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CROP IDENTIFICATION TECHNOLOGY ASSESSMENT FOR REMOTE SENSING (CITARS)

VOLUME IX

STATISTICAL ANALYSIS OF RESULTS

National Aeronautics and Space Administration

LYNDON B. JOHNSON SPACE CENTER

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13. ABSTRACT

This volume features the main body of results of CITARS data processing in raw form. Tables of descriptive statistics are given along with descriptions and results of inferential analyses. The inferential results are organized by questions which CITARS was designed to answer.

14. SUBJECT TERMS

crop identification
remote sensing
ERTS data

GLOSSARY

ADP — automatic data processing.

CITARS — Crop Identification Technology Assessment for Remote Sensing.

EOD/SP1 and EOD/SP2 — single-pass ADP procedures used by the Earth Observations Division. SP1 utilizes a clustering algorithm to generate class and subclass statistics and a Gaussian maximum likelihood classifier. SP2 utilizes multitemporal multispectral scanner data.

ERIM/PSP1 and ERIM/PSP2 — single-pass ADP procedures developed at the Environmental Research Institute of Michigan. These procedures are the same as ERIM/SP1 and ERIM/SP2 except that the data are preprocessed by a mean level adjustment.

ERIM/SP1 and ERIM/SP2 — two types of decision algorithms used at the Environmental Research Institute of Michigan; SP1 being a linear rule and SP2 a more conventional quadratic (Gaussian maximum likelihood) rule.

LARS/SP1 and LARS/SP2 — single-pass procedures developed by the Laboratory for Applications of Remote Sensing using two versions of the maximum likelihood classification algorithm. The first classification method, LARS/SP1, is the maximum likelihood classification rule assuming equal prior probabilities for all classes and subclasses. The second method, LARS/SP2, uses "class weights" proportional to the class prior probabilities.

Local recognition – the process of classifying data which lie in close proximity to the training data, both spatially and in time of observation.

Nonlocal recognition – the process of classifying data which do not lie in close proximity to the training data because the data are either spatially distant or were observed at a different time.

Period – 5-day frame required for the Earth Resources Technology Satellite to acquire data over the six CITARS segments in Indiana and Illinois. Each period begins every 18 days.

Pixel – picture element (refers to instantaneous field of view as recorded by the multispectral scanning system on the Earth Resources Technology Satellite).

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1.0 OBJECTIVES

The first objective of the statistical analysis in the Crop Identification Technology Assessment for Remote Sensing (CITARS) was to describe the classification performance obtained by the 5 local recognition procedures, the 7 non-local recognition procedures, and the 15 combinations of segment and time period procedures. Classification performance was examined in two ways: (1) the classification accuracy for corn, soybeans, and "other" classes or for wheat and "other" classes was derived from the labeled resolution elements from field centers, and (2) the proportion estimation accuracy was obtained within 1-mile sections (including field boundaries) by comparing the computer-estimated and the photointerpreted proportions.

The second objective of the statistical analysis was an attempt to answer the following questions.

1. Is there a significant difference in local recognition performance among the three major procedures LARS/SP1, ERIM/SP1, and EOD/SP1?
2. Is there a significant difference in local recognition performance between ERIM/SP1 and ERIM/SP2, the linear and quadratic procedures?
3. Is there a significant difference in local recognition performance between LARS/SP1 and LARS/SP2, the equal and unequal a priori probability procedures?
4. Is there a significant difference in local recognition performance in different segments?

5. Is there a significant difference in local recognition performance at different time periods?

6. Can multitemporal data be used to improve classification performance?

7. Is there a significant difference in nonlocal recognition performance among the three major procedures (LARS/SP1, ERIM/SP1, and EOD/SP1)?

8. Is there a significant difference in nonlocal recognition performance between ERIM/SP1 and ERIM/SP2?

9. Is there a significant difference in nonlocal recognition performance between LARS/SP1 and LARS/SP2?

10. Is there a significant difference in nonlocal recognition performance between preprocessed data (mean level adjustment) and nonpreprocessed data?

11. Is there a significant difference in nonlocal recognition performance between ERIM/SP1 and ERIM/SP2 when applied to preprocessed data (mean level adjustment)?

12. What differences in recognition performance are there between the various types of signature extension (i.e., time, distance, direction)?

2.0 APPROACH

2.1 SELECTION OF PERFORMANCE CRITERIA

To evaluate the classification accuracy, a performance matrix can be estimated from the labeled resolution elements within the field interiors. An element of this matrix, e_{ij}, is the number of resolution elements in class j that were classified into class i divided by the total number of resolution elements in class j. The diagonal elements of the performance matrix are the proportions of each group classified correctly, whereas the off-diagonal elements are the errors of omission and commission.

This matrix can be computed for each section in a segment or for all sections of a segment together. The average of the diagonal elements of an entire segment matrix is the average conditional class accuracy for the segment.

For whole areas, the proportion estimation accuracy can be measured by examining differences between the photo-interpreted (true) and the estimated proportions. This simple difference, bias, is used to describe performance for individual crops, whereas the root-mean-square (rms) error

$$q = \sqrt{\frac{\sum_{i=1}^{K} \left(\hat{P}_i - P_i\right)^2}{K}} \qquad (1)$$

indicates an overall performance. In equation (1), $\hat{P}_i$ is

the estimated proportion of crop i and P_i is the photo-interpreted proportion of crop i. These measures can be calculated for an entire segment or for each section.

It must be realized that the proportion estimate obtained by counting picture elements (pixels) classified as a particular crop is biased. The bias depends on the matrix of conditional probabilities of classifying a pixel as one crop (given that it is an observation from another crop or mixture of crops) and on the true proportions. For this reason, the rms error might be questioned as a reliable measure of accuracy for a procedure because the true proportions and the confusion matrix for a particular procedure could be such that the bias is very large or very small (almost zero), thus making the procedure appear very good or very bad.

It is true, however, that the bias tends to decrease as the accuracy of the classifier increases. Also, on a section-by-section basis, the true proportions vary considerably; hence, if a procedure does well on most or all sections in a segment, one cannot attribute the result to "luck" (classification errors canceling each other). For this reason, the specific analyses for which rms errors were computed on a section-by-section basis should be valid. The possible effect of bias should be considered, however, when reading statements about overall rms values in section 3.0.

Provision was made for unbiasing the "raw" proportion estimates with a confusion matrix obtained from classifying the pilot sections. However, when this procedure was tried, results were exceptionally poor. Part of the problem was

that classification results were not readily available for all classes, but only for corn, soybeans, and "other" or for wheat and "other." Consequently, it was decided to treat pilot sections as test sections and simply use the raw estimate for computation of the rms error.

2.2 DESCRIPTIVE SUMMARIES OF RESULTS

Descriptive summaries of the local recognition results (see Appendix A) for CITARS are given in Tables 1-9. For each procedure, Tables 1-3 show the bias in the proportion estimates for corn, soybeans, and "other," respectively, aggregated over all sections (test and pilot) analyzed within each data set (except those eliminated for reasons given on page 9).

Table 4 shows the rms error of the overall segment estimates for the same data sets, and Table 5 shows the average of the rms errors obtained for each section in the segment.

Tables 6-8 show the classification accuracy obtained by processing the labeled resolution elements for corn, soybeans, and "other," respectively, whereas Table 9 gives the average conditional classification accuracy. As in Tables 1-4, the entries in Tables 6-9 are obtained for each procedure-data set combination by aggregating over analyzed sections. For nonlocal recognition, Tables 10-14 correspond to Tables 1-5, whereas Tables 15-18 correspond to Tables 6-9.

Results for Period I (wheat versus "other") are shown in a similar format in Tables 19-26. However, for proportion estimation, only wheat biases b_1 are given since the "other" bias, b_2, is equal to $-b_1$, and the rms error is simply $|b_1|$. Tables 27-30 correspond to Tables 1-4 for the multitemporal analyses made by the Earth Observations Division (EOD), whereas Tables 31-34 correspond to Tables 6-9.

Finally, Tables 35-38 show the relative ranking of each procedure for each data set for local recognition proportion estimation, local recognition classification accuracy, nonlocal recognition proportion estimation, and nonlocal recognition classification accuracy.

2.3 INFERENTIAL ANALYSES

2.3.1 Analyses of Variance

2.3.1.1 Selection of dependent variables.- To apply the analyses of variance to comparisons of classification accuracy, a single measure of classification performance is needed. One measure of error is the sum of off-diagonal elements of the performance matrix; that is, the total errors of both commission and omission. Because the elements of the estimated performance matrix can be considered to be distributed binomially, the variance of the sum of the off-diagonal elements will be less dependent on the mean if the individual elements of the performance matrix are transformed.

$$h_{ij} = \frac{2}{\pi} \arcsin \sqrt{e_{ij}} \qquad (2)$$

The elements of the transformed matrix are approximately Gaussian and range from 0 to 1. The dependent variable used in the analyses of variance to describe classification accuracy is the sum of the off-diagonal elements of the transformed performance matrix.

The behavior of this variable can be examined by considering its value in certain artificial situations. For example, consider a classification in which all the error elements in the performance matrix are equal. Figure 1 shows the variable as a function of the magnitude of the error elements in such a matrix.

The curve varies with the number of classes k since the number of terms in the summation depends on k. An average interclass error of 0.1 in the three-class case is an average conditional class accuracy of 80 percent. In the two-class case, an average conditional class accuracy of 90 percent is achieved for an average interclass error of 0.1. Note that this curve was computed from a symmetric performance matrix with equal off-diagonal elements and not on the actual CITARS results.

The proportion estimation accuracy is measured by

$$\sum_{i=1}^{K} \left(\hat{P}_i - P_i\right)^2 \qquad (3)$$

where K is the number of classes, $\hat{P}_i$ is the estimated proportion of class i, and P_i is the true proportion

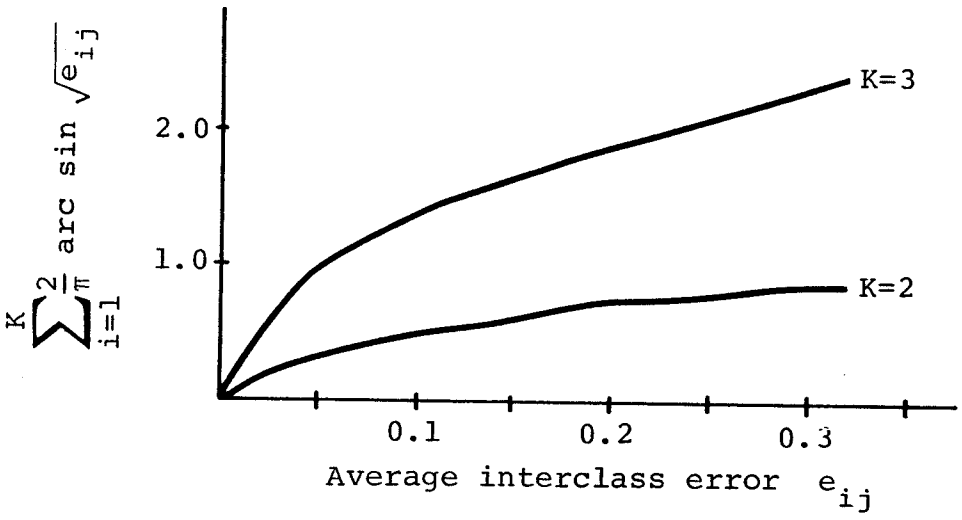

Figure 1.— Field center dependent variable versus average interclass error.

of class i as determined by photointerpretation. The estimated proportion $\hat{P}_i$ was calculated merely by dividing the number of resolution elements classified into a class i by the total number of resolution elements.

The variable was transformed to obtain more homogeneous variances. The transformation

$$y = \ln\left(100 \sum_{i=1}^{K} \left(\hat{P}_i - P_i\right)^2 + 0.2\right) \qquad (4)$$

was chosen. The lowest value of y is -1.609, representing complete agreement between the computer-estimated and the photointerpreted proportions.

Figure 2 shows y as a function of the absolute error in a class. This error is assumed to be the same for each class for the purpose of constructing this graph. Again, the number of classes K affects the number of terms in the summation and so influences the curve. For example, with three classes, a y value of 1.0 corresponds to an absolute error of approximately 0.09 in each class; a y value of 3.0 represents very poor estimation, an error of about 0.25 in each class.

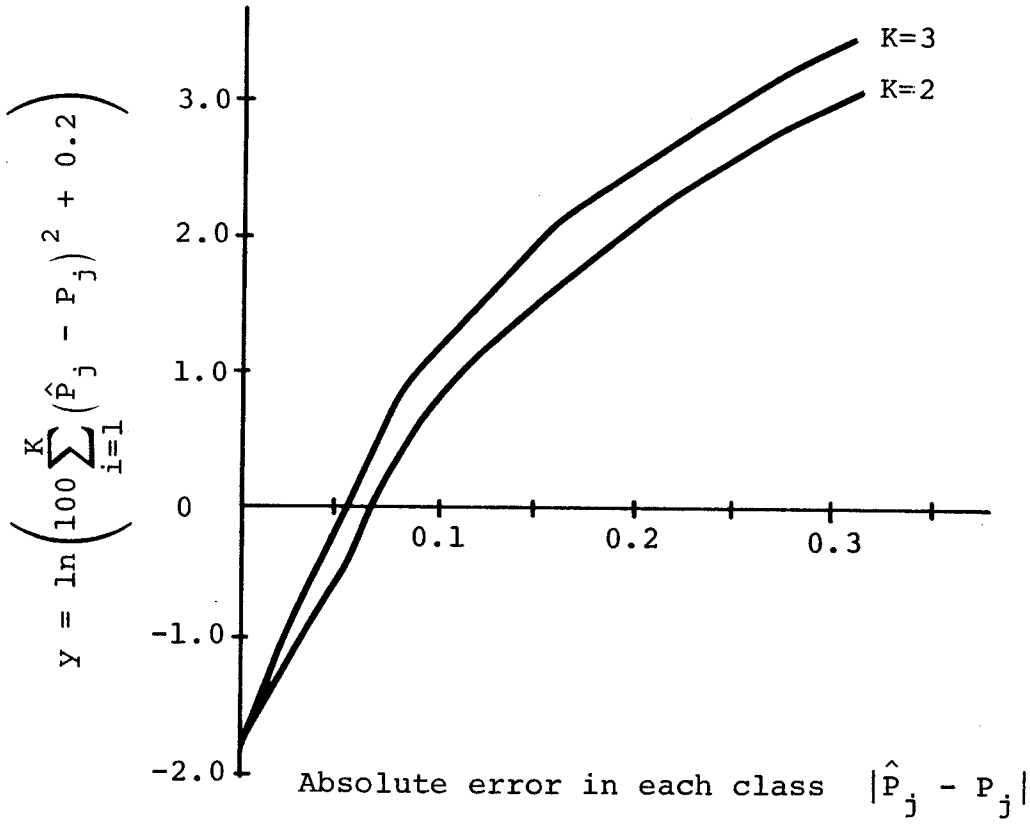

Figure 2.— Whole area dependent variable versus absolute error in each class.

2.3.1.2 Descriptions of analyses of variance.- The analyses of variance are categorized into overall analyses and specific, or section-by-section, analyses. The specific analyses are further divided into analyses concerning local recognition of corn, soybeans, and "other"; nonlocal recognition of corn, soybeans, and "other"; multitemporal recognition; and recognition of wheat versus "other." Each analysis is referred to by two letters and a number. The first letter refers to the categories given above: O for overall; C for local recognition of corn, soybeans, and "other"; N for nonlocal recognition of corn, soybeans, and "other"; T for multitemporal recognition; and W for wheat versus "other." The second letter indicates whether the analysis concerned whole areas (W) or field centers (F). The number then refers to a specific analysis in the category given by the letters.

2.3.1.2.1 Overall analyses: Preliminary analyses of variance were run for comparing procedures over all the data sets for local, nonlocal, field center, and whole areas. The dependent variable was computed for each data set and procedure only; that is, results were aggregated over test and pilot sections within a data set. The four overall analyses are labeled as follows: OW1 – local recognition, whole areas; OF1 – local recognition, field centers; OW2 – nonlocal recognition, whole areas; and OF2 – nonlocal recognition, field centers.

2.3.1.2.2 Specific (section-by-section) analyses: To compare procedures for specific counties or times or to compare counties, times, and types of nonlocal recognition, it

was necessary to reduce the size of the experimental unit to a section. Appropriate interactions between sections and other factors were then used as estimates of error in the analysis of variance F-tests.

