, DPR Korea-2, India-3, Iran-1, Kazakhstan-2, Malaysia-1, Mongolia-2, Nepal-1, Philippines-1, Republic of Korea-1, Sri Lanka-1, Thailand-1 and Vietnam-2.



Inaugural Function of the course

Dr. AKS Gopalan, Director, SAC inaugurated the course and delivered a talk on ISRO's Space Programme. Director, SAC also released a set a three lecture volumes on this occasion. These edited and compiled lecture notes comprise of lectures delivered during the SATMET-2000 Course. These lecture notes would form the basic resource material for the SATMET participants. To facilitate better utilization of SAC library facilities, library brought out a special Bibliography on Satellite Meteorology & Oceanography related themes and the same was released by Director, SAC.

The Nine-months SATMET Course is divided into three modules, each of three months duration. During the first fortnight, an orientation program consisting of lectures on Geographic perspectives of India, social systems, custom and festivals of India in general and of Gujarat in particular, overview of Space Science-Technology & Applications, Basics in Mathematics, Statistics and computer programming was organized. At present, the course participants are going through the Module-I dealing with Basics in Meteorology, Climatology and Physical Oceanography, Basics in Satellite Remote Sensing-Radiative Transfer, Orbits and Instrumentation and Image Interpretation. The module-I will be over by October 30, 2002. The core faculty consists of senior scientists of SAC, besides, well known experts from India Meteorological Department, Indian Institute of Science etc have been invited to deliver the lectures on specialized topics. On a weekend, participants undertook a trip to the twin cities of Ahmedabad and Gandhinagar and visited many places of historical significance.

