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MULTIPLE FRAME LIVESTOCK SURVEYS

A COMPARISON OF AREA AND LIST SAMPLING

Fred Vogel

Ron Bosecker

Sample Survey Research Branch
Research Division
Statistical Reporting Service
U.S. Department of Agriculture
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CONTENTS

INTRODUCTION

Current indications of cattle and hog inventories are provided by the Livestock Multiple Frame surveys and the June and December Enumerative surveys. These surveys are based on probability sampling designs that should provide unbiased estimators for the universe of interest. In theory, the only difference that exists between these two survey indications is that caused by sampling variation. However, in practice the levels from these estimators are often farther apart than can be attributed to sampling variation alone.

Before initiating large scale research projects to examine the problem, it seemed advisable to analyze existing data. Data from the June 1973 Enumerative and Multiple Frame Hog and Cattle surveys in Nebraska were originally subjected to this analysis. The analysis was initiated with two basic objectives. The first objective was to compare the efficiency of the area and list frames in estimating for various size groups in the list frame and thus determine the optimum mix of the area and list sampling frames. The second objective was to identify some sources of nonsampling errors that might be contributing to the differences in livestock inventories obtained from the two surveys. The results of this analysis were published in March 1974 under the title "Analysis of 1973 Nebraska June Enumerative and Multiple Frame Survey Livestock Estimates - Reduced List Sample Concept."

Several States were contacted after the completion of the analysis of the Nebraska data and asked to submit data from the 1973 June Enumerative Survey for a similar review. This report summarizes results for the States that provided the additional information required. The extra effort from the participating States in providing input to this analysis is appreciated.

METHODS AND PROCEDURES

The original multiple frame direct expansion for the June and July hog and cattle surveys was based on a nonoverlap domain estimator computed as follows:

a. The "weighted segment" estimating procedure was used. With this procedure, entire farm data is collected for every tract designated as nonoverlap prior to the survey period. It is also collected for each tract that had a change in operation since the previous survey. A special "pink" questionnaire was used for nonresident operators fitting the above definitions. Entire farm data is then prorated into the tract using the ratio of tract acres to total acres in the farm.

b. Only nonoverlap tracts from nonrotated segments were used.

c. The sampling error for the nonoverlap domain was computed assuming all area tracts were in one stratum. The geographic or land use stratification in the area frame was ignored.

The summary procedures used to prepare data for States included in this report were somewhat different. The procedures follow:

a. The "tract" and "farm" methods of estimation for the area frame were used rather than the "weighted" procedure. This was necessary because entire farm data was not collected for tracts designated as overlap prior to the survey period and those in segments in the survey for the first time.

b. Every State except Indiana and Idaho determined the nonoverlap domain for the entire area frame.

c. Sampling errors were computed using the geographic or land use stratification built into the area sampling frame.

The different summary procedures used for this report compared to those used in the operational program should be considered in the analysis to follow.

The following summary steps were completed separately for cattle and hogs. Each State submitted keypunch cards for each overlap tract containing the segment-tract identification, the identification number of the name on the list that made the tract overlap, and the hog and cattle list stratum code belonging to each name. These cards were used to sort the 1973 June Enumerative Survey data into several domains. The first domain consisted of nonoverlap area tracts. Additional domains were constructed, each consisting of the area tracts that were overlap with a particular stratum on the list. The area frame was divided into as many domains as there were strata in the list frame, plus the nonoverlap domain.

Direct expansions and sampling errors were then computed for each domain using both tract and farm methods of estimation. The results provide a comparison of the area and list frame estimates by size groups as defined by the list frame strata.

The next part of the analysis was to determine the impact on the multiple frame direct expansion and its sampling error when the list frame was used to estimate for a smaller portion of the total inventory. This was accomplished by adding the area tracts identified as overlap for a particular stratum to the nonoverlap domain, eliminating that stratum from the list frame and recomputing the multiple frame estimate. Additional list strata were added to the nonoverlap domain one at a time and the multiple frame estimate recomputed. The multiple frame estimates were computed using both "tract" and "farm" methods of estimation for the nonoverlap domain. The results allow a comparison of direct expansions and sampling errors with the original multiple frame estimate as the list frame becomes smaller and the nonoverlap domain becomes larger.

ANALYSIS

Tables 1 and 2 in the appendix compare by State the direct expansions and relative sampling errors (CV) of the nonoverlap domain using the weighted procedure versus the tract and farm estimating procedure.

