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Reporting Consistency for Winter Wheat Planted Acreage: A Comparison of QAS and FSA Data for Kansas

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REPORTING CONSISTENCY FOR WINTER WHEAT PLANTED ACREAGE: A COMPARISON OF QAS AND FSA DATA FOR KANSAS, by Robert G. Hood. Research Division, National Agricultural Statistics Service, United States Department of Agriculture, Washington, D.C. 20250-2000, November 1996. Report No. SRB-96-03.

ABSTRACT

The National Agricultural Statistics Service (NASS) conducts Quarterly Agricultural Surveys (QAS) in order to gather information on a variety of commodities, including winter wheat. Data collected for winter wheat seeded (planted) acreage during the December Agricultural Survey is an essential component in forecasting the total acres to be harvested the following summer. There has been concern expressed over the degree of reporting inconsistency and change in survey indications for winter wheat planted acreage from December to March.

NASS has recently conducted research on the feasibility of using a Farm Service Agency (FSA) list of tracts as a sampling frame to produce state level estimates for crop acreage in Kansas. Data from this research were used in a subsequent reinterview study to try to determine possible sources of reporting inconsistency. The levels of quarter-to-quarter reporting consistency and change in total acres planted were also compared between QAS reports and reporting based on FSA tracts. The results indicate that while the percentage of inconsistent reports is not appreciably lower, the magnitude of the survey-to-survey changes for FSA reported data was much lower than that for QAS data.

KEY WORDS

Farm Service Agency, Reinterview, Winter Wheat, Reporting Consistency

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SUMMARY

The lack of reporting consistency from quarter-to-quarter is a concern with the winter wheat planted acreage indications from the Quarterly Agricultural Surveys (QAS). For crop years 1994 through 1996, reported winter wheat planted acreage in December and the following March were different for more than half of the Kansas operations that were sampled both quarters. This seems to be a rather high percentage given that at the time the December Agricultural Survey (DAS) is conducted essentially all of the winter wheat crop has been seeded.

The high number of individual quarter-to-quarter reporting changes suggests response error. Response error can occur if there is concept or reporting unit confusion; if a respondent does not know the answer, misunderstands the question, or deliberately gives false information; if exact questionnaire wording is not followed; if data are recorded incorrectly; or if the questionnaire design is flawed.

A follow-on survey to the November 1995 Farm Service Agency (FSA) study was conducted in April 1996 in Kansas to evaluate the degree of reporting consistency for winter wheat planted acreage that could be expected from the FSA sampling approach. This reinterview study was conducted to determine whether sampling from a frame composed of FSA tracts would reduce the severity of this problem, and to identify possible reasons for inconsistency that could be contributing to the problem in the QAS. Kansas was chosen for the study because of its importance to winter wheat production and because of the SSO's participation in past FSA research projects, not because the problems are any more severe in that State than in others.

Using FSA data is not new to NASS. FSA (formerly, the Agricultural Stabilization and Conservation Service) data have been used since 1983 to update and build the NASS list frame. Several research projects have also been conducted in recent years on the possible uses of FSA data. Weaver (1994) showed that FSA data could provide an alternate sampling frame and that FSA land in farm coverage exceeded the NASS list sampling frame land in farm coverage (in the States studied). Research by Parsons (1996) in Kansas and Nebraska showed that the coverage level of certified cropland by FSA data exceeded 97 percent. Parsons also examined the feasibility of estimating the proportion of crop acreage that is covered in FSA totals using farmer reported data and used the information to produce planted acreage indications. Most recently, Benz (1996) showed that a sampling frame based on an FSA list of certified tracts could be used to produce viable State level estimates for crop acreage in Kansas. The April 1996 reinterview study conducted in Kansas was based on the data collected during the November 1995 study by Benz.

In April 1996 a brief CATI survey was conducted in Kansas in which operators from a subsample of tracts selected from the November 1995 FSA study were reinterviewed. Questions pertaining to winter wheat planted and harvested acreage were asked and data from November were used to validate the reinterview responses. When reinterview responses differed from

November responses by a certain percentage, the difference was reconciled and a reason for the difference was obtained.

One potential cause of response error that is of particular interest is the different wording used in collecting winter wheat planted acreage for the December and March Agricultural Surveys (MAS). In December, the number of acres of winter wheat that have been **seeded** or will be seeded is asked, while in March the number of acres **planted** is asked. The November and April FSA surveys used the same questionnaire wording currently used for the December and March surveys, respectively. In no case was a conceptual difference between planted and seeded acreage used to explain a difference in reported acreage.

State level estimates for winter wheat planted acreage, harvested acreage, and the ratio of harvested to planted acreage were generated. The coefficient of variation for planted acres was 2.8, which was essentially the same as was obtained from the MAS with a much larger sample size. The ratio of harvested acreage to planted acreage was comparable to the most current ratio which was set after the June 1996 acreage survey, but (due primarily to continued adverse weather between March and April) much lower than that indicated by the MAS. The winter wheat planted acreage was 0.5% lower than the list portion from the November 1995 FSA survey, compared to a 6.4% decline from December to March in the QAS.

The frequency of differences between November and April FSA reported acreage was higher than expected, but still lower than that demonstrated by the DAS and MAS for the last three crop years. However, the differences observed for FSA tracts were generally smaller both absolutely and on a percentage basis than those from the QAS. The November-April FSA data had considerably fewer large changes (greater than 25%) and more small changes (less than 5%) than December-March matched records over the last three crop years.

As a result of the 1996 Federal Agriculture Improvement and Reform Act, it is unclear what administrative data FSA will collect in future years. NASS should keep apprised of any revisions in the legislation and changes in FSA data collection. Future research can be considered once it has been fully decided what data FSA will collect to administer the new Farm Bill.

INTRODUCTION

The level of winter wheat planted (seeded) acreage from the December Agricultural Survey (DAS) and the instability of subsequent indications from the March Agricultural Survey (MAS) has been a source of recent concern at NASS. An associated perplexity is the degree of reporting inconsistency for winter wheat planted (seeded) acreage from December to March. For crop years 1994-1996, reported winter wheat planted acreages from December and the following March were different for more than half of the operations that were sampled both quarters.

These quarter-to-quarter changes indicate response error, perhaps due to concept or reporting unit confusion. Response errors can occur when a respondent does not know the answer and/or guesses, misunderstands the question, or deliberately gives false information. Response errors can also occur when the enumerator fails to ask a question as written, records the data incorrectly, or misunderstands the answer. Questionnaire design can also be a contributing factor to response error. Potential for this exists in the way winter wheat acreage is asked in the DAS and the MAS. In December, the number of acres of winter wheat that have been **seeded** or will be seeded is asked, while in March the number of acres **planted** is asked. Isolating the reason(s) why reported winter wheat acreage data change so often between quarters is one of the goals of this study.

Several questions related to these issues arise. What is the source of the concern over the December DAS acreage indication? Is the level too high or too low? Is the level from March consistent with that of December? Why does reported winter wheat planted acreage vary from December to March for the same operation? Why is different wording ("seeded acres" in December vs." planted acres" in March) used in trying to obtain the same data? Is the reporting inconsistency a problem, and if so, how does it affect the survey indications?

To study these problems, particularly the issue of reporting consistency, the edited data files of the DAS and MAS from Kansas were reviewed for the past three crop years (1994-1996). List and area records were subset to identify records sampled in both December and March in order to identify data discrepancies. Namely, matched records whose March and December reports of winter wheat acreage differed by more that a specified percentage were examined. Differences in reported planted acreage from December to March were discovered in over 55% of the matched records for the last three crop years. The magnitude of these discrepancies and the net effect are examined.

Graphs were produced to show the frequency of change from December to March in reported winter wheat acreages for matched list and area records. No consistent trends between quarters, such as March consistently being less than December, were evident. Figure 1 illustrates the changes in individual firms' reported acreage from December to March for crop years 1995 and 1996.

