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THE LACIE OUTLOOK

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The LACIE has advanced, in a major way, the application of aerospace remote sensing and weather effects modeling for crop inventory. Further, it has established the applicability of this technology to global wheat-production estimation. It is fitting, at the completion of the total LACIE experience, to reflect on the future directions and uses of this technology.

The purpose of this paper is to project, on the basis of the LACIE experience, the technological prospects for various crop inventories over the next few years. To arrive at this projection, an attempt is made to state the essence of the conclusions from LACIE. The outlook itself addresses the following issues: improvements needed in the technology, availability of the technology, the project's recommendations for future activity, and the present status of these plans.

LACIE RESULTS

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Both the accuracy and efficiency with which LACIE crop survey estimates were made showed significant improvement in the three crop years of LACIE. In the U.S. and U.S.S.R. winter wheat regions the original accuracy goals have been met or exceeded. Key technical problems were identified with U.S. and Canadian spring wheat. Technical solutions developed and tested, partly resolved these issues with a significant improvement realized in the accuracy of the spring wheat area estimates. Results of the three years of LACIE experimental surveys and simulation tests of the LACIE yield models using 10 years of historic data have indicated that these simple first generation regression models worked reasonably well in view of their many limitations. The efficiency of the analysis systems throughput has improved by a factor of 4 during the LACIE. Additionally the technology to meet or exceed the original turnaround goal of 14 days from Landsat acquisition to analysis and the throughput performance required for data volumes encountered in a global survey have been developed.

LACIE EXPERIMENT DESIGN

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The LACIE was a major effort toward the development and demonstration of the technology for an operational global crop inventory system. Specific planning for what eventually became the LACIE was initiated within NASA as early as 1973 and provided for the design and implementation of the Applications Evaluation System (AES) the quasi-operational[1] element of LACIE responsible for the acquisition and analysis of Landsat, meteorological, and ancillary data to make experimental estimates of wheat area, yield, and production and the assessment of system performance.

A significant portion of the basic design and implementation of the AES was accomplished before the initiation of LACIE and was based on existing research and development components and experience. However, because no similar system had been previously designed, much of the knowledge had to be obtained within the LACIE experience, resulting in significant evolution from the initial system. That such a sys system was designed, implemented, and operated with the performance achieved within the time frame of LACIE is considered a major and significant accomplishment by LACIE participants. Numerous technological issues for an operational crop inventory system have been identified and resolved through the AES experience.

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[1] "Quasi-operational" describes an experimental system which is technologically and functionally equivalent to an operational system. The quasi-operational AES extensively utilized existing hardware, software, and procedures to meet resources and schedule constraints while it also allowed for development and test of the technology.

LACIE OVERVIEW

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The Large Area Crop Inventory Experiment (LACIE) was initiated in 1974 as a proof-of-concept experiment (1) to assimilate remote sensing technology developed during the previous decade, (2) to apply a resultant experimental system to the task of monitoring a singularly important agricultural commodity over the world, (3) to isolate and establish priorities for key technical problems, (4) to modify the approach as necessary and conceivable, and (5) to demonstrate the technical and cost feasibility of global agricultural monitoring system.

The LACIE was designed to accomplish these objectives in major wheat producing regions of the world. The current world crop inventory systems are deficient in two ways: (1) there is a need for more frequent, timely, and accurate information and (2) the crop production data are not well incorporated into the total agricultural information system for each country, with the exception of the United States.