The weighted segment estimator usually has a smaller sampling error for a given sample size than do the other estimators. However, the summary procedures used for this report shows that the CV of the tract estimate of the nonoverlap domain compares favorably with that of the weighted estimate.

The tract estimator is based on a larger sample in most States; however, it is utilizing all data that is available at the end of the survey. The computation of the sampling errors utilizing the area frame stratification is a mechanical process that does not affect survey procedures. The additional work caused by using the entire area frame for nonoverlap determination may be offset by not having to collect entire farm data for nonresident tracts.

Tables for each State included in the analysis are also in the appendix. The first table for each State shows a step-by-step comparison of the multiple frame direct expansion and its sampling error as the list frame became smaller and the area frame nonoverlap domain estimated for a larger portion of the total inventory.

The analysis shows in several instances that sampling errors in the June Multiple Frame Hog Survey and July Cattle Survey do not change appreciably if the area frame is used to estimate for strata such as no livestock or livestock unknown. The same holds true for some of the smaller size groups. In other words, sample sizes from the list frame could be reduced by not sampling the no livestock, livestock unknown, and small livestock list strata.

The third table in the appendix for each State compares the list, tract, and farm estimates on a size group (list stratum) basis. Results for States included in this analysis were combined to determine the net effect of not sampling the smaller list strata but allowing the area nonoverlap domain to estimate for a larger portion of the livestock inventory. These results with Board comparisons are shown in the following tables.

Table A--Multiple frame direct expansions, relative sampling errors, and list frame universe and sample sizes - June 1973 Hog Multiple Frame Survey, Nebraska, Indiana, South Dakota, Illinois, Kentucky, combined

Estimates	Direct expansion	CV	N	n
	(000)			
Entire list	17,164.0 1/	3.0	421,094	8,660
	17,470.2 2/	3.1		
Small size strata deleted	17,575.0 2/	3.6	78,015	4,375
Board	18,447			

1/ Weighted segment estimate of the nonoverlap domain not using geographic stratification.

2/ Tract estimate of nonoverlap domain using geographic stratification and the entire area frame in South Dakota, Illinois and Kentucky.

Table B--Multiple frame direct expansions, relative sampling errors, and list frame universe and sample sizes - June 1973 Cattle Multiple Frame Survey, Nebraska, Indiana, South Dakota, Colorado, Illinois, North Dakota, Idaho, Kentucky, combined

Estimates	Direct expansion	CV	N	n
	(000)			
Entire list	32,242 1/	1.8	498,000	12,601
	32,971.7 2/	1.6		
Small size strata deleted	31,945.1 2/	1.9	78,000	5,538
Board	30,176			

1/ Weighted segment estimate of the nonoverlap domain not using geographic stratification.

2/ Tract estimate of nonoverlap domain using geographic stratification and entire area frame in Colorado, North Dakota, South Dakota, Illinois and Kentucky.

FIGURE 1

A Comparison of Survey Estimates (1973 JES Tract and Farm Indications and June 1973 Multiple Frame Indications, Entire Sample and Reduced Sample) of Hog and Pig Inventories in Selected States

