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Interviewing Non-respondents to a Mail Survey: An Experiment in Connection With April 1948 Farm Stocks Report¹

By J. C. Scholl and C. E. Burkhead

One of the most important aspects of the statistical-improvement work in the BAE is the measurement and the elimination, if possible, of any biases in the official estimates resulting from the use of mail surveys. This article reports on one of the attempts to deal with this problem.

ESTIMATES prepared by the Crop Reporting Board are recognized as generally reliable, especially where collateral check data are available. Such check data vary among the crops, but quantitative acreage and production bench marks for most crops are provided by the Federal Census of Agriculture every 5 years. One important series of estimates, stocks of grains on farms at specified dates, has not been supported by such collateral check data. Owing to the vital need for some objective test for ascertaining the reliability of estimates of stocks for the principal grain crops, a special survey, involving the interviewing of non-respondents, was conducted during April 1948.

The general schedule now provides the principal basis for preparing estimates of stocks on farms. Data collected in this way may contain some bias because of selectivity both in the list and in the response. A special study seemed appropriate in order to obtain information regarding the extent of bias, if any, resulting from each of these potential sources of selectivity.

It is felt that we have made a start toward checking some of our estimates, where bench marks are generally lacking, in an objective way and that we have established the feasibility of enumerating non-respondents for research purposes, but not necessarily for current estimates. The conclusions drawn in this report are based on a small number of non-respondents, perhaps too few, but the study does establish the fact that the

groundwork has been laid for making future surveys of this nature.

Plan

The problem was to measure the bias, if any, in the ratio of farm stocks to production as obtained by mail questionnaire. The procedure followed was to use a special schedule, containing questions regarding grain stocks comparable with those on the April 1948 general schedule, in each of the 25 States participating in the project (table 1). Ten of these States have an annual State assessors' census, from which names were systematically drawn for use in connection with the special schedule. In the remaining States other lists, which State statisticians had for other purposes, were used. The special schedules were mailed from field offices on approximately the same date as the general schedules. The information from the special schedules was transmitted to Washington with information collected from the general schedule. They were given little consideration when the April 1 official estimates were prepared because an analysis of the results could not be completed before the estimates were made. It did not appear desirable to disrupt the comparability with previous years until the results could be examined more carefully.

It was believed that a special survey of this kind would provide a check upon the present level of estimates of grain stocks as of April 1.

¹ The interviewing of the non-respondents entailed considerable effort on the part of the State Statisticians and their staffs; the authors wish to express their thanks for this help. Interviewing in Indiana was done by M. M. Justin, T. J. Kuzelka, and R. E. Straszheim; in Kansas by Rex G. Butler, W. G. Hill, R. R. Schlicht, and two hired enumerators; in North Carolina by Henry G. Brown, C. E. Burkhead, Ray B. Converse, W. C. Hinson, Jr., J. C. Scholl, O. Wakefield, and C. Z. Willis; and in Washington by H. N. Hadley, A. R. Larsen, H. C. R. Stewart, and J. C. Thompson.

A limited number of non-respondents were selected and interviewed in each of four States, Indiana, Kansas, North Carolina, and Washington. In addition, questions regarding six grain crops were asked in an interview survey of a cross-section sample of about 800 farms in Kansas, beginning about March 15. These various phases are discussed in more detail later in this report.

Results

Table 1 shows the percentage the April 1, 1948, grain stocks on farms were of the 1947 production as indicated by the special survey, together with the indications from the general schedule, for the grain crops in each State where the special survey

was made. The first 10 States in the table are those in which the special schedules were sent to an assessors' list. Averages for this group of States, weighted by 1947 production, are also shown, the general-schedule averages being higher in all cases than the special-survey indications. Table 1 also includes similar data for the remaining States, those in which the special schedule was sent to some list other than the assessors'. It appears that the general-schedule averages for this latter group of States also have an upward bias, compared with the special schedule. However, the difference between the special- and general-schedule averages were generally smaller for the group of States using "other lists" than for those using the assessors' list.

