EXAMINATION OF FARMER-REPORTED ACREAGES

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EXAMINATION OF FARMER-REPORTED ACREAGES. By Roberta B. Pense; Statistical Research Division, Economics and Statistics Service; U.S. Department of Agriculture, Washington, D.C. 20250, November 1980.

ABSTRACT

This report examines farmers' reported planted acreages in 71 corn fields and 57 soybean fields in Northern Missouri for bias. Results obtained for the planted acreages are assumed to be similar to the results for harvested acreages. Reported waste acreages and total field size are also examined for bias.

The farmers' estimates of planted acreages were significantly different from the digitized planted acreages for both corn and soybean fields. The reported waste acreage was significantly different from the digitized value for the corn fields. The reported total field size for the soybean fields was significantly different from the digitized total field size.

ACKNOWLEDGMENTS

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INTRODUCTION

In the 1978 paper, "Forecasting Corn Yields: A Comparison Study Using 1977 Missouri Data", Carol House noted that all of the yield models studied consistently overestimated the harvested yield per acre as computed from the elevator weight of grain and the farmer's estimate of field size. Since the elevator weight should have been accurate (receipts were obtained from the grain elevator), the bias was probably caused by some other factor. Two possible causes mentioned in the 1978 paper were the underestimation of harvest loss and the overestimation of harvested acreage. The present acreage definition study, which was conducted in conjunction with the 1979 Missouri Corn and Soybean Yield Research Project, examines the second possible cause, a bias in farmer-reported acreage. This study attempts to discover whether a bias exists, and if it does exist, what factors are involved.

Field acreages obtained from the digitization of current infrared aerial photographs are used as the most objective and consistent measurement of acreage data in this study. Because the actual harvested acres (as opposed to acres planted but not harvested) cannot be accurately determined from the digitized photographs, farmer reported planted acres is compared against digitized planted acres. Thus, if there is (or is not) a bias in the planted acreages reported by the farmers, it is assumed that there will (or will not) be a similar bias in the harvested acreages reported by the farmers.

LITERATURE REVIEW

Several acreage definition studies were conducted in 1954 and 1955. Summaries of these studies are found in the 1954 and 1955 Annual Research Reports. A brief review of the studies and their findings are as follows:

1. In 1954, a study connected with a cotton objective yield research project compared farmer reported acreages for the August 1 survey to Agricultural Stabilization Committee (ASC) aerial photograph measurements of field size (fencepost to fencepost) for 129 cotton fields. The item "acres standing less ditches" was found to be 100.6% of the ASC or aerial photo measurement. In the postharvest survey, the reported "acres planted" was 99.8% of the ASC value.

2. In 1954, a cotton project conducted at North Carolina State College used chain measurements of cotton fields as "truth" data. The farmer's estimate of acreage was about one percent less than the chain measurement. The planimetered acreage was about 7.6% greater than the chain measurement, and the ASC measured acreage was about 5.5% less than the chain measurement.

3. The N.C. State College study was continued in 1955. The planimetered acreage was 103.1% of the farmer's reported acreage, while the rotometer-measured acreage was 104.8% of the farmer's reported acreage, and the ASC acreage was 97.8% of the farmer's reported acreage.

4. In 1954, a study connected with a corn objective yield research project compared acreages obtained for the September 1 survey to ASC or aerial photography for 102 corn fields. The reported "acres for grain less ditches" was 106.4% of the ASC total field acreage. In the postharvest interview, the reported planted acres was 103.1% of the ASC total field acreage. It was, therefore, suggested that "fencepost to fencepost" acreages were being reported rather than planted acreages, and that a downward adjustment in yield per acre should be made for the objective yield estimate.

5. In 1955, acreage verification studies on cotton, corn, sorghum and soybeans were done. The June Enumerative Survey (JES) reported crop acreage was compared to the total "fencepost to fencepost" field size as measured by a rotometer. The reported cotton acreage was 96% of the rotometered field size. The reported corn acreage was 102% of the field size. The reported sorghum acreage was 109% of the field size, and the reported soybean acreage was 106% of the field size. These results suggested that farmers did not report net acreages when discussing non-allotment crops (cotton was an allotment crop at the time of the study).

While the reports do not state that these findings were declared to be statistically significant or nonsignificant, they indicate that corn, sorghum, and soybean acreages were overestimated by the farmer while cotton acreages were not. Since cotton was an allotment crop at the time of these studies, the farmer should have been more aware of the correct cotton acreages, and therefore, report his acreage more accurately.

In the 1978 paper, "Kansas Wheat Nonsampling Error Analysis", Michael Craig and Manuel Cardenas concluded that digitized acres from aerial photos and farmer reported acreages were not significantly different when expanded to three-strata total. Looking at individual strata, however, the farmer reported acreages were consistently high in stratum 11 (more than 80% cultivated). No significant differences were found in strata 12 and 20 (15-80% cultivated). The results from this study suggest that the bias in reported acres, which was noticed in the 1950's, may still be present.

DATA COLLECTION

The sample used in this study consisted of corn and soybean objective yield and research fields included in the 1979 Missouri research project. All 1979 soybean and corn objective yield fields located in an area covered by two LANDSAT scenes in Northern Missouri were eligible for the study. The research fields were chosen by taking a PPS (probability proportional to size) sample of tracts based on 1978 data and then selecting the field within the tract based on 1979 data. The soybean tracts were chosen by taking a PPS sample of the 1978 JES tracts which were located in the two scenes and which contained a soybean field in 1978. The corn tracts were chosen by taking a PPS sample of the 1978 JES tracts which were located in

three Northern Missouri crop reporting districts and which contained corn fields in 1978. Only those corn tracts located in the two scenes were used in this study. In April of 1979, the sample tracts were enumerated. The research fields were then chosen using a PPS sampling scheme based on the 1979 data. Some of the tracts selected for the corn research sample did not contain corn fields in 1979. In these cases, the enumerators were instructed to randomly pick another tract that did contain corn fields. This problem did not occur with the soybean research tracts, so tract substitution was not allowed. Because of various problems with the data, only 128 of the 160 eligible fields were actually used in this study.

Enumerators obtained the farmer's reported field acreage, waste acreage, and planted acreage for each field during the JES. For each field included in the 1979 objective yield survey, the JES information was updated in August or September during the objective yield survey initial interview. This information, along with the farmer's estimate of acres for harvest for the field, was recorded in Table A of the Objective Yield Survey Form A. (See Appendix 1 for sample forms). During the objective yield postharvest interview, the farmer's final estimate of harvested acres was obtained and recorded on Objective Yield Survey Form D. The Missouri SSO staff then compiled this information for the study.

Color infrared (IR) aerial photographs of the fields were taken in early July and early August of 1979. The JES field boundaries as recorded on the JES aerial photographs (black and white) were transferred onto the color IR's. Because the JES photographs were nine to 11 years old, field boundaries could be more accurately located on the IR photographs. As a result of land use changes and the transfer process, the field boundaries on the IR photographs may have been drawn somewhat differently. For 24 soybean objective yield fields, enumerators outlined (based on consultations with the farmer) the harvested acreage boundaries on the color IR photograph. These fields were used in a soybean objective yield validation study, conducted by the Methods Staff.