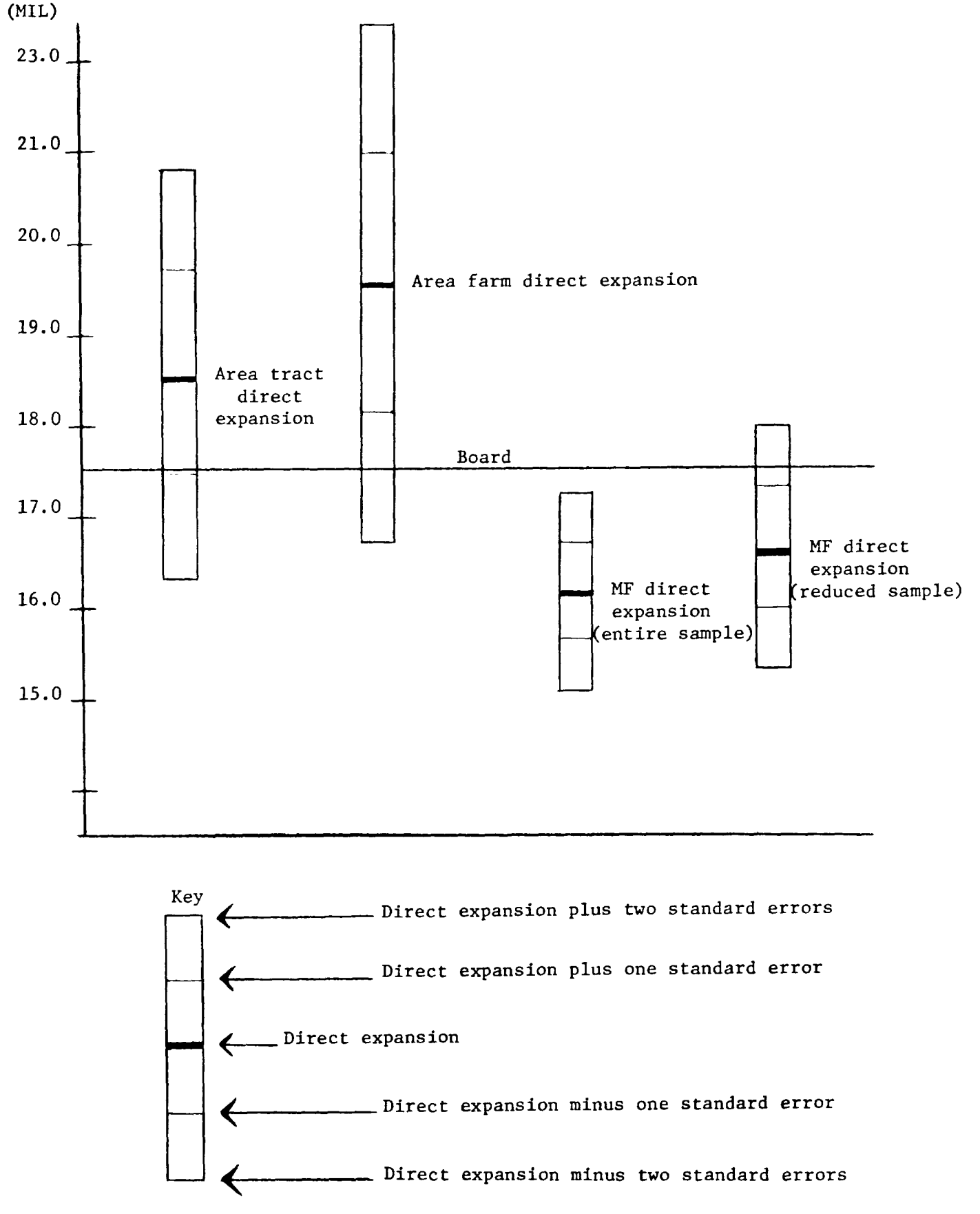
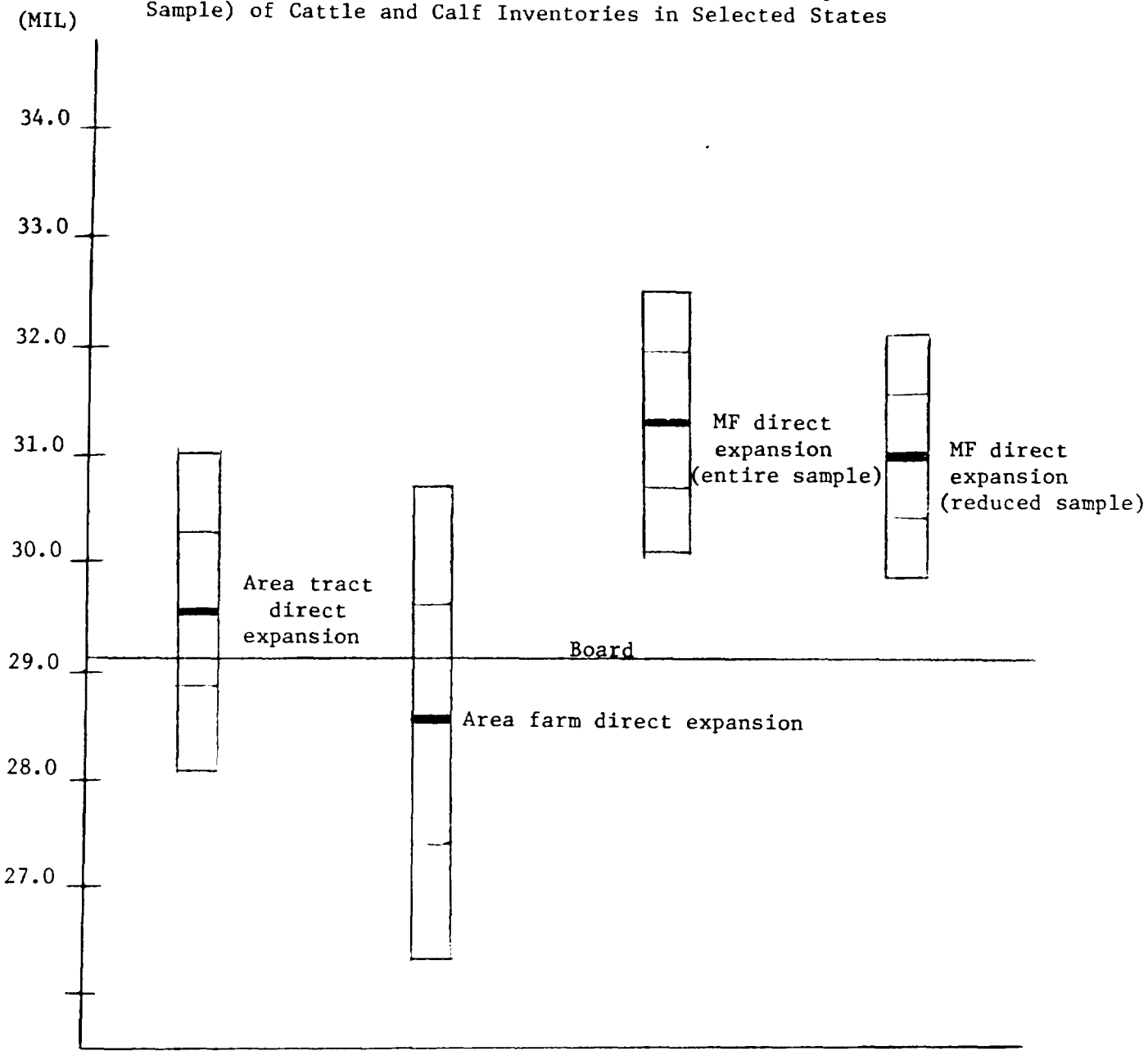