In each analysis of variance, as many sections as possible were used. Sometimes sections would be removed for any one of the following reasons:

- Cloud cover or bad data lines prevented accurate proportion estimation.
- Automatic data processing (ADP) results were not available.
- Photointerpreted proportions were not reliable.
- A balanced design was desirable. The sections used for a given county would not necessarily be the same for all analyses.

The 15 combinations of county and time periods analyzed in the local recognition phase of CITARS are tabulated below.

County	Time period						
	I	II	III	IV	V	VI	VII
Huntington			■				■
Shelby	■					■	■
White					■	■	
Livingston			■	■			
Fayette	■	■	■		■		
Lee			■	■			

Balanced analyses of variance were chosen from these 15 data sets. The two following figures show which data sets were used in particular analyses of local recognition of corn, soybeans, and "other." All of these analyses are labeled with a C as the first letter. For each analysis number given in these figures, there are two analyses, one for whole areas and one for field centers. For example, the two tables below indicate analyses CF1 and CW1, which compare Livingston and Lee Counties in time Periods III and IV.

Specific Analyses of Variance
(Procedures LARS/SP1, ERIM/SP1, EOD/SP1)

County	Period						
	I	II	III	IV	V	VI	VII
Huntington			CF4				CF4
Shelby						CF5	CF5
White					CF6	CF6	
Livingston			CF1	CF1			
Fayette		CF2,3	CF2,3		CF2,3		
Lee			CF1	CF1			

County	Period						
	I	II	III	IV	V	VI	VII
Huntington			CW4				CW4
Shelby						CW5	CW5
White					CW6	CW6	
Livingston			CW1	CW1			
Fayette		CW2,3	CW2,3		CW2,3		
Lee			CW1	CW1			

Specific Analyses of Variance
(Procedures LARS/SP1, ERIM/SP1, EOD/SP1)

County	Period						
	I	II	III	IV	V	VI	VII
Huntington			7				10
Shelby						9	10
White					8	9	
Livingston			7				
Fayette			7		8		
Lee			7				

Data sets used in specific analyses of variance of nonlocal recognition of corn, soybeans, and "other" are tabulated below; these analyses are labeled with N as the first letter. For each number given, there are two analyses, one for whole areas and one for field centers.

Nonlocal Recognition Analyses in Time Period III
(Procedures LARS/SP1, ERIM/SP1, ERIM/PSP1, EOD/SP1)

Training from	Area classified					
	HU(6)	LI(5)	FA(5)	FA(6)	LE(5)	LE(6)
HU(6)		NF1,6 NW1,6		NF1,8 NW1,8		NF1,9 NW1,9
LI(5)			NF7 NW7			
FA(5)		NF2,6 NW2,6		NF2,8 NW2,8		
FA(6)	NF3,5 NW3,5		NF3,7 NW3,7			
LE(5)						NF9 NW9
LE(6)	NF4,5 NW4,5	NF4,6 NW4,6			NF4 NW4	

Nonlocal Recognition Analyses in Time Period IV
(Procedures LARS/SP1, ERIM/SP1, ERIM/PSP1, EOD/SP1)

Training from	Area classified	
	LI(9)	LE(8)
LI(9)		10
LE(8)	10	

Nonlocal Recognition Analyses in Time Period V
(Procedures LARS/SP1, ERIM/SP1, ERIM/PSP1, EOD/SP1)

Training from	Area classified	
	WH(10)	FA(9)
WH(10)		11
FA(9)	11	

Nonlocal Recognition Analyses in Time Period VI
(Procedures LARS/SP1, ERIM/SP1, ERIM/PSP1, EOD/SP1)

Training from	Area classified	
	SH(12)	WH(11)
SH(12)		12
WH(11)	12	

Nonlocal Recognition Analyses in Time Period VII
(Procedures LARS/SP1, ERIM/SP1, ERIM/PSP1, EOD/SP1)

Training from	Area classified	
	HU(13)	SH(13)
HU(13)		13
SH(13)	13	

Multitemporal recognition was applied with the EOD procedure to Fayette County only. Three analyses were run to compare these results to the results for local recognition of corn, soybeans, and "other" obtained with LARS, ERIM, and EOD standard procedures. In TW1 and TF1, the standard results obtained for Fayette II are compared with the multitemporal results from Fayette I and II. In TW2 and TF2, the results obtained for Fayette III-2 are compared to the standard results from Fayette I, II, and III. The analyses TW3 and TF3 compare the standard results for Fayette V to the multitemporal results for Fayette III-2 and V and for Fayette I, II, III-2, and V. Analyses TW4 and TF4 compare the four sets of multitemporal results to each other.

The data sets of wheat versus "other" and the analyses of variance in which each set was used are shown in the following figure. All of these analyses are labeled with a W as the first letter. For numbers 1 through 3, there are two analyses, one for whole areas and one for field centers. For 4 and 5, there is only a whole area analysis.

Wheat versus "Other"

Training from	Area classified		
	SH(1)	FA(1)	FA(2)
SH(1)	WW1	WW3,4	
FA(1)	WW4,5	WW1	WW2,5
FA(2)		WW2,3	WW1

Training from	Area classified		
	SH(1)	FA(1)	FA(2)
SH(1)	WF1	WF3,4	
FA(1)	WF4,5	WF1	WF2,5
FA(2)		WF2,3	WF1

2.3.2 Nonparametric Tests

The relative ranks of the procedures for each data set were used to test for an overall significant difference between procedures. To do this, a form of blocked rank test (ref. 1) was utilized.

In this test, the null hypothesis H_0 is that for each data set, the ranks are randomly assigned. The test is performed by computing the (m - 1) by 1 vector $\bar{R}$, which contains the average rank for each procedure* and then calculating

$$q = (\bar{R} - R_0)'K^{-1}(\bar{R} - R_0) \qquad (5)$$

*One procedure must be left out so that K is nonsingular; however, the value of q does not depend on which procedure is left out.

where m is the number of procedures, and R_0 and K are the mean vector and covariance matrix, respectively, for $\bar{R}$ under H_0. (It can be shown R_0 and K are simple, known functions of m and the number of data sets.) If H_0 is true, then q should have approximately a chi-square distribution with $m - 1$ degrees of freedom.

3.0 RESULTS

Section 3.0 describes results in direct application to questions 1-12 raised in section 1.0. For each question, results for corn, soybeans, and "other" analyses are given in the general categories of descriptive summaries (Appendix A), overall inferential tests, and specific inferential tests. Brief summaries of the descriptive analyses are provided with tables of means in Appendix B. The results for Period I analyses of wheat versus "other" are reported together after the results of corn, soybeans, and "other."

3.1 ANALYSES OF CORN, SOYBEANS, AND "OTHER"

1. *Is there a significant difference in local recognition performance among the three major procedures: LARS/SP1, ERIM/SP1, and EOD/SP1?*

For whole areas, the average rms error for the three standard procedures on 15 local data sets was 0.118, with LARS/SP1 having the smallest error (0.095) and ERIM/SP1 the largest (0.150).

In the overall analysis of variance on transformed rms values computed on a county basis, procedures were significantly different with LARS/SP1 being significantly better than both ERIM procedures, but not from EOD/SP1. The block rank test also showed procedures to be significantly different with LARS/SP1 having the lowest average rank. This procedure ranked first among five procedures in 8 of the 15 data sets. (See Table 35.)

On field center data, the average classification accuracy for the three standard procedures was 0.597, ranging from 0.567 (EOD/SP1) to 0.639 (ERIM/SP1).

The overall analysis of variance showed ERIM/SP1 to be significantly better than the other procedures. The block rank test also showed procedures to be significantly different with ERIM/SP1 being best in 8 of the 15 data sets. Also noteworthy was the relatively poor performance of EOD/SP1 on field center data; its average classification accuracy of 0.567 was significantly worse than the other procedures in the overall analysis of variance. The average rank of the EOD procedure was 3.73 out of 5.00.

In local proportion estimation accuracy, the three standard procedures were significantly different in 8 of the 10 local recognition whole area analyses. For those analyses in which procedures were significantly different, the following results were obtained.

- LARS/SP1 was best in analysis CW1 and ranked second in the other analyses.
- In analyses CW4, CW7, CW9, and CW10, EOD/SP1 gave the best performance.
- In analyses CW2, CW3, and CW8, ERIM/SP1 ranked first.

Thus LARS/SP1 was neither "best" nor "worst" in proportion estimation accuracy, whereas the comparative accuracy of ERIM/SP1 and EOD/SP1 alternated in different analyses.

In local classification accuracy, the three standard procedures were significantly different in 7 of 10 analyses

of variance. For those seven analyses in which procedures were significantly different, the following results were obtained.

- ERIM/SP1 ranked first in analyses CF1, CF3, CF5, CF6, CF7, and CF8 and was a close second to LARS/SP1 in analysis CF4.
- EOD/SP1 was worst in all analyses except CF3 and CF5, in which LARS/SP1 was worst.

These analyses suggest that ERIM/SP1 generally had less error in the classification examined than did either LARS/SP1 or EOD/SP1. In general, EOD/SP1 had the worst classification accuracy.

2. *Is there a significant difference in local recognition performance between ERIM/SP1 and ERIM/SP2, the linear and quadratic procedures?*

There was no evidence that the quadratic classifier was any better than the linear one; if anything, linear classification gave better results.

For whole areas, ERIM/SP1 had an average rms error of 0.150 over 15 local data sets, compared with 0.187 for ERIM/SP2. SP1 had a lower rms error than SP2 in 11 of the 15 cases.

For field centers, average classification accuracy for ERIM/SP1 was 0.639, compared with 0.606 for ERIM/SP2. Again, SP1 had better performance on 11 of the 15 data sets. See Tables 6-9 for comparisons on each set.

Because there was no evidence to indicate the superiority of ERIM/SP2 over the standard ERIM/SP1 procedure, no specific analyses involving ERIM/SP2 were run.

3. *Is there a significant difference in local recognition performance between LARS/SP1 and LARS/SP2, the equal and unequal a priori probability procedures?*

The use of historical data for a priori probabilities in classification did not help performance on either whole areas or field centers.

Average rms errors for LARS/SP1 and LARS/SP2 over the 15 data sets were 0.095 and 0.123, respectively, whereas the average classification accuracies were 0.584 and 0.588.

For individual data sets, the difference in rms errors between the two procedures was usually quite small; SP1 was better on 10 of the 15 whole area sets, whereas SP2 was better on 9 of the 15 field center sets.

Because historical acreage figures are not applicable to individual sections, formal comparisons were not made between LARS/SP2 and other procedures on a section-by-section basis.

4. *Is there a significant difference in local recognition performance in different counties?*

Results on every county at every time could not be obtained because cloud cover prevented acquisition of data; hence, overall comparisons between counties or times are all but meaningless. Even for the specific analyses for which

only counties having data at a given time are compared, observed responses could have been more a function of local atmospheric conditions than any other factor, thus confounding county and time effects with local or day-to-day weather effects. By assuming a noninteractive model (i.e., that the difference between counties is constant over times and that the difference between times is constant over counties) and considering all data, one can obtain estimates of the county and time effects. (See appendix C for details.)

Averaged over procedures, the best county-time combination for whole areas was Livingston IV with an rms error of 0.052. The worst performance was on Huntington III with an rms error of 0.269.

For field centers, Shelby VII had the lowest average classification accuracy (0.486), and Fayette V had the best (0.783).

The proportion estimation accuracy for local recognition was found to differ between counties in three local recognition analyses. In analysis CW1, the proportion estimates on a section-by-section basis were better on Livingston County than on Lee County in Periods III (July 15-18) and IV (August 3-5).

In analysis CW7, the proportion estimates on a section-by-section basis were best on Livingston County and worst on Huntington County during Period III (July 15-18).

The proportion estimation accuracy on White County was better than that on Fayette County in Period V (August 20-21) as shown in analysis CW8.

In examining classification accuracy, counties had a significant effect only once; in analysis CF10, Huntington VII (September 24) was significantly better than Shelby VII (September 24).

5. *Is there a significant difference in local recognition performance at different time periods?*

Overall comparisons between times are confounded with county and local weather effects. See discussion under question 4.

The proportion estimation accuracy over the time periods was found to differ significantly between Periods III (July 15) and VII (September 24) of Huntington County in analysis CW4.

In examining classification accuracy, significant differences between time periods were found between Periods III (July 15) and VII (September 24) of Huntington in analysis CF4, with Period III having better classification accuracy than Period VII. Significant differences between periods were also found among Periods II (June 29), III-1 (July 16), and V (August 21) of Fayette in analysis CF2, with the time periods ranked as follows: V (August 21), II (June 29), and III-1 (July 16). Notice, however, that no significant differences between periods were found in analysis CF3, which compared Periods II (June 29), III-2 (July 17), and V (August 21) of Fayette.

6. *Can multitemporal data be used to improve classification performance?*

Multitemporal classification was performed with various combinations of passes over Fayette County only. In every situation rms errors and average classification accuracies were better than those of the single-pass main procedures. (See Tables 30 and 34.)

For whole areas, the multitemporal procedure was significantly superior to the three main procedures in the specific analyses. In Period II (analysis TW1), the combination I, II was significantly better than II alone. For Period III (analysis TW2), the combination II, III was significantly better than III alone; and in Period V (analysis TW3), the combination I, II, III, V was significantly better than V alone. The combination III, V was also tested; it was better than any single-pass procedure but not significantly better than LARS/SP1 or ERIM/SP1.

For field centers, results were similar except those in analysis TF1; and the combination I, II — while better than any single-pass procedure — was not significantly better.

7. *Is there a significant difference in nonlocal recognition performance among the three major procedures: LARS/SP1, ERIM/SP1, and EOD/SP1?*

The overall performance for the main procedures on nonlocal data was poor; the average rms proportion error for whole areas over 20 nonlocal classifications was 0.159, whereas the average classification accuracy on labeled pixels was only 0.468.

The best whole area performance was on the classification SH(12)-WH(11), in which the three procedures gave an average rms of 0.059; the worst was on the WH(10)-FA(9), with the procedures averaging 0.227.

On field center data, average classification accuracy for the three procedures ranged from 0.261 on LE(5)-FA(5) to 0.612 on LE(8)-LE(7).

The block rank test did not indicate a significant difference between the main procedures for either whole areas or field centers.

In the OW2 and OF2 analyses with whole-county figures for all the nonlocal recognitions, there was no significant difference between the main procedures for either whole areas or field centers; however, differences between procedures for some particular nonlocal classifications were considerable.

In the case of proportion estimation for whole areas, the three standard procedures, ERIM/SP1, LARS/SP1, and EOD/SP1, were significantly different on most analyses; but there was little consistency in the differences among the procedures.

For those analyses in which procedures were significantly different, the following results were obtained.

- In analyses NW1, NW9, NW12, and NW13, EOD/SP1 showed the best performance.
- In analysis NW10, LARS/SP1 had the best performance.

- In analysis NW2, LARS/SP1 and ERIM/SP1 were about equal and exhibited better performance than EOD/SP1.
- In analyses NW7, NW9, NW10, NW11, NW12, and NW13, ERIM/SP1 had a higher mean (worse performance) than the other procedures.

For the field center situation, the main procedures were significantly different in analyses NF1, NF2, NF3, NF4, NF7, NF8, NF9, NF10, and NF11. In these analyses, except for NF4 and NF10, ERIM/SP1 gave the best performance. In NF4 and NF10, LARS/SP1 was best. The EOD/SP1 procedure was worst except for NF7 and NF11, in which LARS/SP1 was worst. The EOD procedure was particularly bad on the recognition HU(6)-FA(6).

In analysis NF10, LARS and EOD did better on the classification LE(8)-LI(7), whereas ERIM did better on LI(7)-LE(8). This difference resulted in a significant interaction.

8. *Is there a significant difference in nonlocal recognition performance between ERIM/SP1 and ERIM/SP2?*

Over 20 nonlocal classifications, ERIM/SP1 had an average rms proportion error of 0.183 for whole areas, compared with 0.206 for ERIM/SP2. The average ranks were 4.25 for SP1 and 5.20 for SP2, with the SP1 procedure being better 12 of 20 times.

On the field center data, the overall average classification accuracies for SP1 and SP2 were 0.490 and 0.486, respectively.

Corresponding average ranks were 4.00 and 4.05, with SP1 showing greater accuracy 12 of 20 times.

Although the differences between ERIM/SP1 and ERIM/SP2 were not large enough to be significant in the overall tests, the linear classifier worked at least as well, if not better, than the quadratic.