Total field and waste acreages were digitized for each field. (See Appendix 2 for the procedures used.) The planted acreages were than calculated as the difference between the two digitized values. The harvested acreage was also digitized for those fields for which harvested acreage boundaries had been drawn. A listing of the data for the 128 fields actually used is found in Table 1 of Appendix 3.

Since this study is concerned with the accuracy with which the farmer estimates his field acreages, it was important that the area digitized be the same as the area for which the farmer was reporting. It was not assumed that the farmer's perception of the field coincided with the field as drawn on the JES photographs because of the age of the photographs. Some of the digitized acreages were, therefore, edited to correspond to the farmer's responses. For example, in 21 cases the farmer did not report any waste acreage, but the field boundaries as drawn did include waste around the edge of the field. In these cases, the field boundaries were redrawn to

exclude edge waste. The effect of this editing on the results will be discussed when the results are analyzed. There were other instances where the JES boundaries did not agree with the obvious field boundaries pictured on the IR photographs. In these cases, the field was digitized using the boundary (IR or JES) that appeared to correspond most closely with the farmer's response. Four fields were deleted from the study because no logical adjustments were apparent. Fields which were divided by segment boundaries also required editing. When it appeared that the farmer reported total field acreage (not just within segment acreage), the entire field was digitized. For three of the eight fields which had segment boundary problems, the farmer appeared to report the "within segment" field acreages. For four fields, it appeared that the entire field acreage was reported. One field was deleted because the only data available was through enumerator observation (i.e., farmer did not respond). Seven fields whose digitized boundaries obviously were not equivalent to the farmer's perception of the field boundaries, were also deleted from the study.

Other fields were deleted for various reasons. Three fields were deleted because they had not been planted to corn or soybeans. Fourteen fields were deleted because the objective yield acreages were based on observed data only (i.e., farmer nonresponse). Four additional fields were deleted from the study because the precision of calibration was not within one percent. These fields had to be calibrated against a 2° map rather than a 7 1/2' or 15' Geological Survey map, and the prescribed level of precision could not be attained within a reasonable number of calibrations.

A listing of the data for the deleted fields and some simple statistics are found in Table 2 of Appendix 3.

As a result of editing, it was assumed that the farmer's perception of the field boundaries was the same as the digitized field boundary. In addition, it was assumed that the digitization was accurate. Therefore, any differences in field size between the reported and digitized acreages was assumed to be due to the farmer's inability to estimate field size accurately.

ANALYSIS AND RESULTS

The hypothesis that there was no difference between reported and digitized acreages was tested using a paired t-test. Since four independent samples were drawn (i.e., corn objective yield, soybean objective yield, corn research, and soybean research), each observation was weighted by the inverse of the within sample variance. Letting d_{ih} = reported - digitized acreage for the i^{th} observation in the h^{th} sample,

$$d_{ih}' = d_{ih} \frac{\frac{1}{S^2_{dh}}}{\sum_h \frac{1}{S^2_{dh}}} .$$ The test was then $t(\alpha, \Sigma(n_h - 1)) = \frac{\bar{d}' - 0}{S_{\bar{d}'}}$,

where $\bar{d}' = \frac{\sum\sum d_{ih}'}{\sum n_h}$ and $S_{\bar{d}} = \frac{\sum n_h S_{dh}^2}{(\sum n_h)^2}$,

h denotes the h^{th} sample,
n_h is the number of paired observations in the h^{th} sample,
S_{dh}^2 is the estimated within sample variance of the d_i',
d_{ih}' is the weighted difference for the i^{th} observation in the h^{th} sample.

The results of the paired t-test are presented in Table 1.

The assumption was made that a bias in farmer reported planted acreage would be indicative of a bias in farmer reported harvested acreage. Therfore, the first objective was to determine whether or not there was a bias in reported planted acres. The paired t-test indicated that the digitized and reported planted acreages were significantly different at the .01 level for both the corn and soybean fields. The average difference was approximately 5% of the average weighted digitized acreage for corn and 3.7% for soybeans. Thus, there does appear to be a significant bias in the farmers reported planted acreages, and this bias is common to both corn and soybean fields.

In order to determine whether the bias in planted acres was due to an inability to estimate total field size, a paired t-test of farmer-reported total field acreage to digitized total field acreage was computed. This test indicates that the digitized and reported total field acreages are the same for the corn fields. However, there is a significant difference between the digitized and reported total field size acreages for the soybean fields at the .01 level. This difference is about 2.8% of the average weighted digitized acreage. The interpretation of this result is somewhat complicated by the editing procedures, which assumed that the farmer reported edge waste only when he considered it part of the total field. If the farmer did not report any waste, and waste was present on the edge of the field, the edge waste was not digitized as part of the total field. If this assumption was not correct, digitized total field size would be understated and the difference in reported and digitized acreages would be slightly overestimated. Therefore, the significant difference between reported and digitized total field size for soybeans may be partially due to the editing procedures.

The waste acreage (which was defined as woods, roads, ditches, lakes, etc.) was examined next. Based on the paired t-test, the soybean reported and digitized waste acreages were not significantly different, while corn reported and digitized waste acreages were significantly different at the .01 level. The average difference for corn was 60.8% of the average weighted digitized

Table 1: Summary of Paired T-Tests

Variable	Field Crop	n	$\bar{d}'$ 1/	$S_{\bar{d}'}$	t
Planted acres	both	128	.344	.065	5.25**
Planted acres	corn	71	.604	.157	3.83**
Planted acres	soybeans	57	.669	.234	2.86**
Total acres	both	128	.219	.067	3.24**
Total acres	corn	71	.288	.147	1.96
Total acres	soybeans	57	.765	.273	2.79**
Waste acres	both	128	-.128	.042	-3.05**
Waste acres	corn	71	-.249	.085	-2.91**
Waste acres	soybeans	57	.209	.203	1.03

1/ $\bar{d}' = \frac{\Sigma(\text{reported} - \text{digitized})'}{n}$ $\quad S_{\bar{d}'} = \sqrt{\frac{\Sigma n_h^2 S_h}{(\Sigma n_h)^2}}$, where $(\text{reported-digitized})'$ = the weighted difference the i^{th} observation.

n_h = no. of observations in h^{th} stratum and

S_h^2 = variance of d' in the h^{th} stratum

* indicates the reported and digitized acreages are significantly different at the .05 level.
** indicates the reported and digitized acreages are significantly different at the .01 level.

acreage. Again, the assumption that the farmer reported edge waste when he considered it part of the total field, caused some potential digitized waste acreage to be deleted. If the assumption was incorrect, digitized waste is underestimated and the difference in reported and digitized waste may be overestimated (i.e., the difference is more negative). Thus, one cause of the overestimation of planted acres in corn appears to be the underestimation of waste acreages.