TABLE 1.—Reported grain stocks on farms as of Apr. 1, 1948, expressed as a percentage of 1947 production¹

State	Corn		Wheat		Oats		Barley		Rye		Soybeans		Flaxseed	
	a	b	a	b	a	b	a	b	a	b	a	b	a	b
Illinois	41.3	37.4	6.3	5.0	30.6	30.4	18.0	9.7	9.5	3.9	16.1	13.5	-----	-----
Indiana	41.2	39.0	8.7	6.4	33.0	30.5	28.4	² 8.9	16.0	5.9	15.7	14.0	-----	-----
Iowa	44.4	43.0	13.4	13.9	36.7	35.5	59.5	58.5	26.9	10.2	21.3	18.8	24.1	12.5
Kansas	35.2	30.2	22.4	17.3	32.5	28.5	33.6	22.3	11.3	17.3	18.8	17.5	5.2	5.8
Minnesota	36.4	36.2	30.2	28.5	36.3	33.7	22.4	19.8	7.3	12.1	17.7	15.1	21.8	16.2
Missouri	36.6	38.3	9.4	10.7	41.0	34.1	26.3	20.3	7.1	21.4	18.5	22.9	-----	-----
Nebraska	39.4	36.4	18.2	16.5	34.0	29.9	29.5	29.9	22.9	14.6	17.6	42.6	-----	-----
North Carolina	49.5	48.1	20.0	20.1	18.5	20.5	22.1	25.6	13.3	34.8	21.3	40.3	-----	-----
South Dakota	38.3	37.3	37.8	34.9	41.0	33.7	36.1	32.2	22.4	17.6	24.9	14.7	21.0	21.6
Wisconsin	34.8	32.7	42.7	44.9	37.8	33.7	20.1	19.0	26.5	30.0	32.1	25.0	31.5	46.8
Average 10 States	40.5	38.5	21.2	17.8	35.8	32.8	29.4	26.1	17.9	15.9	17.5	16.2	-----	-----
Arkansas	a 36.5	c 27.8	a 23.3	c 18.1	a 12.9	c 12.4	a 16.3	c -----	a -----	c -----	a 8.0	c 7.2	a -----	c -----
Delaware	35.2	34.3	9.1	13.7	11.6	10.8	15.2	19.6	7.8	0.1	28.9	26.8	-----	-----
Idaho	66.4	19.7	10.2	14.2	29.3	27.0	25.0	21.7	17.1	10.8	-----	-----	-----	-----
Kentucky	39.4	36.7	5.1	6.4	27.7	19.7	14.4	10.0	6.8	3.7	24.1	18.8	-----	-----
Maryland	32.5	34.9	8.3	8.2	30.4	25.4	18.0	17.3	9.5	8.6	26.1	22.2	-----	-----
Michigan	38.9	40.4	21.1	19.9	41.1	36.7	37.2	33.1	19.7	21.2	41.8	17.1	-----	-----
Montana	35.8	33.4	26.8	22.6	46.8	46.1	30.5	29.4	22.8	52.8	-----	-----	² 12.6	² 38.6
New York	37.2	35.1	21.2	19.3	41.0	34.0	41.5	39.8	16.4	.2	42.0	77.5	-----	-----
North Dakota	26.2	29.7	38.7	35.9	48.9	44.4	36.9	36.3	15.5	12.8	72.3	13.5	29.6	28.2
Oklahoma	24.5	23.0	9.7	8.1	21.9	21.7	25.5	32.2	7.6	5.6	² 18.1	² 35.4	-----	² 2.9
Oregon	30.5	29.6	8.5	7.7	30.1	28.6	12.7	16.3	26.8	² 31.3	-----	-----	-----	² 5.8
Pennsylvania	44.6	44.4	21.0	21.2	35.5	40.7	26.3	19.4	29.4	32.5	21.9	49.8	-----	-----
Tennessee	39.3	40.5	9.4	9.9	13.4	16.2	11.6	12.1	9.4	4.8	11.0	12.2	-----	-----
Texas	19.7	21.6	10.3	8.9	12.1	14.8	18.8	15.5	13.1	² 30.4	-----	-----	-----	² 4.1
Virginia	44.1	42.8	13.6	17.2	20.9	22.4	22.6	21.0	18.8	18.6	29.0	17.2	-----	-----
Average 15 States	36.3	35.7	20.1	18.5	33.6	32.0	29.9	29.0	16.2	16.6	21.4	16.1	-----	-----
Average all 25 States	39.6	37.9	20.6	18.2	35.3	32.6	29.7	27.7	17.2	16.2	17.7	16.1	-----	-----