To determine possible sources of reporting inconsistency for winter wheat planted acreage, a reinterview study was conducted in Kansas in April 1996. One goal was to evaluate the level of reporting consistency

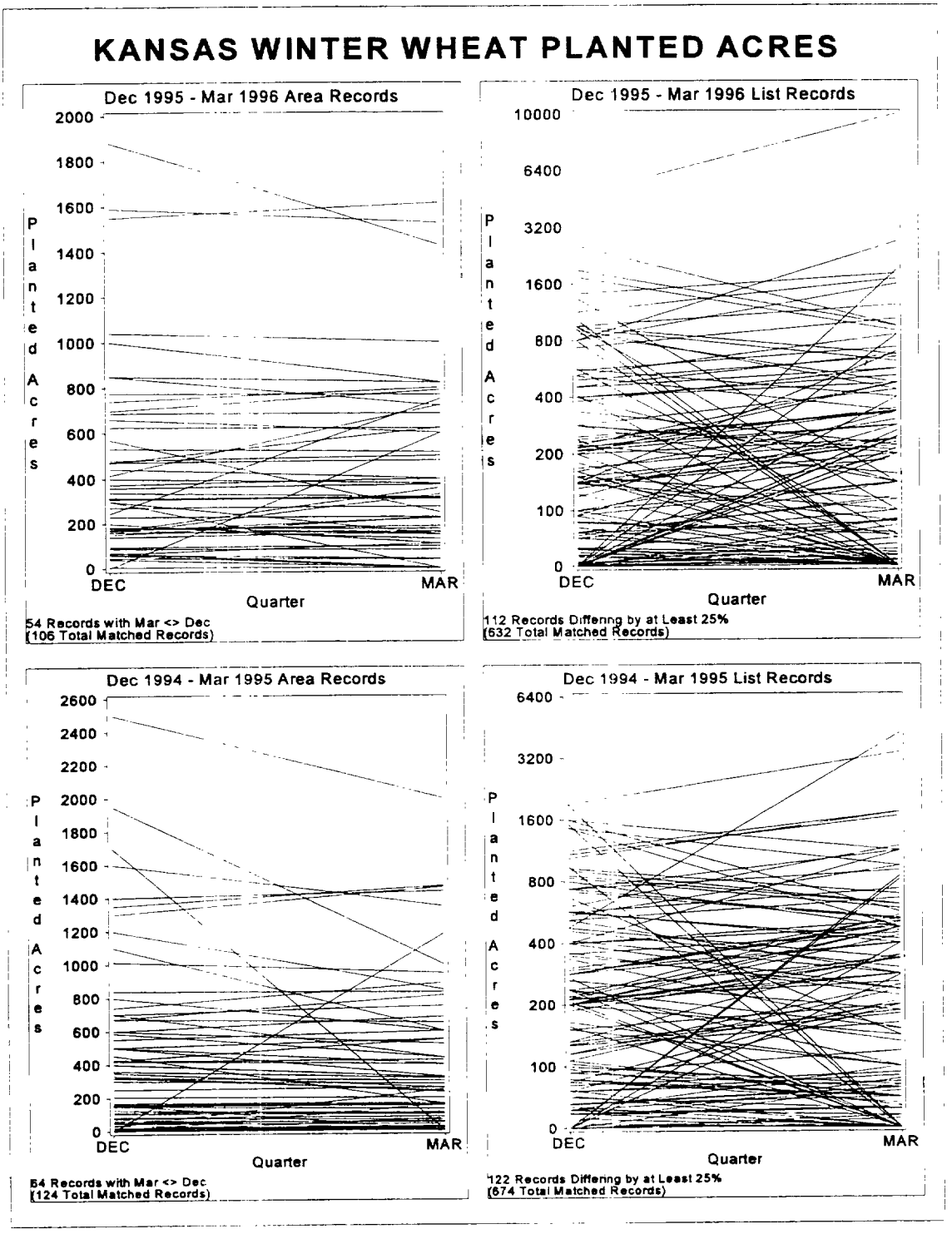

Figure 1. December Winter Wheat Seeded Acres vs March Planted Acres

for winter wheat planted acreage that could be expected from sampling from a frame of Farm Service Agency (FSA) tracts. If quarter-to-quarter reporting inconsistency is due to reporting unit confusion, then using FSA tracts as a sampling frame could possibly reduce the problem (assuming the FSA tract is a more stable reporting unit than entire farm operation). A secondary objective was to determine whether the difference in question wording between December and March in the Quarterly Agricultural Surveys (QAS) could be contributing to response variability. Kansas was selected for this study because of its importance to winter wheat production and because of the previous work by Parsons (1996) and Benz (1996) on FSA coverage and the evaluation of using FSA tracts as a sampling frame for an acreage survey.

A subsample of FSA tracts was selected from the November 1995 survey that was conducted to evaluate the feasibility of using FSA tracts as a sampling frame. Operators of these tracts were telephoned in April as a follow-up to verify the previously reported data and to collect current and up-to-date data. The follow-up study was designed to help determine whether sampling FSA tracts would result in more consistent responses from quarter-to-quarter and whether the difference in question wording could be contributing to response variability. The reinterview study also provided another indication of total winter wheat planted acreage, as well as an indication of the percentage of planted acres that were expected to be harvested.

BACKGROUND

The Sampling and Estimation Research Section of the Research Division and the Kansas SSO conducted a study in November 1995 to evaluate the benefits of using an alternative sampling scheme for the acreage surveys. This approach utilized a sampling frame composed of Farm Service Agency tracts. One potential advantage of the approach is the stability of the FSA tract, which is a fixed area of land, regardless of who operates it. Reporting for FSA tracts is perceived to be more stable than for entire farm acreage operated by a particular firm, which is the unit for QAS reporting. FSA tracts are fixed pieces of land, smaller on average than entire farm acreages, and have a detailed "legal description" making the exact acreage in question easy to identify to the respondent. If a substantial portion of the quarter-to-quarter reporting inconsistency observed in the QAS is attributable to reporting unit confusion or instability, then this problem could be significantly reduced by using the FSA frame.

The FSA has historically maintained a list of farms and tracts in order to implement and administer farm programs. Farm operators have reported to FSA throughout the year for various purposes, including the farm program sign-up and the certification of crop acreage. During the farm program sign-up, farm operators would sign contracts with the Commodity Credit Corporation agreeing to abide by the rules of the current farm program. All operators that were in farm programs would identify crops and acreage by field for an FSA farm, including non-program crops. This "certification" of acreage was done at the county FSA office. Other farm operators who were not in farm programs could also certify their acreage in order to maintain their crop acreage base and for crop insurance purposes (Parsons 1996).

FSA farms are composed of tracts. An FSA tract is a contiguous piece of land under one ownership and operated as a farm or part of a farm. The sample for the November survey was selected from a list of FSA certified tracts in Kansas. Preparing the sampling frame for use involved several steps. First, data for fields that were certified with FSA for the 1994 crop year were obtained from local FSA offices. These field level data were then aggregated to the tract level to form the sampling frame. Next, the sample was stratified on total cropland and a wheat presence indicator (based on the sum of wheat, summer fallow, and fallow in the tract) using certification data for the 1994 crop year. Finally, additional strata were created for tracts with land only in the Conservation Reserve Program (CRP) and for tracts that had over 1,000 acres of cropland (Benz 1996).

Using such a list of certified FSA tracts as a "list frame" should not present too much concern in terms of coverage for Kansas. Weaver (1994) showed that FSA land in farm coverage exceeded the NASS list sampling frame land in farm coverage (in the States that were evaluated) and that FSA coverage of land in farms in Kansas exceeded 99%. Coverage levels exceeded 98% for the farm program crops of corn, wheat, and sorghum in Kansas. Parsons (1996) showed that for crop year 1995, almost 99% of all winter wheat acres found in Kansas were FSA certified. While this project dealt with a list of certified tracts from 1994 FSA data, there is no reason to suspect that 1994 coverage would be much different than 1995. However, to account for any incompleteness, a small sample was selected for the November study from an "area frame" of cropland areas believed to be non-certified for the 1994 crop year.

METHODOLOGY

November FSA Survey Design

For the November study a total of 925 FSA tracts were sampled from a list frame composed of 209,080 FSA tracts in Kansas. In addition, a sample of 43 land areas were chosen from an area frame of non-certified land. This "area frame" consisted of 77 areas that were split into two strata based on expanded cropland in the land areas. Since these area samples were merely areas of land delineated on a map and had no descriptors, they were field enumerated. Enumerators were provided a state map and a larger scale county map to aid in locating the samples. The area frame survey contained a question to determine if the land area was certified with FSA for the 1994 crop year. This was an additional attempt to verify that the land area was truly not certified in 1994 (as had been reported in the June area survey) and was therefore non-overlap (NOL) with the list sample frame of certified tracts (Benz 1996). Data for several items of interest, including winter wheat planted acres, were collected. See the section on Estimation for a complete description of the sample design.

April Reinterview Survey Design

A subsample of FSA tracts from the November list sample was selected for reinterview in April. NOL samples from November were not selected for two reasons. First, they contributed very little (less than 1%) to the total expanded winter wheat planted acreage. Second, reinterviewing the NOL samples would have required personal enumeration, because there was no easy way to identify these

parcels of land to the respondent. Since they had not been certified, no FSA farm or tract numbers existed for them.

The goal of the April project was to recontact as many of the tracts with usable November data as possible in order to test reporting consistency for FSA tracts. State level estimates for total winter wheat planted acres and a ratio of harvested to planted acreage were also produced.

The April reinterview sample was taken from the 723 usable list reports from the November survey. In order to minimize respondent burden, any operation among these 723 that could be identified as being in the 1996 March Ag Survey sample was excluded from the reinterview sample. This reduced the possible sample by 66 (22 from the 196 records reporting zero planted acres in November, and 44 from the 527 records reporting positive planted acreage in November). All of the remaining tracts that reported wheat plantings in November and about half of those reporting zero wheat acreage were selected for the April reinterview. Therefore, the final sample for April consisted of 583 tracts, 100 that reported zero planted acres in November and 483 that reported positive planted acres in November.