One assumption so far has been that a bias in planted acres would be indicative of a bias in harvested acres. Since the boundaries of the harvested areas of the field were outlined for 24 of the fields (in connection with a soybean objective yield validation study), the digitized harvested acres and the farmer reported harvested acres were compared for these fields to test this assumption. Five of the 24 soybean fields were not used in the analysis because of problems with the objective yield data. A list of this data set is found in Appendix 4. A paired t-test on these 19 fields reveals that there is no significant difference between reported and digitized harvested acres. It appears that harvested acreages were accurately reported. For 13 of the 24 fields which had harvested acreages outlined, the harvested areas were identical to the areas outlined as planted. Therefore, any change in farmer reported acreages from planted to harvested for these fields would indicate a revised estimate of planted acreage rather than a decision not to harvest all that was planted. While the average difference in reported planted and digitized harvested acreage was 1.05 acres and the average difference in reported harvested and digitized acreage was -.15, paired t-tests revealed that there were no significant differences between either the reported planted or reported harvested and digitized harvested. Moreover, the paired t-test for reported planted vs. reported harvested acreage indicated no significant differences at the .05 level. (However, at the .10 level, the test would have been significant). In summary, the assumption that a bias in planted acres would be indicative of a bias in harvested acres could not be proven due to a small sample size of only soybean fields. However, the assumption was not disproven either.

CONCLUSIONS AND RECOMMENDATIONS

To summarize the conclusions of this analysis, planted acreages for corn and soybeans were overstated by the farmer. For soybean fields, the overstatement of total field size by the farmer may be a contributing factor. For corn fields, the major culprit seems to be the underestimation of waste acreage by the farmer. Based on previous studies, it does not appear that the results from this study can be generalized to all crops, particularly when an allotment crop is involved. While it does appear that the results for planted acreages may be generalized to harvested acreages, the results are not conclusive.

Because planted acreages are being overestimated and because the difference in farmer's planted acreage and digitized acreage was as much as 30 acres

for a 120-acre field, it is recommended that any validation study of corn or soybeans, or any analysis done on a field-by-field basis on these two crops should use some method other than the farmer's estimate to determine field acreage. Moreover, the suggestion that a bias in farmer reported acreages reported in the 1977 comparison study was one reason that all corn yield models overestimated the "true" yield, as computed from elevator receipts and farmer's acreage reports, may be valid.

The objective yield acreage estimates may also be biased. If this bias is due to an inability to estimate field size, as with soybeans, this bias would affect the production estimate. However, if the bias is due to inability to estimate waste acreage, as with corn, the production estimate should not be effected. The objective yield data collection procedures allow a survey plot to fall within waste areas if the farmer did not report the waste area. Thus, the objective yield estimates of yield correspond to both the planted and the unreported waste acreage. If, however, enumerators are either consciously or unconsciously not locating plots within waste areas when they should, the objective yield estimate of yield would be biased upward because the survey plots do not represent both the planted and unreported waste. This question was not addressed in this study. If there is sufficient belief that this is a problem then a study which would address this question as one of its primary concerns should be conducted.

This study assumed the farmer's perception of field boundary and the digitized field boundaries were the same or nearly identical. Problems in identifying these boundaries were not dealt with statistically because questionable fields were deleted from the analysis. However, several comments can be made based on the editing of the data. These comments point out the need for current photography so that both the enumerator and farmer are sure of the field boundaries. In four cases, the boundaries as drawn on the aerial (black and white) photograph appeared to correspond to the farmer's perception of field boundaries, but these boundaries could not be identified on the IR photographs. In seven additional cases, the farmer's perception of the field was obviously not the field as digitized and no other field boundaries appeared to correspond to the farmer's perception. For example, two fields were digitized as having 82 and 49 planted acres. The farmers reported having 126 and 70 planted acres, respectively, and all of the field was to be harvested. However, on the Form D's, the farmers reported 80 and 50 acres harvested. This suggests the farmers did not understand the field boundaries when they reported planted acreages, but did understand them when they reported harvested acreages. Problems with using old photography to draw segment boundaries were also pointed out. Eight fields were cut by segment boundaries, even though this "should not" occur. Moreover, the farmer reported "total" field acreages more often than "within segment" field acreages when the field was cut by the segment boundary. Thus, current photography is necessary for the proper identification of fields.

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Crop Reporting Board

Economics, Statistics, & Cooperatives Service

U.S. Department of Agriculture

Form Approved
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C. E. 12-0029n

PART A – 10

[Wtd., Central Missouri]

JUNE 1979

ACREAGE & LIVESTOCK

Enumerative Survey

State	District	Segment	Tract
___	_____	00000_____	___

Response to this survey is voluntary and not required by law. However, cooperation is very important in order to establish crop acreage planted this spring and current livestock numbers. Facts about your farm or ranch will be kept CONFIDENTIAL and used only in combination with similar reports from other producers.

1. Segment Number: _____ Tract Letter: ___

County: _____

MF Livestock Operator			Cattle E. O.	Hog E. O.	White Corn	Rice	Labor	Optional
401	List ID		402	403	405	409	410 .000	407
NOL ☐ POL ☐ OL ☐	Cattle Strata 411	Hog Strata 412	NOL ☐ POL ☐ OL ☐	NOL ☐ POL ☐ OL ☐			NOL ☐ OL ☐	408

2. I need to make sure that we have your *(the operator's)* name and address complete and correct.

Name of Farm, Ranch or Operation: _____

Name of Operator: _____
(Last) (First) (Middle)

Address: _____
(Route or Street)

_____
(City) (State) (Zip)

Phone No: (_____) _____
Area Code

3. Is the operation named above: *Individually operated* - 1 ☐ *Partnership or joint* - 2 ☐ *Managed Land* - 3 ☐ . . . . . ENTER CODE [845]

4. Does the operator of this tract live INSIDE or OUTSIDE the segment?

INSIDE ☐ - 5 *Enter 5 in Code Box and continue.*
OUTSIDE ☐ - 6 *Enter 6 in Code Box and go to Page 2.* . . . . . [81 __ 1]

5. Are there any other persons living in this household who operate a farm or ranch?

NO ☐ - *Continue* YES ☐ - *Enter Name* _____
(Assign tract on Part ID, go to item 6.)

6. Do you operate land under any other name or land arrangement other than the one listed above?

NO ☐ - *Continue.* YES ☐ - *Assign another tract letter for other arrangement.*

SECTION A – ACREAGES OF FIELDS AND CROPS INSIDE BLUE TRACT BOUNDARY

How many acres are inside this blue tract boundary drawn on the photo *(or map)*? . . . . . Acres ☐ .

Now I would like to ask about each field inside this blue tract boundary and its use in 1979.