a. April 1948 General Schedule.
 b. Assessors' list.
 c. "Other" lists used.

¹ Refers to mail surveys only.
² Straight average.

As the production of grains in the 25 States participating in the project represents most of the total of United States production in 1947, the averages obtained from the special schedule in these 25 States are assumed to approximate closely the national averages that would have been obtained had the survey been conducted in all 48 States. The special-schedule averages, which are shown at the bottom of table 1 for the 25 States combined, were lower for all commodities than were the averages from the general schedule.

In addition to the data for stocks provided by this survey, collateral data for stocks of wheat, corn, oats, sorghum grains, barley, and rye were obtained from questions included in the 800-farm interview survey conducted in Kansas during March 1948. Summaries have been prepared only for wheat, corn, and oats. The results of this interview survey are not entirely comparable with those obtained from either the special or the general schedules because a farmer was visited *before* April 1 and was asked to estimate the stocks he would have on his farm on April 1. In this particular survey in Kansas, stocks as a percentage of production were lower, for the three crops for which summaries have been prepared, than those reported on the general schedule.

Results of this study cannot be considered conclusive in establishing a quantitative measure of bias in the returns from the general schedule because of the small sample used in some States, the fact that the study covers only one quarterly period and other reasons. It appears that a bias exists in both reported stocks and in production but is more pronounced in regard to the stocks. Here it seems appropriate to point out the results of the January 1948 mail survey, in which the 15,000 farmers who had been interviewed during the January 1947 Enumerative Survey were sent a questionnaire that included questions on grain stocks on farms. About 7,400 of these questionnaires were returned. The stocks reported on hand as of January 1, 1948, as a percentage of 1947 production are in close agreement with those adopted by the Crop Reporting Board at the national level. Table 2 shows the results of this mailed questionnaire survey.

Based on what information we now have, it is possible that the bias in farm-stocks data obtained by mail is of a seasonal nature, being less for periods when farm stocks are highest and probably greater

TABLE 2—*Grain stocks on farms expressed as a percentage of 1947 production as of January 1, 1948*

Crop	Board	January 1948 mailed survey	
		Weighted by board production ¹	Weighted by sample-indicated production ²
	Percent	Percent	Percent
Corn.....	70	71	71
Wheat.....	31	28	30
Oats.....	61	60	58
Soybeans.....	28	28	28

¹ Survey stocks divided by production drawn from schedules usable for both items; those percentages weighted by States, using the Board's estimates of 1947 production.

² Per farm average of stocks and production expanded by Census number of farms, by States, to obtain total indicated stocks and production, from which the percentages were derived.

as we get further away from the harvest season. We have no conclusive proof that this is true but we have the results from this particular study and the indications from the January 1948 mail survey mentioned above. To substantiate this assumption fully we would need to have surveys for each quarter of a crop-marketing season and occasional repetition in other years would be necessary before these assumptions would be firmly enough established to be used in adjusting reported data.

It is possible that any bias that may exist in stocks data reported by general crop reporters is generally consistent from year to year. Previous surveys have indicated that this is true for other types of information obtained through the general schedule. Thus the percentage change may be properly reflected by the results obtained from the general schedule.

