

SUMMARY OF RESULTS FROM  
NEBRASKA SURVEY CONCEPT STUDY

By

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### ACKNOWLEDGMENTS

A project of this magnitude required special effort of many people. The Nebraska SSO and their enumerators deserve special mention. The project succeeded primarily because of the enthusiasm and dedication of the enumerators in tackling a most difficult interviewing assignment. Our thanks to them all.

## INTRODUCTION

This paper is a summary of results from a case study of respondent nonsampling error conducted in Nebraska in June 1974. Data supplied by respondents for probability livestock surveys were examined for any departures from the survey concepts employed by the Statistical Reporting Service (SRS). The complete report from which this summary was compiled is entitled "Nebraska Survey Concept Study".

The June Enumerative Survey (JES) is the basic data collection instrument for major crop and livestock items. The survey provides estimates of crop acreages and livestock inventories at the State, Regional, and United States levels. Subsamples of farm operators identified during the June Enumerative Survey are contacted several times during a year for many items of interest. Another major use of the June Enumerative Survey is to provide a basis for estimating the incompleteness of list frames used in the multiple frame surveys.

Closely associated with the JES area frame is the use of a list frame in the Livestock Multiple Frame surveys. In spite of the differences in sampling frames, both survey procedures are faced with the problem of identifying a unique reporting unit. This becomes complicated when partnership arrangements are present. The reporting unit problem follows through to the estimation because it affects the identification of overlap units which arise from the joint use of both area and list sample frames.

Investigating the hypotheses associated with both the area and list frames necessitated that the survey be conducted in two parts. Part A related to the area frame and consisted of reinterviewing 193 JES tract operators immediately after the 1974 JES survey. Part B was an independent study to examine the concepts as applied to the list frame and relied upon interviews with 181 tract operators who were rotated out before the 1974 JES survey.

Nebraska was selected because the replicated sample design made it easy to subsample the JES. The tracts selected for both parts of the study were arranged by an index of size of livestock operation within land use stratum and replication. Non-ag tracts and tracts with livestock reported in 1973 were two of the sample strata. Extreme operator tracts comprised another stratum. The remaining tracts reporting zero livestock in June 1973 were divided into two strata based on whether or not they were designated as livestock farms on the multiple frame list. Those on the list with a high positive livestock index were put in one stratum while the nonoverlap tracts and tracts with zero or a small livestock index were put in another stratum.

A systematic sample was selected in each of the five livestock strata across land use strata.

To decrease time and cost, the Part A and Part B studies were conducted simultaneously between one and two weeks after the JES survey.

The two parts of the study required three different questionnaire versions. The questionnaires were designed to examine current area and multiple frame concepts and not as an alternative to the present questionnaires. Questionnaire A was used for Part A to reinterview JES respondents with more probing than the JES questionnaire. Questionnaire, B-1 and B-2 were used in Part B to simulate mail and interview versions of multiple frame livestock questionnaires.

### CONCEPTS AND RESULTS

The purpose of the research project was to examine in an exploratory fashion the current survey concepts and determine if the respondents were conforming to these concepts in reporting data. Hopefully the study would provide some insight into how and why reported data may vary from the carefully constructed theory and concepts of the SRS estimates program. Because of small net differences due to offsetting errors and corresponding large variation in paired observations, no statistically significant differences in acreage or livestock numbers resulted.

It was assumed in advance that the study was looking for fairly rare events with a relatively small number of observations. However, the fact that differences in concepts should be rare attaches a special significance to each case where the data do not agree with current concepts. Nonsampling errors relate to the accuracy of reported data and therefore to the level of the estimate rather than to the precision or variance of the estimate.

In obtaining data such as acres, hogs, cattle etc., it is nearly impossible to determine truth. Thus, in this report differences are discussed. One can normally assume in an interview situation that the second interview will provide more accurate data than the original due to a more detailed and probing type of interview. Following is summary table of the number of observations and differences between reported and reconciled data.

As can be observed from the tables, the number of differences is quite large in relative terms. However, the effects of the differences on the final estimate were generally quite small, implying that the errors were self balancing. The relatively large percent of differences is cause for alarm. This study represents a sample of one and it cannot be assumed that the balancing effect would be repeatable on subsequent surveys. In addition, if a change in concept or procedure is instituted which would effect only the positive or negative differences then the differences would not be self balancing and as a result, the bias in resulting estimates would be increased.