FIELD NUMBER	827 1	827 2	827 3	827 4
1. TOTAL ACRES IN FIELD	828 .	828 .	828 .	828 .
2. CROP OR LAND USE *(Specify)*				
3a. WOODS, WASTE, IDLE LAND, ROADS, DITCHES, ETC. *(Less than 5.0 acres)*	829 .	829 .	829 .	829 .
3b. WASTE, IDLE LAND ROADS, DITCHES, ETC *(5.0 acres or more)*	830 .	830 .	830 .	830 .
3c. WOODS, *(Including grazed wood land)* *(5.0 acres or more)*	831 .	831 .	831 .	831 .
4. OCCUPIED FARMSTEAD OR DWELLING	843 .	843 .	843 .	843 .
5. PASTURE	842 .	842 .	842 .	842 .
6. TWO CROPS PLANTED IN THIS FIELD for harvest this year or two uses of the same crop?	NO ☐ YES ☐ 844 .	NO ☐ YES ☐ 844 .	NO ☐ YES ☐ 844 .	NO ☐ YES ☐ 844 .
7. ACRES LEFT TO BE PLANTED?	61– .	61– .	61– .	61– .
11. WINTER WHEAT — Planted	540 .	540 .	540 .	540 .
12. WINTER WHEAT — For Grain	541 .	541 .	541 .	541 .
13. RYE — Planted and to be planted	547 .	547 .	547 .	547 .
14. RYE — For Grain	548 .	548 .	548 .	548 .
15. OATS — Planted and to be planted	533 .	533 .	533 .	533 .
16. OATS — For Grain	534 .	534 .	534 .	534 .
19. CORN — Planted and to be planted	530 .	530 .	530 .	530 .
20. CORN — For Grain	531 .	531 .	531 .	531 .
21. SORGHUM *(Excl. crosses)* — Planted and to be planted	570 .	570 .	570 .	570 .
22. SORGHUM *(Excl. crosses)* — For Grain	571 .	571 .	571 .	571 .
23. OTHER USES OF GRAINS PLANTED . Use				
Acres abandoned, cut for hay, silage, etc. Acres	.	.	.	.
24. HAY Cut and to be cut — ALFALFA and ALFALFA MIXTURES	653 .	653 .	653 .	653 .
25. HAY Cut and to be cut — OTHER HAY Kind				
OTHER HAY Acres	65– .	65– .	65– .	65– .
26. SOYBEANS — Planted and to be planted	600 .	600 .	600 .	600 .
27. TOBACCO — Class *(Specify _____)*	67– .	67– .	67– .	67– .
29. RICE — Planted and to be planted	605 .	605 .	605 .	605 .
30. COTTON UPLAND — Planted and to be planted	524 .	524 .	524 .	524 .
31. COTTON UPLAND — Abandoned	523 .	523 .	523 .	523 .
38. OTHER CROPS — Acres planted or in use	--- .	--- .	--- .	--- .

UNITED STATES DEPARTMENT OF AGRICULTURE
ECONOMICS, STATISTICS, AND COOPERATIVES SERVICE
Form Approved
O. M. B. Number 40-R2764
Approval Expires 6-30-82

C.E. 12-0032A

FORM A: CORN YIELD SURVEY – 1979
INITIAL INTERVIEW

MONTH CODE
Aug. 1...1
Sept. 1...2
Oct. 1....3

YEAR, CROP, FORM, MONTH
941

About the first of June a representative from our office obtained information about your farming operations. We are now interested in estimating the production of corn and updating information about your corn fields. Your response to this survey is voluntary and not required by law. However, we need and appreciate your cooperation.

Date (_____) 170 171

Starting Time .....

JES PLANTED TRACT ACRES 161 (Do Not Change)

1. **Around June 1, you had planted or intended to plant..... acres of corn for all purposes in _____ fields in this tract.**

SHOW operator his tract and fields on PHOTO.
VERIFY the fields and the acreages of corn planted in the tract and entered in the shaded areas of Table A. OUTLINE and label on the photo all acres reported in Column 5.
MAKE necessary corrections and new entries in non-shaded areas of Table A.

If no corn planted in tract, correct Table A and return all forms.

RECORD the acreages of corn to be harvested for grain in Column 6 and ADD to total.

TABLE A

FIELD NUMBER (Sample field number is circled.)	TOTAL ACRES IN FIELD	ACRES PLANTED TO CORN	Acres in USES or CROPS other than corn to be harvested for grain (For example: Corn silage or forage waterways, roads, other crops, etc.)		ACRES OF CORN FOR GRAIN
			USE	ACRES	
1	2	3	4	5	6

102

2. **The total corn acreage *(Column 6)* to be harvested for grain in this tract is.....Acres**

IS THAT RIGHT? *NO -- Review all fields, RE-ADD Column 6.*
YES -- Continue.

IF ITEM 2 HAS *A ZERO entry -- Complete Form H and return all forms except Form AA.*
An ACREAGE entry -- TURN PAGE.

17

FORM A: CORN (Cont'd)

All questions on this page apply to the SAMPLE FIELD ONLY.

If no corn was planted in the designated sample field, BUT a NEW field to be harvested for grain is listed in Table A, this new field then becomes the sample field to enter in Item 3.

3. Copy acres of corn for grain in Sample Field Number _____ from Table A..... *Record acres or "0".....* **Acres** 103 _____

If Item 3 has — *A ZERO entry -- Go to Form H.*
An ACREAGE entry -- Continue.

4. On what date was this corn field planted? _____ 106 _____
(Month and Day)

5. When do you expect to harvest this field? _____
(Georgia, North Carolina & Texas) *(Month and Day)*

NOW -- *COMPLETE FORM H BEFORE ASKING ITEM 6.*

6. "With your permission I would like to go out to the field and mark off sample units to be used in making stalk and ear counts. I will return to the units each month until harvest to make counts and harvest several ears to determine their weight and size. Would that be O. K." YES ☐ NO ☐ *If "NO", conclude interview and return all forms.*

7. Where should I leave the corn picked from the units? _____

8. ***After reviewing form for completeness, sign it. Then transfer necessary data from Table A and Item 2 to Form AA.***

Copy onto the sample kit envelope the location where the operator wishes you to leave the corn, and for Georgia, North Carolina and Texas the expected date of harvest.

ENDING TIME 172 _____

STATUS CODE 180 _____

Enumerator _____

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ECONOMICS, STATISTICS, AND COOPERATIVES SERVICE
Form Approved
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FORM D: CORN YIELD SURVEY - 1979
POST-HARVEST INTERVIEW

MONTH CODE
Sept. 1 2
Oct. 1 3
Nov. 1 4
Dec. 1 or later ... 5

YEAR, CROP, FORM, MONTH (1-4)
946

Earlier this year, I (or a representative from our office) contacted you and made some counts and ear measurements on small units in one of your corn fields. I would like to know how your crop turned out in this field.

Date (_____) 670
Starting Time 671

1. *Enter from (Form AA, Table AA, Column 5)*

   Sample Field Number (_____) Acres for Grain (_____.____)

2. How many acres of corn were (or will be) harvested for grain from this field ..... Acres 606

   If Item 2 is different from Item 1, ask Item 3. If not, skip to Item 4.

   DO NOT CHANGE ITEM 1.

3. Earlier in the crop year (Item 1) _____ acres was recorded as being intended for harvest as grain. Can you give me a reason for the difference?

   _____

   _____

4. How many bushels were harvested from these (Item 2) _____ acres? 607
   Include grain harvested when opening the field and hand gleaning if any ..... Total Bushels

   If operator indicates yield per acre, multiple by acres in Item 2 to determine total bushels. Show your work.

5. How many bushels do you still expect to harvest from this field? 608
   Include hand gleaning ..... Total Bushels

6. Then the total bushels harvested (or expected) from this field is (Items 4 + 5) ..... Total Bushels (_____).

7. How was this production determined?

	Code		Code
Bushels held by combine bins	1	Capacity of storage bins	4
Number of wagon or truck loads.....	2	Field not harvested -- estimated..	5
Weight at elevator	3	Other _____	6

Enter Code 609

FORM D: CORN (Cont'd)

8. What was (or will be) the method of harvesting?

	CODE
a. Mechanical Picker?	1
b. Grain Combine?	2
c. Other Picker-sheller (Mechanical picker with shelling attachment, etc.)	3
d. Other	4

Enter Code 624

9. On what date was or will harvest be completed in this field? _____ (Month and Day) OFFICE USE 604

10. Have livestock grazed on this field since harvest?

NO – 2 *Complete a Form E in the sample field.*

YES – 1 *Select an alternate corn for grain field if available in the tract.*

Enter Code 610

"I would like to thank you for your cooperation this season. Before I go, I would like to go into the field in which we made our counts to check on harvesting losses."