FIGURE 2

A Comparison of Survey Estimates (1973 JES Tract and Farm Indications and June 1973 Multiple Frame Indications, Entire Sample and Reduced Sample) of Cattle and Calf Inventories in Selected States



The effect of the different summary procedures was to increase the relative sampling error for hogs from 3.0 to 3.1 percent while for cattle it decreased from 1.8 to 1.6 percent.

The preceding data also shows that the total list sample size for hogs in the States considered could be reduced by about 50 percent and result in an increase in the relative standard error from 3.1 to 3.6 percent. For cattle in eight States, the list sample size could be reduced 56 percent and result in an increase in the relative standard error from 1.6 to 1.9 percent. That is, the increase in error is less than would be expected by reducing the sample size in half.

Because of the level differences in the current estimators, the Board relies most heavily on the enumerative survey estimators for current national and regional estimates. Enumerative survey data for the 48 States have been available since 1964 and have provided consistent indications for national and regional estimates. Additional information such as slaughter, previous inventory classification, and historic survey and slaughter relationships are used in reviewing the official estimates. If the level of the estimator is not acceptable, corrective steps should be taken. However, until the corrective steps are identified a trend between Board level and the survey indications should establish itself. Any time the questionnaire, survey procedures, or sample design changes, there is a possibility that the level of the estimator may change and thus distort historic relationships. Thus, the preceding figures comparing the tract, farm, original multiple frame, the multiple frame with small size strata not sampled, and Board action were constructed to visually determine if a change in the number of list strata sampled would affect Board action.

Figures 1 and 2 indicate the Board analysis and resulting estimate would probably not have been affected by not sampling the smaller list strata in these States in June 1973.

NONSAMPLING ERRORS

Several sources of nonsampling errors were identified. Most of them were identified by the State offices when they were preparing the data. Other sources were identified during the course of the analysis. The survey statistician has a tremendous burden with presurvey preparations and the operation of the survey in a short time period. The sources of nonsampling errors that were identified were of the type that can be magnified by the pressures of completing the job on time. The nonsampling errors that were identified follow:

1. To provide the information needed for the analysis, it was necessary to supply additional information for each overlap tract such as the identification number of the name on the list that made the area tract overlap. In other words, if a tract was coded overlap, there was a

name somewhere on the list associated with the area tract. The name, originally coded overlap, was sometimes difficult to find on the list. Nearly every State identified some errors resulting in additional nonoverlap tracts. This is a source of nonsampling error which resulted in raising the level of the multiple frame estimate.