Because of these considerations, no specific nonlocal analyses involving ERIM/SP2 were performed. See Tables 13 and 18 for rms errors and classification accuracies of ERIM/SP1 and ERIM/SP2 for each nonlocal classification.

9. *Is there a significant difference in nonlocal recognition performance between LARS/SP1 and LARS/SP2?*

The use of unequal a priori probabilities based on historical data did not improve performance significantly for nonlocal classification.

For whole areas, the average rms errors over 20 nonlocal classifications were 0.157 and 0.177 for LARS/SP1 and LARS/SP2, respectively. SP1 (equal prior probabilities) had a lower error in 11 of the 20 cases.

On the field center data, SP2 was slightly better than SP1, with the average classification accuracy figures being 0.453 for SP1 and 0.462 for SP2. In 12 of the 20 types of classification, LARS/SP2 had a higher average classification accuracy, but differences were usually negligible. (See Table 18.)

No specific analyses involving LARS/SP2 were performed. (See question 3.)

10. *Is there a significant difference in nonlocal recognition performance between preprocessed data (mean level adjustment) and nonpreprocessed data?*

For whole areas, the mean rms for ERIM/PSP1 over all 20 nonlocal classifications was 0.157, compared with 0.157, 0.182, and 0.136 for the LARS, ERIM, and EOD main procedures, respectively. In the overall analysis of variance (OW2), there was no significant difference between ERIM/SP1 and ERIM/PSP1; however, PSP1 exhibited better performance in 13 of the 20 cases. The average rank of ERIM/PSP1 was 2.90 (out of 7), compared with 3.15 for EOD, 3.65 for LARS/SP1, and 4.25 for ERIM/SP1.

For field centers, the average classification accuracy for ERIM/PSP1 was 0.556, compared with 0.453, 0.490, and 0.461 for the LARS, ERIM, and EOD procedures, respectively.

The average rank of ERIM/PSP1 was 2.15 (out of 7), compared with 4.00 for ERIM/SP1, the best nonpreprocessed procedure. In 17 of 20 nonlocal classifications, ERIM/PSP1 was better than ERIM/SP1, a significant result.

In the overall analysis (OF2), the difference between ERIM/PSP1 and the average of the three main procedures was significant; also, the average of the two ERIM preprocessed procedures was significantly better than that of the two nonpreprocessed ones.

For proportion estimation in whole areas, preprocessing the data with a mean level adjustment had a significant but inconsistent effect. In analyses NW7 and NW11, ERIM/PSP1

was significantly superior to the other procedures, whereas the nonpreprocessed counterpart, ERIM/SP1, showed the worst performance. In analysis NW2, however, ERIM/PSP1 gave the worst performance – significantly worse than LARS/SP1 and ERIM/SP1.

In analyses NW9 and NW12, ERIM/PSP1 was significantly better than ERIM/SP1 but not as good as LARS or EOD. In NW9 and NW13, ERIM/PSP1 was better than ERIM/SP1 but not significantly so.

In analyses NW3, NW4, NW5, NW6, and NW8, the average performance of ERIM/PSP1 was not significantly different from that of the other procedures; however, significant interactions occurred because for those classifications in which ERIM/PSP1 did better, the other procedures did worse (and vice versa).

In the field center, in which ERIM/SP1 was already the overall best basic procedure, the addition of preprocessing sometimes helped classification accuracy, sometimes made no significant difference, but never significantly hurt.

In analyses NF4, NF7, and NF11, the preprocessed data gave significantly better classification accuracy than the nonpreprocessed for ERIM or any other procedure. In analysis NF1, ERIM/PSP1 was best, but not significantly better than LARS or ERIM/SP1.

There were no field center analyses in which ERIM/PSP1 was significantly worse than some other procedure.

11. *Is there a significant difference in nonlocal recognition performance between ERIM/SP1 and ERIM/SP2 when applied to preprocessed data (mean level adjustment)?*

For preprocessed data, the ERIM/PSP1 procedure had a smaller proportion estimation error than the PSP2 procedure 16 of 20 times (significant at the 0.01 level) for whole areas. The average rms errors were 0.157 for PSP1 and 0.210 for PSP2, with average ranks of 2.90 and 4.80, respectively.

On field centers, the average classification accuracy for PSP1 was 0.556, compared with 0.543 for PSP2. Of the 20 nonlocal classifications, PSP1 had a higher accuracy 13 times, the average ranks being 2.15 for ERIM/PSP1 and 2.80 for ERIM/PSP2.

No specific analyses involving the quadratic classifier ERIM/PSP2 were run. See Tables 13 and 18 for rms errors and classification accuracies of ERIM/PSP2 for each nonlocal classification.

12. *What differences in recognition performance are there between various types of signature extension (i.e., time, distance, direction)?*

For whole areas, performance on nonlocal recognition was rather poor; the average rms error for all procedures on nonlocal recognitions was 0.175. The best results were observed on the extension SH(12)-WH(11) with an rms error of 0.064. The worst case was FA(6)-HU(6) with a corresponding value of 0.256.

On field centers, the average classification accuracy for all procedures on all nonlocal extensions was only 0.493, with extremes of 0.330 on LI(5)-FA(5) to 0.627 on FA(5)-FA(6). The highest accuracy on a county-to-county extension was 0.617 on HU(6)-FA(6). See Table 18 for details.

The specific analyses NW1-NW9 dealt with whole area extensions within Period III (July 14-18). Recognitions or interactions involving recognitions were significant in analyses NW2-NW9. In particular, the following differences were observed.

1. Often, significantly better performance was achieved on a time extension (i.e., different passes) than on a county-to-county extension. Specifically, for analysis

- NW2, the extension FA(5)-FA(6) was better than the FA(5)-LI(5) for all procedures.
- NW3, the extension FA(6)-FA(5) was better than the FA(6)-HU(6) for ERIM/PSP1 only. Other procedures gave about the same performance.
- NW4, the extension LE(6)-LE(5) was better than the LE(6)-HU(6) or the LE(6)-LI(5) for LARS and EOD with about no difference for ERIM/SP1. For ERIM/PSP1, the extension LE(6)-LE(5) was worst (significant interaction).
- NW7, the extension FA(6)-FA(5) was better than the LI(5)-FA(5) except for a slight reversal in the case of ERIM/PSP1.
- NW8, the extension FA(5)-FA(6) was better than the HU(6)-LE(6) for all procedures except ERIM/PSP1, for which there was a slight opposite effect.

- NW9, the extension LE(5)-LE(6) was better than the HU(6)-LE(6) for LARS and EOD. However, for ERIM/SP1, the reverse was true, whereas for ERIM/PSP1, performance was about the same on both recognitions.

2. The effect of the location of the training site was found to be significant for county-to-county extensions as follows. For analysis

- NW5, training of Lee was significantly better than training on Fayette for classifying Huntington crops with ERIM/PSP1 (but not the other procedures).
- NW6, training on Huntington was better than training on Lee, which in turn was better than training on Fayette when classifying Livingston.

3. The locations of the test site on county-to-county extensions was significant in NW4, in which classifying Huntington was better than classifying Livingston when training on Lee.

4. In analyses NW10-NW13 (whole areas for periods other than III), it was found that reversing the direction of a signature extension could make a significant difference. Specifically, for analysis

- NW10, the extension LE(8)-LI(7) was better than the LI(7)-LE(8) for EOD and ERIM, but the opposite was true for LARS (significant interactions).
- NW11, there was no significant difference between the extension WH(10)-FA(9) and the FA(9)-WH(10).
- NW12, the extension SH(12)-WH(11) was better than the WH(11)-SH(12) for all procedures.

- NW13, the extension HU(13)-SH(13) was better than the SH(13)-HU(13) for LARS and EOD, but the opposite was true for ERIM/SP1 and ERIM/PSP1 (significant interactions).

The section-to-section variation was usually too great to provide enough power to show significance in the field center analyses NF1-NF13. The few significant results were the following:

1. In analysis NF1, the location of the test site was significant when training on Huntington; for LARS and ERIM, it was better to classify Fayette, whereas for EOD, it made little difference.

2. In analysis NF7, the extension FA(6)-FA(5) was significantly better than the LI(5)-FA(5).

3. In analysis NF8, the extension HU(6)-FA(6) was better than the FA(5)-FA(6) for LARS and ERIM, but the opposite was true for EOD (significant interaction).

4. In analysis NF10, the extension SH(13)-HU(13) was significantly better than the HU(13)-SH(13).

As can be seen from these results, in many instances an extension that did relatively better for whole areas was worse for field centers.

3.2 ANALYSES OF WHEAT VERSUS "OTHER"

Care was taken in interpreting the results of Period I wheat versus "other" because the training points available for wheat were very few (26 points in Shelby and 40 points in Fayette). The results are as follows.

For whole areas, local recognition, rms errors ranged from 0.001 (LARS/SP2 on Shelby) to 0.149 (EOD/SP1 on pass 1 over Fayette). The ERIM and LARS procedures performed reasonably well on all three data sets, whereas the EOD procedure was good only on Shelby data.

In general, results were better on Shelby than on Fayette, with the two Fayette passes producing about the same performance in all procedures. There was almost no difference between the performances of LARS/SP1 and LARS/SP2 and between ERIM/SP1 and ERIM/SP2. (See Table 22.)

On field centers, average classification accuracies ranged from 0.50 to 0.75 with EOD/SP1 showing a small but consistent edge over the other procedures. It must be pointed out, however, that EOD/SP1 was only applied to the test sections for field centers, whereas the other procedures were applied to both test and pilot sections. Nevertheless, it is interesting to note that for corn and soybean data, EOD/SP1 was usually the worst on field centers and relatively good on whole areas.

Average classification performance on Shelby was better than on Fayette for each procedure; also, Fayette pass 1 (June 10) appeared better than Fayette pass 2 (June 11).

As in the case of whole areas, the auxiliary procedures, LARS/SP2 and ERIM/SP2, gave essentially the same results as their main counterparts.

For nonlocal recognition, the average rms error for all seven procedures on four types of extension was 0.075, with the best result being 0.016 for EOD/SP1 on SH(1)-FA(1) and the worst being 0.150 for EOD/SP1 on FA(1)-FA(2).

The nonpreprocessed procedures performed about the same, with the best results on SH(1)-FA(1) and the worst on FA(1)-FA(2). The only obvious inconsistency was the very poor performance of EOD/SP1 on FA(2)-FA(1) as compared to the other procedures.

Preprocessing seemed to help on the recognitions FA(1)-SH(1) and FA(1)-FA(2), but not on the recognition SH(1)-FA(1).

There were no clear differences between linear and quadratic classifiers or between the use of equal or unequal a priori probabilities.

On field centers for nonlocal recognition, average classification accuracies were surprisingly high; in fact, the overall average accuracy (for all procedures and data sets) was 0.692, compared to 0.678 for local classification.

As on the local classifications, EOD/SP1 gave slightly better performance than the other procedures on all data sets, a reversal of form from the corn and soybean results.

Probably because of the paucity of sections available for comparison, no significant differences of any kind were observed in the field center analyses WF1, WF2, or WF3.

For whole areas, local recognition, procedures were significantly different in analysis WW1, with EOD/SP1 being worse than the LARS and ERIM main procedures. Results on Shelby were also found to be significantly better than on Fayette (June 10).

For nonlocal recognition, when comparing SH(1)-FA(1) with FA(1)-SH(1), there was a significant interaction; ERIM/SP1, LARS/SP1, and EOD/SP1 did better on SH(1)-FA(1), but the preprocessed procedure ERIM/PSP1 did better on FA(1)-SH(1).

In analyses WW3 and WW5, procedures were significantly different, with ERIM/PSP1 being the best and EOD/SP1 the worst.

In analysis WW3, training on Shelby was significantly better than training on Fayette (June 10) when classifying Fayette (June 11); whereas in analysis WW5, classifying Shelby was significantly better than classifying Fayette (June 11) when training on Fayette (June 10).

APPENDIX A

DESCRIPTIVE SUMMARIES OF RESULTS

TABLE 1.— LOCAL RECOGNITION (CORN, SOYBEANS, "OTHER") — BIAS OF CORN IN PROPORTION ESTIMATION PROCEDURES

[Bias = estimated - photointerpreted proportion]

SEGMENT (PASS)	LARS SP1	LARS SP2	ERIM SP1	ERIM SP2	EOD SP1	MEANS OVER PROCEDURES
HU(6)	0.157	0.227	0.142	0.215	0.085	0.165
HU(13)	0.061	0.177	0.281	0.225	0.031	0.155
SH(12)	0.014	0.125	0.055	-0.037	0.027	0.037
SH(13)	0.206	0.044	-0.138	-0.069	-0.133	-0.018
WH(10)	-0.058	-0.041	-0.060	-0.055	-0.090	-0.061
WH(11)	-0.046	-0.062	0.217	0.220	0.073	0.080
LI(5)	0.004	0.014	-0.018	0.039	-0.019	0.004
LI(7)	-0.013	0.097	0.043	0.082	-0.025	0.037
FA(4)	0.127	0.078	0.136	0.298	0.149	0.158
FA(5)	0.185	0.086	0.106	0.126	0.128	0.126
FA(6)	0.179	0.180	0.168	0.206	0.127	0.172
FA(9)	0.076	0.092	0.182	0.220	0.058	0.126
LE(5)	0.014	0.075	0.030	0.024	0.059	0.041
LE(6)	0.011	0.069	-0.030	-0.019	-0.074	-0.008
LE(8)	0.029	0.007	-0.144	-0.098	-0.035	-0.048
MEANS OVER SEGMENTS	0.063	0.078	0.065	0.092	0.024	0.064

TABLE 2.– LOCAL RECOGNITION (CORN, SOYBEANS, "OTHER") – BIAS OF SOYBEANS IN PROPORTION ESTIMATION PROCEDURES

[Bias = estimated - photointerpreted proportion]

SEGMENT (PASS)	LARS SP1	LARS SP2	ERIM SP1	ERIM SP2	EOD SP1	MEANS OVER PROCEDURES
HU(6)	0.302	0.229	0.143	0.205	0.180	0.212
HU(13)	0.121	0.006	0.049	0.217	0.146	0.108
SH(12)	-0.038	-0.069	-0.017	-0.142	-0.036	-0.061
SH(13)	-0.057	0.051	0.146	0.114	0.088	0.068
WH(10)	0.091	-0.002	-0.080	-0.063	0.110	0.011
WH(11)	0.080	-0.072	0.001	0.015	0.021	0.009
LI(5)	-0.005	0.016	0.120	0.167	0.030	0.066
LI(7)	0.017	-0.098	-0.112	-0.028	-0.014	-0.047
FA(4)	-0.152	0.014	-0.123	-0.047	0.025	-0.057
FA(5)	-0.020	0.140	0.122	0.213	0.123	0.116
FA(6)	0.017	-0.007	0.095	0.190	0.143	0.088
FA(9)	0.145	0.140	-0.021	-0.000	0.216	0.096
LF(5)	0.015	0.219	0.268	0.293	0.033	0.166
LF(6)	-0.034	0.117	0.307	0.304	0.198	0.178
LF(8)	0.018	0.125	-0.002	0.029	-0.037	0.027
MEANS OVER SEGMENTS	0.033	0.054	0.060	0.098	0.082	0.065

TABLE 3.— LOCAL RECOGNITION (CORN, SOYBEANS, "OTHER") — BIAS OF "OTHER" IN PROPORTION ESTIMATION PROCEDURES

[Bias = estimated - photointerpreted proportion]

SEGMENT (PASS)	LARS SP1	LARS SP2	ERIM SP1	ERIM SP2	EOD SP1	MEANS OVER PROCEDURES
HU(6)	-0.459	-0.456	-0.285	-0.420	-0.265	-0.377
HU(13)	-0.182	-0.183	-0.330	-0.443	-0.177	-0.263
SH(12)	0.024	-0.056	-0.038	0.178	0.009	0.024
SH(13)	-0.149	-0.095	-0.008	-0.045	0.045	-0.050
WH(10)	-0.033	0.042	0.140	0.118	-0.021	0.049
WH(11)	-0.034	0.134	-0.218	-0.234	-0.095	-0.090
LI(5)	0.001	-0.031	-0.102	-0.206	-0.011	-0.070
LI(7)	-0.004	0.001	0.070	-0.054	0.039	0.010
FA(4)	0.025	-0.091	-0.013	-0.251	-0.174	-0.101
FA(5)	-0.165	-0.226	-0.228	-0.338	-0.251	-0.242
FA(6)	-0.196	-0.173	-0.263	-0.395	-0.271	-0.260
FA(9)	-0.220	-0.232	-0.161	-0.220	-0.274	-0.222
LE(5)	-0.029	-0.294	-0.298	-0.318	-0.093	-0.206
LE(6)	0.023	-0.187	-0.277	-0.285	-0.124	-0.170
LE(8)	-0.047	-0.132	0.146	0.070	0.073	0.022
MEANS OVER SEGMENTS	-0.096	-0.132	-0.124	-0.190	-0.106	-0.130

