IRRIGATION SYSTEM MANAGEMENT IN LARGE IRRIGATED COMMANDS USING SATELLITE REMOTE SENSING

by

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Choet-SM
Irrigation Engineering -
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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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"Gratitude is what, what the snail has got for the raindrop"

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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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