TABLE A--Number of Times Reported Data Differed From Reconciled Data, Survey Cconcept Study, June 1974

DIFFERENCES IN REPORTED DATA	TOTAL NUMBER OBSERVATIONS	NO. WITH ITEM OF INTEREST	NO. OF DIFFERENCES	NO. OF DIFF VS. ITEM OF INTEREST (%)
Hogs & Cattle inconsistent with land operated				
Part A before asking for land Reinterview vs. JES tract	198	165	17	10.3
Reinterview vs. JES farm	163	110	2	1.8
Part B self completed	62	60	2	3.3
	181	161	14	8.7
Part A Reinterview vs. JES <sup>1/</sup>				
Tract acres	163	163	24	14.7
Tract hogs	163	32	6	18.8
Tract cattle	163	110	24	21.8
Total farm acres (all)	163	163	52	31.9
Total farm acres (RFO)	62	62	21	33.9
Entire farm hogs	62	25	7	28.0
Entire farm cattle	62	60	22	36.7
NOL determination	198	22 <sup>2/</sup>	5	22.7
Tract/farm acres weight	198	165 <sup>3/</sup>	41	24.8
Part B Mail Ques. vs. Interview				
Total Acres	181	181	32	17.7
Total hogs	181	66	4	6.1
Total cattle	181	161	32	20.0

<sup>1/</sup> Differences due to all reasons except those caused by time of interviews.

<sup>2/</sup> Joint land arrangements

<sup>3/</sup> Reports having livestock for weighted estimate

## CONCEPT I - REPORTING UNIT VS. SAMPLING UNIT

The reporting unit for both the list and area frame units is land operated. All livestock, regardless of ownership, on all land operated at the time of the interview are to be reported. This information is obtained by asking detailed questions about the land operated followed by questions about livestock on these acres.

If the farm operators do not normally equate all the livestock in the operation with all the land operated then the respondent may be confused by this concept and report according to his own concept of livestock in his operation.

The first objective to study concept I was to determine what the respondent considered to be his land and livestock operation. This was accomplished in Part A by asking the respondent for livestock in his operation before asking land questions and then reconciling his concept with the current survey concept.

The second objective was to examine the accuracy of land and livestock data when they are obtained with a mail-type questionnaire and no enumerator assistance. This was done in Part B of the study.

The study resulted in the following observations:

1. A RESPONDENTS' NATURAL INCLINATION WAS TO REPORT HIS OWN LIVESTOCK ONLY, REGARDLESS OF WHERE THEY ARE LOCATED.  
It appears that this is his way of avoiding duplication between himself and another operator. Personal interviews in both parts of the study indicated ownership of the livestock is more important initially to the respondent than where they are located. Almost nine percent of all A questionnaires, livestock requested before land, and B-1 questionnaires having cattle contained errors in cattle vs. land operated. Many of these errors resulted from problems with cattle on a fee-per-head basis.
2. RESPONDENTS WERE NOT MAKING THE CONNECTION BETWEEN THE ACRES THEY REPORT AND THE NUMBER OF HEAD TO REPORT, I.E. THE REASON FOR COMPLETING THE LAND QUESTIONS WAS LOST. When the respondent completed a mail type livestock questionnaire on his own with land questions first, as was done in Part B of the study, there were almost as many reporting errors for livestock relative to land as resulted with Questionnaire A which had no lead-in questions about land before the livestock questions. Additional study on land questions was reported in "The Effect of Land Questions on the Multiple Frame Hog Survey" by Barry L. Ford, Sampling Studies Section, June 1975.
3. THE ENUMERATOR WAS THE DECIDING FACTOR IN WHETHER THE RESPONDENT CONSISTENTLY ADHERED TO THE SURVEY CONCEPT. The natural inclination to report only owned livestock described above in (1) and the problems of completing the questionnaire alone as discussed in (2) appeared to be controlled in the 1974 Nebraska June Enumerative Survey. Very few of the original JES reports in the sample were inconsistent with the "livestock or land operated" concept.

4. THERE WAS NO EVIDENCE THAT THE CURRENT PRACTICE OF TRYING TO ACCOUNT FOR EVERY ACRE OPERATED HELPED THE RESPONDENT REPORT LIVESTOCK ACCORDING TO THE ON-LAND-OPERATED CONCEPT. It may in fact confuse him or obscure the purpose of such questions. An accurate count of acres in the operation is important to livestock estimates only for the weighted segment approach currently used for nonoverlap tracts. Tract, farm and list frame estimates are dependent only upon accurate livestock counts for an operation regardless of the number of acres. It is, therefore, most important to impress upon the respondent, that all livestock on land he operates are to be reported. "Land Operated" should be more carefully explained than counted on a livestock questionnaire.