Data Collection

The sample for the November survey was drawn from a list of 1994 certified tracts and included names that were no longer operating the tracts. The April sample, however, consisted of only operations that were able to report data in the November 1995 survey. Operator name, address, and phone number updates were made to several of these November records in order to make it easier to contact the operator of the specified FSA tract.

If the respondent no longer operated the FSA tract, but could report for it, the April interview was conducted. If the farmer no longer operated the FSA tract and could not report for it, or if the tract had been split, we did not require the enumerator to follow up on the new operator(s). In this case, the interview was concluded by entering 'NO', and the questionnaire was coded as being inaccessible. This situation occurred rarely, and following up these cases would have increased the complexity and cost of the study while yielding little insight into the reasons for the reporting variability.

With respect to winter wheat planted acreage, the wording of the November FSA Survey paralleled the DAS and the wording of the April FSA Reinterview survey, the MAS. In the November FSA Survey the winter wheat question was asked the following way: Did you seed, or will you seed, any winter wheat for all purposes in FSA tract XXXX for the 1996 Crop Year? (If yes), How many acres of winter wheat have been seeded or will be seeded for all purposes for the 1996 Crop Year? The DAS winter wheat acreage question was asked in the following way: Please report winter wheat (and rye) seedings for the 1996 Crop Year. Winter wheat acres seeded and to be seeded for all purposes.

The April FSA Reconciliation followed the wording of the MAS. The MAS winter wheat acreage was asked in the following way: For winter wheat (and oats), please report acres planted (and to be planted) for all purposes last fall (or this spring), and acres to be harvested for grain for the 1996

Crop Year. The April FSA Reconciliation asked winter wheat the following way: How many acres of winter wheat were planted for all purposes last fall for the 1996 Crop Year in FSA Tract XXXX. Both survey instruments also contained a question on winter wheat acreage to be harvested for grain.

To collect data for April, a short CATI interview was conducted. Survey Quality Research Section (SQRS) and Technology Research Section (TRS) of Research Division developed the reinterview instrument using Blaise software. (See Appendix B for screen captures of the Blaise CATI instrument.) The CATI instrument used data from the November FSA Tract Acreage Project to validate the current survey response for winter wheat planted acreage. When the November and April responses differed by more than a certain percentage, the April response was flagged, and the difference was reconciled, capturing the correct response and the reason for the difference.

The rules for flagging differences varied by the number of reported acres of wheat planted. This was done to avoid flagging small changes for small acreages and reduce respondent burden. The consistency checks (shown in Table 1) were based on the ratio of April acres to November acres and used ranges that were chosen after analyzing the distribution of the November winter wheat data and consulting with the KS SSO.

Table 1.
FSA Reinterview Consistency Checks

April Acreage	Response Flag Condition
Zero	If Nov > 0
Positive	If Nov = 0
> 500	If Apr/Nov > 1.10 or < 0.90
30 - 499	If Apr/Nov > 1.15 or < 0.85
<= 30	If Apr/Nov > 1.25 or < 0.75

Estimation

The November FSA sample consisted of 968 sample units, 925 list and 48 NOL. Nine list strata were created based on total cropland and the presence of wheat . Table 2 (Benz 1996) gives a breakdown of the strata counts used in November.

Recall the sampling scheme for April, in which FSA tracts were selected from usable reports from the November FSA study. NOL tracts and any operations that could be identified as being in the MAS were excluded from the April reinterview sample. All positive usables from November were selected for reinterview (excluding 66 observations that were also selected for the MAS). One hundred tracts were randomly selected from the 196 tracts with zero winter wheat planted acres in November. This produced a sample size of 583 for April, with 483 tracts that had reported positive planted acreage and 100 tracts that had reported zero planted acres.

Tracts reporting zero planted acreage in November were sampled at a different rate than those reporting positive acreage. Therefore, a tenth stratum was created to represent the zero acreage tracts in the frame and the other nine strata were adjusted to represent only positive acreage tracts. Since the population counts for the restratification were unknown, they had to be estimated. Using the original population counts for the nine strata and the proportion of zero and positive reports from the November FSA

Table 2.

Sample Design of November FSA Tract Acreage Study

Stratum	Description	Pop Count	Sample	Usable	Usable Positive
1	CRP only with < 1000 acres cropland [1]	13,986	25	21	1
2	0.1 - 100 acres 'cropland' with no wheat indicator[2]	33,419	100	81	23
3	100-400 acres 'cropland' with no wheat indicator	12,198	50	39	12
4	400-1000 acres 'cropland' with no wheat indicator	304	25	21	3
5	0.1 - 100 acres 'cropland' with wheat indicator	56,503	100	80	62
6	100 - 200 acres 'cropland' with wheat indicator	62,719	275	217	183
7	200 - 400 acres 'cropland' with wheat indicator	23,171	200	161	147
8	400-1000 acres 'cropland' with wheat indicator	6,327	100	71	67
9	1000+ acres 'cropland'	453	50	32	29
NOL	(Not sampled in April reinterview)		43	43	12
TOTAL		209,080	968	766	539

1/ 'cropland' is the sum of the certified acres in the tract

2/ the wheat indicator is based on the sum of wheat, summer fallow, fallow in the tract

survey, strata population counts were estimated for the ten strata. The estimated population count for the new tenth stratum was the sum of the estimated number of zero acreage units in the original nine strata.

Specifically, the adjusted strata population counts for strata 1 through 9 were estimated by multiplying the original population counts by the proportion of tracts with positive planted acres in November. The remaining tracts with no planted acres were then grouped together in a new tenth stratum. Since there were usable zero acreage reports in all of the original nine strata, we can treat the 100 zero reports as a simple random sample from the newly created stratum 10 and use the same basic expansion formula for all strata. Table 3 shows the November strata counts, the proportion of usable positive reports, and the April adjusted stratum population counts.

The expansion factor, adjusting for nonresponse in the reinterview survey, was calculated as the April adjusted stratum level population counts divided by the number of usable reports in that stratum. For the ratio of harvested to planted acres, the expansion factor was based on the number of reports that were usable for both items in April. That is, both harvested acreage and planted acreage had to be usable for the report to be used in calculating the ratio. The variances were estimated using bootstrap estimation. See Appendix A for a discussion of the estimators used in calculating acreage totals and variance.

Table 3.
Adjusted Strata Counts for April

Stratum	November Population Count	Proportion of Nov. Usable Positive Reports	April Adjusted Population Count
1	13,986	1/21	666
2	33,419	23/81	9,489
3	12,198	12/39	3,753
4	304	3/21	43
5	56,503	62/80	43,790
6	62,719	183/217	52,892
7	23,171	147/161	21,156
8	6,327	67/71	5,971
9	453	29/32	411
10			70,909
Total	209,080		209,080

RESULTS

April FSA Reinterview Response Rates

The 583 tracts from the November FSA study selected for the following April reinterview study yielded 548 usable reports, with 452 positive usables. There were 23 refusals and inaccessibles and 12 cases in which the respondent was unable to report for the tract. Ninety-two of the hundred tracts with zero planted acres in November were usable, with three reporting positive winter wheat acreage in April. Note that the April reinterview survey excluded inaccessible reports and refusals from the November survey, which no doubt contributed to the high rate of usability in April.

There were 497 usable reports for winter wheat harvested acres, with 344 usable positives. There were 57 which reported zero harvested acres and 51 which reported "Don't Know", all of which had planted acres. The average number of planted acres for these 51 "Don't Know" reports was 122. By comparison, the average number of planted acres for the 344 tracts which reported positive harvested acres was 144. The overall average harvested acreage for all 497 usable reports was 114 acres. For the 57 reports of zero harvested acres and positive planted acres, the average number of planted acres was 122.

Only two percent of the April sample respondents were unable to report for FSA tracts. In November, less than two percent of sampled operators were unable to recognize the specific FSA tract requested (Benz 1996). This lends support to the belief that FSA tracts may be a viable reporting unit for use with NASS surveys, at least in Kansas.

Total Winter Wheat Planted Acreage and Harvested-Planted Ratio

The State level indication for expanded winter wheat planted acres for the April study was **11,356,797** which was comparable to the level from the MAS. The bootstrap estimated coefficient of variation of 2.8 was the same as that obtained from the MAS, which had five times the sample size. Thus, using a small sample of data from FSA tracts, we were able to produce an estimate that was comparable in both level and precision to the MAS. (In all fairness, it must be noted that the November FSA sample, and thus the April reinterview sample, was stratified particularly for winter wheat, while the MAS is a multi-purpose survey also targeting commodities other than winter wheat.) A comparable ratio of

harvested/planted acres was computed for tracts with usable planted and harvested acreages, with the following results.