2. Another problem concerned accounting of nonoverlap tracts. After a set of tracts was determined to be nonoverlap, some were not processed due to various reasons, mainly oversights. The inclusion of the omitted tract had an upward effect on the original multiple frame estimate.

3. The sampling frame used to identify nonoverlap was different from the sample frame from which the list sample was selected. For example, the alpha printout of the list frame contained names that did not have a chance to be selected by the sample select program. To the extent that this occurred, the resulting multiple frame estimate was biased downward.

4. Another nonsampling error was the inclusion of data for extreme operators in the JES area frame which should have been edited out. This resulted in the tract and farm estimate being biased upward.

CONCLUSIONS

1. The level and precision of the multiple frame estimate would not be seriously affected by not sampling the small size group list strata but allowing the nonoverlap domain to estimate for a larger portion of the inventory.

2. Board action in the States considered in this analysis would not have been substantially different if the small list strata were not sampled.

3. The relatively small decrease in sampling error obtained in the multiple frame estimate by allocating 50 percent of the hog sample and 56 percent of the cattle sample to the zero or small size group list strata is not providing a better estimate to the extent expected from the increased sample size.

4. In order to calculate the weighted estimate for the nonoverlap portion of the multiple frame estimator, additional data on entire farm hogs and cattle must be obtained during the interview. The additional information will normally result in a lower standard error of the estimate. Under the current summarization procedures the efficiency gained by using the weighted estimator is minimized by not using the land use stratification in calculating the standard error of the nonoverlap estimator.

5. The tract estimator of the nonoverlap domain using all available data and the stratification inherent in the area frame does as well or better than the weighted estimator as now computed.

6. Nonsampling errors detected in this analysis reduced the difference in levels of the multiple frame and area frame estimates by lowering the area frame estimates and raising the multiple frame estimates.

Perhaps a better job could be accomplished by working with a smaller list of larger operations. This does not in any way decrease the need for an effective farm directory but does suggest the major gain in estimation of hogs and cattle will be due to sampling the larger operations. A complete farm directory with control or classification data available for every name will meet the criteria for efficient list frame sampling. It should also contain suitable control information for crops and other economic variables needed for surveys. However, this does not mean the entire directory should be used for any given survey. For example, when conducting a hog survey, this does not mean the entire farm directory should be used as sampling frame. It may be more efficient to classify a certain portion of a list as hog operators and use only that portion in the Multiple Frame Hog Survey. The area frame would provide an estimate of the part of the directory not used. This could provide additional resources for improved list building and updating activities.

RECOMMENDATION

It is recommended an analysis program be prepared to continue the analysis presented in this report. A code box was placed on the front of the 1974 enumerative questionnaire for this purpose. We hope most States utilize the code box for both internal office control as well as making possible continued analysis.

APPENDIX

APPENDIX (Con.)

Table 1--Nonoverlap estimates obtained by different estimating procedures - June 1973 Hog Multiple Frame surveys in selected States

State	Weighted estimates 1/		Tract estimates 2/		Farm estimates 2/	
	DE	CV	DE	CV	DE	CV
	(000)	(%)	(000)	(%)	(000)	(%)
Nebraska	441.5	18.5	470.1	20.7	517.2	20.0
Indiana	484.0	24.7	452.8	34.7	414	37.5
South Dakota	105.1	36.7	158.7 3/	31.6	121.2 3/	35.3
Illinois	812.7	25.8	1,041.0 3/	33.5	1,384.0 3/	36.4
Kentucky	207.0	18.8	234.1 3/	23.2	315.1 3/	33.2
Total	2,050.3	23.8	2,356.7	30.0	2,751.5	33.1

1/ All nonoverlap tracts grouped into one stratum and summarized.

2/ Nonoverlap tracts summarized by JES district.

3/ Analysis based on all segments instead of only those not rotated.