#### CONCEPT II - DEFINING THE OPERATION

The purpose here was to determine if the operation description sections of the area frame and list frame questionnaires provide all the information necessary to:

- a. associate individuals with operations
- b. detect joint land arrangements
- c. determine the operator
- d. determine valid partners to prorate list frame livestock data
- e. determine the overlap status of the reporting unit in the area frame

Failure in the above determinations can cause joint operations associated with resident farm operators to be missed, joint land operations to be treated as individual and vice versa, the wrong partner to be considered the operator, incorrect proration of list frame data leading to a bias in the multiple frame estimate and an inaccurate estimate of the nonoverlap domain.

Results concerning this second concept were:

1. The few errors in name spelling and addresses made on the JES questionnaire face page did not affect area frame data.
2. IF ENTIRE FARM ESTIMATES ARE MADE USING THE CONCEPT OF "SENIOR" OPERATOR FOR JOINT OPERATIONS THE QUESTIONS TO DETERMINE THE OPERATOR SHOULD BE EMPHASIZED. Neither the face page nor the operation description section in the JES give any guidance to the enumerator on whose name to record as "Name of Resident Operator" in joint land arrangements. This information is on page 5 of the 1974 JES enumerator manual but perhaps should become part of the questionnaire. One error of this type occurring in the study sample revealed 1000 acres and 514 head of cattle with an expansion factor of 166 were incorrectly included in the JES entire farm estimate under the current concept.

3. THE LIST FRAME QUESTIONNAIRES CONTAIN MORE MISLEADING INFORMATION ABOUT JOINT OPERATIONS THAN DOES THE AREA QUESTIONNAIRE. This study found a tendency for respondents to complete the mail questionnaire page on joint arrangements when further probing by the enumerator showed it was not really a partnership. The current procedure of dividing list questionnaire data by the reported number of partners resulted in a downward bias when people who were not partners in the land operated were listed.

#### CONCEPT III - NONOVERLAP DETERMINATION AND ESTIMATION

The nonoverlap domain is estimated by:

- a. prorating entire farm livestock into the tract by the proportion of tract acres to total acres (weighted segment approach)
- b. prorating these livestock between overlap and nonoverlap by the number of partners that are on the list frame (partial nonoverlap procedure)

Are the present procedures adequate to determine the nonoverlap domain?

1. **Weighted segment approach:** NO MATTER HOW WELL ENTIRE FARM LIVESTOCK ARE REPORTED, THE NUMBER SUMMARIZED DEPENDS UPON AN ACCURATE REPORT OF FARM ACRES FOR THE AREA FRAME WEIGHTED ESTIMATE. Errors in reporting entire farm acres can strongly affect livestock expansions where the number on the farm is weighted to a tract basis. Individual reports were altered considerably by correcting errors made in reported farm acres in the JES. More reporting errors were made concerning entire farm acreage than any other item. Accuracy in reported farm acres should be improved if the weighted estimate is to be used.
2. THE CURRENT NONOVERLAP PROCEDURE WAS DIFFICULT TO FOLLOW FOR CERTAIN "JOINT LAND ARRANGMENTS." The Sampling Studies Section felt there was more subjectivity in the overlap determination than is desirable in a probability survey. As a result, a six state study of alternative procedures was conducted and a new procedure recommended. The report on the nonoverlap study will soon be released.

## MISCELLANEOUS

Other observations made during the course of this study not specifically associated with the designated concepts include:

1. There were sizable changes in livestock inventories due to the one-to-two week time period between the JES and reinterview. This points out the importance of relating estimates to a given time period. Cattle multiple frame estimates could be affected since nonoverlap data and list frame cattle data are obtained in two different time periods.
2. There were 6 cases where respondents to the mailed questionnaire excluded calves still with the cows because they did not yet consider them as part of the inventory. This needs to be considered in the wording of the question on calves weighing less than 500 pounds.
3. No cases were discovered where hogs could move across tract boundaries into adjoining land. This study helped support the current procedure of not prorating for movement of hogs across tract boundaries. On the other hand, 14% of the tracts with cattle had movement across tract boundaries. Presently, the survey statistician prorates the cattle based upon acreage inside and outside the tract on which the cattle are permitted to move.

