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RELATIONSHIP BETWEEN SCENE CHARACTERISTICS AND LANDSAT CLASSIFICATION PERFORMANCE OF CORN AND SOYBEANS

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Accuracy of classification of Landsat MSS data depends on a number of parameters such as scene characteristics, training, classification, and area estimation procedures selected. The variability in accuracy that one may find using the same classification procedure applied at different locations is due primarily to scene variability. The understanding of the way that characteristics of a scene affect classifier performance is an important step to determine the amount of training, classification algorithm, and area estimation procedures that would be suitable to achieve an optimal accuracy.

The objective of this paper was to sample a variety of corn and soybean areas in the U.S. Corn Belt and classify them using fixed training and classification procedures in order to determine how agronomic parameters of a scene affect the classification accuracy. The classifications were based on multitemporally registered Landsat MSS data acquired during the 1978 crop year over LACIE-type sample segments in several regions of the U.S. Corn Belt. Digital "ground truth" consisted of both wall-to-wall field observations of all ground covers present throughout the growing season and agronomic observations acquired simultaneously with Landsat passes, including percent ground cover, height and growth stage for several corn and soybean fields within each segment. Color IR aerial photographs were available for all segments. The classifications were performed using the per point maximum likelihood classifier implemented in LARSYS, based on one visible and one near infrared channel from acquisitions at planting and after tasseling of corn. Segments selected for analysis had similar Landsat data acquisition histories. A modified supervised training approach was used in a consistent fashion for all segments. Several characteristics of the scenes studied involving aspects of crops, soils and weather conditions were compared to classification performances.

Analysis conducted in this investigation to date reveals that segment-to-segment variability has a significant effect on classification performance. Although high overall performances have been achieved for most of the segments, individual class performances have varied considerably from segment-to-segment. For example, accuracy for corn varied from 71 to 99 percent; for soybeans, it varied from 82 to 93 percent. Preliminary results have shown that units of the size of a segment are too large for comparisons with many of the important agronomic characteristics of a scene. Therefore, qualitative and quantitative comparisons between scene characteristics and classification performance of smaller units (1 nm square) are currently underway.

In our presentation we will discuss several specific characteristics of the scenes involving particular aspects of crops, soils properties, and weather parameters that affect classification performances on a segment basis and within a segment based on smaller units.

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