Table 2--Nonoverlap estimates obtained by different estimating procedures - June 1973 Cattle Multiple Frame surveys in selected States

State	Weighted estimates 1/		Tract estimates 2/		Farm estimates 2/	
	DE	CV	DE	CV	DE	CV
	(000)	(%)	(000)	(%)	(000)	(%)
Idaho	829.3	36.9	962.8	20.2	903.8	19.0
Colorado	506.8	42.4	463.3 3/	18.2	556.0 3/	19.7
Nebraska	1,398.6	9.7	1,661.3	12.9	1,370.9	24.8
Indiana	491.9	19.0	646.4	25.4	602.8	24.3
North Dakota	147	26.7	144.3 3/	29.4	59.6 3/	46.6
South Dakota	592.2	32.2	442.3 3/	17.8	353.8 3/	41.6
Illinois	295.2	19.7	480.0 3/	17.5	358.5 3/	24.5
Kentucky	606.6	8.8	796.7 3/	9.4	792.9 3/	13.9
Total	4,867.6	22.4	5,597.1	16.7	4,998.3	22.8

1/ All nonoverlap tracts grouped into one stratum and summarized.

2/ Nonoverlap tracts summarized by JES district.

3/ Analysis based on all segments instead of only those not rotated.

Table 3--Summary of estimates as list becomes smaller - Indiana 1973 JES and Multiple Frame hog and pig estimates

Multiple frame	Direct expansions using tract and farm estimates of nonoverlap domain						Universe and sample size	
	Tract			Farm			N	n
	DE	SE	CV	DE	SE	CV		
	(000)	(000)	(%)	(000)	(000)	(%)		
List (Orig.)	3,711.3	202.8	5.5	3,711.3	202.8	5.5	84,010	1,573
NOL "	452.8	157.1	34.7	414.0	155.3	37.5	-	189
Total "	4,164.1	256.5	6.2	4,125.3	255.4	6.2		
List-Str. 1	3,290.3	181.2	5.5	3,290.3	181.2	5.5	50,656	957
NOL+Str. 1	1,308.7	598.9	45.8(29.2)	1,113.8	603.3	54.2(32.4)	-	295
Total 1/	4,599.0	625.7	13.6(7.0)	4,404.1	629.9	14.3(6.5)		
List-Str. 1,2	3,244.4	179.3	5.5	3,244.4	179.3	5.5	32,603	830
NOL+Str. 1,2	1,448.2	608.5	42.0	1,251.2	614.0	49.1	-	378
Total	4,692.6	634.4	13.5	4,495.6	639.6	14.2		
List-Str. 1-4	2,783.4	123.3	4.4	2,783.4	123.3	4.4	23,517	712
NOL+Str. 1-4	1,453.5	608.5	41.9	1,295.7	614.8	47.5	-	417
Total	4,236.9	620.9	14.7	4,079.1	627.0	15.4		
List-Str. 1-5	1,868.7	84.4	4.5	1,868.7	84.0	4.5	6,447	367
NOL+Str. 1-5	2,773.8	691.1	24.9	2,147.6	658.0	30.6	-	506
Total	4,642.5	696.2	15.0	4,016.3	663.4	16.5		
List-Str. 1-6	1,306.6	58.2	4.5	1,306.6	58.2	4.5	3,189	251
NOL+Str. 1-6	3,493.6	756.9	21.7	3,113.4	769.8	24.7	-	528
Total	4,800.2	759.1	15.8	4,420.0	772.0	17.5		
List-Str. 1-7	763.4	45.1	5.9	763.4	45.1	5.9	1,150	141
NOL+Str. 1-7	4,379.1	981.9	22.4	3,934.2	995.3	25.3	-	546
Total	5,142.5	982.9	19.1	4,697.6	996.3	21.2		
List-Str. 1-8 (EO)	405.9	29.8	7.3	405.9	29.8	7.3	303	75
NOL+Str. 1-8	4,727.9	1,011.0	21.4	4,190.1	1,024.7	24.5	-	556
Total	5,133.8	1,011.4	19.7	4,596.0	1,025.1	22.3		

1/ Figures in parenthesis show the effect of excluding one outlier report.

Table 4--Summary of estimates as list becomes smaller - Indiana 1973 JES and Multiple Frame cattle and calf estimates