## POSSIBLE MODIFICATION IN CONCEPTS AND PROCEDURES

### FOR FUTURE SURVEYS

This study indicates respondents sometimes have difficulties in understanding the desired reporting unit. Although individual reports varied considerably from the SRS concept of the reporting unit, they differed in both directions and tended to offset one another. Guidance from enumerators was found to be important in insuring an estimate which conformed to current survey rules rather than an estimate which reflected the concepts of the respondent. The following ideas are offered for consideration.

1. Conduct a large scale study of the list frame to determine whether respondents to the mail, telephone, and personal interview procedures differ significantly in their adherence to current survey concepts. This study showed weakness in the data when the respondent completed a questionnaire on his own.
2. Develop and test questionnaire versions in an attempt to improve respondent understanding. Be more explicit on both the list and area frame questionnaires about the purpose of the land questions relative to livestock to be reported. Some way must be devised to explain that this is the method SRS uses to avoid duplication between respondents.
3. Alternative procedures should be studied to determine whether sketching parcels and completing a matrix of cells is necessary to determine the area frame acres operated.

4. Emphasize full name of operator and name of operation on the face page of both list and area questionnaires. Increase the emphasis on obtaining notes from enumerators and respondents. Several departures from survey concepts in this study were either discovered or explained by notes on the questionnaire.
  5. Clarify and simplify the operation description section for both the enumerator and the mail respondent.
    - a. Consider deleting the request for name and address of landlords and tenants in Section B of the JES questionnaire since it is not needed to conform to current survey concepts.
    - b. Consider including the questions from the enumerator's manual for determining the correct operator in the operation description section of the JES questionnaire. It is very important to the entire farm estimates.
  6. Conduct research for alternatives to the partial nonoverlap procedures currently used to estimate for the nonoverlap domain. One alternative would require that the partnership name be on the list to be overlap, otherwise it is a complete nonoverlap. This plan could be an improvement over the current procedure for the following reasons:
    - a. the dividing line between the overlap and nonoverlap domains becomes sharper and clearer since a reported name either matches the list of names (sampling units) or it does not;
    - b. this alternative is simpler and should therefore be more uniformly and consistently applied;
    - c. no partial or proration fractions need to be computed for either the area frame nonoverlap estimate or the list frame reports;
    - d. the list frame questionnaire can be structured for the respondent to report specifically for the name on the label (separate questionnaires may be desirable to mail to individual and joint names.);
    - e. automatic record linkage by computer becomes much easier and less costly.
  7. Use the area frame tract estimate for the nonoverlap domain instead of the weighted segment approach because: <sup>1/</sup>
    - a. the weighted estimate is dependent upon an accurate report of entire farm acres and this study indicates respondents have most difficulty in reporting total farm acres;
- 1/ This would necessitate estimating NOL calf crop and deaths with the entire farm estimator or obtaining these numbers for the tract.

- b. this study also indicates that respondents make more errors in reporting entire farm livestock than they do tract livestock;
  - c. observing or estimating entire farm acreage and livestock for nonrespondents is much more difficult than observing tract livestock;
  - d. the nonoverlap domain of the multiple frame estimate would be identical to the nonoverlap domain which comprises part of the total area frame tract estimate;
  - e. it simplifies data collection since no special instructions for nonoverlap tracts need be incorporated into the questionnaire.
8. Further study the effect of differences in estimates due to collecting data in different time periods since about 15% of the July 1 cattle estimate is based on data collected around June 1. Part A of this study showed large changes in inventory occurred on both the tract and farm in the one to two weeks following the JES survey period.
9. Do all proration of data by computer.
- a. Area frame data for the nonoverlap domain should be summarized automatically by multiplying reported data by a NOL code entered on the questionnaire.
  - b. Proration of livestock which can cross tract boundaries should be accomplished internally by the computer.
  - c. Enter the stratum code of the tract operator on the questionnaire instead of crossing out reported data. The list livestock stratum would be entered for overlap tracts and code 88 for nonoverlap tracts. Extreme operator data on the area questionnaire could be suppressed by the computer. This would permit exclusion of data for large operators through any stratum level desired and also permit the computation of a pure area frame estimate at the U.S. level. It would also permit full multiple frame estimators to be used at the stratum level.
  - d. List frame data to be prorated (in the absence of the proposed alternative NOL plan recommended in item 7 above) should also be accomplished by computer rather than adjusting reported data which is subject to human error. This could be done by supplying item codes for partnership land and livestock and entering the desired fraction to compute partnership data to add to the individual data.