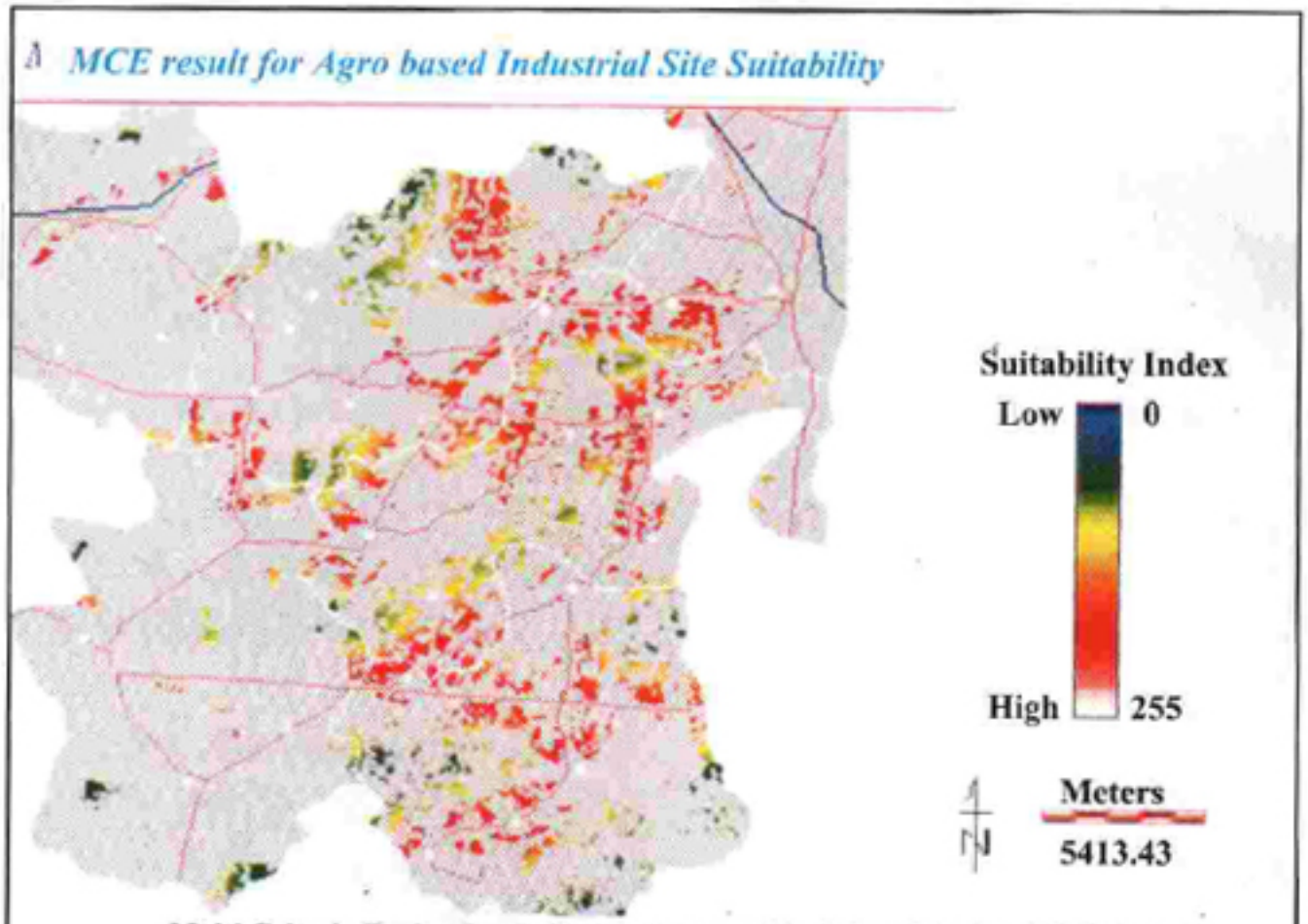
THIRD SPACE SCIENCE COURSE

The third Space Science course of CSSTEAP started at Physical Research Laboratory (PRL), Ahmedabad on August 1, 2002. There are in all 11 participants from Mongolia, Uzbekistan and India. This course is made up of four modules (two dealing with theory and two dealing with experiments) and a pilot project. The assessment of first theory module consists of two theory papers (Paper-I : Structure, Composition & Dynamics of planetary Atmospheres; Paper II : Ionospheric Physics) has been completed. As some of the participants had difficulty in understanding and speaking English, coaching of English language has been arranged for these participants for a period of two months.

MULTI CRITERIA EVALUATION FOR AGRO-BASED INDUSTRIAL SITE SUITABILITY- GIS BASED DECISION SUPPORT SYSTEM APPROACH - A case study in East Godavari District, Andhra Pradesh, India

Mr. Suresh Betapudi,
India

The prime objective of this M.Tech research project was to develop and implement a method of choosing an optimal land allocation model for the development of -Agro-based industrial sites in 6 Mandal administrative units in East Godavari districts, state of Andhra Pradesh, India. Several criteria were incorporated into the analyses, these included central and state Government Policies and regulations for the industrial site devolvement. Multi Criteria Evaluation (MCE) - Weighted Linear Combination Model (WLCM) has been applied for an optimal landuse allocation plan to establish Agro-based industrial sites in the study area. The MCE final suitability map. (Fig) showed varying ranges of suitability for locating the best suitable site for developing Agro-based industries through out the study area. The spatial patterns on the map are strongly influenced by the proximity to road and railway factors and population density, waste-land and landuse /land cover constraints. The influence of the population density in South West and North West part of the study area is clearly evident in the resultant map. Most part of the study area constitutes agriculture land, settlements, plantation, water bodies where unsuitable areas are found. The resultant suitability map satisfied all the criteria by being located nearby transportation proximity, canal proximity, market places, located away from the settlements, populated areas, agriculture land, minimizing the disruption to such environmentally sensitive areas. The steps of data analysis followed in this project were - development of a site model within 6 Mandals in the study area; creation of "Criterion" (Constraints & Factors) with respect to the transformation, canal network, villages/ markets, landuse/landcover, slope and soil maps etc; and finally, Multi-criterial Evaluation (MCE) using WLCM model by using constraint and factor maps. The GIS based Decision Support System (DSS) approach developed in this study can be used to formalize the decision-making process for rural landuse planning.



Multi Criteria Evaluation (MCE) - Weighted Linar Combination (WLC) result for Agro based Industrial Site Suitability

This is a summary of 1 year follow up project of M.Tech degree awarded to the above student of 4th RS & GIS (1999-2000), under supervision of Dr. A.K. Misra, IIRS, Dehradun, India

SIXTH RS & GIS COURSE

The valedictory function of 6th RS & GIS Course of CSSTEAP, conducted during October 1, 2001 to June 30, 2002 was held on June 30, 2002 at Indian Institute of Remote Sensing (IIRS), Dehradun. Dr. S.M. Virmani, former Principal Scientist and Program Director, International Crops Research Institute for Semi-Arid Tropics (ICRISAT), Hyderabad, India, the chief guest of the function distributed certificates to the course participants. The chief guest also delivered valedictory address on "Space Science & Technology for Sustainable Agricultural Development". Director, CSSTEAP and Dean, IIRS also addressed the gathering. The course report was presented by course co-ordinator. Two participants, one each from Bangladesh and Kazakhstan, presented feedback of the course, on behalf of course participants. A memoir was also released by the chief guest on this occasion.

