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THEMATIC MAPPER AGRICULTURAL APPLICATIONS PERFORMANCE - SPECULATIONS AND IMPLICATIONS FOR RESEARCH

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We discuss how performance of the technology used in agricultural applications such as satellite-aided production forecasting as was done in the Large Area Crop Inventory Experiment (LACIE) is expected to be improved when using Thematic Mapper (TM) data as opposed to Landsat Multispectral Scanner (MSS) data. We place this discussion in the context of eight characteristics of the TM: (1) Spectral band placement and width, (2) spacial resolution, (3) temporal registration accuracy, (4) radiometric sensitivity, (5) temporal sampling frequency, (6) scan angle, (7) data timeliness, and (8) data volume.

The TM specifications clearly alleviate many of the deficiencies of the MSS; experience with similar aircraft scanner data shows that the TM will lead to substantial improvements in our ability to recognize or characterize the elements of agricultural scene. The major research issues associated with the TM are then:

- How useful is TM data for applications?
- How much better is TM data than MSS data for applications?
- What is the relative importance of various TM features in the improvements?
- How should existing analysis procedures be modified to best use TM data?
- Does the extra information brought by TM increase the range of applicability of a crop or vegetation signature?

One of the major lessons of LACIE was that, given the great diversity of agricultural conditions, quantitative procedural comparisons are extremely difficult. This is true both because of the high variance introduced by the diversity of the problem and because certain procedures (or features) have benefits only under specific conditions. We believe that an objective, representative evaluation of the TM in agriculture will require a carefully designed series of extensive experiments using state-of-the-art procedures, rather than the sort of exploratory investigations conducted in the ERTS and ERTS follow-on investigations.

A portion of this evaluation will be conducted within the Agriculture and Resources Inventory Surveys Through Aerospace Remote Sensing (AGRISTARS) program to be conducted jointly by the U. S. Department of Agriculture, the National Aeronautics and Space Administration, the U. S. Department of Commerce (NCAA), the Department of Interior, and the Agency for International Development - we will outline the types of investigations to be done - but it is clear that a full evaluation includes detailed comparative evaluations and will require the involvement of many institutions. The challenge now facing primarily the research institutions, but also NASA, is to devise an approach including the use of state-of-the-art technology whereby the efforts of many investigators can be combined to:

- Identify the experiments to be done which focus on critical applications technology issues (such as separation of wheat and barley, small fields, etc.)
- Acquire the data, including ground truth.
- Conduct the data processing.
- Analyse the results.

Perhaps some approaches used in LACIE could be helpful here.

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