Enumeration of Non-Respondents

It has long been recognized that more information is needed about reporters who fail to return schedules. Such information would be helpful in evaluating data from the reporters who do respond. As a part of this over-all project, approximately 50 non-respondents to the general schedule and 50 non-respondents to the special schedule were interviewed in each of the States of Indiana, Kansas, and North Carolina. These States have an annual State assessors' census from

which the special survey lists were drawn. In addition, 34 general-schedule non-respondents were enumerated in the State of Washington.

These non-respondents were selected in the following way:

1. Non-respondents to the general schedule were selected for interviewing in 10 counties in each of the above 4 States. The counties were selected in such a way that those with the largest number of non-respondents had a proportionately greater chance of being selected. Similarly, 10 counties were selected for the interviewing of the special-survey non-respondents in the 3 States mentioned above. The groups of counties were selected independently and only 4 counties were drawn from which both general-schedule and special-schedule non-respondents were interviewed.

2. Five non-respondents and several alternates were drawn in each county selected under (1), using a method of systematic sampling beginning with a random start. In a few instances, the number of non-respondents (general schedule only) was inadequate for the purposes of making county selections so it was necessary to combine two or more counties into a "pseudo" county.

The selected non-respondents were interviewed and, among other items, stocks data comparable to those secured by mail from the special and general schedules were recorded. A summary of the data obtained by personal interview is shown, by States, in table 3, together with the data from reporters who replied to the mail inquiries (special and general schedules).

Farm-stocks data obtained from the interviewed non-respondents were usually lower than those obtained from the respondents to the general and special schedules. Some of this difference may be attributed to the fact that the non-respondents were interviewed several days or weeks *after* the mail surveys were over. Even though enumerators were specifically requested to obtain stocks on farms as of April 1, it is possible that in some cases stocks on hand at time of interview were given.

Results from the 34 non-respondents to the general schedule who were interviewed in Washington State are also shown in table 3. The special-schedule survey was not made in Washington State. Moreover, there are no annual assessor censuses there from which an assessors' list could be drawn. Because of these facts it was not possible to show the same comparative data for

Washington in table 3 as for the other three States. Therefore, the data for general-schedule respondents and non-respondents in Washington State are not included in the calculations upon which certain conclusions are made in this report. It should be noted, however, that stocks data for the 34 non-respondent farmers who were interviewed agree very closely with the reported data from the first mail response to the general schedule. But the eastern counties that were not enumerated could have influenced the results considerably because they constitute a heavy grain-producing area of Washington State.

Assuming that the general- and special-schedule non-respondents who were interviewed were representative of the entire group who did not respond, it may be concluded that the indications provided by mail contained an upward bias.

The assessors' list represented a systematically drawn sample from all of the farms in each of the three States. For the purpose of this study, it has been assumed that the results from the interviewed non-respondents can be considered representative of the entire non-respondent universe. Thus, "assessors' weighted" averages—obtained by weighting the percentage stocks on farms reported by the special-schedule (assessors' list) respondents and the interviewed non-respondents, by production weights for respondents and *all* non-respondents—should provide unbiased estimates of grain stocks on hand (percentage of previous year's production). These averages were more nearly in line with the results of the interviewed non-respondents because the non-respondent category had a much heavier weight in the computations.

Another series of indications obtained from this study in each of the three States was the "general weighted"—computed for the general schedule respondents and non-respondents in the same manner as described for the "assessors' weighted." Four indications were available for this study: (1) "assessors' weighted," computed as described, (2) "general weighted," computed as described, (3) as reported by respondents to the special mail survey, and (4) as reported by respondents to the general schedule.