Planted Acres:	10,318,099
Harvested Acres:	7,928,877
H/P:	0.77
Std. Err.	0.025

About 91% of the expanded planted acreage was covered by tracts reporting harvested acres. The ratio of harvested to planted winter wheat acreage from the April FSA survey (0.77) was much closer to the current Board estimate of the harvested to planted acreage ratio of 0.82 than to the 0.95 ratio obtained from the MAS. The difference in level of the March and April ratios largely reflected deteriorating expectations for the winter wheat crop. The weather conditions in Kansas as well as other Plains States were severe during the winter and spring. Cold temperatures and drought had a tremendous impact on the wheat that was planted and the amount farmers expected to harvest. Kansas experienced dry conditions from the time of seeding, resulting in poor emergence and root development, leaving wheat crops susceptible to wind damage and freezing (NASS 1996). There was still some optimism for the crop during the time period that the March Ag Survey was being conducted. However, an early April freeze and spring drought created further problems and the wheat crop had deteriorated by the time the reinterview survey was conducted. This is reflected in the number of acres farmers expected to harvest. The forecast for winter wheat harvested acreage was revised to 8.8 million acres after the June acreage survey, resulting in a harvested to planted ratio of 0.82. The April FSA survey provided a better indication (based on current forecasts) of harvested acreage than the MAS.

The April study results for wheat planted acreage compared favorably to the November FSA list results, with only a slight decrease (0.5%) in reported acreage from November to April. The change from the December to March Ag Surveys was much higher (but within the bounds of sampling variability) with a decrease of 6.4%. The reason for the big decline seems to be largely attributable to the sample rotation in the list. The ratio to previous for March list units that matched December list units was 1.003.

Change in Level

Questions about the current level of total winter wheat planted acreage and about the instability of the indication from December to March have been noted in various sources. The April reinterview study was not designed specifically to address the issue of level, but relative information may be gleaned from the results, at least for Kansas.

Generally, indications derived from summing up FSA data are thought to provide a lower bound to NASS acreage indications, since FSA data are expected to be somewhat incomplete. In this study, the November and April FSA indications were quite close to the DAS indication for winter wheat acreage, and actually higher (though not significantly so) than the subsequent March indication. This reinterview study therefore tended to support the DAS level of planted acres in Kansas. Until this crop year, there had not been any exceptionally large changes from December to March in Kansas in recent years. Table 4 shows the changes from December to March for the

Table 4.
Percent Change: A Comparison of QAS Indications for Winter Wheat Planted Acres by Crop Year

	Crop Year			
Frame	1996	1995	1994	1993
LIST	-6.2	-1.1	1.4	-3.0
NOL	-7.5	-7.2	7.8	-2.6
TOTAL	-6.4	-2.2	2.5	-2.9

% Change = (Mar - Dec)/Dec * 100%

last four crop years. Changes from December to March have been less than 3%, except for the current crop year which had a change of 6.4%.

While there was almost no change in the indication for the total winter wheat planted acreage from November to April (-0.5%) compared to a substantial change from December to March (-6.4%), several facts must be noted. The FSA surveys involved the same people for both surveys, unlike the QAS surveys in which roughly only 40% of the samples were in both surveys. Bailey (1994) noted that QAS indications decline in quarters following the June Survey and that the data adjustment factor (DAF) is a major factor in the decline. He also noted that quarter-to-quarter changes in the DAF have had a much larger effect on survey expansions than changes in the data.

Comparison of Reporting Consistency Between QAS and FSA Data

In order to study the issue of consistency and stability in QAS data for winter wheat planted acres, the edited files of the DAS and MAS from Kansas were reviewed for the last three crop years (1994-1996). List and area records that were sampled both quarters were used to identify data discrepancies. Only records with usable **reported** data for both quarters were used in these comparisons. Records whose data were imputed or estimated (including known zeros) were not used as that alone could account for differences (or artificially the lack thereof). Valid zeros from reported data, including records that reported being out of business in March, were included, but known zeros were excluded. Reporting consistency in QAS winter wheat planted acreage for these three crop years was compared to reporting consistency between the November and April surveys of FSA tracts. Responses were compared for operations that were in both the DAS and MAS (for crop years 1994-1996) and that had usable reported winter wheat planted acreage.

For crop years 1994-1996, the percentage of matched DAS and MAS records that had different responses for winter wheat planted acres was between 56-60%. The percentage of matched area records with different responses between December and March for these three crop years ranged from 51-56%. A similar rate of differences was observed for matched list records, where the range was 57-60%. Matched area records accounted for 12-16% of all matched records for these three years.

Table 6 compares the rates of consistency for the total QAS sample (combined list and NOL) for individual crop years versus that of the FSA studies. From this table, there does not appear to be much difference. Only about 40-46% of the matched records reported exactly the same for either FSA or QAS surveys. The percentage of records reporting exactly the same data from

Table 6.

Comparison of Reporting Consistency for Winter Wheat Planted Acreage
Nov-Apr FSA Surveys vs. Dec-Mar Quarterly Ag Surveys

	Nov95-Apr96		Dec95-Mar96		Dec94-Mar95		Dec93-Mar94	
Reporting Consistency	No.	%	No.	%	No.	%	No.	%
No Change	**251**	**45.8**	**303**	**41.1**	**352**	**44.1**	**317**	**40.3**
Zero-Zero	89	16.2	162	22.0	190	23.8	154	19.6
Pos-Pos	162	29.6	141	19.1	162	20.3	163	20.7
Change	**297**	**54.2**	**435**	**58.9**	**446**	**55.9**	**470**	**59.7**
Zero-Pos	3	0.5	16	2.2	12	1.5	17	2.2
Pos-Zero	7	1.3	23	3.1	20	2.5	17	2.2
Pos-Pos	287	52.4	396	53.7	414	52.0	436	55.4
Matched Records	548		738		798		787	

November to April for FSA tracts is only slightly higher than the percentage for matched records for the DAS and MAS for crop years 1994-1996.

However, if we consider consistency in terms of percent change from previous quarter, reporting for FSA tracts appears to be substantially more consistent than that for QAS. Table 7 shows a finer breakdown

Table 7.

Comparison of Percent Change for Winter Wheat Planted Acreage
For Matched Records With a Change in Response
(Positive Data Both Quarters as a Percentage of All Matched Records)

	Nov95-Apr96		Dec95-Mar96		Dec94-Mar95		Dec93-Mar94	
Change (C)	No.	% [1]	No.	%	No.	%	No.	%
C≤ 5%	156	28.5	139	18.9	134	16.8	129	16.4
5% < C ≤ 10%	53	9.7	79	10.7	76	9.5	99	12.6
10%< C ≤ 15%	23	4.2	38	5.1	43	5.4	64	8.1
15%< C ≤ 20%	16	2.9	40	5.4	36	4.5	41	5.2
20%< C ≤ 25%	7	1.3	13	1.8	23	2.9	17	2.2
C > 25% [2]	32	5.8	87	11.8	102	12.8	86	11.0

1/ Percentages based on total number of matched records

2/ Change calculated as absolute value of {(Dec - Mar)/Dec} * 100%

for matched positive records that had different responses across surveys. When responses for positive planted acreage did change, fewer large changes (as a percent of initially reported data) and more smaller changes occurred with FSA tract data than with QAS entire farm operation data. So, while the percentage of records changing response was only slightly lower with the FSA frame, the changes observed were, in relative terms, much smaller than those observed in the QAS.

Figure 2 is a graphical comparison of the frequency and magnitude of changes in reported winter wheat planted acreage between the (November and April) FSA surveys and matched records from the DAS and MAS (for the last three crop years).

Reasons for Differences Between November and April Reported Acreage

Edit checks were built into the data collection instrument to flag cases in which the difference between the November and final April responses was outside a specified range. When a response was flagged, a warning message for the enumerator was displayed on the screen with instructions to resolve the difference with the help of the respondent. The respondent was given both the original November response and the current April response to help reconcile the difference between responses. The respondent was then given the opportunity to verify the current response or change his response.

