

IRRIGATION SYSTEM MANAGEMENT IN LARGE IRRIGATED COMMANDS USING SATELLITE REMOTE SENSING

by

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Submitted
in fulfilment of the requirements of the degree of Doctor of Philosophy
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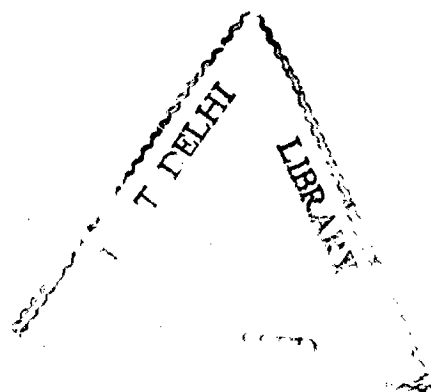
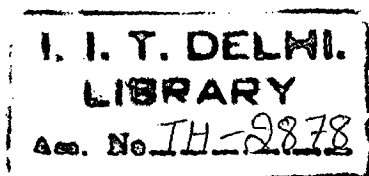


**Indian Institute of Technology, Delhi
Hauz Khas, New Delhi – 110 016 (India)**

NOVEMBER, 2001

Sheet-54
Irrigation Engineering -
Remote Sensing

TM
626.81: 621.37
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CERTIFICATE

This is to certify that the thesis entitled "**Irrigation System Management in Large Irrigated Commands using Satellite Remote Sensing**" being submitted by **Mr. Sunil Kumar Ambast** to the **Indian Institute of Technology, Delhi** for the award of the degree of **Doctor of Philosophy** is a bonafide record of research work carried out by him under our supervision and guidance. The thesis work, in our opinion, has reached the requisite standard, fulfilling the requirements for the said degree. The results contained in the thesis have not been submitted, in part or full, to any other University or Institute for the award of any degree or diploma.



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ACKNOWLEDGEMENTS

“Gratitude is what, what the snail has got for the raindrop”

I feel immense pleasure in expressing my profound sense of gratitude to **Dr. Ashok Kumar Keshari and Prof. A. K. Gosain**, Department of Civil Engineering, I.I.T. Delhi, New Delhi for their constant and consistent inspiring guidance, and constructive criticism during the course of the present investigation and preparation of the manuscript, and utmost co-operation at every stage, which culminated in successful completion of my research work.

I am also thankful to Prof. Subhash Chander and Prof. P. B. S. Sarma, formerly Professors emeritus, Department of Civil Engineering, I.I.T. Delhi, New Delhi for their keen interest and constructive suggestions in the research work. I also wish to extend my sincere thanks to all faculty members of the Water Resources Engineering, Department of Civil Engineering, I.I.T. Delhi, New Delhi for their co-operation.

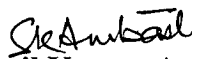
I am eternally indebted to Dr. N. K. Tyagi, Director, Central Soil Salinity Research Institute (a unit of ICAR), Karnal for allowing me to carry out this study. He has been a constant source of inspiration throughout this research work. The support received from Dr. S. K. Gupta, Dr. P. S. Kumbhare and Dr. R. S. Pandey, Principal Scientists, Central Soil Salinity Research Institute, Karnal is thankfully acknowledged.

The author wishes to appreciate the co-operation received by him from Mr. D. K. Singh and Mr. K. K. Das, Executive Engineers, Sone Command Development

Authority, Patna for their valuable suggestions and support for carrying the field work. I am also thankful to Dr. L. K. Prasad, Soil Scientist, Directorate of Water Management, Patna for providing necessary help while carrying the fieldwork.

My sincere thanks are due to Dr. V. S. Chalapathi, Dr. Rakesh Kumar Gupta, Mr. Quamrul Hassan, and Mr. Lalith Pintoo Jayawardena for their friendship and help. Co-operation extended by the technical/non-teaching staff especially by Mr. O. P. Sharma, Mr. Bikram, Mr. R. Agarwal, Mr. Puran Chand, Mr. Ram Swaroop of the Department of Civil Engineering, I.I.T. Delhi, New Delhi is duly acknowledged.

Above all, I am very much indebted to my parents, brothers and their families for their moral and enliven support for successful completion of this work. Lastly but not the least, I tender my grateful thanks to my wife Mrs. Sanjeeta Amabst and two little daughters Ms. Sagarika and Ms. Niharika for their sacrifice and the patience for all time endeavours.


(Sunil Kumar Ambast)

ABSTRACT

The main aim of this study is to develop a simplified operational procedure to estimate spatial evapotranspiration (ET) and root-zone soil moisture (θ_{RZD}) using remotely sensed data to support irrigation system management.

An iterative procedure to model spatial ET by surface energy partitioning (RESEP) has been developed and validated using four Landsat-TM sub-scenes for the Western Yamuna Canal (WYC) and the Sone Low Level Canal (SLLC) systems in India. The model has performed reasonably well with slight overestimation of ET. A simplified procedure has been evolved wherein assessments on the significance of reference levels for heat exchange suggests that reference level may be used at crop height. A correction factor to account for surface heterogeneity has been introduced in this simplified procedure. Results obtained from this procedure are in good agreement with those obtained using the complex iterative approach. The study indicates that surface temperature (T_s), albedo (α) and evaporative fraction (Λ), but not NDVI, have significant correlation with θ_{RZD} . There is a significant improvement in the spatial estimation of ET and θ_{RZD} using artificial neural network (ANN) than standard regression models.

The spatial values of ET, Λ , NDVI and yield have been used to evaluate water delivery and agricultural performance of the SLLC system at three different levels i.e. for whole system, at branch canal and at distributary canal levels. The geographical information system (GIS) has been used to analyse the remote sensing derived outputs for meaningful interpretation. The study reveals non-uniform, inadequate water availability and overall low water productivity in the SLLC system. Further, a GIS based CROPWAT package has been used to explore the alternatives for improvement in performance. The results reveal that implementation of a fixed interval, fixed depth irrigation schedule starting from 10th January after the pre-sowing irrigation would increase the overall production and water productivity in the SLLC system.

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