Since the "assessors' weighted" averages are unbiased estimates, the departure of the (1) general (as reported), (2) "general weighted," and (3) assessors (as reported), from the "assessors' weighted" indicated the extent to which each

TABLE 3. — Grain stocks on farms April 1, 1948, expressed as percentage of 1947 production (as indicated by respondents to the general schedule, assessors' survey, and interviewed non-respondents from both surveys)

State	Corn	Wheat	Oats	Barley	Rye	Soybeans	Flaxseed
NORTH CAROLINA							
	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>
General ¹ -----	49.5	20.0	18.5	22.1	13.3	21.3	(²)
General ³ (N. R.)-----	43.8	16.9	9.6	8.1	6.0	43.6	(²)
Assessors ⁴ -----	48.1	20.1	20.5	25.6	34.8	40.3	(²)
Assessors ⁵ (N. R.)-----	39.2	17.9	5.9	.0	11.4	11.7	(²)
KANSAS							
General ¹ -----	35.2	22.4	32.5	33.6	11.3	18.8	5.2
General ³ (N. R.)-----	22.5	13.7	22.6	25.5	.0	5.5	.0
Assessors ⁴ -----	30.2	17.3	28.5	22.3	17.8	17.5	5.8
Assessors ⁵ (N. R.)-----	17.2	12.9	31.5	17.4	.0	.0	.0
Interview survey ⁶ -----	23.9	18.3	22.3				
INDIANA							
General ¹ -----	41.2	8.7	33.0	28.4	16.0	15.7	-----
General ³ (N. R.)-----	38.1	8.6	36.4	.0	7.4	8.6	-----
Assessors ⁴ -----	39.0	6.4	30.5	47.3	5.9	14.0	-----
Assessors ⁵ (N. R.)-----	39.7	5.9	27.4	.0	1.1	8.0	-----
WASHINGTON							
General ¹ -----	28.1	7.8	25.1	17.7	12.3	(²)	(²)
General ⁶ (N. R.)-----		7.7	25.2	19.3	-----	(²)	(²)

¹ Respondents to the general schedule.

² Not asked.

³ Interviewed non-respondents (general schedule).

⁴ Respondents to the assessors' list survey.

⁵ Interviewed non-respondents (assessors' list survey).

⁶ Kansas March 1948 enumerative survey.

varied from these unbiased estimates. These estimates are compared graphically in figure 1 for each of the three States where non-respondents in both surveys were interviewed. Most of these indications, especially the results from the general schedule (as reported), were higher than the "assessors' weighted."

It is realized that a comparison of these indications for such crops as barley and rye may not be reliable in some States where the percentage of all farms having these stocks is small. Mailed surveys may sometimes include a few non-representative farms in districts that are heavily weighted. Likewise, results that would be obtained if several interviewed non-respondents who have abnormally small (or large) quantities of grain stocks on hand are included would distort the averages and comparisons as used in this study. But the consistency with which the results of the general schedule, and to a less extent the assessors' survey, are above the "assessors' weighted" indications, appears significant. This apparent bias is already

being taken into consideration to some extent by the Crop Reporting Board when preparing its official estimates.

Operational Problems

One of the primary objectives of this study was to learn the operational difficulties and costs involved in conducting a survey of this kind, including the problems of locating non-respondents and reasons for non-response.

Little difficulty was encountered in locating non-respondents to the general schedule, as most of them were well-known farmers. Assessors' non-respondents were somewhat more difficult to locate. As the assessors' list used originally represented a selection from all farms in a State, the non-respondents from this list included some small and more-or-less unimportant farms, the operators of which were not very well known in their communities. Inquiries were made at stores, dwellings, and garages but the most effective method of locating the selected farms was to

COMPARISON OF ESTIMATES OF FARM STOCKS ON BASIS OF THE ASSESSORS, WEIGHTED BY NONRESPONDENTS (X)