Multiple frame	Direct expansions using tract and farm estimates of nonoverlap domain						Universe and sample sizes	
	Tract			Farm			N	n
	DE	SE	CV	DE	SE	CV		
	(000)	(000)	(%)	(000)	(000)	(%)		
List (Orig.)	1,754.7	88.5	5.0	1,754.7	88.5	5.0	83,938	1,645
NOL "	646.4	163.9	25.4	602.8	146.2	24.3	-	189
Total "	2,401.1	186.3	7.8	2,357.5	170.9	7.2		
List-Str. 1	1,529.5	84.4	5.5	1,529.5	84.4	5.5	50,583	1,113
NOL+Str. 1	709.5	164.9	23.2	668.4	150.4	22.5	-	295
Total	2,239.0	185.2	8.3	2,197.9	172.5	7.8		
List-Str. 1,2	1,481.7	83.9	5.7	1,481.7	83.9	5.7	42,722	957
NOL+Str. 1,2	775.3	173.7	22.4	745.7	155.5	20.9	-	348
Total	2,257.0	192.9	8.5	2,227.4	176.7	7.9		
List-Str. 1-4	1,287.1	40.8	3.2	1,287.1	40.8	3.2	33,647	869
NOL+Str. 1-4	875.5	177.3	20.3	783.9	156.5	20.0	-	387
Total	2,162.6	181.9	8.4	2,071.0	161.7	7.8		
List-Str. 1-5	905.6	30.6	3.4	905.6	30.6	3.4	12,518	547
NOL+Str. 1-5	1,307.8	200.9	15.4	1,227.5	176.2	14.4	-	482
Total	2,213.4	203.2	9.2	2,133.1	178.8	8.4		
List-Str. 1-6	607.6	26.5	4.4	607.6	26.5	4.4	5,413	339
NOL+Str. 1-6	1,487.5	207.5	14.0	1,367.5	180.6	13.2	-	518
Total	2,095.1	209.2	10.0	1,975.1	182.5	9.2		
List-Str. 1-7	331.1	20.5	6.2	331.1	20.5	6.2	1,764	190
NOL+Str. 1-7	1,779.2	220.5	12.4	1,592.8	201.2	12.6	-	546
Total	2,110.3	221.5	10.5	1,923.9	202.2	10.5		
List-Str. 1-8	107.9	14.6	13.5	107.9	14.6	13.5	207	58
NOL+Str. 1-8	1,784.5	220.6	12.4	1,592.8	201.2	12.6	-	555
Total	1,892.4	221.1	11.7	1,700.7	201.7	11.9		
List-Str. 1-9	103.0	14.5	14.1	103.0	14.5	14.1	180	49
NOL+Str. 1-9	1,784.5	220.6	12.4	1,592.8	201.2	12.6	-	556
Total	1,887.5	221.1	11.7	1,695.8	201.7	11.9		

Table 5--List and area frame estimates by livestock strata, Indiana, June 1973 2/

Multiple frame sample	List		List sample size	Tract		No. of tracts	Farm		List as % of tract	List as % of farm
	DE	CV		DE	CV		DE	CV		
Hogs & pigs	(000)	(%)		(000)	(%)		(000)	(%)	(%)	(%)
Nonoverlap	549.2 1/	24.7	-	452.8	34.7	189	414.0	37.5	121	133
1 (no livestock)	421.0	21.6	616	855.9	67.6	108	699.8	83.4	49	60
2 (no hogs)	45.9	56.7	127	139.5	84.3	85	137.4	85.5	33	33
3 & 4 (unknown)	461.0	28.3	118	5.2	96.2	39	44.4	71.6	-	-
5 (1-99)	914.7	9.8	345	1,320.3	26.3	90	851.9	29.0	69	107
6 (100-199)	562.1	10.9	116	719.9	48.7	22	965.9	44.5	78	58
7 (200-399)	543.2	6.8	110	885.5	74.5	19	820.8	80.9	61	66
8 (400-999)	357.5	9.5	66	348.7	76.1	7	255.9	97.5	103	140
Cattle & calves										
Nonoverlap	528.8 1/	19.0	-	646.4	25.4	189	602.8	24.3	82	88
1 (no livestock)	225.2	11.8	555	63.1	39.9	108	65.6	40.2	357	343
2 (no cattle)	47.8	19.2	171	65.9	87.0	53	77.3	62.6	73	62
3 & 4 (unknown)	194.6	37.7	93	100.2	43.6	39	38.2	51.8	194	62
5 (1-24)	381.5	7.1	350	432.3	23.6	95	443.7	19.7	88	86
6 (25-49)	298.0	5.2	230	179.7	33.1	37	140.0	38.6	166	213
7 (50-99)	276.5	6.0	159	291.7	32.1	31	225.3	41.6	95	123
8 (100-499)	223.2	6.5	150	5.3	96.2	9	-	-	43	-
9 (500+ (Not EO))	4.9	30.1	13	-	-	1	-	-	-	-

1/ The weighted nonoverlap estimate from the area frame as computed for the multiple frame survey indication.