TABLE 4.— LOCAL RECOGNITION (CORN, SOYBEANS, "OTHER") — ROOT MEAN SQUARE ERROR IN PROPORTION ESTIMATION PROCEDURES

[Overall segment estimates]

SEGMENT (PASS)	LARS SP1	LARS SP2	ERIM SP1	ERIM SP2	EOD SP1	MEANS OVER PROCEDURES
HU(6)	0.330	0.322	0.202	0.297	0.192	0.268
HU(13)	0.131	0.147	0.252	0.313	0.134	0.195
SH(12)	0.027	0.089	0.040	0.133	0.027	0.063
SH(13)	0.151	0.067	0.116	0.081	0.096	0.102
WH(10)	0.065	0.034	0.100	0.084	0.083	0.073
WH(11)	0.057	0.095	0.178	0.186	0.070	0.117
LI(5)	0.004	0.022	0.091	0.155	0.022	0.059
LI(7)	0.013	0.079	0.080	0.059	0.028	0.052
FA(4)	0.115	0.070	0.106	0.226	0.133	0.130
FA(5)	0.144	0.162	0.161	0.242	0.178	0.177
FA(6)	0.154	0.144	0.188	0.280	0.191	0.191
FA(9)	0.158	0.165	0.141	0.180	0.204	0.170
LE(5)	0.020	0.216	0.232	0.250	0.066	0.157
LE(6)	0.025	0.133	0.239	0.241	0.142	0.156
LE(8)	0.034	0.105	0.118	0.072	0.051	0.076
MEANS OVER SEGMENTS	0.095	0.123	0.150	0.187	0.108	0.132

TABLE 5.— LOCAL RECOGNITION (CORN, SOYBEANS, "OTHER") — ROOT MEAN SQUARE ERROR IN PROPORTION ESTIMATION PROCEDURES

[Average over sections]

SEGMENT (PASS)	LARS SP1	LARS SP2	ERIM SP1	ERIM SP2	EOD SP1	MEANS OVER PROCEDURES
HU(6)	0.292	0.281	0.213	0.262	0.222	0.254
HU(13)	0.157	0.182	0.240	0.279	0.198	0.211
SH(12)	0.129	0.163	0.128	0.173	0.113	0.141
SH(13)	0.207	0.148	0.212	0.166	0.176	0.182
WH(10)	0.109	0.094	0.117	0.109	0.126	0.111
WH(11)	0.150	0.146	0.193	0.193	0.106	0.158
LI(5)	0.112	0.131	0.144	0.188	0.114	0.138
LI(7)	0.097	0.150	0.182	0.162	0.107	0.140
FA(4)	0.180	0.139	0.168	0.249	0.162	0.180
FA(5)	0.192	0.175	0.171	0.222	0.182	0.188
FA(6)	0.178	0.172	0.179	0.232	0.182	0.189
FA(9)	0.136	0.141	0.152	0.181	0.177	0.157
LE(5)	0.111	0.203	0.224	0.242	0.115	0.179
LE(6)	0.110	0.142	0.248	0.247	0.187	0.187
LE(8)	0.118	0.147	0.143	0.129	0.131	0.134
MEANS OVER SEGMENTS	0.152	0.161	0.181	0.202	0.153	0.170

TABLE 6.— LOCAL RECOGNITION (CORN, SOYBEANS, "OTHER") — CORN CLASSIFICATION ACCURACY PROCEDURES

[Accuracy = proportion of correctly classified pixels in a class]

SEGMENT (PASS)	LARS SP1	LARS SP2	ERIM SP1	ERIM SP2	EOD SP1	MEANS OVER PROCEDURES
HU(6)	0.599	0.681	0.688	0.688	0.663	0.664
HU(13)	0.478	0.669	0.796	0.771	0.236	0.590
SH(12)	0.498	0.623	0.602	0.440	0.553	0.543
SH(13)	0.640	0.528	0.494	0.484	0.378	0.505
WH(10)	0.748	0.721	0.714	0.751	0.698	0.726
WH(11)	0.545	0.489	0.821	0.819	0.771	0.689
LI(5)	0.618	0.582	0.550	0.594	0.516	0.572
LI(7)	0.691	0.803	0.770	0.854	0.623	0.748
FA(4)	0.745	0.513	0.690	0.823	0.682	0.691
FA(5)	0.864	0.850	0.934	0.948	0.802	0.879
FA(6)	0.968	0.958	0.961	0.965	0.941	0.959
FA(9)	0.790	0.762	0.874	0.878	0.781	0.817
LF(5)	0.570	0.686	0.634	0.591	0.626	0.621
LF(6)	0.641	0.633	0.597	0.621	0.563	0.611
LF(8)	0.568	0.555	0.412	0.456	0.484	0.495
MEANS OVER SEGMENTS	0.664	0.670	0.702	0.712	0.621	0.674

TABLE 7.— LOCAL RECOGNITION (CORN, SOYBEANS, "OTHER") — SOYBEAN CLASSIFICATION ACCURACY PROCEDURES

[Accuracy = proportion of correctly classified pixels in a class]

SEGMENT (PASS)	LARS SP1	LARS SP2	ERIM SP1	ERIM SP2	EOD SP1	MEANS OVER PROCEDURES
HU(6)	0.910	0.889	0.831	0.873	0.654	0.831
HU(13)	0.471	0.249	0.386	0.397	0.336	0.368
SH(12)	0.482	0.441	0.510	0.224	0.534	0.438
SH(13)	0.266	0.367	0.595	0.553	0.514	0.459
WH(10)	0.841	0.808	0.775	0.785	0.809	0.804
WH(11)	0.810	0.659	0.733	0.741	0.658	0.720
LI(5)	0.632	0.674	0.850	0.839	0.704	0.740
LI(7)	0.633	0.552	0.433	0.563	0.578	0.552
FA(4)	0.235	0.444	0.618	0.682	0.624	0.521
FA(5)	0.425	0.567	0.654	0.668	0.530	0.569
FA(6)	0.458	0.489	0.642	0.718	0.514	0.564
FA(9)	0.950	0.944	0.855	0.874	0.961	0.917
LE(5)	0.634	0.825	0.890	0.907	0.625	0.776
LE(6)	0.573	0.716	0.895	0.898	0.762	0.769
LE(8)	0.536	0.641	0.592	0.622	0.403	0.559
MEANS OVER SEGMENTS	0.590	0.618	0.684	0.690	0.614	0.639

TABLE 8.— LOCAL RECOGNITION (CORN, SOYBEANS, "OTHER") — "OTHER" CLASSIFICATION ACCURACY PROCEDURES

[Accuracy = proportion of correctly classified pixels in a class]

SEGMENT (PASS)	LARS SP1	LARS SP2	ERIM SP1	ERIM SP2	EOD SP1	MEANS OVER PROCEDURES
HU(6)	0.313	0.317	0.491	0.345	0.747	0.443
HU(13)	0.505	0.513	0.484	0.303	0.702	0.502
SH(12)	0.527	0.463	0.495	0.660	0.550	0.539
SH(13)	0.245	0.340	0.565	0.450	0.582	0.436
WH(10)	0.639	0.773	0.903	0.888	0.313	0.703
WH(11)	0.471	0.618	0.189	0.186	0.341	0.361
LI(5)	0.512	0.510	0.686	0.294	0.518	0.504
LI(7)	0.777	0.763	0.879	0.581	0.630	0.726
FA(4)	0.651	0.549	0.696	0.408	0.409	0.543
FA(5)	0.325	0.292	0.375	0.233	0.168	0.279
FA(6)	0.433	0.535	0.406	0.251	0.359	0.397
FA(9)	0.652	0.615	0.698	0.618	0.497	0.616
LE(5)	0.413	0.141	0.174	0.152	0.385	0.253
LE(6)	0.462	0.255	0.148	0.154	0.342	0.272
LE(8)	0.549	0.435	0.786	0.725	0.435	0.586
MEANS OVER SEGMENTS	0.498	0.475	0.532	0.417	0.465	0.477

TABLE 9.— LOCAL RECOGNITION (CORN, SOYBEANS, "OTHER") — AVERAGE CONDITIONAL CLASSIFICATION ACCURACY PROCEDURES

SEGMENT (PASS)	LARS SP1	LARS SP2	ERIM SP1	ERIM SP2	EOD SP1	MEANS OVER PROCEDURES
HU(6)	0.607	0.629	0.670	0.635	0.688	0.646
HU(13)	0.484	0.477	0.555	0.490	0.425	0.486
SH(12)	0.502	0.509	0.536	0.441	0.546	0.507
SH(13)	0.384	0.412	0.551	0.496	0.492	0.467
WH(10)	0.742	0.767	0.797	0.808	0.607	0.744
WH(11)	0.609	0.589	0.581	0.582	0.590	0.590
LI(5)	0.588	0.589	0.695	0.576	0.579	0.605
LI(7)	0.700	0.706	0.694	0.666	0.611	0.675
FA(4)	0.544	0.502	0.668	0.638	0.572	0.585
FA(5)	0.538	0.570	0.654	0.616	0.500	0.576
FA(6)	0.620	0.660	0.670	0.645	0.605	0.640
FA(9)	0.797	0.774	0.809	0.790	0.747	0.783
LE(5)	0.539	0.551	0.566	0.550	0.545	0.550
LE(6)	0.559	0.535	0.547	0.558	0.556	0.551
LE(8)	0.551	0.543	0.597	0.601	0.440	0.547
MEANS OVER SEGMENTS	0.584	0.588	0.639	0.606	0.567	0.597

TABLE 10.— NONLOCAL RECOGNITION (CORN, SOYBEANS, "OTHER") — BIAS OF CORN IN PROPORTION ESTIMATION PROCEDURES

[Bias = estimated - photointerpreted proportion]

RECOGNITIONS TRAINING-- CLASSIFIED	LARS SP1	LARS SP2	ERIM SP1	ERIM SP2	ERIM PSP1	ERIM PSP2	EOD SP1	MEANS OVER PROCEDURES
FA(5)--FA(6)	0.129	0.066	0.090	0.105	0.104	0.119	0.086	0.100
FA(6)--FA(5)	0.189	0.177	0.199	0.232	0.163	0.207	0.126	0.185
LE(5)--LE(6)	-0.007	-0.043	-0.072	-0.040	0.051	0.069	-0.046	-0.013
LE(6)--LE(5)	-0.113	-0.092	-0.012	0.003	-0.045	-0.044	-0.029	-0.048
HU(6)--LI(5)	0.185	0.288	0.053	0.265	-0.073	0.012	0.024	0.108
HU(6)--LE(6)	-0.117	0.037	-0.191	0.067	-0.169	-0.048	-0.096	-0.074
LE(6)--LI(5)	-0.267	-0.277	-0.208	-0.123	-0.027	-0.025	-0.160	-0.155
LE(6)--HU(6)	-0.126	-0.141	0.083	0.130	-0.003	0.052	0.128	0.018
LI(7)--LE(8)	0.093	0.295	0.225	0.249	0.184	0.226	0.058	0.190
LE(8)--LI(7)	-0.037	-0.159	-0.292	-0.269	-0.255	-0.235	-0.137	-0.198
LI(5)--FA(5)	-0.075	-0.112	0.005	0.147	-0.042	0.067	-0.088	-0.014
FA(5)--LI(5)	-0.225	-0.135	-0.174	-0.193	-0.287	-0.272	-0.266	-0.222
WH(11)--SH(12)	0.017	-0.025	0.398	0.436	0.263	0.324	0.134	0.221
SH(12)--WH(11)	-0.036	0.014	-0.089	0.104	-0.029	0.183	-0.060	0.012
SH(13)--HU(13)	0.306	0.071	-0.058	0.000	0.107	0.153	-0.012	0.081
HU(13)--SH(13)	0.068	0.278	0.375	0.245	0.060	0.008	0.042	0.154
FA(6)--HU(6)	0.119	0.217	0.101	0.143	0.175	0.205	0.041	0.143
HU(6)--FA(6)	0.174	0.197	0.190	0.218	0.174	0.173	0.099	0.175
WH(10)--FA(9)	-0.142	-0.141	-0.155	-0.151	-0.033	-0.012	-0.156	-0.113
FA(9)--WH(10)	-0.221	-0.190	-0.205	-0.161	0.049	0.085	-0.202	-0.121
MEANS OVER RECOGNITIONS	-0.004	0.016	0.013	0.070	0.018	0.062	-0.026	0.021

TABLE 11.— NONLOCAL RECOGNITION (CORN, SOYBEANS, "OTHER") — BIAS OF SOYBEANS IN PROPORTION ESTIMATION PROCEDURES

[Bias = estimated - photointerpreted proportion]

RECOGNITIONS TRAINING--CLASSIFIED	LARS SP1	LARS SP2	ERIM SP1	ERIM SP2	ERIM PSP1	ERIM PSP2	EOD SP1	MEANS OVER PROCEDURES
FA(5)--FA(6)	-0.031	0.084	0.037	0.207	0.142	0.255	0.106	0.114
FA(6)--FA(5)	0.051	0.055	0.119	0.180	0.068	0.163	0.166	0.115
LE(5)--LE(6)	0.094	0.318	0.426	0.410	0.257	0.266	0.129	0.271
LE(6)--LE(5)	0.002	0.114	0.147	0.168	0.273	0.294	0.037	0.148
HU(6)--LI(5)	0.030	-0.074	-0.116	-0.052	0.157	0.188	-0.070	0.009
HU(6)--LE(6)	0.298	0.129	0.174	0.146	0.239	0.244	0.237	0.210
LE(6)--LI(5)	-0.070	0.032	-0.043	0.000	0.125	0.143	-0.110	0.011
LE(6)--HU(6)	0.108	0.161	0.090	0.122	0.085	0.101	-0.045	0.089
LI(7)--LE(8)	0.167	-0.091	-0.057	0.000	-0.014	0.033	0.174	0.030
LE(8)--LI(7)	0.005	0.232	0.096	0.130	-0.032	0.010	-0.047	0.056
LI(5)--FA(5)	-0.240	-0.265	-0.250	-0.074	0.070	0.322	-0.226	-0.095
FA(5)--LI(5)	0.053	0.141	-0.057	0.330	0.273	0.345	0.248	0.190
WH(11)--SH(12)	-0.105	-0.200	-0.125	-0.121	0.013	0.018	-0.116	-0.091
SH(12)--WH(11)	-0.035	-0.042	0.015	-0.034	-0.001	-0.032	-0.019	-0.021
SH(13)--HU(13)	-0.038	0.122	0.055	0.051	0.074	0.050	0.064	0.054
HU(13)--SH(13)	0.103	-0.095	-0.095	0.097	0.176	0.305	0.091	0.083
FA(6)--HU(6)	0.140	0.076	0.128	0.321	0.263	0.317	0.234	0.211
HU(6)--FA(6)	0.241	0.209	0.141	0.210	0.066	0.193	0.012	0.153
WH(10)--FA(9)	-0.116	-0.205	-0.265	-0.251	-0.189	-0.164	-0.125	-0.188
FA(9)--WH(10)	-0.073	-0.097	-0.123	-0.066	0.030	0.062	-0.068	-0.048
MEANS OVER RECOGNITIONS	0.029	0.030	0.015	0.089	0.104	0.156	0.034	0.065

TABLE 12.— NONLOCAL RECOGNITION (CORN, SOYBEANS, "OTHER") — BIAS OF "OTHER" IN PROPORTION ESTIMATION PROCEDURES

[Bias = estimated - photointerpreted proportion]