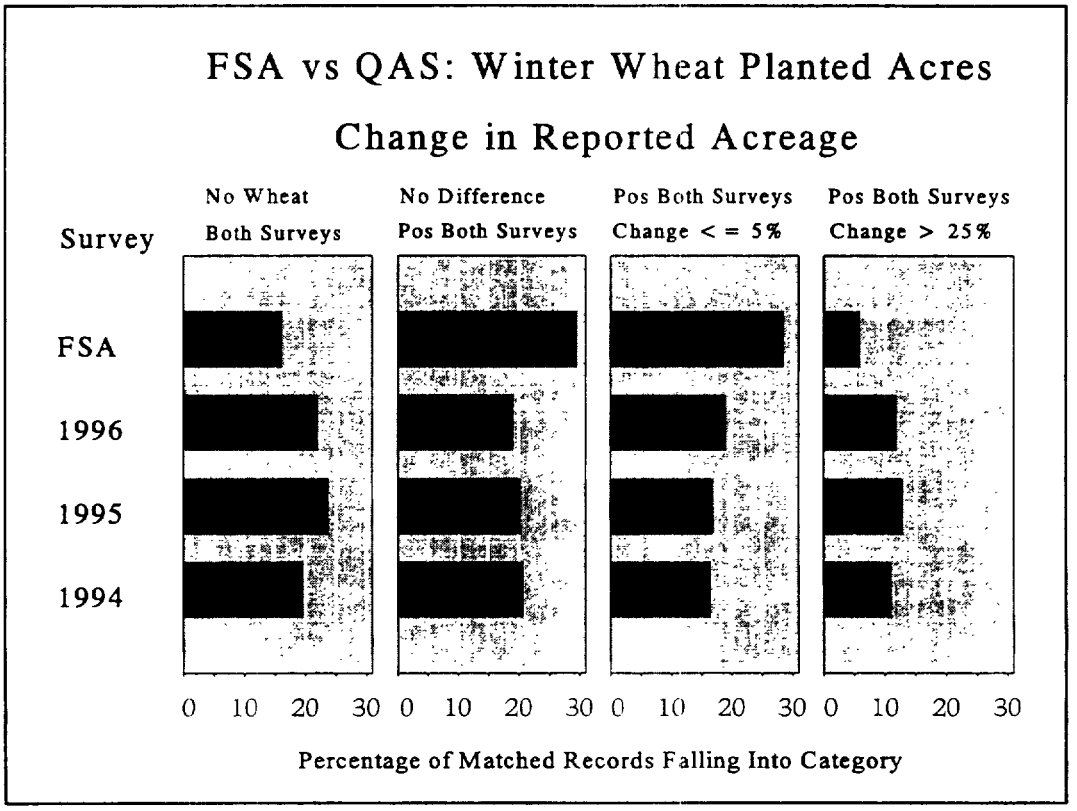

Figure 2. Quarter-to-Quarter Change in Reported Planted Acreage: FSA vs QAS (December - March) for Last Three Crop Years

When a response was flagged, the respondent was asked to give a reason, if possible for the difference between the November and April responses. If the respondent was unable to provide a reason, the enumerator was then allowed to prompt the respondent with the following possible reasons:

a) The wrong tract level data was recorded in November
b) A change was made to the land agreement of the tract involving rented acres of winter wheat
c) One or more fields of winter wheat in the tract were excluded in November
d) Reported farm level data
e) Acres seeded (as asked in November and for DAS) has a different meaning than acres planted (as asked in April and for MAS)
f) Included only acres to be harvested. Excluded acres for hay, grazing, etc...
g) Planting intentions changed
h) Other explanation

Although the April reported winter wheat planted acreage differed from the November response for seeded acres in over half of the matched usable reports, only 11% (62) of the differences were large enough to be flagged. In two of the flagged cases, the respondent changed the April response to match the November acreage. Seventeen of the remaining 60 could not or would not give a reason. Reasons cited for the other 43 records, the majority of which involved tract reporting problems (either reporting for the wrong tract or excluding fields from the tract) are indicated in Table 8.

The fact that no differences were due to the wording of the question suggests that there may be no conceptual difference between "seeded" and "planted" acres, at least in Kansas. However, consistent wording should be used whenever possible. Another reason that was not reported was "including only acres to be harvested." It has been suggested that total wheat planted acreage is low because people do not report wheat for grazing. This appeared to be a problem for only one sample.

Net Effect of Change in Responses Between Surveys

To examine the net effect of changes in reported planted acreage of winter wheat between surveys, the data were grouped by the "Change-No Change" categories and expanded. The numbers in Table 9 were derived from the matched reports from the November and April FSA surveys. The percent change groups (left most column of the table) are based on reported data. The grouped November and April data were expanded based on the same expansion factor (April's) to eliminate any differences due to weighting and survey design. The difference between expanded April and November data was then calculated to determine each group's proportion of the total percent change from November. The goal of this analysis was to see if any group contributed more to the overall change in the expansion. Note that the total expanded planted acres for November *is not* the indication from the November FSA survey, since it only represents matched records which were weighted by the April expansion factors.

Table 8.

Reasons for Differences between November and April Responses

Reason	Number
The wrong tract level data was recorded in November	19
Planting intentions changed	9
One or more fields of wheat were excluded in November	9
Included only acres to be harvested, excluded acres for hay, grazing, etc	1
Estimated acreage in November	1
Forgot some acres in summer fallow	1
Tore up some acreage	1

This analysis (based only on matched records) indicates a 1.5 percent increase from November, contrary to the full direct comparison of November and April expanded data which indicated a 0.5 percent decrease. This difference, which is within the range of sampling variability, would appear to be due to the change in expansion factors from November to April. The positive-zero, zero-positive, and positive-positive categories all showed relatively the same amount of change, with the positive to zero group showing a decrease from November. The group contributing the most, in terms of absolute change, in the positive-positive category was the "> 25%" group. However, this group only contributed about 6% of the (November) total planted acreage as compared to 40% for the "< 5%" group.

Since the change from November was small to begin with, the above analysis was unable to provide much insight into the factors or type of reports contributing to the difference. Similar analyses were performed for matched DAS and MAS records for crop years 1994-1996. While matched responses were possible for all of the FSA tracts, this was not the case for QAS samples. Due to the rotation of replicates and other factors, less than 30 percent of the sample units in both the DAS and MAS were matched and usable (reported, non-estimated) for winter wheat planted acres. These matched records accounted for roughly 40 percent of the total planted acreage. Results on matched DAS and MAS reports were inconclusive and no obvious trends were discovered.

Table 9.

Proportion of Total Percent Change of Expanded Planted Acres Based on Grouping Matched Records by Percent Change of Reported Acres

	Matched Records	Nov Exp Acres	April Exp Acres	Change as a Percentage of Nov Total
No Change	**251**	**3,495,055**	**3,495,055**	0
Zero-Zero	89	0	0	0
Pos-Pos	162	3,495,055	3,495,055	0
Change	**297**	**7,692,029**	**7,861,742**	**1.52**
Pos-Zero	3	159,383	0	-1.42
Zero-Pos	7	0	167,022	1.49
Pos-Pos	287	7,532,646	7,694,720	1.45
%C≤5	*156*	*4,503,157*	*4,528,938*	*0.23*
5≤%C<10	*53*	*1,406,608*	*1,396,034*	*-0.09*
10≤%C<15	*23*	*459,289*	*451,298*	*-0.07*
15≤%C<20	*16*	*330,173*	*327,312*	*-0.03*
20≤%C<25	*7*	*158,305*	*161,518*	*0.03*
%C > 25	*32*	*675,113*	*829,621*	*1.38*
Total	**548**	**11,187,084**	**11,356,797**	**1.52**

Reporting Unit and Respondent Type Effects

Next, the reporting unit and respondent types for matched DAS and MAS records were analyzed by the above categories and percent change groups. Nothing unusual stood out. Table 10 shows that for crop year 1996, 85% of the matched, positive acreage reports showing differences involved the same reporting unit. Also, 80% of the reports with differences were for records in which the respondent type was the same. The positive to zero category contains 11 reports that reported positive data in December prior to being coded as "out of business" in March. Roughly 90% of the zero to positive changes involved the same reporting units and respondent types. Since they are relatively infrequent, changes in reporting unit and respondent type do not appear to be the driving force in differences between quarters.

CONCLUSIONS

The goal of this project was to study the problem of quarter-to-quarter reporting inconsistency for winter wheat planted acreage. Additional goals included producing State level indications for total winter wheat acreage planted and for the harvested to planted ratio. We also hoped to gain insight on whether questionnaire wording ("seeded" vs. "planted") or

Table 10.

Percent of Records with Same Reporting Unit and Respondent Type Matched DAS and QAS Records: Crop Years 1995 and 1996

	Dec95 - Mar96		Dec94-Mar95	
	% With Matching Reporting Unit	% With Matching Respondent Type	% With Matching Reporting Unit	% With Matching Respondent Type
No Change	**76**	**76**	**78**	**75**
Zero-Zero	64	64	70	65
Pos-Pos	89	91	86	86
Change	**82**	**80**	**80**	**81**
Zero-Pos	88	94	58	50
Pos-Zero	22	65	25	70
Pos-Pos	85	80	83	82
%C≤5	*80*	*78*	*89*	*86*
5≤%C<10	*91*	*85*	*84*	*88*
10≤%C<15	*87*	*79*	*84*	*84*
15≤%C<20	*90*	*80*	*78*	*69*
20≤%C<25	*85*	*92*	*78*	*78*
%C > 25	*85*	*78*	*78*	*77*
Total	**79**	**78**	**79**	**78**

reporting unit (FSA tract vs entire farm operation) plays a role in reporting consistency. Kansas was selected for this study because of its importance in winter wheat production and its participation in the 1995 FSA Coverage Research Project and the November 1995 study on the use of FSA tracts as a sampling frame for an acreage survey. The general implications of using a frame based on FSA tracts are not addressed here. Parsons (1996) and Benz (1996) discuss the advantages and disadvantages of using FSA data in their recent research reports.