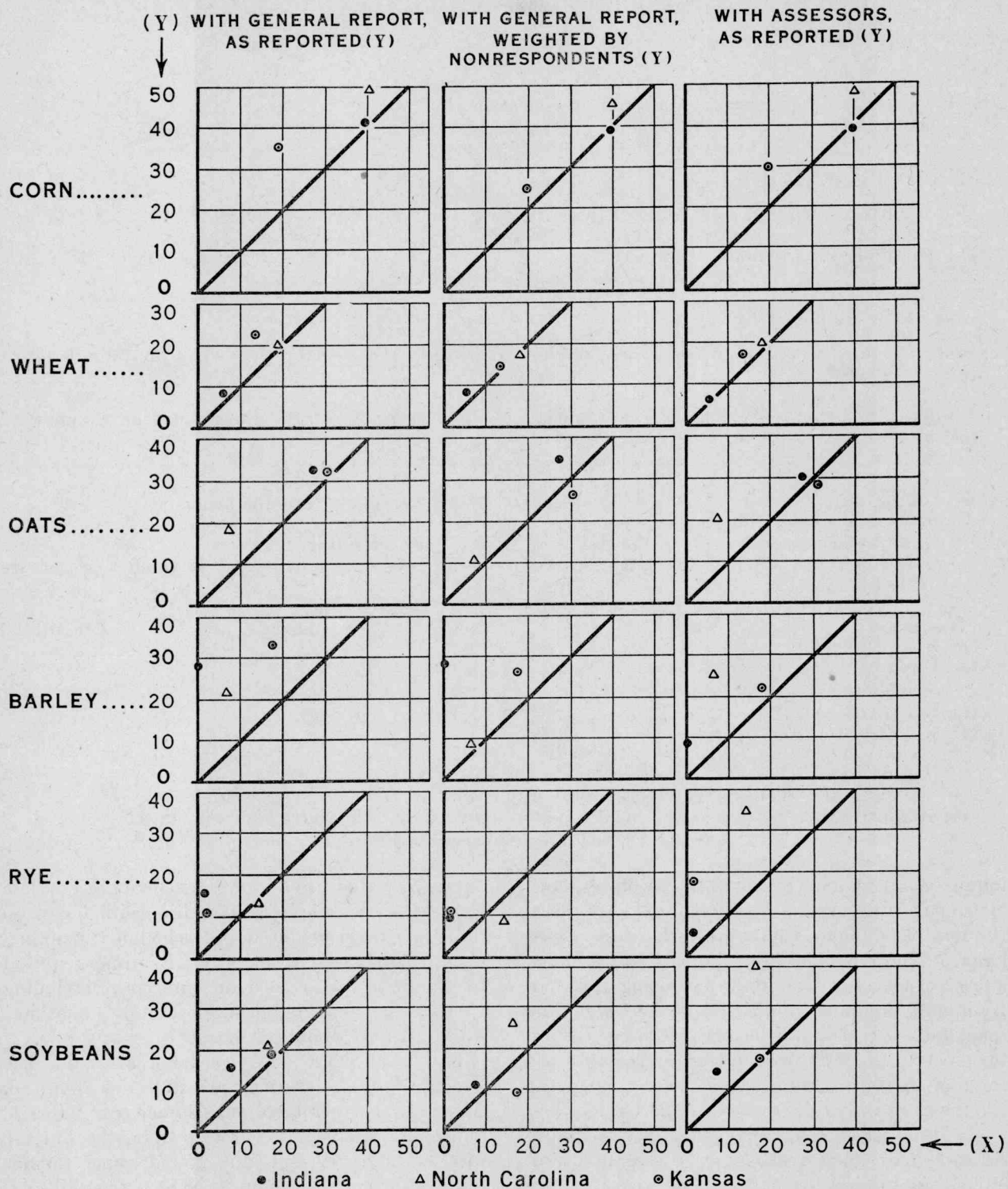


FIGURE 1.

APRIL 1948 SPECIAL INTERVIEW CHECK SHEET

(For use in interviewing nonrespondent reporters)

Name of reporter ----- Interviewer -----
 Time interview began ----- a. m. Ended ----- a. m. Date -----
 ----- p. m. ----- p. m. -----
 This is a general (assessors) reporter—check one.
 This (general) reporter returned ----- reports past year and ----- past 6 months.