RECOGNITIONS TRAINING--CLASSIFIED	LARS SP1	LARS SP2	ERIM SP1	ERIM SP2	ERIM PSP1	ERIM PSP2	EOD SP1	MEANS OVER PROCEDURES
FA(5)--FA(6)	-0.098	-0.149	-0.127	-0.312	-0.247	-0.374	-0.192	-0.214
FA(6)--FA(5)	-0.240	-0.233	-0.318	-0.412	-0.231	-0.370	-0.293	-0.299
LE(5)--LE(6)	-0.087	-0.275	-0.353	-0.369	-0.308	-0.335	-0.083	-0.259
LE(6)--LE(5)	0.111	-0.021	-0.135	-0.172	-0.228	-0.250	-0.008	-0.101
HU(6)--LI(5)	-0.215	-0.213	0.062	-0.213	-0.084	-0.200	0.045	-0.117
HU(6)--LE(6)	-0.182	-0.166	0.017	-0.214	-0.070	-0.196	-0.140	-0.136
LE(6)--LI(5)	0.337	0.245	0.251	0.123	-0.098	-0.117	0.271	0.144
LE(6)--HU(6)	0.018	-0.020	-0.173	-0.252	-0.082	-0.153	-0.083	-0.106
LI(7)--LE(8)	-0.259	-0.205	-0.167	-0.250	-0.171	-0.259	-0.232	-0.220
LE(8)--LI(7)	0.032	-0.073	0.195	0.139	0.288	0.225	0.185	0.141
LI(5)--FA(5)	0.315	0.377	0.245	-0.074	-0.027	-0.389	0.315	0.109
FA(5)--LI(5)	0.173	-0.006	0.231	-0.137	0.014	-0.073	0.018	0.032
WH(11)--SH(12)	0.088	0.224	-0.273	-0.315	-0.277	-0.342	-0.018	-0.130
SH(12)--WH(11)	0.071	0.028	0.074	-0.070	0.031	-0.151	0.079	0.009
SH(13)--HU(13)	-0.269	-0.193	0.003	-0.052	-0.181	-0.204	-0.052	-0.135
HU(13)--SH(13)	-0.171	-0.183	-0.279	-0.343	-0.236	-0.313	-0.133	-0.237
FA(6)--HU(6)	-0.259	-0.293	-0.229	-0.464	-0.438	-0.522	-0.275	-0.354
HU(6)--FA(6)	-0.415	-0.405	-0.330	-0.428	-0.240	-0.366	-0.111	-0.328
WH(10)--FA(9)	0.257	0.346	0.420	0.402	0.222	0.177	0.282	0.301
FA(9)--WH(10)	0.294	0.287	0.329	0.228	-0.079	-0.147	0.270	0.169
MEANS OVER RECOGNITIONS	-0.025	-0.046	-0.028	-0.159	-0.122	-0.218	-0.008	-0.087

TABLE 13.— NONLOCAL RECOGNITION (CORN, SOYBEANS, "OTHER") — ROOT MEAN SQUARE ERROR IN PROPORTION ESTIMATION PROCEDURES

[Overall segment estimates]

RECOGNITIONS TRAINING--CLASSIFIED	LARS SP1	LARS SP2	ERIM SP1	ERIM SP2	ERIM PSP1	ERIM PSP2	EOD SP1	MEANS OVER PROCEDURES
FA(5)--FA(6)	0.095	0.106	0.092	0.225	0.175	0.270	0.136	0.157
FA(6)--FA(5)	0.179	0.172	0.227	0.292	0.168	0.262	0.208	0.215
LE(5)--LE(6)	0.074	0.244	0.322	0.319	0.233	0.250	0.093	0.219
LE(6)--LE(5)	0.092	0.086	0.115	0.139	0.207	0.225	0.028	0.127
HU(6)--LI(5)	0.164	0.211	0.082	0.198	0.111	0.159	0.050	0.139
HU(6)--LE(6)	0.213	0.123	0.149	0.155	0.174	0.183	0.168	0.166
LE(6)--LI(5)	0.252	0.214	0.190	0.101	0.093	0.108	0.192	0.164
LE(6)--HU(6)	0.097	0.124	0.122	0.178	0.068	0.110	0.092	0.113
LI(7)--LE(8)	0.186	0.214	0.165	0.204	0.145	0.199	0.171	0.183
LE(8)--LI(7)	0.029	0.168	0.210	0.190	0.223	0.188	0.136	0.163
LI(5)--FA(5)	0.233	0.274	0.202	0.104	0.050	0.294	0.230	0.198
FA(5)--LI(5)	0.167	0.113	0.170	0.235	0.229	0.257	0.210	0.197
WH(11)--SH(12)	0.080	0.174	0.288	0.318	0.221	0.272	0.103	0.208
SH(12)--WH(11)	0.050	0.031	0.068	0.075	0.025	0.138	0.058	0.064
SH(13)--HU(13)	0.236	0.138	0.046	0.042	0.129	0.150	0.048	0.113
HU(13)--SH(13)	0.121	0.200	0.275	0.250	0.174	0.252	0.096	0.196
FA(6)--HU(6)	0.183	0.215	0.162	0.336	0.312	0.372	0.210	0.256
HU(6)--FA(6)	0.294	0.287	0.234	0.302	0.175	0.259	0.086	0.234
WH(10)--FA(9)	0.182	0.246	0.300	0.287	0.170	0.139	0.200	0.218
FA(9)--WH(10)	0.216	0.207	0.235	0.166	0.056	0.104	0.199	0.169
MEANS OVER RECOGNITIONS	0.157	0.177	0.183	0.206	0.157	0.210	0.136	0.175

TABLE 14.— NONLOCAL RECOGNITION (CORN, SOYBEANS, "OTHER") — ROOT MEAN SQUARE ERROR IN PROPORTION ESTIMATION PROCEDURES

[Average over sections]

RECOGNITIONS TRAINING-- CLASSIFIED	LARS SP1	LARS SP2	ERIM SP1	ERIM SP2	ERIM PSP1	ERIM PSP2	EOD SP1	MEANS OVER PROCEDURES
FA(5)--FA(6)	0.159	0.136	0.129	0.210	0.165	0.181	0.244	0.175
FA(6)--FA(5)	0.186	0.177	0.212	0.249	0.197	0.168	0.222	0.202
LE(5)--LE(6)	0.128	0.254	0.330	0.317	0.150	0.218	0.227	0.232
LE(6)--LE(5)	0.149	0.168	0.169	0.172	0.114	0.232	0.246	0.179
HU(6)--LI(5)	0.268	0.309	0.255	0.286	0.200	0.253	0.269	0.263
HU(6)--LE(6)	0.260	0.155	0.221	0.188	0.219	0.238	0.223	0.215
LE(6)--LI(5)	0.268	0.292	0.270	0.226	0.227	0.185	0.190	0.237
LE(6)--HU(6)	0.204	0.228	0.190	0.212	0.210	0.169	0.184	0.200
LI(7)--LE(8)	0.181	0.243	0.191	0.207	0.180	0.164	0.190	0.194
LE(8)--LI(7)	0.151	0.239	0.299	0.289	0.157	0.266	0.252	0.236
LI(5)--FA(5)	0.273	0.282	0.267	0.227	0.267	0.184	0.287	0.255
FA(5)--LI(5)	0.257	0.245	0.241	0.320	0.311	0.333	0.350	0.294
WH(11)--SH(12)	0.143	0.189	0.311	0.334	0.172	0.220	0.257	0.232
SH(12)--WH(11)	0.122	0.117	0.154	0.150	0.115	0.121	0.174	0.136
SH(13)--HU(13)	0.264	0.185	0.208	0.165	0.177	0.231	0.205	0.205
HU(13)--SH(13)	0.146	0.234	0.299	0.187	0.153	0.222	0.267	0.215
FA(6)--HU(6)	0.254	0.267	0.178	0.310	0.244	0.285	0.328	0.267
HU(6)--FA(6)	0.261	0.253	0.220	0.261	0.197	0.180	0.224	0.228
WH(10)--FA(9)	0.236	0.256	0.277	0.269	0.240	0.200	0.183	0.237
FA(9)--WH(10)	0.195	0.188	0.198	0.163	0.182	0.106	0.119	0.164
MEANS OVER RECOGNITIONS	0.205	0.221	0.231	0.237	0.194	0.208	0.232	0.218

TABLE 15.— NONLOCAL RECOGNITION (CORN, SOYBEANS, "OTHER") — CORN CLASSIFICATION ACCURACY PROCEDURES

[Accuracy = proportion of correctly classified pixels in a class]

RECOGNITIONS TRAINING-- CLASSIFIED	LARS SP1	LARS SP2	ERIM SP1	ERIM SP2	ERIM PSP1	ERIM PSP2	EOD SP1	MEANS OVER PROCEDURES
FA(5)--FA(6)	0.885	0.892	0.927	0.951	0.906	0.906	0.882	0.907
FA(6)--FA(5)	0.934	0.920	0.968	0.934	0.973	0.954	0.922	0.944
LE(5)--LE(6)	0.634	0.657	0.705	0.738	0.731	0.705	0.585	0.679
LE(6)--LE(5)	0.166	0.181	0.379	0.445	0.491	0.493	0.443	0.371
HU(6)--LI(5)	0.777	0.835	0.731	0.733	0.647	0.673	0.548	0.706
HU(6)--LE(6)	0.513	0.598	0.491	0.736	0.557	0.685	0.561	0.592
LE(6)--LI(5)	0.020	0.018	0.054	0.355	0.628	0.653	0.194	0.275
LE(6)--HU(6)	0.172	0.166	0.624	0.720	0.516	0.688	0.921	0.544
LI(7)--LE(8)	0.687	0.870	0.963	0.850	0.938	0.932	0.494	0.819
LE(8)--LI(7)	0.644	0.440	0.165	0.202	0.247	0.279	0.451	0.347
LI(5)--FA(5)	0.024	0.014	0.161	0.780	0.248	0.853	0.016	0.300
FA(5)--LI(5)	0.147	0.311	0.249	0.211	0.139	0.181	0.048	0.184
WH(11)--SH(12)	0.594	0.525	0.976	0.989	0.895	0.917	0.695	0.799
SH(12)--WH(11)	0.329	0.391	0.328	0.495	0.441	0.710	0.306	0.429
SH(13)--HU(13)	0.541	0.280	0.178	0.223	0.637	0.694	0.157	0.387
HU(13)--SH(13)	0.635	0.824	0.937	0.683	0.787	0.666	0.511	0.721
FA(6)--HU(6)	0.771	0.802	0.764	0.841	0.752	0.777	0.640	0.764
HU(6)--FA(6)	0.874	0.888	0.944	0.961	0.822	0.822	0.361	0.810
WH(10)--FA(9)	0.024	0.031	0.003	0.017	0.238	0.262	0.017	0.085
FA(9)--WH(10)	0.089	0.105	0.114	0.102	0.760	0.765	0.141	0.297
MEANS OVER RECOGNITIONS	0.473	0.487	0.533	0.598	0.618	0.681	0.445	0.548

TABLE 16.— NONLOCAL RECOGNITION (CORN, SOYBEANS, "OTHER") — SOYBEAN CLASSIFICATION ACCURACY PROCEDURES

[Accuracy = proportion of correctly classified pixels in a class]

RECOGNITIONS TRAINING-- CLASSIFIED	LARS SP1	LARS SP2	ERIM SP1	ERIM SP2	ERIM PSP1	ERIM PSP2	EOD SP1	MEANS OVER PROCEDURES
FA(5)--FA(6)	0.430	0.626	0.659	0.704	0.735	0.776	0.182	0.587
FA(6)--FA(5)	0.545	0.603	0.642	0.695	0.628	0.676	0.536	0.618
LE(5)--LE(6)	0.664	0.855	0.984	0.970	0.898	0.909	0.667	0.850
LE(6)--LE(5)	0.620	0.751	0.750	0.798	0.863	0.873	0.613	0.753
HU(6)--LI(5)	0.413	0.303	0.219	0.248	0.700	0.629	0.243	0.393
HU(6)--LE(6)	0.774	0.651	0.780	0.608	0.861	0.789	0.692	0.737
LE(6)--LI(5)	0.389	0.449	0.339	0.426	0.684	0.679	0.294	0.466
LE(6)--HU(6)	0.302	0.376	0.291	0.328	0.365	0.370	0.048	0.297
LI(7)--LE(8)	0.643	0.419	0.504	0.473	0.568	0.564	0.642	0.545
LE(8)--LI(7)	0.509	0.745	0.569	0.620	0.481	0.532	0.485	0.563
LI(5)--FA(5)	0.031	0.014	0.020	0.092	0.413	0.559	0.005	0.162
FA(5)--LI(5)	0.429	0.536	0.333	0.729	0.731	0.794	0.751	0.615
WH(11)--SH(12)	0.377	0.154	0.333	0.338	0.489	0.485	0.327	0.358
SH(12)--WH(11)	0.663	0.687	0.718	0.672	0.705	0.655	0.686	0.684
SH(13)--HU(13)	0.349	0.630	0.598	0.487	0.635	0.566	0.654	0.560
HU(13)--SH(13)	0.359	0.114	0.055	0.224	0.291	0.418	0.295	0.251
FA(6)--HU(6)	0.275	0.386	0.593	0.788	0.741	0.778	0.529	0.584
HU(6)--FA(6)	0.737	0.732	0.804	0.816	0.844	0.883	0.453	0.753
WH(10)--FA(9)	0.134	0.081	0.156	0.187	0.198	0.232	0.156	0.164
FA(9)--WH(10)	0.608	0.585	0.575	0.735	0.838	0.867	0.676	0.698
MEANS OVER RECOGNITIONS	0.463	0.485	0.496	0.547	0.633	0.652	0.447	0.532

TABLE 17.– NONLOCAL RECOGNITION (CORN, SOYBEANS, "OTHER") – "OTHER" CLASSIFICATION ACCURACY PROCEDURES

[Accuracy = proportion of correctly classified pixels in a class]

RECOGNITIONS TRAINING--CLASSIFIED	LARS SP1	LARS SP2	ERIM SP1	ERIM SP2	ERIM PSP1	ERIM PSP2	EOD SP1	MEANS OVER PROCEDURES
FA(5)--FA(6)	0.487	0.452	0.572	0.326	0.310	0.179	0.381	0.387
FA(6)--FA(5)	0.418	0.494	0.274	0.140	0.457	0.186	0.240	0.316
LE(5)--LE(6)	0.212	0.065	0.055	0.011	0.110	0.099	0.239	0.113
LE(6)--LE(5)	0.456	0.293	0.242	0.231	0.192	0.187	0.353	0.279
HU(6)--LI(5)	0.082	0.082	0.205	0.066	0.096	0.059	0.349	0.134
HU(6)--LE(6)	0.103	0.109	0.324	0.132	0.286	0.154	0.228	0.191
LE(6)--LI(5)	0.583	0.305	0.326	0.294	0.533	0.528	0.584	0.451
LE(6)--HU(6)	0.576	0.533	0.525	0.451	0.593	0.534	0.788	0.572
LI(7)--LE(8)	0.168	0.304	0.461	0.286	0.456	0.291	0.247	0.316
LE(8)--LI(7)	0.856	0.823	0.893	0.888	0.902	0.902	0.935	0.886
LI(5)--FA(5)	0.639	0.803	0.666	0.274	0.433	0.093	0.782	0.527
FA(5)--LI(5)	0.244	0.128	0.392	0.162	0.210	0.153	0.267	0.222
WH(11)--SH(12)	0.635	0.719	0.250	0.234	0.315	0.103	0.460	0.388
SH(12)--WH(11)	0.482	0.417	0.480	0.322	0.475	0.213	0.440	0.404
SH(13)--HU(13)	0.428	0.545	0.510	0.507	0.390	0.382	0.736	0.500
HU(13)--SH(13)	0.365	0.335	0.190	0.105	0.240	0.100	0.495	0.261
FA(6)--HU(6)	0.349	0.369	0.623	0.282	0.340	0.175	0.708	0.406
HU(6)--FA(6)	0.192	0.233	0.332	0.184	0.529	0.323	0.226	0.289
WH(10)--FA(9)	0.687	0.799	0.896	0.861	0.882	0.837	0.781	0.821
FA(9)--WH(10)	0.529	0.514	0.620	0.505	0.592	0.431	0.615	0.544
MEANS OVER RECOGNITIONS	0.425	0.416	0.442	0.313	0.417	0.297	0.493	0.400