There does appear to be considerable reporting inconsistency in QAS data for winter wheat acreage from December to March. There is also some quarter-to-quarter instability in the indication. This study has shown that reporting based on FSA tracts from a frame of certified FSA tracts has potential to both reduce the number and size of inconsistencies, and produce State level indications for total planted acreage comparable to QAS indications with a fraction of the sample size. However, it must be noted that not all states have the high coverage of FSA land in

farms that made Kansas a prime choice for the recent studies concerning FSA data.

Although the results were not overwhelming, they were encouraging. With only one study for comparison, it is difficult to say if more stable acreage estimates could be produced using a frame of FSA tracts, but the FSA approach deserves additional consideration. **Even though the point estimate for acreage planted was not significantly different for QAS and FSA data, reducing the reporting variability is advantageous in reducing our estimated "sampling variability".** Further research should be conducted before making any definite conclusions about using this approach and especially before trying to extend these results to States other than Kansas where coverage levels are not as high.

A new farm bill was recently implemented that affects the type of data that will be available in the future, with FSA data likely not being as complete. The current farm bill will be in effect for the next seven years, but could be revised. Benz (1996) recommended that if, in the future, FSA data become available again, another FSA tract wheat acreage survey be conducted, perhaps expanding to other states such as Oklahoma and Nebraska. If this should transpire, then a reinterview study such as this one would be a logical follow up.

Reporting was more consistent for winter wheat planted acreage between the November and April FSA surveys than between December and March QAS surveys. Matched records for FSA tracts showed almost the same rate of reporting changes from November to April as did matched records from December to March for QAS for the last three crop years. However, the magnitude of these changes, measured as a percentage change from previous survey, was much smaller. Reports for FSA tracts exhibited fewer large survey-to-survey changes and a higher frequency of small survey-to-survey changes than comparable DAS and MAS reporting. This could be due in part to a more stable reporting unit, FSA tract versus entire farm.

Unfortunately, not much insight on why differences occurred was gained through the reasons provided during the reconciliation process. Perhaps this was because too few differences were actually flagged, but it is questionable whether more flags would have resulted in more meaningful reasons. In general, I have observed from several reinterview studies that during the reconciliation process, when responses are compared and a difference occurs, that the reasons recorded are generally vague. This could be due to several reasons. The respondent may not want to take the time to determine the cause and just say "I don't know why", different people could have responded for the two surveys, it is easy to say that the previous number was recorded or reported incorrectly, or proper probing may not have been carried out by the enumerator.

Indications comparable to QAS results were produced for winter wheat planted and harvested acreage. Both the November and April indications based on FSA tracts were comparable to DAS and MAS indications. The FSA surveys, with only a fraction of the sample size of the DAS and MAS, produced estimates for total planted acres that were comparable in level

and precision to the quarterly surveys. There was essentially no change (0.5% decrease) in the level from November to April based on FSA reporting, compared to a 6.4% decrease from December to March for QAS data. Although this is only one study in one State, indications based on FSA tract reporting appeared to be quite stable and consistent across time.

One underlying issue that probably contributes to the change from December to March is land operation changes that occur prior to March. This would include selling or renting part of an operation, or an operation going out of business between December and March. Since the FSA tract remains a viable unit in spite of ownership changes, using the land area as a sampling unit would avoid instability in reporting that results from these types of changes.

The FSA tract is a viable reporting unit. Several results indicate that using a frame based on FSA tracts may be beneficial. First, only two percent of the April reinterview sample was considered not usable because respondents could not report for the sampled tract. Second, there was almost no change in the estimated total for winter wheat planted acreage between the November survey and the April reinterview study. Third, Benz (1996) found that farm operators thought reporting data for FSA tracts or FSA farms was easier and more accurate than reporting for an entire operation.

RECOMMENDATIONS

Continue to look at QAS data for sources of reporting inconsistency. This project dealt primarily with examining the level of reporting consistency that could be expected from data collected from a frame of FSA tracts. While some analyses involving QAS data were performed, there are possibilities for more research using the data that are available to us through the Agricultural Surveys in order to investigate the high level of reporting inconsistency and level change from December to March. Possible areas include effects from the mode of data collection, a more in-depth analysis of respondent effects, and the effects of imputation and estimation.

Use consistent wording in December and March when asking for winter wheat planted (seeded) acreage. There does not appear to be any reason why the DAS and MAS use different wording for collecting acreage data for winter wheat. Because there was no indication from the April reinterview study that the difference in wording was contributing to inconsistency, it is recommended that consistent wording be used in the future to avoid any confusion and to head off any future questions about the issue.

Monitor changes in the availability of farmer reported FSA acreage data that result from modifications in the Farm Bill. Due to provisions of the current Farm Bill, FSA data will likely not be as complete and usable as a sampling frame in the future. The situation could change again later on, in which case NASS should take another look at these data as a potential sampling frame.

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APPENDIX A: FORMULAS FOR ESTIMATING ACREAGE TOTALS AND VARIANCE

Acreage Estimates

The winter wheat planted and harvested acreage estimates were calculated as described in Kott's (1990) discussion on estimating totals for stratified samples.

$$Y = \sum_{h=1}^{H} Y_h \quad \text{where} \quad Y_h = a_h \sum_{i \in U_h} y_i$$

given

- H = number of stratum
- U_h = set of selected units with usable values in stratum h in April
- a_h = reweighted expansion factor (N^*_A/u_h) based on adjusted stratum level population counts, where N^*_A is the adjusted stratum population count as shown in Table 3 and u_h is the number of selected units with usable values for selected unit i
- y_i = value for selected unit i

Variance Estimates

The bootstrap technique is one method that can be used for estimating the sampling distribution of a parameter estimator $\hat{\theta}$. In this case, it is the variance of total winter wheat planted acreage (or the harvested to planted ratio) that needs to be estimated.

A brief description of how to produce a bootstrap estimate is given by Sarndal, Swensson, and Wretman (1992).

1) Using the sample data (n observations), construct an artificial population P^* of size n that mimics the true unknown population P.

2) Draw a series of independent samples from P* with replacement using the same sampling scheme that was used to draw the original sample. For each bootstrap sample, calculate an estimate $\hat{\theta}_a$ $(a = 1,2,\ldots,A)$ in the same way that $\hat{\theta}$ would be calculated.

3) The observed distribution of $\hat{\theta}^*_1, \ldots, \hat{\theta}^*_A$ is considered an "estimate" of the sampling distribution of the estimator $\hat{\theta}$ and $V(\hat{\theta})$ is estimated

by $\hat{V}_{BS} = \frac{1}{A-1} \sum_{a=1}^{A} (\hat{\theta}^*_a - \theta^*)^2$ where $\theta^* = \frac{1}{A} \sum_{a=1}^{A} \hat{\theta}^*_a$.

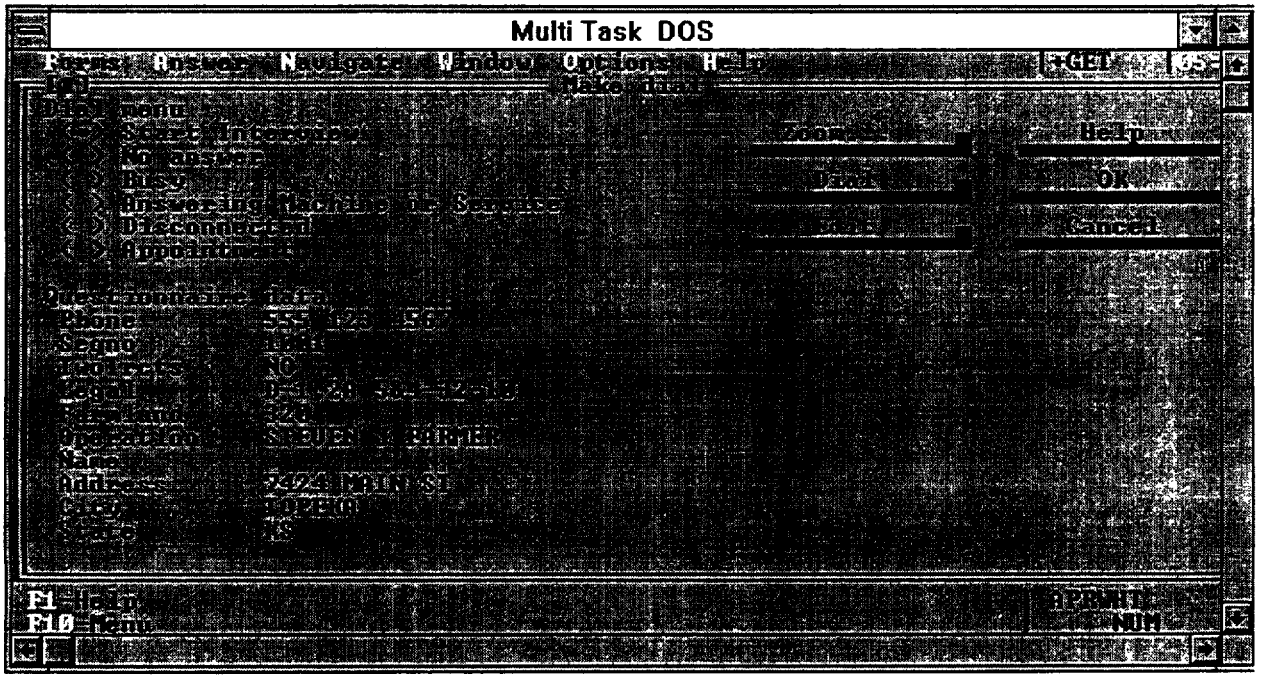
For this project, n=548 (the number of usable reports) with A=1000 bootstrap samples.