Ending Time 672

Status Code 680

Enumerator _____

UNITED STATES DEPARTMENT OF AGRICULTURE
ECONOMICS, STATISTICS, & COOPERATIVES SERVICE
Form Approved
O. M. B. Number 40-R2764
Approval Expires 6-30-82

C.E. 12-0034A

MONTH CODES

Aug. 1..... 1
Sept. 2
Oct. 3

FORM A: SOYBEAN YIELD SURVEY - 1979
INITIAL INTERVIEW

YEAR, CROP, FORM, MONTH (1-4)

921 ___

About the first of June a representative from our office obtained information about your farming operations. We are now interested in estimating production of soybeans and updating information about your soybean fields. Response to this survey is voluntary and not required by law. However, we need and appreciate your cooperation.

Date (_____) .... 170 / 171

Starting Time *(Military Time)* ..

JES PLANTED ACRES

101 .

(Do Not Change)

1. **Around June 1, you had planted or intended to plant..... acres of soybeans in _____ fields in this tract.**

SHOW operator his tract and fields on PHOTO.
VERIFY the fields and the acreages of soybeans which actually were planted in this tract.
MAKE necessary corrections and new entries in non-shaded areas of Table A.

If no soybeans were planted in tract, correct Table A.

RECORD the acreages of soybeans to be harvested for beans in Column 6 and ADD to total.

TABLE A

FIELD NUMBER *(Sample field number is circled.)*	TOTAL ACRES IN FIELD	ACRES PLANTED TO SOYBEANS	Acres in USES or CROPS other than soybeans to be harvested for beans. *(For example: ditches, fence rows, waterways, roads, other crops, etc.)*		ACRES OF SOYBEANS TO BE HARVESTED FOR BEANS
			USE	ACRES	
1	2	3	4	5	6
	.	.		.	.
	.	.		.	.
	.	.		.	.
	.	.		.	.
	.	.		.	.
	.	.		.	.
					102 .

2. **The total soybean acreage *(Column 6)* to be harvested for beans is .....Acres**

IS THAT RIGHT? < *NO -- Review all fields, RE-ADD Column 6.*
YES -- Continue.

IF ITEM 2 HAS < *A ZERO entry -- Complete Form H and return all forms.*
An ACREAGE entry -- TURN PAGE.

FORM A: SOYBEANS (Cont'd)

All questions on this page apply to the SAMPLE FIELD ONLY.

If no soybeans were planted in the sample field, BUT a NEW field to be harvested for beans is listed in Table A, this new field then becomes the sample field to enter in Item 3.

3. Copy acres of soybeans for beans in Sample Field Number _____ from Table A..... *Record acres or "0"* **.....** Acres

103 .

If Item 3 has
- *A "ZERO" entry – Go to Form H and send in all forms.*
- *An "Acreage" entry – Go to Item 4.*

4. What variety or varieties of soybeans did you plant in this field?

104

111

_____

Name(s)

5. On what date was planting completed in this soybean field?

106

_____

Month and Day

Now –– Complete Form H before asking item 6.

6. "With your permission I will now go out to the field and mark off two small plots to be used in making plant and fruit counts."

"I will return to the plots each month until harvest to make counts and harvest a few beans to determine their number and weight. Would that be all right?" **YES** ☐ **NO** ☐ *If "NO", conclude interview and return all forms.*

If this is an even-numbered sample, tell the operator, **"After you have finished harvesting this field, I will be back to ask you about the number of bushels of soybeans harvested from this field."**

172

Ending Time

180

STATUS CODE

IMPORTANT: Review this form for completeness. Record ending time and sign name. Transfer necessary data from Item 3 to Form D, Item 1.

Enumerator _____

UNITED STATES DEPARTMENT OF AGRICULTURE
ECONOMICS, STATISTICS, & COOPERATIVES SERVICE
Form Approved
O. M. B. Number 40-R2764
Approval Expires 6-30-81

C.E. 12-0034D

MONTH CODE
Oct. 1 3
Nov. 1 4
Dec. 1 or later .5

YEAR, CROP, FORM, MONTH (1-4)
926 __

FORM D: SOYBEAN YIELD SURVEY
1979 Post-Harvest Interview

Earlier this season, I (or a representative from our office) obtained some information on your soybean acreage and made some plant and pod counts in your soybean field. I would like to know how the crop turned out in the sample field. This information will help us in evaluating the counts made this season.

Date (_____) 670
Starting Time 671

1. Enter acres of soybeans for beans *(Item 3, on the back of Form A)*.
   Sample Field No. _____ ..... Acres 600 . 601 .

2. How many acres of soybeans were or will be harvested for beans from this field? ... Acres

   If Item 2 is different from Item 1, ask Item 3.
   If not, skip to Item 4.

   Do not change Item 1.

3. Earlier in the crop year (Item 1) _____ acres was recorded as being intended for harvest for beans. Can you give me a reason for the difference? _____

   _____

   _____

4. How many bushels were or will be harvested from these *(Item 2)* acres? .....
   Total Bushels 607
   OR
   Bushels Per Acre ..... 608 . 622 .

5. What was the moisture content of these beans when they were harvested? ..... Percent

6. Has this sample field been grazed by livestock or plowed since harvest?

   NO ☐ *Complete a Form E in the sample field.*

   YES ☐ *Select an alternate soybean field for gleaning if available in the tract.*

I would like to thank you for your cooperation this season and hope you will continue to have an interest in crop estimating and crop reporting work. Before I go, I would like to go out to the field and pick up any pods and beans left in the sample plots to give us some measure of harvesting loss.

Ending Time 672
STATUS CODE 680

Enumerator _____

Digitization Procedures

The digitization process relates field boundaries on an aerial photograph or infrared photograph to a map base (for example, USGS maps). Precise area measurements are then available for the field. Two steps are involved in the digitization process, which utilizes the coordinate digitizing tablet. First, map coordinates must be assigned to the photograph by locating four points that are common to both the USGS map and the photograph. Ideally, these will be permanent points such as road intersections. Four or more known latitude - longitude points must also be located on the map in order to give the coordinates a point of reference. This process is called calibration. Once the photograph has been calibrated, it can then be digitized. This process allows the calculation of the area of the field by locating the points on the infrared photograph at which the field boundary changes direction. Thus, there are two steps at which measurement errors can occur: during calibration, and during digitization.

In order to be certain that the mean digitized field acreage was within one percent of the actual field acreage, 95% of the time, it was necessary to determine the number of times (n) each field should be digitized. To do this, three infrared photographs were chosen which represented a cross-section of field sizes; one large, one small, and one medium-sized field. Five calibrations were done per field, and five digitizations for total field acreage were done per calibration. The same error limitations in calibration were allowed as in the acreage estimation projects conducted by the Remote Sensing Branch of the Statistical Research Division. The data are shown on the last page of this appendix.