INTERNATIONAL COURSE ON GEOINFORMATICS FOR DISASTER MANAGEMENT

A four week international course of CSSTEAP on "Geoinformatics for Disaster Management" was conducted during August 12 to September 6, 2002 at Indian Institute of Remote Sensing, Dehradun. Twelve participants from nine countries of Asia-Pacific region attended the course. The course was inaugurated by Shri. J.C. Pant, Chairman, High Power Committee, Disaster Management, Govt. of India. In his inaugural speech he described the key role played by geoinformatics techniques for monitoring, assessment and management of natural disasters. The course was organized in modular structure and provided a balanced treatment of theory, application and practical hands on experience. The various topics covered in this course consisted of fundamentals of Remote Sensing and Geoinformation Science; Applications of Geoinformatics in Natural Hazards Assessment and Disaster Management with reference to Hydro-meteorological, Geological and Environmental Hazards; and Role of Satellite communication; Satellite Meteorology and SDSS (Spatial Decision Support System) in Disaster Management.

The valedictory function of the course was held on September 6, 2002. The valedictory address was given by Director, CSSTEAP and he also distributed certificates to the course participants. Dean, IIRS highlighted the role of geoinformatics in Disaster Management. Two course participants - one each from Fiji and Thailand gave feed back of the course. Course report and vote of thanks were presented by Shri. V. Hariprasad, Course Co-ordinator and Dr S.K. Saha, Program Co-ordinator of CSSTEAP, respectively.

BACKGROUND OF CSSTEAP

In response to the UN General Assembly Resolution (45/72 of 11th December, 1990) endorsing the recommendations of UNISPACE-82 the United Nations Office for Outer Space Affairs (UN-OOSA) prepared a project document (A/AC.105/534) envisaging the establishment of Centres for Space Science & Technology Education in the developing countries. The objective of the Centres is to enhance the capabilities of the member states in different areas of space science & technology that could advance their social and economic development. The first of such centres, named as Centre for Space Science & Technology Education in Asia & the Pacific (CSSTEAP) was established in India in November 1995. Government of India has made available appropriate facility and expertise to the Centre through the Indian Institute of Remote Sensing (IIRS) Dehradun, Space Application Centre (SAC) & Physical Research Laboratory (PRL) Ahmedabad. The Centre is an education and training institution that is capable of high attainments in the development and transfer of knowledge in the fields of space science & technology. The emphasis of the Centre is on in-depth education, training and applications programmes, linkages to global programmes/databases; execution of pilot projects, continuing education and awareness and appraisal programmes. The Centre offers Post Graduate level & Short courses in the fields of (a) Remote Sensing and Geographic Information Systems, (b) Satellite Communications and GPS, (c) Satellite Meteorology and Global Climate, (d) Space and Atmospheric Sciences. A set of standard curricula developed by the United Nations is adapted for the educational programmes. The Centre is affiliated to the United Nations and its education programmes are recognised by Andhra University, India.

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Courses in Progress

- Third 9-month Post Graduate course in Satellite Meteorology & Global Climate at SAC, Ahmedabad from August 1, 2002.
- Third 9-month Post Graduate course in Space and Atmospheric Science at PRL, Ahmedabad from August 1, 2002.

Forthcoming Course

- Seventh 9-month Post Graduate Course in Remote Sensing & GIS (RS & GIS) at IIRS, Dehradun from October 1, 2002.

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FUNDING OF CSSTEAP

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Scholarships/travel grants are provided by the United Nations Economic and Social Commission for Asia and the Pacific (UN-ESCAP); United Nations Educational, Scientific and Cultural Organization (UNESCO) and fellowship programmes of the Government of India through the Department of Space (DOS), the Ministry of External Affairs (MEA) and the Ministry of Finance (MOF). Some course participants are sponsored through their home/parent organizations.

CSSTEAP welcomes the views and opinions of the readers of the Newsletter. Short communications on space science and technology education which may be relevant to the Asia Pacific Region are also welcome. Views expressed in the articles of the Newsletter are those of the authors.