APPENDIX B: SCREENS FROM CATI REINTERVIEW INSTRUMENT

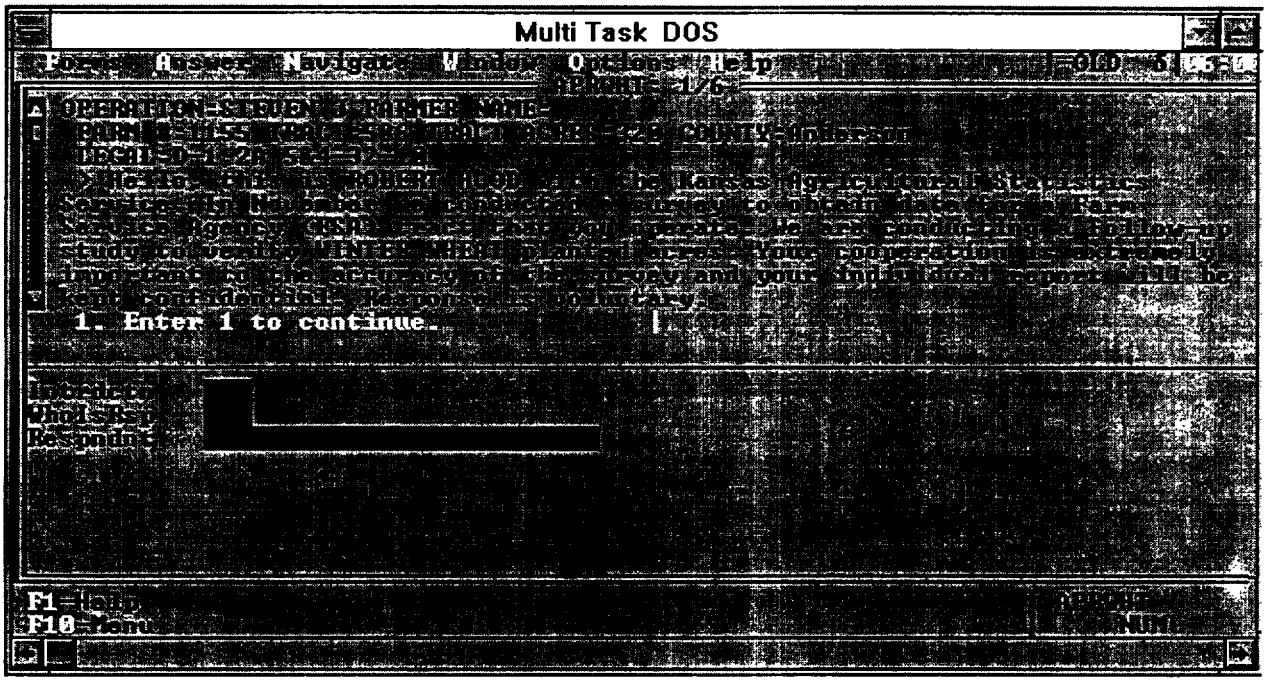
The Questionnaire

To collect the data for the April FSA Reinterview Project, a short CATI interview was conducted in which the enumerator confirmed the reporting unit and asked for the winter wheat planted and harvested acreage. The CATI instrument used data from the November FSA Tract Acreage Project to validate the current survey response. The respondent's April response was reviewed only when the November and April responses differ by more than a certain percentage, in which case the differences were reconciled, capturing the correct response and the reason for the difference.

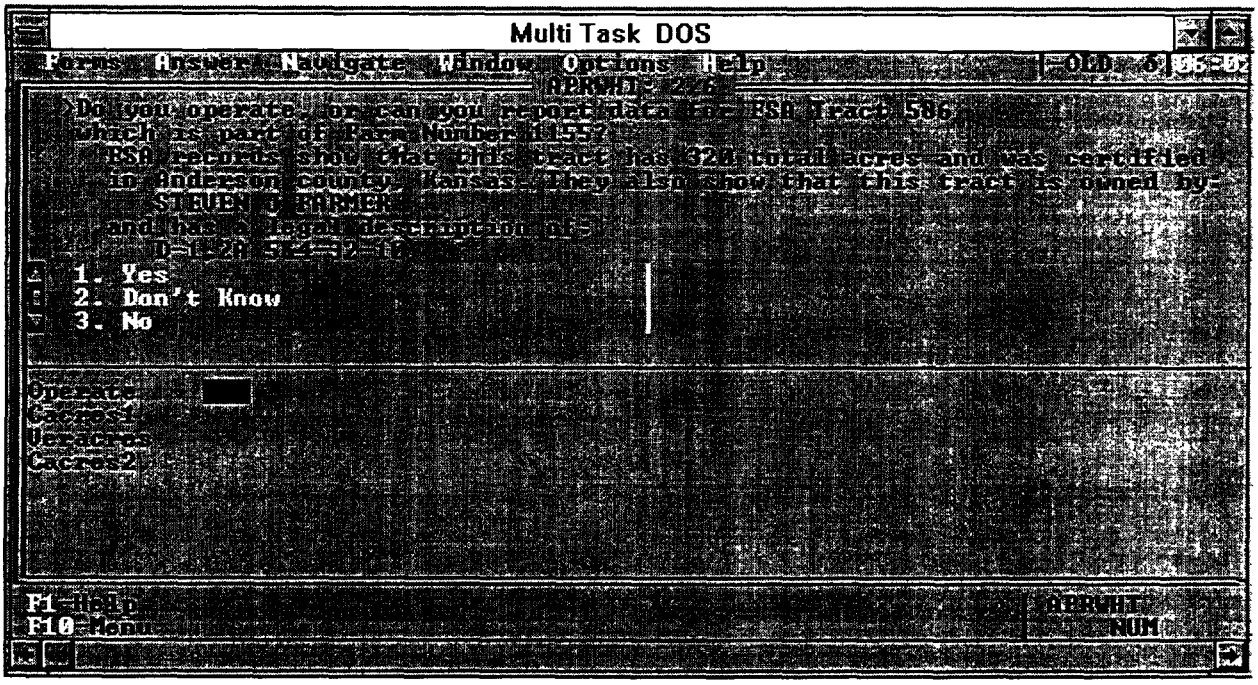
The Dial Menu shown below is a standard one used in Blaise CATI applications. Comments from the November survey can be viewed by scrolling down or by pressing <CTRL><ENTER> once the survey has started.



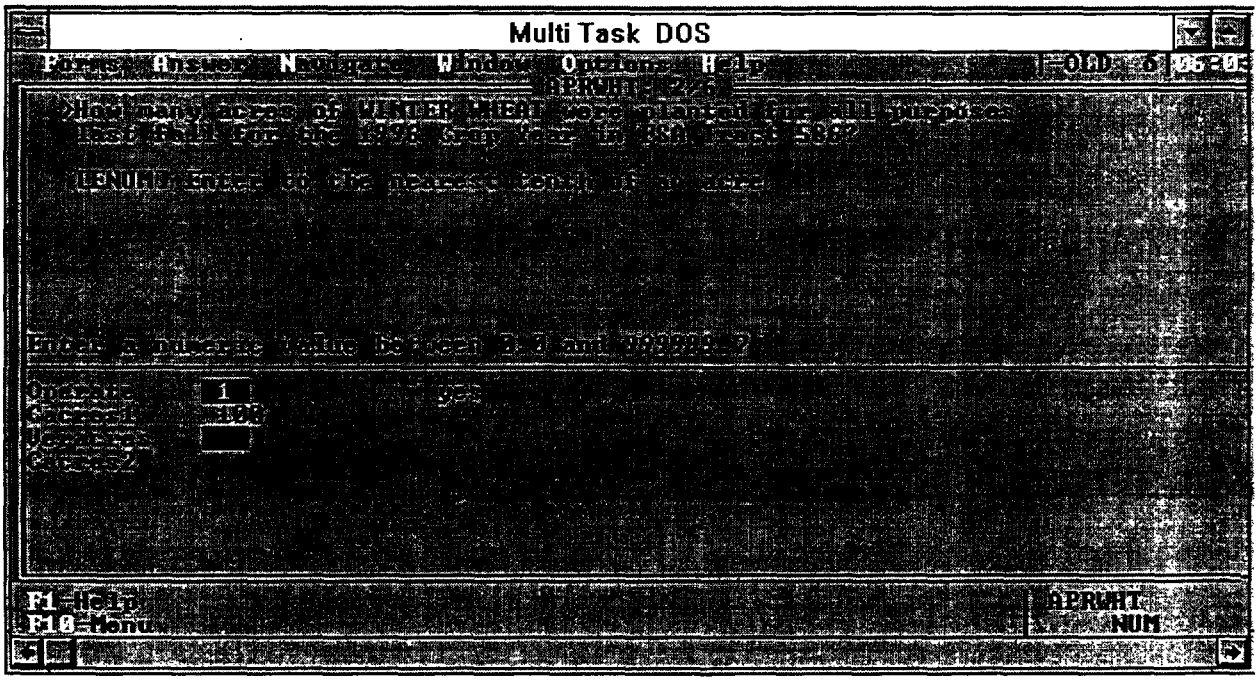
A standard introductory paragraph was provided to explain the purpose of the April reinterview survey to the respondent.