A nested analysis of variance was performed on the variable,

$$Y_{ijk} = \frac{X_{ijk} - \bar{X}_{i..}}{\bar{X}_{i..}}, \text{ where}$$

X_{ijk} = the field acreage for the k^{th} digitization within the j^{th} calibration of the i^{th} field,

$\bar{X}_{i..}$ = the mean field acreage for the i^{th} field,

$i = 1,2,3;\ j=1,\ldots,5\ ;\ k=1,\ldots,5$

The model used for the analysis of variance was $Y_{ijk} = u + F_i + c_{j(i)} + d_{k(ij)}$ where the F_i's are fixed effects and the $c_{j(i)}$'s and $d_{k(ij)}$'s are random effects.

Source	df	SS	MS	EMS
Field	2	.0000000005	.00000000025	$\sigma^2 + 5\sigma^2 + 25 \frac{\Sigma F_i^2}{2}$
Calibration (field)	12	.0059833105	.0004986092	$\sigma_d^2 + 5\sigma_c^2$
Digitization (field calibration)	60	.0040947980	.00006808	σ_d^2
Corrected Total	74	.0100681090		

$\hat{\sigma}_d^2 = .00006808$ $\hat{\sigma}_c^2 = .0000861058$

The mean value of y for the i^{th} field can be expressed as

$$\bar{Y}_{i..} = u + F_i + \frac{\Sigma_j C_{j(i)}}{c} + \frac{\Sigma_j \Sigma_k d_{k(ij)}}{cd},$$

where c = the number of calibrations,
and d = the number of digitizations per calibration.

Since u and F_i are fixed effects, the variance of $\bar{Y}_{i..}$ can be expressed as $V(\bar{Y}_{i..}) = \frac{\sigma_c^2}{c} + \frac{\sigma_d^2}{cd}$, where c and d are defined as above.

Since increasing the number of digitizations would not reduce the variance of the mean very quickly, d was set to 1. In order for the mean field acreage to be within one percent of the actual value, 95% of the time, the equation, $t_{.05} \sqrt{V(\bar{y} \text{ field})} = .01$, must be true. Solving this equation for the number of calibrations per field, one finds that each field should be calibrated six times.

In order to allocate resources more efficiently, it was decided that a field by field decision should be made as to how many times the field should be calibrated and digitized. Each field was calibrated and digitized three times, and the value,

$$w = \frac{1}{n} \frac{Xmax - Xmin}{Xmax}$$

where Xmax = the maximum acreage obtained for the field,
Xmin = the minimum acreage obtained for the field,
n = the number of times the field was calibrated and digitized.

The value for w was then compared to some constant, A. If $w \leq A$ then the field was not calibrated and digitized again. If $w > A$ then the field was calibrated and digitized another time, and w was recomputed.

The value A, such that $2\sqrt{\sigma^2_{\bar{y}}} \leq .01$, where $Y_i = \frac{X_i - \bar{X}}{\bar{X}}$ and X_i = the digitized acreage from the i^{th} calibration of a field, was determined empirically by calculating several values of w and $2\sqrt{\sigma^2_{\bar{y}}}$ from the data. Some of these values were:

w	$2\sqrt{\sigma^2_{\bar{y}}}$
.01052	.0207
.00889	.0173
.00667	.0160
.00631	.0120
.00648	.0116
.00555	.0112
.00534	.0099
.00486	.0083
.00433	.0077

Thus, a value of .005 was chosen for A.

It should be noted that the value of n was calculated using total field acreage only. Therefore, the level of precision in digitization was known for total field acreage. It was not known for planted acreage or waste acreage. It was assumed that the level of precision in digitization of planted acres would be very close to that of total field acres. This assumption was not made for the waste acreage, because the acreage being digitized was very small (usually less than one acre) and the digitization program calculated acreage to the nearest tenth of an acre. In addition, it was assumed that there was no bias in digitization.

Summary of Data

Segment 6035 -- Field C012

Dig/Cal	1	2	3	4	5
1	41.2	40.1	40.2	40.2	40.4
2	41.2	39.9	40.0	40.0	40.4
3	41.4	40.0	40.3	39.9	40.5
4	41.2	39.8	40.1	39.8	40.4
5	41.3	39.9	40.1	40.1	40.3

Segment 9061 -- Field 718

Dig/Cal	1	2	3	4	5
1	136.6	138.4	137.2	138.7	138.0
2	136.0	138.7	136.8	137.0	136.9
3	136.6	138.2	137.1	137.6	137.6
4	136.5	138.4	136.8	138.5	137.2
5	136.6	137.3	137.5	137.7	137.8

Segment 6020 -- Field C008

Dig/Cal	1	2	3	4	5
1	5.9	6.0	6.0	5.9	6.0
2	6.0	6.2	6.0	6.0	6.0
3	6.1	5.9	5.9	5.8	6.1
4	6.0	6.0	5.9	5.9	6.1
5	5.9	5.9	6.0	5.9	6.1