TABLE 18.– NONLOCAL RECOGNITION (CORN, SOYBEANS, "OTHER") – AVERAGE CONDITIONAL CLASSIFICATION ACCURACY PROCEDURES

RECOGNITIONS TRAINING-- CLASSIFIED	LARS SP1	LARS SP2	ERIM SP1	ERIM SP2	ERIM PSP1	ERIM PSP2	EOD SP1	MEANS OVER PROCEDURES
FA(5)--FA(6)	0.600	0.656	0.719	0.660	0.650	0.620	0.482	0.627
FA(6)--FA(5)	0.632	0.672	0.628	0.590	0.686	0.606	0.566	0.626
LE(5)--LE(6)	0.503	0.526	0.581	0.573	0.580	0.571	0.497	0.547
LE(6)--LE(5)	0.414	0.408	0.457	0.491	0.515	0.518	0.470	0.468
HU(6)--LI(5)	0.424	0.407	0.385	0.349	0.481	0.454	0.380	0.411
HU(6)--LE(6)	0.463	0.453	0.532	0.492	0.568	0.543	0.494	0.506
LE(6)--LI(5)	0.331	0.257	0.240	0.358	0.615	0.620	0.357	0.397
LE(6)--HU(6)	0.350	0.358	0.480	0.500	0.491	0.531	0.586	0.471
LI(7)--LE(8)	0.499	0.531	0.643	0.536	0.654	0.596	0.461	0.560
LE(8)--LI(7)	0.670	0.669	0.542	0.570	0.543	0.571	0.624	0.598
LI(5)--FA(5)	0.231	0.277	0.282	0.382	0.365	0.502	0.268	0.330
FA(5)--LI(5)	0.273	0.325	0.325	0.367	0.360	0.376	0.355	0.340
WH(11)--SH(12)	0.535	0.466	0.520	0.520	0.567	0.502	0.494	0.515
SH(12)--WH(11)	0.491	0.498	0.509	0.497	0.540	0.526	0.477	0.506
SH(13)--HU(13)	0.440	0.485	0.429	0.406	0.554	0.548	0.516	0.482
HU(13)--SH(13)	0.453	0.424	0.394	0.337	0.439	0.395	0.434	0.411
FA(6)--HU(6)	0.465	0.519	0.660	0.637	0.611	0.577	0.626	0.585
HU(6)--FA(6)	0.601	0.617	0.693	0.654	0.732	0.676	0.347	0.617
WH(10)--FA(9)	0.282	0.304	0.352	0.355	0.439	0.444	0.318	0.356
FA(9)--WH(10)	0.409	0.401	0.436	0.447	0.730	0.688	0.477	0.513
MEANS OVER RECOGNITIONS	0.453	0.463	0.490	0.486	0.556	0.543	0.461	0.493

TABLE 19.— LOCAL RECOGNITION (WHEAT VERSUS "OTHER") — BIAS OF WHEAT IN PROPORTION ESTIMATION PROCEDURES

[Bias = estimated - photointerpreted proportion]

SEGMENT (PASS)	LARS SP1	LARS SP2	ERIM SP1	ERIM SP2	EOD SP1	MEANS OVER PROCEDURES
SH(1)	0.003	0.001	0.033	0.034	0.043	0.023
FA(1)	0.080	0.074	0.049	0.075	0.149	0.085
FA(2)	0.052	0.039	0.071	0.085	0.144	0.078
MEANS OVER SEGMENTS	0.045	0.038	0.051	0.065	0.112	0.062

TABLE 20.— LOCAL RECOGNITION (WHEAT VERSUS "OTHER") — WHEAT CLASSIFICATION ACCURACY PROCEDURES

[Accuracy = proportion of correctly classified pixels in a class]

SEGMENT (PASS)	LARS SP1	LARS SP2	ERIM SP1	ERIM SP2	EOD SP1	MEANS OVER PROCEDURES
SH(1)	0.444	0.444	0.528	0.528	0.556	0.500
FA(1)	0.246	0.231	0.231	0.261	0.500	0.294
FA(2)	0.400	0.338	0.477	0.492	0.625	0.467
MEANS OVER SEGMENTS	0.364	0.338	0.412	0.427	0.560	0.420

TABLE 21.— LOCAL RECOGNITION (WHEAT VERSUS "OTHER") — "OTHER" CLASSIFICATION ACCURACY PROCEDURES

[Accuracy = proportion of correctly classified pixels in a class]

SEGMENT (PASS)	LARS SP1	LARS SP2	ERIM SP1	ERIM SP2	EOD SP1	MEANS OVER PROCEDURES
SH(1)	0.989	0.990	0.975	0.975	0.973	0.980
FA(1)	0.909	0.912	0.924	0.912	0.897	0.911
FA(2)	0.933	0.938	0.912	0.895	0.895	0.915
MEANS OVER SEGMENTS	0.944	0.947	0.937	0.928	0.922	0.935

TABLE 22.— LOCAL RECOGNITION (WHEAT VERSUS "OTHER") — AVERAGE CONDITIONAL CLASSIFICATION ACCURACY PROCEDURES

SEGMENT (PASS)	LARS SP1	LARS SP2	ERIM SP1	ERIM SP2	EOD SP1	MEANS OVER PROCEDURES
SH(1)	0.716	0.717	0.751	0.751	0.764	0.740
FA(1)	0.578	0.572	0.577	0.587	0.698	0.602
FA(2)	0.667	0.638	0.694	0.694	0.760	0.691
MEANS OVER SEGMENTS	0.654	0.642	0.674	0.677	0.741	0.678

TABLE 23.— NONLOCAL RECOGNITION (WHEAT VERSUS "OTHER") — BIAS OF WHEAT IN PROPORTION ESTIMATION PROCEDURES

[Bias = estimated - photointerpreted proportion]

RECOGNITIONS TRAINING-- CLASSIFIED	LARS SP1	LARS SP2	ERIM SP1	ERIM SP2	ERIM PSP1	ERIM PSP2	EOD SP1	MEANS OVER PROCEDURES
SH(1)--FA(1)	-0.052	-0.049	0.034	0.034	0.077	0.077	0.016	0.020
FA(1)--SH(1)	0.077	0.069	0.068	0.098	0.033	0.056	0.113	0.073
FA(1)--FA(2)	0.115	0.111	0.113	0.127	0.085	0.112	0.150	0.116
FA(2)--FA(1)	0.034	0.018	0.042	0.051	0.070	0.085	0.146	0.064
MEANS OVER RECOGNITIONS	0.044	0.037	0.064	0.077	0.066	0.083	0.106	0.068

TABLE 24.— NONLOCAL RECOGNITION (WHEAT VERSUS "OTHER") — WHEAT CLASSIFICATION ACCURACY PROCEDURES

[Accuracy = proportion of correctly classified pixels in a class]

RECOGNITIONS TRAINING-- CLASSIFIED	LARS SP1	LARS SP2	ERIM SP1	ERIM SP2	ERIM PSP1	ERIM PSP2	EOD SP1	MEANS OVER PROCEDURES
SH(1)--FA(1)	0.154	0.154	0.385	0.385	0.292	0.292	0.438	0.300
FA(1)--SH(1)	0.778	0.778	0.778	0.833	0.528	0.556	0.833	0.726
FA(1)--FA(2)	0.446	0.446	0.431	0.461	0.400	0.461	0.688	0.476
FA(2)--FA(1)	0.415	0.323	0.400	0.354	0.461	0.431	0.500	0.412
MEANS OVER RECOGNITIONS	0.448	0.425	0.498	0.508	0.420	0.435	0.615	0.479

TABLE 25.— NONLOCAL RECOGNITION (WHEAT VERSUS "OTHER") — "OTHER" CLASSIFICATION ACCURACY PROCEDURES

[Accuracy = proportion of correctly classified pixels in a class]

RECOGNITIONS TRAINING-- CLASSIFIED	LARS SP1	LARS SP2	ERIM SP1	ERIM SP2	ERIM PSP1	ERIM PSP2	EOD SP1	MEANS OVER PROCEDURES
SH(1)--FA(1)	0.976	0.976	0.911	0.938	0.915	0.915	0.948	0.940
FA(1)--SH(1)	0.932	0.940	0.887	0.882	0.900	0.894	0.921	0.908
FA(1)--FA(2)	0.870	0.870	0.870	0.860	0.878	0.870	0.876	0.871
FA(2)--FA(1)	0.927	0.934	0.907	0.895	0.894	0.878	0.906	0.906
MEANS OVER RECOGNITIONS	0.926	0.930	0.894	0.894	0.897	0.889	0.913	0.906

TABLE 26.— NONLOCAL RECOGNITION (WHEAT VERSUS "OTHER") — AVERAGE CONDITIONAL CLASSIFICATION ACCURACY PROCEDURES

RECOGNITIONS TRAINING-- CLASSIFIED	LARS SP1	LARS SP2	ERIM SP1	ERIM SP2	ERIM PSP1	ERIM PSP2	EOD SP1	MEANS OVER PROCEDURES
SH(1)--FA(1)	0.565	0.565	0.648	0.661	0.604	0.604	0.693	0.620
FA(1)--SH(1)	0.855	0.859	0.833	0.857	0.714	0.725	0.877	0.817
FA(1)--FA(2)	0.658	0.658	0.650	0.661	0.639	0.666	0.782	0.674
FA(2)--FA(1)	0.671	0.628	0.653	0.624	0.678	0.654	0.703	0.659
MEANS OVER RECOGNITIONS	0.687	0.678	0.696	0.701	0.659	0.662	0.764	0.692

TABLE 27.— MULTITEMPORAL RECOGNITION (CORN, SOYBEANS, "OTHER") — BIAS OF CORN IN PROPORTION ESTIMATION PROCEDURES

[Bias = estimated - photointerpreted proportion]

SEGMENT (PASS)	LARS SP1	LARS SP2	ERIM SP1	ERIM SP2	EOD SP1	EOD MSP1	MEANS OVER PROCEDURES
FA(4)	0.127	0.078	0.136	0.298	0.149	0.035	0.137
FA(6)	0.179	0.180	0.168	0.206	0.127	-0.012	0.141
FA(9)	0.076	0.092	0.182	0.220	0.058	-0.030	0.100
FA(9)	0.076	0.092	0.182	0.220	0.058	0.066	0.116
MEANS OVER SEGMENTS	0.114	0.111	0.167	0.236	0.098	0.015	0.123

TABLE 28.— MULTITEMPORAL RECOGNITION (CORN, SOYBEANS, "OTHER") — BIAS OF SOYBEANS IN PROPORTION ESTIMATION PROCEDURES

[Bias = estimated - photointerpreted proportion]

SEGMENT (PASS)	LARS SP1	LARS SP2	ERIM SP1	ERIM SP2	EOD SP1	EOD MSP1	MEANS OVER PROCEDURES
FA(4)	-0.152	0.014	-0.123	-0.047	0.025	-0.077	-0.060
FA(6)	0.017	-0.007	0.095	0.190	0.143	-0.095	0.057
FA(9)	0.145	0.140	-0.021	-0.000	0.216	-0.097	0.064
FA(9)	0.145	0.140	-0.021	-0.000	0.216	0.028	0.085
MEANS OVER SEGMENTS	0.039	0.072	-0.017	0.036	0.150	-0.060	0.036

TABLE 29.– MULTITEMPORAL RECOGNITION (CORN, SOYBEANS, "OTHER") – BIAS OF "OTHER" IN PROPORTION ESTIMATION PROCEDURES

[Bias = estimated - photointerpreted proportion]

SEGMENT (PASS)	LARS SP1	LARS SP2	ERIM SP1	ERIM SP2	EOD SP1	EOD MSP1	MEANS OVER PROCEDURES
FA(4)	0.025	-0.091	-0.013	-0.251	-0.174	0.042	-0.077
FA(6)	-0.196	-0.173	-0.263	-0.395	-0.271	0.107	-0.199
FA(9)	-0.220	-0.232	-0.161	-0.220	-0.274	0.127	-0.163
FA(9)	-0.220	-0.232	-0.161	-0.220	-0.274	-0.095	-0.200
MEANS OVER SEGMENTS	-0.153	-0.182	-0.150	-0.272	-0.248	0.045	-0.160

TABLE 30.– MULTITEMPORAL RECOGNITION (CORN, SOYBEANS, "OTHER") – ROOT MEAN SQUARE ERROR IN PROPORTION ESTIMATION PROCEDURES

SEGMENT (PASS)	LARS SP1	LARS SP2	ERIM SP1	ERIM SP2	EOD SP1	EOD MSP1	MEANS OVER PROCEDURES
FA(4)	0.115	0.070	0.106	0.226	0.133	0.054	0.118
FA(6)	0.154	0.144	0.188	0.280	0.191	0.083	0.173
FA(9)	0.158	0.165	0.141	0.180	0.204	0.094	0.157
FA(9)	0.158	0.165	0.141	0.180	0.204	0.069	0.153
MEANS OVER SEGMENTS	0.146	0.136	0.144	0.216	0.183	0.075	0.150

TABLE 31.— MULTITEMPORAL RECOGNITION (CORN, SOYBEANS, "OTHER") — CORN CLASSIFICATION ACCURACY PROCEDURES

[Accuracy = proportion of correctly classified pixels in a class]

SEGMENT (PASS)	LARS SP1	LARS SP2	ERIM SP1	ERIM SP2	EOD SP1	EOD MSP1	MEANS OVER PROCEDURES
FA(4)	0.745	0.513	0.690	0.823	0.682	0.625	0.680
FA(6)	0.968	0.958	0.961	0.965	0.941	0.889	0.947
FA(9)	0.790	0.762	0.874	0.878	0.781	0.875	0.827
FA(9)	0.790	0.762	0.874	0.878	0.781	0.929	0.836
MEANS OVER SEGMENTS	0.824	0.749	0.850	0.886	0.797	0.830	0.822

TABLE 32.— MULTITEMPORAL RECOGNITION (CORN, SOYBEANS, "OTHER") — SOYBEAN CLASSIFICATION ACCURACY PROCEDURES

[Accuracy = proportion of correctly classified pixels in a class]

SEGMENT (PASS)	LARS SP1	LARS SP2	ERIM SP1	ERIM SP2	EOD SP1	EOD MSP1	MEANS OVER PROCEDURES
FA(4)	0.235	0.444	0.618	0.682	0.624	0.699	0.550
FA(6)	0.458	0.489	0.642	0.718	0.514	0.708	0.588
FA(9)	0.950	0.944	0.855	0.874	0.961	0.728	0.885
FA(9)	0.950	0.944	0.855	0.874	0.961	0.941	0.921
MEANS OVER SEGMENTS	0.648	0.705	0.742	0.787	0.765	0.769	0.736

TABLE 33.— MULTITEMPORAL RECOGNITION (CORN, SOYBEANS, "OTHER") — "OTHER" CLASSIFICATION ACCURACY PROCEDURES

[Accuracy = proportion of correctly classified pixels in a class]

SEGMENT (PASS)	LARS SP1	LARS SP2	ERIM SP1	ERIM SP2	EOD SP1	EOD MSP1	MEANS OVER PROCEDURES
FA(4)	0.651	0.549	0.696	0.408	0.409	0.704	0.569
FA(6)	0.433	0.535	0.406	0.251	0.359	0.942	0.488
FA(9)	0.652	0.615	0.698	0.618	0.497	0.939	0.670
FA(9)	0.652	0.615	0.698	0.618	0.497	0.799	0.647
MEANS OVER SEGMENTS	0.597	0.579	0.624	0.474	0.441	0.846	0.593

TABLE 34.— MULTITEMPORAL RECOGNITION (CORN, SOYBEANS, "OTHER") — AVERAGE CONDITIONAL CLASSIFICATION ACCURACY PROCEDURES

SEGMENT (PASS)	LARS SP1	LARS SP2	ERIM SP1	ERIM SP2	EOD SP1	EOD MSP1	MEANS OVER PROCEDURES
FA(4)	0.544	0.502	0.668	0.638	0.572	0.676	0.600
FA(6)	0.620	0.660	0.670	0.645	0.605	0.846	0.674
FA(9)	0.797	0.774	0.809	0.790	0.747	0.847	0.794
FA(9)	0.797	0.774	0.809	0.790	0.747	0.890	0.801
MEANS OVER SEGMENTS	0.690	0.678	0.739	0.716	0.667	0.815	0.717

TABLE 35.– LOCAL RECOGNITION (CORN, SOYBEANS, "OTHER") – ROOT MEAN SQUARE ERROR IN PROPORTION ESTIMATION PROCEDURES

[Overall segment estimates]