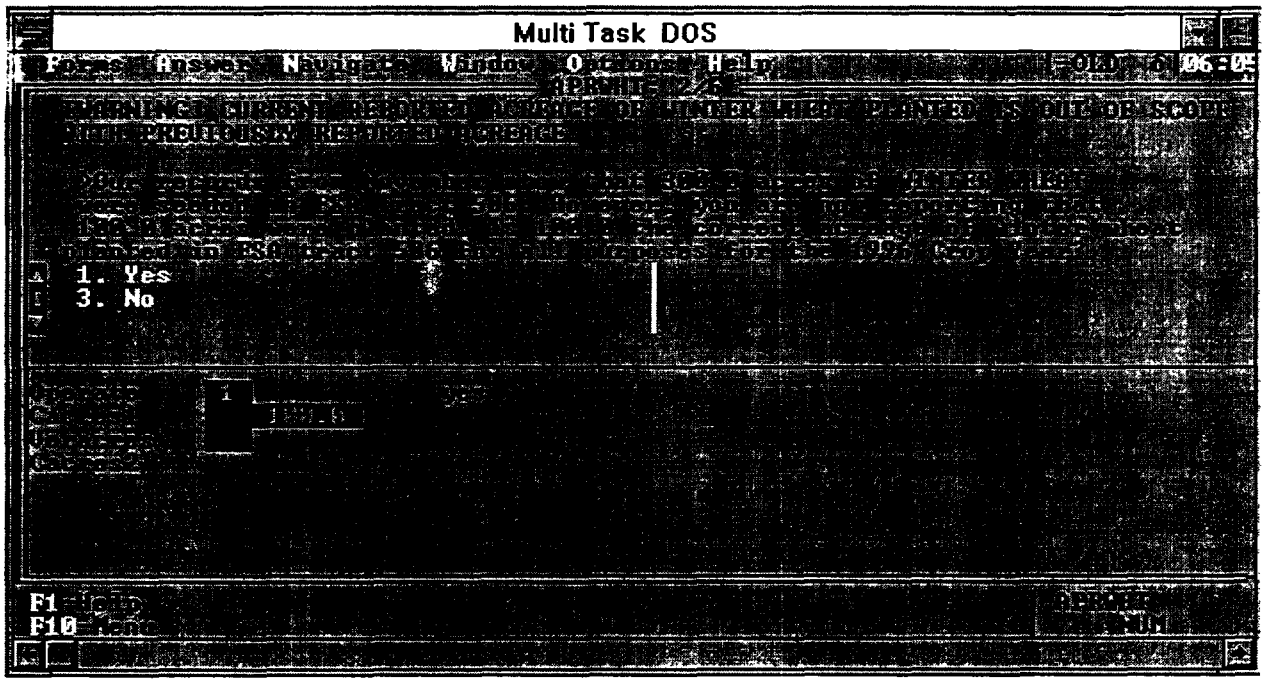
The next screen was used to determine if the respondent could report for the selected FSA tract. If the respondent no longer operated the FSA tract, but could report for the it, the interview was conducted. If the person no longer operated the FSA tract and could not report for it, or if the tract had been split, we did not require the enumerator to follow up on the new operator(s). In this case, 'NO' was entered and the interview was concluded. If the tract was split or was now operated by more than one person, the questionnaire was coded inaccessible. If the respondent could report for the tract, the reinterview proceeded, otherwise it was concluded.



The next screen contains the question for the number of winter wheat acres that were planted. Note that this question's wording followed the March Agricultural Survey wheat question. "Refusal" and "Don't Know" were allowed for this question. If the respondent could not report for the tract, the enumerator would go back and code the previous questions as either "No" or "Don't Know" and conclude the interview.



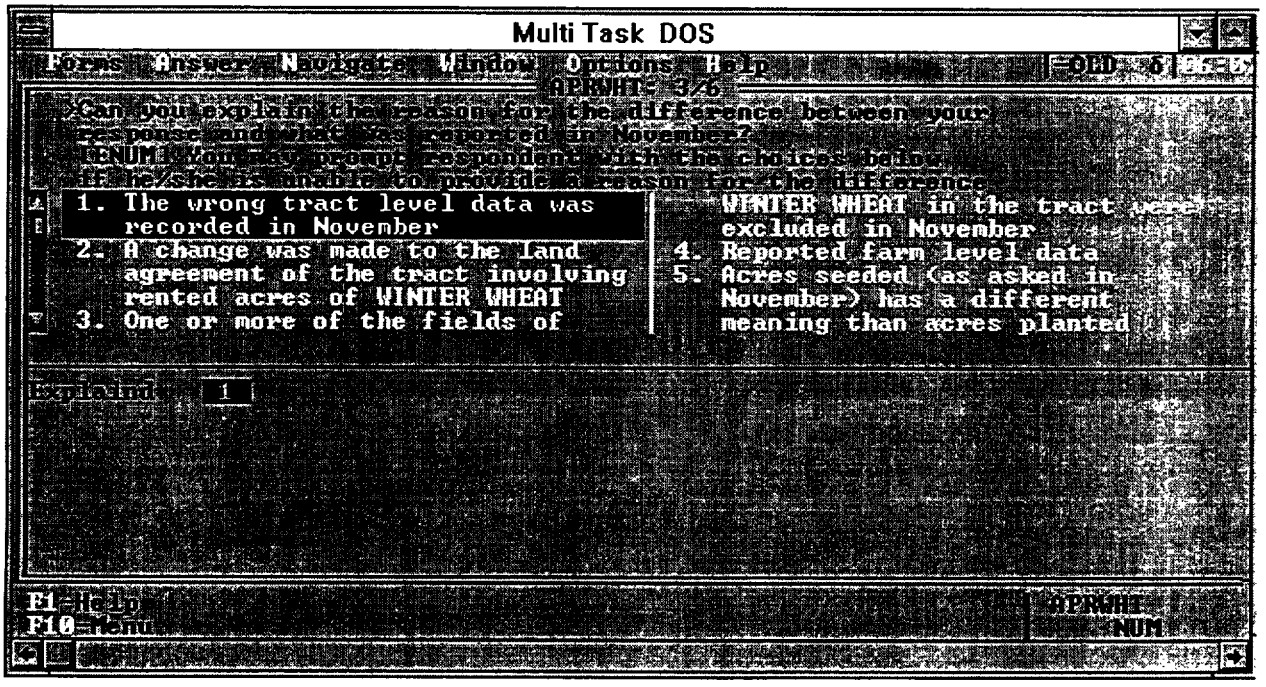
The current response was compared to the November response. If the responses were within a given percentage of each other, the instrument was routed to the next question. However, if the two responses differed by more than the preset range, the enumerator was instructed to reconcile the difference and obtain a reason, if possible, for the difference between the two responses.



Note: This question was asked only if April and November responses differed by more than a given percentage. If the respondent replied 'YES', the enumerator continued and obtained a reason for the difference. If the respondent replied 'NO', the instrument routed back to question 2, in which the acres planted question was re-asked.

Seven possible reasons were provided on the screen so that the enumerator had only have to enter the number corresponding to the reason, in the event that one of these reasons was supplied by the respondent. If the respondent gave a reason other than what was supplied, "8" was entered for "Other Explanation" and the reason was then entered by the enumerator. If the respondent was unable to provide a reason, the enumerator was instructed to prompt him/her with the following reasons which were provided on the screen.

a. The wrong tract level data was recorded.
b. A change was made to the land agreement of the tract involving rented acres
c. Reported farm level data.
d. One or more of the fields of winter wheat in the tract were excluded.
e. Acres seeded (as asked in November) has a different meaning than acres planted.
f. Included only acres to be harvested. Excluded acres for hay, grazing, etc.
g. Planting intentions changed.
h. Other explanation.



If planted acres was greater than zero, then the respondent was asked how many acres he intended to harvest. Harvested acres had to have been less than or equal to planted acres or an error would occur. A warning would appear if harvested acres was less than 25% of planted acres. The interview was then concluded after the response to the harvested acres question was recorded.