A P P E N D I X 3

Summary of Data

Table 1: Summary of Data Used

CROP=C

SAMPLE	STRATA	DYPLANT	DIGPLANT	DYTOTAL	DIGTOTAL	DYWASTE	DIGWASTE
C007	1	55.0	52.900	55.0	52.900	0.0	0.000
C008	1	7.0	5.943	7.0	5.943	0.0	0.000
C009	1	40.0	40.375	40.0	40.375	0.0	0.000
C012	1	38.0	40.600	38.0	40.600	0.0	0.000
C013	1	135.0	136.200	135.0	142.675	0.0	6.475
C014	1	135.0	136.200	135.0	142.675	0.0	6.475
C015	1	135.0	136.200	135.0	142.675	0.0	6.475
C016	1	12.0	11.000	12.0	11.000	0.0	0.000
C017	1	50.0	51.133	50.0	53.233	0.0	2.100
C018	1	10.0	9.767	10.0	10.333	0.0	0.567
C019	1	24.0	20.838	24.0	20.838	0.0	0.000
C020	1	21.9	20.512	21.9	20.512	0.0	0.000
C025	1	82.0	67.375	82.0	78.925	0.0	11.550
C026	1	82.0	67.375	82.0	78.925	0.0	11.550
C027	1	35.5	29.133	35.5	32.200	0.0	3.067
C029	1	18.0	14.375	22.0	16.650	4.0	2.275
C039	1	60.0	60.200	60.0	68.775	0.0	8.575
C077	1	73.0	74.733	78.0	77.967	5.0	3.233
C075	1	83.5	91.900	95.0	96.533	11.5	4.633
C076	1	83.5	91.900	95.0	96.533	11.5	4.633
C079	1	70.0	62.740	73.0	69.660	3.0	6.920
C080	1	21.0	21.700	26.0	22.300	5.0	0.600
C081	1	19.5	15.067	22.5	16.089	3.0	1.022
C086	1	45.0	43.767	45.0	45.333	0.0	1.567
C087	1	24.0	25.580	24.0	25.580	0.0	0.000
C088	1	40.0	37.400	40.0	37.933	0.0	0.533
C094	1	11.0	11.390	11.0	11.490	0.0	0.100
C098	1	4.0	3.200	4.0	3.200	0.0	0.000
C099	1	37.6	36.200	37.6	39.233	0.0	3.033
C100	1	20.0	18.067	20.0	18.367	0.0	0.300
C115	1	12.0	8.900	12.0	9.925	0.0	1.025
C045	1	25.0	26.680	26.0	28.060	1.0	1.380
C046	1	76.0	66.967	80.0	76.800	4.0	9.833
C047	1	76.0	66.967	80.0	76.800	4.0	9.833
C053	1	10.0	6.200	10.0	7.133	0.0	0.933
C054	1	20.0	18.325	20.0	18.325	0.0	0.000
C055	1	27.0	25.367	27.0	25.367	0.0	0.000
C057	1	30.0	30.120	30.0	30.120	0.0	0.000
C058	1	13.5	19.167	22.5	21.433	9.0	2.267
C059	1	62.0	59.067	65.0	59.767	3.0	0.700
C060	1	37.0	31.033	37.0	33.167	0.0	2.133
C063	1	93.0	86.767	93.0	86.767	0.0	0.000
C064	1	5.6	6.267	5.6	6.267	0.0	0.000
C066	1	30.0	29.400	30.0	29.700	0.0	0.300
C065	1	77.0	76.233	81.0	77.300	4.0	1.067
C069	1	25.5	22.867	26.0	29.000	0.5	6.133
C071	1	8.0	8.567	8.0	8.567	0.0	0.000
C102	1	80.0	73.033	80.0	73.033	0.0	0.000
C113	1	20.0	25.533	20.0	25.800	0.0	0.267
C112	1	120.0	107.225	120.0	107.625	0.0	0.400
C114	1	10.0	11.367	12.0	11.367	2.0	0.000
C028	1	45.0	46.840	45.0	47.325	0.0	0.775
R606	3	12.0	11.000	12.0	11.000	0.0	0.000
R610	3	35.5	29.133	35.5	32.200	0.0	3.067
R611	3	45.0	46.550	45.0	47.325	0.0	0.775
R649	3	24.0	25.580	24.0	25.580	0.0	0.000
R665	3	12.0	8.900	12.0	9.925	0.0	1.025
R630	3	37.0	31.033	37.0	33.167	0.0	2.133
R636	3	30.0	29.400	30.0	29.700	0.0	0.300
R604	3	19.0	14.533	19.0	14.533	0.0	0.000
R605	3	10.0	9.900	10.0	9.900	0.0	0.000
R609	3	29.0	29.867	29.0	32.933	0.0	3.467
R646	3	10.0	9.133	10.0	9.133	0.0	0.000
R652	3	32.7	32.650	33.0	32.650	0.3	0.000
R653	3	9.0	9.775	9.0	9.850	0.0	0.075
R627	3	30.0	26.167	30.0	27.433	0.0	1.267
R628	3	22.0	20.700	22.0	21.300	0.0	0.600
R629	3	22.0	20.700	22.0	21.300	0.0	0.600
R635	3	20.0	17.000	20.0	19.933	0.0	2.933
R643	3	28.0	23.867	30.0	25.000	2.0	1.133
R655	3	15.3	16.467	17.0	16.467	1.7	0.000

Table 1: Summary of Data Used

SAMPLE	STRATA	OYPLANT	DIGPLANT	OYTOTAL	DIGTOTAL	OYWASTE	DIGWASTE
CROP=S							
S002	2	102.0	102.800	105.0	104.600	3.0	1.800
S007	2	15.0	13.786	15.0	13.786	0.0	0.000
S009	2	65.0	57.900	65.0	62.300	0.0	4.800
S013	2	90.0	70.900	90.0	76.900	0.0	6.000
S015	2	12.0	13.500	12.0	13.500	0.0	0.000
S016	2	8.0	7.433	8.0	7.433	0.0	0.000
S018	2	25.0	21.667	25.0	23.367	0.0	1.700
S019	2	18.5	19.367	23.0	23.133	4.5	3.767
S023	2	78.0	71.667	80.0	77.500	2.0	5.833
S027	2	9.0	8.000	9.0	8.000	0.0	0.000
S028	2	35.0	26.333	35.0	26.933	0.0	0.600
S029	2	10.0	9.028	10.0	9.028	0.0	0.000
S030	2	164.0	154.233	164.0	162.833	0.0	8.400
S064	2	35.0	20.667	36.0	25.067	1.0	4.800
S065	2	113.5	103.933	117.0	117.067	3.5	13.133
S066	2	12.0	11.000	12.0	11.000	0.0	0.000
S067	2	40.0	38.100	40.0	39.133	0.0	1.033
S071	2	6.0	6.100	6.0	6.200	0.0	0.100
S073	2	76.0	69.433	76.0	72.033	0.0	2.600
S074	2	28.0	26.933	30.0	29.667	2.0	2.733
S089	2	28.0	28.200	28.0	28.200	0.0	0.000
S035	2	18.0	18.800	18.0	19.000	0.0	0.200
S040	2	40.0	36.900	40.0	38.333	0.0	1.433
S042	2	33.0	31.800	38.0	36.800	5.0	5.000
S043	2	15.0	16.180	16.0	16.180	1.0	0.000
S086	2	135.0	137.933	135.0	137.933	0.0	0.000
S045	2	35.0	28.700	35.0	31.300	0.0	2.600
S047	2	71.5	66.333	78.5	69.833	3.0	3.100
S049	2	43.0	44.975	45.0	45.175	2.0	0.200
S053	2	45.0	42.833	52.0	50.000	7.0	7.167
S058	2	7.0	7.567	7.0	7.733	0.0	0.167
S075	2	79.0	73.467	80.0	75.867	1.0	2.400
S078	2	150.0	120.033	163.0	163.667	13.0	43.633
S080	2	158.0	153.933	160.0	156.400	2.0	2.467
S082	2	15.0	15.714	15.0	15.714	0.0	0.000
S085	2	160.0	154.300	160.0	157.933	0.0	3.633
S068	2	45.0	47.867	50.0	57.767	5.0	9.900
R718	4	135	137.933	135	137.933	0	0.000
R733	4	160	153.933	160	156.400	0	2.467
R736	4	34	34.700	34	35.100	0	0.400
R702	4	20	16.200	20	17.633	0	1.433
R703	4	28	30.767	28	30.767	0	0.000
R709	4	68	61.933	80	62.967	12	1.033
R710	4	11	12.160	12	12.680	1	0.520
R727	4	22	23.600	22	23.600	0	0.000
R728	4	27	26.933	27	27.333	0	0.400
R729	4	28	27.467	30	29.867	2	2.400
R712	4	18	18.940	20	19.080	2	0.140
R713	4	18	18.767	18	18.767	0	0.000
R714	4	69	62.300	70	62.600	1	0.300
R715	4	15	16.683	15	16.683	0	0.000
R716	4	34	28.867	34	29.067	0	0.200
R717	4	53	52.933	53	52.933	0	0.000
R719	4	14	14.220	14	14.580	0	0.360
R720	4	23	22.033	23	23.000	0	0.967
R721	4	25	24.450	25	25.325	0	0.875
R735	4	57	56.800	57	58.000	0	1.200

CROP = C indicates corn, CROP = S indicates soybeans

STRATA indicates the sample

1 = corn objective yield

2 = soybean objective yield

3 = corn research

4 = soybean research

OYPLANT is the farmer's reported planted acreage (either JES or objective yield).

