A STUDY OF THE DETERMINATION OF WHEAT CROP STATISTICS IN INDIA THROUGH THE UTILISATION OF LANDSAT DATA

by

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CERTIFICATE

This is to certify that the thesis entitled, "A STUDY OF THE DETERMINATION OF WHEAT CROP STATISTICS IN INDIA THROUGH THE UTILISATION OF LANDSAT DATA", being submitted by Mr. Manosh Kumar Munshi to the Indian Institute of Technology,Delhi,India, for the award of the degree of DOCTOR OF PHILOSOPHY, is a record of bonafide research work carried out by him under my supervision and guidance. The thesis work, in my opinion, has reached the standard, fulfilling the requirements for Doctor of Philosophy degree. The research report and the results presented in this thesis have not been submitted, in part or in full, to any other University or Institute, for the award of any degree or diploma.

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(Manosh Kumar Munshi)

ABSTRACT

Today we have a global food grain market. Thus prices of food grains at a particular location are not only affected by surpluses or deficits elsewhere in the country but also by the production and demand of other countries. In this context it has become vital for countries like India, with limited storage facilities, major logistics and transportation problems, to have the correct picture of its own food production first and the global situation next as early in the crop season as possible. The Indian crop information system however appears grossly inadequate for the task. Its major shortcomings are: subjectivity in the crop acreage estimation and delays in crop forecasts.

Modern Remote Sensing (RS) Technology in general and the Landsat system in particular appear to provide the only solution to the problem at the present point of time. The Large Area Crop Inventory Experiment (LACIE) is the major reported work in the area of global crop monitoring utilising Landsat data, undertaken in the United States. Though it has achieved certain spectacular results in the wheat acreage assessment of American, Canadian and Soviet crops, the technology does not appear ripe for direct yield estimation from the study of spectral signatures alone. Further no reports appear to be available of the LACIE results in monitoring the Indian crops, where the small field sizes and complex cropping patterns pose real challenge to the technology.

The study takes into consideration the major drawbacks of the Indian crop information system and the problems of crop monitoring in the country utilising RS technology. It primarily addresses itself to developing an operational methodology for deriving wheat crop acreage statistics directly from Landsat MSS data, utilising manual/visual

techniques. Its secondary objectives are to improve the crop yield and production estimates. The choice of a manual analysis technique has been dictated by the non-availability of digital image processing facilities and the fact that the human interpreter is flexible and can work selectively under the prevailing constraints. Maximum use of the wealth of collateral data in the country is the underlying principle of the study.

The developed methodology was tried out in a real life context in three districts of Punjab, one of the most important wheat growing states in the country, over two winter (Rabi) crop seasons. The findings with regard to the acreage estimation were startling. The Government reported acreage appears to be underestimated to the tune of 30 percent when compared with the topographical map acreage of the area. The Landsat derived acreage on the other hand agreed to within 5 percent of the map acreage. The yield estimates however had a better agreement though the production estimates were found to vary in proportion to the variation in the acreage estimates.

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