COUNTY (PASS)	LARS SP1	LARS SP2	ERIM SP1	ERIM SP2	EOD SP1
HU(6)	5	4	2	3	1
HU(13)	1	3	4	5	2
SH(12)	2	4	3	5	1
SH(13)	5	1	4	2	3
WH(10)	2	1	5	4	3
WH(11)	1	3	4	5	2
LI(5)	1	3	4	5	2
LI(7)	1	4	5	3	2
FA(4)	3	1	2	5	4
FA(5)	1	3	2	5	4
FA(6)	2	1	3	5	4
FA(9)	2	3	1	4	5
LE(5)	1	3	4	5	2
LE(6)	1	2	4	5	3
LE(8)	1	4	5	3	2

TABLE 36.— LOCAL RECOGNITION (CORN, SOYBEANS, "OTHER") — AVERAGE CONDITIONAL CLASSIFICATION ACCURACY PROCEDURES

COUNTY (PASS)	LARS SP1	LARS SP2	ERIM SP1	ERIM SP2	EOD SP1
HU(6)	5	4	2	3	1
HU(13)	3	4	1	2	5
SH(12)	4	3	2	5	1
SH(13)	5	4	1	2	3
WH(10)	4	3	2	1	5
WH(11)	1	3	5	4	2
LI(5)	3	2	1	5	4
LI(7)	2	1	3	4	5
FA(4)	4	5	1	2	3
FA(5)	4	3	1	2	5
FA(6)	4	2	1	3	5
FA(9)	2	4	1	3	5
LE(5)	5	2	1	3	4
LE(6)	1	5	4	2	3
LE(8)	3	4	2	1	5

TABLE 37.— NONLOCAL RECOGNITION (CORN, SOYBEANS, "OTHER") — ROOT MEAN SQUARE ERROR IN PROPORTION ESTIMATION PROCEDURES

RECOGNITIONS TRAINING-- CLASSIFIED	LARS SP1	LARS SP2	ERIM SP1	ERIM SP2	ERIM PSP1	ERIM PSP2	EOD SP1
FA(5)--FA(6)	2	3	1	6	5	7	4
FA(6)--FA(5)	3	2	5	7	1	6	4
LE(5)--LE(6)	1	4	7	6	3	5	2
LE(6)--LE(5)	3	2	4	5	6	7	1
HU(6)--LI(5)	5	7	2	6	3	4	1
HU(6)--LE(6)	7	1	3	4	2	6	5
LE(6)--LI(5)	7	6	4	2	1	3	5
LE(6)--HU(6)	3	6	5	7	1	4	2
LI(7)--LE(8)	5	7	3	6	2	1	4
LE(8)--LI(7)	1	3	6	5	7	4	2
LI(5)--FA(5)	5	6	3	2	1	7	4
FA(5)--LI(5)	2	1	3	6	5	7	4
WH(11)--SH(12)	1	3	6	7	4	5	2
SH(12)--WH(11)	3	2	5	6	1	7	4
SH(13)--HU(13)	7	5	2	1	3	4	6
HU(13)--SH(13)	2	4	7	6	3	5	1
FA(6)--HU(6)	1	4	2	6	5	7	3
HU(6)--FA(6)	6	5	3	7	2	4	1
WH(10)--FA(9)	3	5	7	6	2	1	4
FA(9)--WH(10)	6	5	7	3	1	2	4

TABLE 38.— NONLOCAL RECOGNITION (CORN, SOYBEANS, "OTHER") — AVERAGE CONDITIONAL CLASSIFICATION ACCURACY PROCEDURES

RECOGNITIONS TRAINING-- CLASSIFIED	LARS SP1	LARS SP2	ERIM SP1	ERIM SP2	ERIM PSP1	ERIM PSP2	EOD SP1
FA(5)--FA(6)	6	3	1	2	4	5	7
FA(6)--FA(5)	3	2	4	6	1	5	7
LE(5)--LE(6)	6	5	1	3	2	4	7
LE(6)--LE(5)	6	7	5	3	2	1	4
HU(6)--LI(5)	3	4	5	7	1	2	6
HU(6)--LE(6)	6	7	3	5	1	2	4
LE(6)--LI(5)	5	6	7	3	2	1	4
LE(6)--HU(6)	7	6	5	3	4	2	1
LI(7)--LE(8)	6	5	2	4	1	3	7
LE(8)--LI(7)	1	2	7	5	6	4	3
LI(5)--FA(5)	7	5	4	2	3	1	6
FA(5)--LI(5)	7	5	6	2	3	1	4
WH(11)--SH(12)	2	7	3	4	1	5	6
SH(12)--WH(11)	6	4	3	5	1	2	7
SH(13)--HU(13)	5	4	6	7	1	2	3
HU(13)--SH(13)	1	4	6	7	2	5	3
FA(6)--HU(6)	7	6	1	2	4	5	3
HU(6)--FA(6)	6	5	2	4	1	3	7
WH(10)--FA(9)	7	5	4	3	2	1	6
FA(9)--WH(10)	6	7	5	4	1	2	3

APPENDIX B

ANALYSES OF VARIANCE

OVERALL ANALYSES — Local Recognition, whole areas

OW1 (all sections)

	LARS SP1	LARS SP2	ERIM SP1	ERIM SP2	EOD SP1
Means over segments	0.563	1.270	1.759	2.135	0.995

Significant factors: procedures (0.001)

α	Smallest significant difference between procedure means
0.05	0.948
0.01	1.140
0.001	1.372

The dependent variable used:

$$\ln\left(100\sum_{i=1}^{K}(\hat{P}_i - P_i)^2 + 0.2\right) \qquad \text{(A1)}$$

Local Recognition, field centers

OF1 (all sections)

	LARS SP1	LARS SP2	ERIM SP1	ERIM SP2	EOD SP1
Means over segments	0.584	0.587	0.639	0.606	0.567

See table 8 for means over procedures.

Significant factors: procedures (0.001)

α	Smallest significant difference between procedure means
0.05	0.047
0.01	0.056
0.001	0.068

Nonlocal Recognition, whole areas

OW2 (all sections)

	LARS SP1	LARS SP2	ERIM SP1	ERIM SP2	ERIM PSP1	ERIM PSP2	EOD SP1
Means over segments	1.794	2.101	2.120	2.350	1.785	2.477	1.511

Significant factors: procedures (0.01)

α	Smallest significant difference between procedure means
0.05	0.952
0.01	1.112
0.001	1.299

The dependent variable used:

$$\ln\left(100\sum_{i=1}^{K}(\hat{P}_i - P_i)^2 + 0.2\right) \qquad \text{(A2)}$$

Nonlocal Recognition, field centers

OF2 (all sections)

	LARS SP1	LARS SP2	ERIM SP1	ERIM SP2	ERIM PSP1	ERIM PSP2	EOD SP1
Means over segments	0.453	0.463	0.490	0.486	0.556	0.543	0.461

See table 16 for means over procedures.

Significant factors: procedures (0.001)

α	Smallest significant difference between procedure means
0.05	0.075
0.01	0.088
0.001	0.102

ANALYSES OF CORN, SOYBEANS, AND "OTHER" — Local Recognition, whole areas

CW1 (13 sections)

County (pass)	LARS SP1	ERIM SP1	EOD SP1	Means over procedures
LI(5)	0.596	1.314	0.462	0.791
LI(7)	.500	1.612	.821	.978
Means over LI	.548	1.463	.641	.884

County (pass)	LARS SP1	ERIM SP1	EOD SP1	Means over procedures
LE(6)	1.125	2.212	1.659	1.665
LE(8)	.973	1.901	1.514	1.463
Means over Lee	1.049	2.057	1.587	1.564

Time period	LARS SP1	ERIM SP1	EOD SP1	Means over procedures
III	0.861	1.763	1.061	1.228
IV	.736	1.756	1.167	1.220
Means over time	.798	1.759	1.114	1.224

County	LARS SP1	ERIM SP1	EOD SP1	Means over procedures
LI	0.548	1.463	0.641	0.884
LE	1.049	2.057	1.587	1.564
Means over counties	.798	1.760	1.114	1.224

Significant factors: procedures (0.001); counties (0.01)

CW2 (19 sections)

County (pass)	LARS SP1	ERIM SP1	EOD SP1	Means over procedures
FA(4)	1.860	1.803	2.080	1.915
FA(5)	2.063	2.083	2.101	2.082
FA(9)	1.900	1.711	2.458	2.023
Means over counties	1.941	1.866	2.213	2.007

Significant factors: procedures (0.01)

CW3 (19 sections)

County (pass)	LARS SP1	ERIM SP1	EOD SP1	Means over procedures
FA(4)	1.861	1.803	2.080	1.915
FA(6)	2.237	2.236	2.390	2.287
FA(9)	1.900	1.711	2.458	2.023
Means over counties	1.999	1.917	2.309	2.075

Significant factors: procedures (0.01)

CW4 (19 sections)

County (pass)	LARS SP1	ERIM SP1	EOD SP1	Means over procedures
HU(6)	3.344	2.418	2.238	2.667
HU(13)	1.351	2.823	1.644	1.939
Means over counties	2.348	2.620	1.941	2.303

Significant factors: procedures (0.01); time (0.025); procedures × time (0.001).

CW5 (17 sections)

County (pass)	LARS SP1	ERIM SP1	EOD SP1	Means over procedures
SH(12)	1.652	1.466	1.387	1.502
SH(13)	2.213	1.669	1.725	1.869
Means over counties	1.932	1.568	1.556	1.685

No significant factors

CW6 (15 sections)

County (pass)	LARS SP1	ERIM SP1	EOD SP1	Means over procedures
WH(10)	1.278	0.791	1.398	1.156
WH(11)	1.538	2.172	1.074	1.595
Means over counties	1.408	1.481	1.236	1.375

Significant factors: procedures × time (0.001)

CW7 (19 sections)

County (pass)	LARS SP1	ERIM SP1	EOD SP1	Means over procedures
HU(6)	3.272	2.352	2.114	2.580
LI(5)	.582	1.444	.533	0.853
FA(5)	2.063	2.083	2.101	2.082
LE(6)	1.037	2.609	1.884	1.843
Means over counties	1.739	2.123	1.658	1.839

Significant factors: procedures (0.001); counties (0.001); procedures × counties (0.001)

CW8 (19 sections)

County (pass)	LARS SP1	ERIM SP1	EOD SP1	Means over procedures
WH(10)	1.150	0.901	1.330	1.127
FA(9)	1.900	1.711	2.458	2.023
Means over counties	1.525	1.306	1.894	1.575

Significant factors: procedures (0.01); counties (0.01)

CW9 (15 sections)

County (pass)	LARS SP1	ERIM SP1	EOD SP1	Means over procedures
SH(12)	1.605	1.362	1.324	1.430
WH(11)	1.538	2.172	1.074	1.595
Means over counties	1.572	1.767	1.199	1.513

Significant factors: procedures (0.025); procedures × counties (0.025)

CW10 (19 sections)

County (pass)	LARS SP1	ERIM SP1	EOD SP1	Means over procedures
HU(13)	1.351	2.823	1.644	1.939
SH(13)	2.291	1.835	1.796	1.974
Means over counties	1.821	2.329	1.720	1.957

Significant factors: procedures (0.05); procedures × counties (0.01)

Local Recognition, field centers

CF1 (10 sections)

County (pass)	LARS SP1	ERIM SP1	EOD SP1	Means over procedures
LI(5)	1.142	1.012	1.206	1.120
LI(7)	.993	.968	1.167	1.043
LI	1.068	.990	1.187	1.081

County (pass)	LARS SP1	ERIM SP1	EOD SP1	Means over procedures
LE(6)	1.341	0.999	1.149	1.163
LE(8)	1.248	1.217	1.483	1.316
Lee	1.295	1.108	1.316	1.240

Period	LARS SP1	ERIM SP1	EOD SP1	Means over procedures
III	1.242	1.005	1.177	1.141
IV	1.121	1.093	1.325	1.179
Means over time	1.181	1.049	1.251	1.160

Counties	LARS SP1	ERIM SP1	EOD SP1	Means over procedures
LI	1.068	0.990	1.189	1.081
LE	1.295	1.108	1.316	1.240
Means over counties	1.181	1.049	1.251	1.160

Significant factors: procedures (0.01); procedures × time (0.05); counties × time (0.05)

CF2 (10 sections

County (pass)	LARS SP1	ERIM SP1	EOD SP1	Means over procedures
FA(4)	1.188	0.762	0.889	0.946
FA(5)	1.248	.970	1.143	1.121
FA(9)	.768	.744	.883	.798
Means over counties	1.068	.826	.972	.955

Significant factors: time (0.001)

CF3 (10 sections)

County (pass)	LARS SP1	ERIM SP1	EOD SP1	Means over procedures
FA(4)	1.188	0.762	0.889	0.946
FA(6)	.989	.894	.990	.957
FA(9)	.768	.744	.883	.798
Means over counties	.981	.800	.921	.901

Significant factors: procedures (0.01); procedures × time (0.01)

CF4 (9 sections)

County (pass)	LARS SP1	ERIM SP1	EOD SP1	Means over procedures
HU(6)	0.519	0.557	0.922	0.666
HU(13)	1.139	1.113	1.369	1.207
Means over counties	.829	.835	1.146	9.36

Significant factors: procedures (0.05); time (0.01)

CF5 (18 sections)

County (pass)	LARS SP1	ERIM SP1	EOD SP1	Means over procedures
SH(12)	1.493	1.427	1.433	1.451
SH(13)	1.788	1.384	1.599	1.591
Means over counties	1.640	1.405	1.516	1.521

Significant factors: procedures (0.01); procedures × times (0.025)

CF6 (6 sections)

County (pass)	LARS SP1	ERIM SP1	EOD SP1	Means over procedures
WH(10)	0.839	0.637	1.061	0.846
WH(11)	1.111	1.035	1.238	1.128
Means over counties	.975	.836	1.150	.987

Significant factors: procedures (0.025)

CF7 (10 sections)

County (pass)	LARS SP1	ERIM SP1	EOD SP1	Means over procedures
HU(6)	0.492	0.526	0.854	0.624
LI(5)	1.142	1.012	1.206	1.121
FA(5)	1.248	.970	1.143	1.201
LE(6)	1.290	1.144	1.168	1.120
Means over counties	1.043	.913	1.093	1.016

Significant factors: procedures (0.01)

CF8 (10 sections)

County (pass)	LARS SP1	ERIM SP1	EOD SP1	Means over procedures
WH(10)	0.979	0.774	1.169	0.974
FA(9)	.768	.744	.883	.798
Means over counties	.873	.759	1.026	.886

Significant factors: procedures (0.001)

CF9 (9 sections)

County (pass)	LARS SP1	ERIM SP1	EOD SP1	Means over procedures
SH(12)	1.303	1.259	1.233	1.265
WH(11)	1.197	1.076	1.257	1.177
Means over counties	1.250	1.167	1.245	1.221

No significant factors

CF10 (10 sections)

County (pass)	LARS SP1	ERIM SP1	EOD SP1	Means over procedures
HU(13)	1.167	1.143	1.233	1.181
SH(13)	1.908	1.546	1.688	1.714
Means over counties	1.537	1.344	1.460	1.447

Significant factors: counties (0.05)

Nonlocal Recognition, whole areas

NW1 (18 sections)

Recognition	LARS SP1	ERIM SP1	ERIM PSP1	EOD SP1	Means over procedures
HU(6)-LI(5)	2.774	2.717	1.934	2.130	2.389
HU(6)-LE(6)	2.649	2.421	2.393	2.294	2.439
HU(6)-FA(6)	3.274	2.818	2.151	2.531	2.693
Means over recognitions	2.899	2.652	2.160	2.319	2.507

Significant factors: procedures (0.001)

NW2 (18 sections)

Recognition	LARS SP1	ERIM SP1	ERIM PSP1	EOD SP1	Means over procedures
FA(5)-FA(6)	1.551	1.656	2.307	1.837	1.838
FA(5)-LI(5)	2.871	2.748	3.162	2.984	2.941
Means over recognitions	2.211	2.202	2.734	2.410	2.390

Significant factors: recognitions (0.001); procedures (0.01)

NW3 (19 sections)

Recognition	LARS SP1	ERIM SP1	ERIM PSP1	EOD SP1	Means over procedures
FA(6)-FA(5)	2.338	2.467	1.993	2.440	2.309
FA(6)-HU(6)	2.506	2.117	3.132	2.327	2.520
Means over recognitions	2.422	2.292	2.562	2.384	2.415

Significant factors: procedures × recognitions (0.001)

NW4 (19 sections)

Recognition	LARS SP1	ERIM SP1	ERIM PSP1	EOD SP1	Means over procedures
LE(6)-LE(5)	1.568	2.089	2.517	1.144	1.829
LE(6)-LI(5)	3.046	3.007	1.916	2.744	2.678
LE(6)-HU(6)	2.290	1.988	1.726	2.537	2.135
Means over recognitions	2.301	2.361	2.053	2.141	2.214