DIGPLANT is the digitized planted acreage.

OYTOTAL is the farmer's reported total field size.

DIGTOTAL is the digitized total field size.

OYWASTE is the farmer's reported waste acreage.

DIGWASTE is the digitized waste acreage.

Table 2: Summary of Deleted Data

Sample	Reason	JES PLANT	OY PLANT	DIG PLANT	JES TOTAL	OY TOTAL	DIG TOTAL	JES WASTE	OY WASTE	DIG WASTE	OY HARV	FMD HARV
S008	1											
S010	1											
S039	1	20		21.7	20		22.2	0		.5		
avg.	1	20		21.7	20		22.2	0		.5		
S014	2											
S022	2	30		29.6	30		29.6	0		0		
C040	2	55		49.7	55		51.4	0		1.7		
C041	2	114		112.6	114		112.8	0		.2		
C042	2	114		112.6	114		112.8	0		.2		
C082	2	145		131.3	145		133	0		1.7		
C083	2	145		131.3	145		133	0		1.7		
C084	2	54		55.6	54.5		56.3	.5		.7		
S031	2	19		17.2	20		18.6	1		1.4		
S041	2	17	17	14.5	17	17	14.9	0	0	.4	17	10.5
S048	2	25		32	25		33.7	0		1.8		
C101	2	285		24.7	30		24.7	1.5		0		
C105	2	30		35.9	30		36.9	0		1		
S081	2	210		195.4	210		205.8	0		10.4		
avg.	2	75.8		72.5	76.1		74.1	.2		1.6		
C024	3	4	5	4.8	4	5	4.9	0	0	.1	5	5
S020	3	19	19	17.2	19	19	17.2	0	0	0	19	20
S021	3	39	39	40.2	39	39	40.0	0	0	.7	39	39
R707	3	41		38.1	41		39.2	0		1.1		
avg	3	25.8		25.1	25.8		25.6	0		.5		
S011	4	32	23.5	61.7	32	32	63.9	0	8.5	2.2		
S017	4	70	70	48.6	70	70	48.6	0	0	0	70	50
C043	4	126	126	82.3	146	146	86.7	20	20	4.4	126	80
C044	4	126	126	82.3	146	146	86.7	20	20	4.4	126	80
S068	4	30	21	21.7	30	30	21.7	0	9	0	20.9	22
S069	4	63	63	23.7	65	65	23.7	2	2	0	63	23
S086	4	55	55	35.5	55	55	35.5	0	0	0	55	55
R619	4	126	126	82.3	146	146	86.7	20	20	4.4		
R723	4											
R650*	4	20	20		20	20		0	0			
R731	4											
avg.	4	78.5	76.2	54.8	86.2	86.2	56.7	7.8	9.9	1.9		

* Not included in averages.

REASON = reason for deletion of the observation
1 indicates field not planted to corn or soybeans
2 indicates observed data only
3 indicates digitization not within prescribed accuracy
4 indicates inability to define farmer's perception of field boundary.
JES PLANT = farmers reported planted acres on JES (June)
OY PLANT = farmers reported planted acres on objective yield Form A (July or August)
DIGPLANT = digitized planted acres
JES TOTAL = farmers reported total field size on JES (June)
OYTOTAL = farmers reported total field size on objective yield Form A (July or August)
DIGTOTAL = digitized total field size
JESWASTE = farmer reported waste acreage on JES (June)
OYWASTE = farmer reported waste acreage on objective yield Form A (July or August)
DIGWASTE = digitized waste acreage.
OYHARV = farmer reported harvested acreage on objective yield Form A (July or August)
FMDHARV = farmer reported harvested acreage on objective yield Form D (postharvest interview)

A P P E N D I X 4

Summary of Harvested Acres Analysis

Table 1: Soybean Fields with Harvested Acres Outlined

Segment	Sample	Form D Harvested Acres	Digitized Harvested Acres
6018	S009	62.0	58.07
6043	S015	12.0	13.50
6045	S016	8.0	7.43
*6053	*S017	50.0	48.57
6058	S018	20.0	21.67
6059	S019	18.5	19.37
6088	S027	6.0	2.47
6093	S028	28.0	26.30
6125	S065	108.0	102.80
6155	S071	6.0	6.10
6169	S074	28.0	26.27
6369	S089	27.5	28.20
9016	S035	17.0	17.40
9047	S042	33.8	31.80
9052	S043	15.0	16.18
*9057	*S045	32.0	28.70
9066	S047	68.0	74.87
9072	S049	43.0	44.98
9097	S058	7.0	7.57

* not used in analysis of planted acres because the farmer's perception of planted field boundaries did not appear to correspond to the boundaries as drawn on the IR.

$$R = \frac{\text{Reported}}{\text{Digitized}} = 1.013 \qquad n = 19$$

$$t_{18} = \frac{\text{Reported} - \text{Digitized}}{S_{\bar{D}}} = \frac{.397}{.6268} = .634$$

Table 2: Soybean Fields with Outlined Harvested Acres Equal to Outlined Planted Acres

Segment	Sample	Form A Planted	Form A Harvested	Form D Harvested	Digitized Planted	Form A Total Field	Digitized Total Field	Form A Waste	Digitized Waste
6018	S009	65.0	65.0	62.0	57.90	65.0	62.30	0.0	4.40
6043	S015	12.0	12.0	12.0	13.50	12.0	13.50	0.0	0.00
6045	S016	8.0	8.0	8.0	7.43	8.0	7.43	0.0	0.00
6058	S018	25.0	25.0	20.0	21.67	25.0	23.37	0.0	1.70
6059	S019	18.5	18.5	18.5	19.37	23.0	23.13	4.5	3.77
6093	S028	35.0	35.0	28.0	26.33	35.0	26.93	0.0	0.60
6155	S071	6.0	6.0	6.0	6.10	6.0	6.20	0.0	0.10
6369	S089	28.0	28.0	27.5	28.20	28.0	28.20	0.0	0.00
9016	S035	18.0	18.0	17.0	18.80	18.0	19.00	0.0	0.20
9047	S042	33.0	33.0	33.8	31.80	38.0	36.80	5.0	5.00
9052	S043	15.0	15.0	15.0	16.18	16.0	16.18	1.0	0.00
9072	S049	43.0	43.0	43.0	44.98	45.0	45.17	2.0	0.20
9097	S058	7.0	7.0	7.0	7.57	7.0	7.73	0.0	0.17

$$R = \frac{\text{Reported Planted}}{\text{Digitized Planted}} = 1.045$$

$$R = \frac{\text{Form D Harvested}}{\text{Digitized Planted}} = .993$$

$$t_{12} = \frac{\text{Reported Planted - Reported Harvested}}{S_{\bar{D}}} = \frac{1.207}{.650} = 1.857$$

$$t_{12} = \frac{\text{Reported Planted - Digitized Harvested}}{S_{\bar{D}}} = \frac{1.051}{.925} = 1.137$$

$$t_{12} = \frac{\text{Reported Harvested - Digitized Harvested}}{S_{\bar{D}}} = \frac{-.156}{.498} = -.313$$