ASK BEFORE SCHEDULE

1. We recently mailed you a schedule of this kind—we wondered if you received it?
 YES (Ask 2) NO (Explain and ask schedule)
2. Did you fill it out and mail it back to us? YES NO
 (Ask schedule data if answer is either yes or no)

ASK AFTER SCHEDULE

3. (Ask *only* those who did not return a schedule) Was there any special reason why you did not return the schedule? -----
4. (General reporters) Which of these questions do you think farmers find hardest to answer? (Why) -----

Now it's important for us to know a little about you and the farm you are operating.

5. About what year did you start operating this farm? -----
6. Do you own (check one): All part or none of this farm?
7. (General reporters) What is the total acreage in the farm you are now operating (including pasture and rented land)? ----- acres.
8. What do you get most of your cash farm income from? (Check one)
 Livestock Grain Truck Dairy Fruit
 Other (Explain) -----
9. (a) Have you a radio? YES NO
 (b) Telephone? YES NO
 (c) Electricity? YES NO
10. How old are you? ----- years.
11. (a) What was the last school you attended? (Check one):
 Grade High school College Other -----
 (b) (If grade school only) What was the last grade completed? ----- grade.
 (If attended high school or college) Did you graduate? YES NO

(Use the back of this sheet for recording comments of reporters interviewed)

inquire at Post Offices or county PMA offices, both of which were very cooperative. In most cases, the non-respondents who were to be interviewed lived on rural mail routes. Some of these lived along or near the road that was being traveled. By making frequent inquiries of farmers along the road for several miles before reaching certain towns as to the territory covered by rural routes, some of the farms were located before going into the towns in which the routes originated.

The number of interviews per day varied considerably for such reasons as travel involved, difficulties in locating farms, and weather. An

average of about five interviews (or one complete county) were completed per day, with 35 to 40 miles of travel required per schedule (including distance between counties). The time required to complete and record an interview, including time used for establishing friendly relations, averaged only about 21 minutes per schedule.

Based on what data we have at hand, the average cost per interview schedule was about \$6. This included per diem subsistence, car mileage, and equivalent salary of the people who did the interviewing. It does not include analysis nor duplicating costs. About 80 to 85 percent of total

time involved was spent in finding those to be interviewed and going from one county to another. These costs are based on a relatively small number of non-respondents. We believe the cost per schedule would drop considerably and the over-all operations would be greatly improved as the number of non-respondents interviewed is increased.

Additional data relating to size and type of farm, age and education of farmers, and other items were obtained from each non-respondent who was interviewed. These collateral data are not to be discussed in this paper but a copy of the check sheet used in interviewing and recording this type of information is included.

Conclusions

Non-respondents were generally cooperative in supplying information; some expressed regret for not having returned their schedules. Very few gave specific reasons why they failed to return them. The most frequent general reasons given were that they were too busy or that they overlooked the schedule or neglected to mail it. Less than 5 percent indicated that the reason for non-response was no grain stocks to report.

This particular study provides additional support for the assumption of many of our statisticians that general crop reporters represent a type of farmer that might be expected to retain a relatively larger proportion of grain stocks for home use. Thus, indications from this source may

contain an upward bias. Although the use of a more nearly representative list, such as the assessors' list, apparently eliminates some of the bias in results obtained by mail, the selectivity in the response to both the general schedule and the assessors' list apparently causes the mail returns to be biased in both cases. Consequently the use of representative lists alone is not sufficient to provide unbiased estimates without taking some account of the non-respondents to mail surveys.

The results from interviews with nonrespondents in the three States in which interviews were conducted, in relation to both the general and special surveys, indicate that the reported stocks on farms were generally higher than would have been the case had all schedules been returned. The "assessors' weighted" indication provided the basis for determining unbiased estimates; the accompanying chart shows the extent to which the mail surveys and "general weighted" indications departed from these estimates.

Although the study was of an exploratory nature, the feasibility of an approach of this kind was demonstrated. It is thought that the results obtained, relating to both grain stocks and collateral data, justified the time and relatively small cost involved.

It is believed that additional surveys of this kind, involving the interviewing of a larger number of non-respondents in more States, should be conducted in order that the conclusions of this particular survey may be more fully substantiated.