Significant factors: recognitions (0.01); procedures × recognitions (0.001)

NW5 (19 sections)

Recognition	LARS SP1	ERIM SP1	ERIM PSP1	EOD SP1	Means over procedures
LE(6)-HU(6)	2.386	2.112	1.846	2.612	2.239
FA(6)-HU(6)	2.630	2.197	3.213	2.452	2.623
Means over recognitions	2.508	2.154	2.530	2.532	2.431

Significant factors: procedures (0.05); procedures × recognitions (0.001)

NW6 (20 sections)

Recognition	LARS SP1	ERIM SP1	ERIM PSP1	EOD SP1	Means over procedures
HU(6)-LI(5)	2.879	2.696	2.111	2.122	2.452
LE(6)-LI(5)	3.066	3.074	2.012	2.784	2.734
FA(5)-LI(5)	2.854	2.745	3.211	3.031	2.960
Means over recognitions	2.933	2.838	2.447	2.646	2.715

Significant factors: recognitions (0.01); procedures × recognitions (0.001)

NW7 (12 sections)

Recognition	LARS SP1	ERIM SP1	ERIM PSP1	EOD SP1	Means over procedures
FA(6)-FA(5)	2.338	2.467	1.993	2.440	2.309
LI(5)-FA(5)	3.020	2.957	1.722	2.836	2.634
Means over recognitions	2.679	2.712	1.857	2.638	2.472

Significant factors: procedures (0.001);
recognitions × procedures (0.05)

NW8 (18 sections)

Recognition	LARS SP1	ERIM SP1	ERIM PSP1	EOD SP1	Means over procedures
FA(5)-FA(6)	1.551	1.656	2.307	1.837	1.838
HU(6)-FA(6)	3.274	2.818	2.151	2.531	2.673
Means over recognitions	2.413	2.237	2.229	2.184	2.266

Significant factors: recognitions (0.001);
recognitions × procedures (0.001)

NW9 (20 sections)

Recognition	LARS SP1	ERIM SP1	ERIM PSP1	EOD SP1	Means over procedures
LE(5)-LE(6)	1.525	3.326	2.485	1.719	2.264
HU(6)-LE(6)	2.718	2.471	2.476	2.320	2.496
Means over recognitions	2.122	2.899	2.480	2.019	2.380

Significant factors: procedures (0.001);
procedures × recognitions (0.001)

NW10 (13 sections)

Recognition	LARS SP1	ERIM SP1	ERIM PSP1	EOD SP1	Means over procedures
LE(8)-LI(7)	1.612	3.092	3.106	2.182	1.878
LI(7)-LE(8)	1.943	2.083	1.707	1.779	2.498
Means over recognitions	1.778	2.588	2.407	1.980	2.188

Significant factors: procedures (0.001); recognitions (0.025); procedures × recognitions (0.001)

NW11 (19 sections)

Recognition	LARS SP1	ERIM SP1	ERIM PSP1	EOD SP1	Means over procedures
WH(10)-FA(9)	2.573	3.075	1.940	2.607	2.549
FA(9)-WH(10)	2.517	2.514	1.568	2.368	2.242
Means over recognitions	2.545	2.795	1.754	2.488	2.395

Significant factors: procedures (0.001)

NW12 (15 sections)

Recognition	LARS SP1	ERIM SP1	ERIM PSP1	EOD SP1	Means over procedures
WH(11)-SH(12)	1.822	3.034	2.452	1.782	2.273
SH(12)-WH(11)	1.410	1.816	1.117	1.209	1.388
Means over recognitions	1.616	2.425	1.785	1.496	1.830

Significant factors: procedures (0.001); recognitions (0.01)

NW13 (19 sections)

Recognition	LARS SP1	ERIM SP1	ERIM PSP1	EOD SP1	Means over procedures
SH(13)-HU(13)	2.603	2.170	2.064	1.927	2.191
HU(13)-SH(13)	2.028	3.190	2.687	1.597	2.375
Means over recognitions	2.315	2.680	2.376	1.762	2.283

Significant factors: procedures (0.001); procedures × recognitions (0.001)

Nonlocal recognition, field centers

NF1 (10 sections)

Recognition	LARS SP1	ERIM SP1	ERIM PSP1	EOD SP1	Means over procedures
HU(6)-LI(5)	1.199	1.307	1.077	1.519	1.276
HU(6)-LE(6)	1.410	1.306	1.221	1.362	1.325
HU(6)-FA(6)	.981	.767	.594	1.555	.974
Means over recognitions	1.197	1.126	0.964	1.478	1.192

Significant factors: procedures (0.001); procedures × recognitions (0.001)

NF2 (10 sections)

Recognition	LARS SP1	ERIM SP1	ERIM PSP1	EOD SP1	Means over procedures
FA(5)-FA(6)	1.218	0.812	0.984	1.166	1.045
FA(5)-LI(5)	1.541	1.517	1.345	1.349	1.438
Means over recognitions	1.379	1.164	1.164	1.258	1.241

Significant factors: procedures (0.01); procedures × recognitions (0.01)

NF3 (10 sections)

Recognition	LARS SP1	ERIM SP1	ERIM PSP1	EOD SP1	Means over procedures
FA(6)-FA(5)	1.108	0.922	0.858	1.057	0.986
FA(6)-HU(6)	.904	.622	.797	1.021	.836
Means over recognitions	1.006	.772	.827	1.039	.911

Significant factors: procedures (0.01)

NF4 (10 sections)

Recognition	LARS SP1	ERIM SP1	ERIM PSP1	EOD SP1	Means over procedures
LE(6)-LE(5)	1.563	1.346	1.175	1.499	1.395
LE(6)-LI(5)	1.526	1.744	1.216	1.557	1.510
LE(6)-HU(6)	1.071	.958	.943	.902	.968
Means over recognitions	1.387	1.349	1.111	1.319	1.292

Significant factors: procedures (0.01);
procedures × recognitions (0.05)

NF5 (10 sections)

Recognition	LARS SP1	ERIM SP1	ERIM PSP1	EOD SP1	Means over procedures
LE(6)-HU(6)	1.071	0.958	0.943	0.902	0.968
FA(6)-HU(6)	.904	.622	.796	1.021	.836
Means over recognitions	.988	.790	.870	.961	.902

No significant factors

NF6 (10 sections)

Recognition	LARS SP1	ERIM SP1	ERIM PSP1	EOD SP1	Means over procedures
HU(6)-LI(5)	1.199	1.307	1.077	1.519	1.276
LE(6)-LI(5)	1.526	1.744	1.216	1.557	1.511
FA(5)-LI(5)	1.541	1.517	1.345	1.349	1.438
Means over recognitions	1.422	1.523	1.213	1.475	1.408

Significant factors: procedures (0.01); procedures × recognitions (0.05)

NF7 (10 sections)

Recognition	LARS SP1	ERIM SP1	ERIM PSP1	EOD SP1	Means over procedures
FA(6)-FA(5)	1.109	0.922	0.858	1.057	0.986
LE(5)-FA(5)	1.589	1.709	1.184	1.625	1.527
Means over recognitions	1.349	1.315	1.021	1.341	1.257

Significant factors: procedures (0.01); recognitions (0.05)

NF8 (10 sections)

Recognition	LARS SP1	ERIM SP1	ERIM PSP1	EOD SP1	Means over procedures
FA(5)-FA(6)	1.218	0.812	0.984	1.166	1.045
HU(6)-FA(6)	.981	.767	.594	1.555	.974
Means over recognitions	1.099	.789	.789	1.360	1.009

Significant factors: procedures × recognitions (0.001); procedures (0.001)

NF9 (20 sections)

Recognition	LARS SP1	ERIM SP1	ERIM PSP1	EOD SP1	Means over procedures
LE(5)-LE(6)	1.530	1.090	1.125	1.517	1.315
HU(6)-LE(6)	1.531	1.274	1.225	1.496	1.382
Means over recognitions	1.530	1.182	1.175	1.506	1.348

Significant factors: procedures (0.001)

NF10 (10 sections)

Recognition	LARS SP1	ERIM SP1	ERIM PSP1	EOD SP1	Means over procedures
LI(7)-LE(8)	1.226	0.836	0.835	1.370	1.066
LE(8)-LI(7)	1.153	1.224	1.224	1.333	1.234
Means over recognitions	1.190	1.030	1.029	1.357	1.150

Significant factors: procedures (0.001);
procedures × recognitions (0.01)

NF11 (10 sections)

Recognition	LARS SP1	ERIM SP1	ERIM PSP1	EOD SP1	Means over procedures
WH(10)-FA(9)	1.622	1.302	1.137	1.564	1.406
FA(9)-WH(10)	1.439	1.443	.897	1.335	1.278
Means over recognitions	1.530	1.373	1.017	1.449	1.342

Significant factors: procedures (0.001)

NF12 (9 sections)

Recognition	LARS SP1	ERIM SP1	ERIM PSP1	EOD SP1	Means over procedures
WH(11)-SH(12)	1.171	0.964	1.144	1.118	1.099
SH(12)-WH(11)	1.348	1.379	1.449	1.345	1.380
Means over recognitions	1.259	1.171	1.297	1.232	1.240

No significant factors

NF13 (10 sections)

Recognition	LARS SP1	ERIM SP1	ERIM PSP1	EOD SP1	Means over procedures
SH(13)-HU(13)	1.155	1.210	1.102	1.295	1.190
HU(13)-SH(13)	1.905	1.775	1.838	1.981	1.875
Means over recognitions	1.530	1.492	1.470	1.638	1.533

Significant factors: recognitions (0.01)

Multitemporal Recognition, whole areas

TW1 (19 sections)

Recognition	LARS SP1	ERIM SP1	EOD SP1	EOD MSP1[a]
FA(4)	1.861	1.803	2.080	1.166

[a]Multitemporal I, II

Significant factors: procedures (0.01)

TW2 (19 sections)

Recognition	LARS SP1	ERIM SP1	EOD SP1	EOD MSP1[a]
FA(6)	2.237	2.236	2.390	0.761

[a]Multitemporal II, III-2

Significant factors: procedures (0.001)

TW3 (19 sections)

Recognition	LARS SP1	ERIM SP1	EOD SP1	EOD MSP1[a]	EOD MSP1[b]
FA(9)	1.900	1.711	2.458	1.005	0.602

[a]Multitemporal III-2, V.

[b]Multitemporal I, II, III-2, V.

Significant factors: procedures (0.001)

TW4 (17 sections)

Combinations	EOD MSP1
I, II	1.297
II, III-2	.966
III-2, V	1.173
I, II, III-2, V	.528
Means over combinations	.991

No significant factors

Multitemporal Recognition, field centers

TF1 (10 sections)

Recognition	LARS SP1	ERIM SP1	EOD SP1	EOD MSP1[a]
FA(4)	1.188	0.762	0.889	0.716

[a]Multitemporal I, II.

Significant factors: procedures (0.01)

TF2 (10 sections)

Recognition	LARS SP1	ERIM SP1	EOD SP1	EOD MSP1[a]
FA(9)	0.989	0.894	0.990	0.309

[a]Multitemporal III-2, V.

Significant factors: procedures (0.001)

TF3 (10 sections)

Recognition	LARS SP1	ERIM SP1	EOD SP1	EOD MSP1[a]	EOD MSP1[b]
FA(9)	0.768	0.744	0.883	0.384	0.280

[a]Multitemporal III-2, V.
[b]Multitemporal I, II, III-2, V.

Significant factors: procedures (0.001)

TF4 (17 sections)

Combinations	EOD MSP1
I, II	0.927
II, III	.572
III, V	.479
I, II, III, V	.595
Means over combinations	.643

Significant factors: combinations (0.01)

ANALYSIS OF WHEAT VERSUS "OTHER" — Local Recognition, whole areas

WW1 (12 sections)

County (pass)	LARS SP1	ERIM SP1	EOD SP1	Means over procedures
SH(1)	-0.979	-0.728	-0.569	-0.758
FA(1)	.182	.231	1.436	.617
Means over counties	- .398	- .249	.435	- .071

Significant factors: procedures (0.001); counties (0.01); procedures × counties (0.05)

Local Recognition, field centers

WF1 (7 sections)

County (pass)	LARS SP1	ERIM SP1	EOD SP1	Means over procedures
SH(1)	0.079	0.081	0.070	0.076
FA(1)	.138	.162	.157	.152
Means over counties	.108	.121	.114	.114

No significant factors

Nonlocal Recognition, whole areas

WW2 (8 sections)

Recognition	LARS SP1	ERIM SP1	ERIM PSP1	EOD SP1	Means over procedures
FA(1)-FA(2)	0.915	0.844	0.386	1.655	0.950
FA(2)-FA(1)	.084	.773	.614	1.072	.636
Means over recognitions	.499	.808	.500	1.363	.793

Significant factors: procedures (0.025)

WW3 (12 sections)

Recognition	LARS SP1	ERIM SP1	ERIM PSP1	EOD SP1	Means over procedures
SH(1)-FA(1)	-0.390	0.118	0.470	-0.072	0.032
FA(2)-FA(1)	.140	.476	.617	1.308	.635
Means over recognitions	-.125	.297	.543	.618	.333

Significant factors: recognitions (0.025)

WW4 (12 sections)

Recognition	LARS SP1	ERIM SP1	ERIM PSP1	EOD SP1	Means over procedures
SH(1)-FA(1)	-0.390	0.118	0.470	-0.072	0.031
FA(1)-SH(1)	.231	.166	-.288	.710	.205
Means over recognitions	-.079	.142	.091	.319	.118

Significant factors: procedures × recognitions (0.025)

WW5 (8 sections)

Recognition	LARS SP1	ERIM SP1	ERIM PSP1	EOD SP1	Means over procedures
FA(1)-SH(1)	-0.092	-0.184	-0.612	0.305	-0.146
FA(1)-FA(2)	.915	.844	.386	1.655	.950
Means over recognitions	.411	.330	-.113	.980	.402

Significant factors: procedures (0.001); recognitions (0.05)

Nonlocal Recognition, field centers

WF2 (7 sections)

Recognition	LARS SP1	ERIM SP1	ERIM PSP1	EOD SP1	Means over procedures
FA(1)-FA(2)	0.151	0.157	0.154	0.157	0.154
FA(2)-FA(1)	.154	.159	.166	.165	.161
Means over recognitions	.152	.158	.160	.161	.158

No significant factors

WF3 (7 sections)

Recognition	LARS SP1	ERIM SP1	ERIM PSP1	EOD SP1	Means over procedures
SH(1)-FA(1)	0.178	0.143	0.165	0.128	0.153
FA(2)-FA(1)	.154	.159	.166	.165	.161
Means over recognitions	.166	.151	.165	.146	.157

No significant factors

APPENDIX C

NONINTERACTIVE ESTIMATION OF COUNTY AND TIME EFFECTS

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NONINTERACTIVE ESTIMATION OF COUNTY AND TIME EFFECTS

Under the assumption $Ey_{ij} = \alpha_i + \beta_j$ where y_{ij} represents a dependent variable (either rms or average classification accuracy) measured for county i at time j ($i = 1 - 6$; $j = 2 - 7$), α_i is a county effect, and β_j is a time effect, it is possible to estimate the expected response for a particular county or time by least squares using the available CITARS data. This is done by minimizing

$$S^2 = \sum_i \sum_j (y_{ij} - \alpha_i - \beta_j)^2 \qquad \text{(B1)}$$

with respect to α_i and β_j in which the sum is taken over existing CITARS data sets. To maintain estimatibility of the α's and β's, β_7 is set equal to zero. The expected county response is then given by

$$C_i = \alpha_i + \bar{\beta} \qquad \text{(B2)}$$

and the expected time response is $t_j = \beta_j + \bar{\alpha}$ where $\bar{\alpha}$ and $\bar{\beta}$ are the average values of the α's and β's, respectively. The values of C_i and t_j as estimated from CITARS data averaged over all procedures are tabulated on the following page.

County	Expected response, rms	Expected response, average classification accuracy
Huntington	0.212	0.623
Shelby	.081	.566
White	.097	.612
Livingston	.042	.622
Fayette	.156	.613
Lee	.108	.536

Time period	Expected response, rms	Expected response, average classification accuracy
II	0.090	0.567
III	.154	.600
IV	.105	.628
V	.111	.746
VI	.117	.555
VII	.118	.477

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