2/ Analysis in Tables 3, 4 and 5 based on 50% of total segments (nonrotated segments).

Table 6--Summary of estimates as list becomes smaller - Illinois 1973 JES and Multiple Frame hog and pig estimates

Multiple frame	Direct expansions using tract and farm estimates of nonoverlap domain						Universe and sample size	
	Tract			Farm			N	n
	DE	SE	CV	DE	SE	CV		
	(000)	(000)	(%)	(000)	(000)	(%)		
List (Orig.)	5,739.4	252.6	4.4	5,739.4	252.6	4.4	117,736	1,614
NOL "	1,041.0	349.1	33.5	1,384.0	504.2	36.4		314
Total "	6,780.4	430.9	6.4	7,123.4	563.9	7.9		
List-Str. 26	4,839.9	187.9	3.9	4,839.9	187.9	3.9	57,502	1,061
NOL+Str. 26	1,964.2	419.5	21.4	2,176.5	550.2	25.3		674
Total	6,804.1	459.7	6.8	7,016.4	581.4	8.3		
List-Str.26,25	4,635.2	159.6	3.4	4,635.2	159.6	3.4	33,652	953
NOL+Str.26,25	2,118.3	423.9	20.0	2,250.4	550.2	24.4		895
Total	6,753.5	452.9	6.7	6,885.6	572.9	8.3		
List-Str.26,25,21	3,553.5	114.8	3.2	3,553.5	114.8	3.2	14,270	729
NOL+Str.26,25,21	3,678.5	503.5	13.7	3,864.0	612.1	15.8		1,066
Total	7,232.0	516.4	7.1	7,417.5	622.8	8.4		
List-Str.26,25,21,22	2,510.1	81.9	3.3	2,510.1	81.9	3.3	6,713	519
NOL+Str.26,25,21,22	4,597.2	538.5	11.7	5,035.1	904.3	18.0		1,153
Total	7,107.3	544.7	7.7	7,545.2	908.0	12.0		
List-Str.26,25,21-23	1,472.2	59.0	4.0	1,472.2	59.0	4.0	2,492	304
NOL+Str.26,25,21-23	6,068.3	709.4	11.7	6,292.5	992.3	15.8		1,204
Total	7,540.5	711.8	9.4	7,764.7	994.1	12.8		
List-Str.21-26	628.8	41.8	6.6	628.8	41.8	6.6	561	100
NOL+Str.21-26	6,866.8	777.8	11.3	7,094.1	1,049.2	14.8		1,223
Total	7,495.6	778.9	10.4	7,722.9	1,050.0	13.6		

Table 7--Summary of estimates as list becomes smaller - Illinois 1973 JES and Multiple Frame cattle and calf estimates

Multiple frame	Direct expansions using tract and farm estimates of nonoverlap domain						Universe and sample size	
	Tract			Farm			N	n
	DE	SE	CV	DE	SE	CV		
	(000)	(000)	(%)	(000)	(000)	(%)		
List (Orig.)	2,756.1	96.4	3.5	2,756.1	96.4	3.5	111,500	1,437
NOL "	480.0	83.8	17.5	358.5	88.0	24.5		314
Total "	3,236.1	127.7	3.9	3,114.6	130.5	4.2		
List-Str. 6	2,284.8	74.2	3.2	2,284.8	74.2	3.2	55,246	878
NOL+Str. 6	836.4	122.4	14.6	702.7	140.7	20.0		669
Total	3,121.2	143.1	4.6	2,987.5	159.1	5.3		
List-Str. 6,5	2,209.0	69.7	3.2	2,209.0	69.7	3.2	44,807	806
NOL+Str. 6,5	915.8	124.7	13.6	766.8	145.6	19.0		779
Total	3,124.8	142.9	4.6	2,975.8	161.4	5.4		
List-Str. 6,5,1	1,666.3	58.8	3.5	1,666.3	58.8	3.5	18,361	516
NOL+Str. 6,5,1	1,562.9	153.2	9.8	1,549.6	185.7	12.0		1,003
Total	3,229.2	164.1	5.1	3,215.9	194.8	6.1		
List-Str. 6,5,1,2	1,050.5	47.5	4.5	1,050.5	47.5	4.5	7,645	307
NOL+Str. 6,5,1,2	2,092.4	181.7	8.7	2,002.6	212.4	10.6		1,114
Total	3,142.9	187.8	6.0	3,053.1	217.6	7.1		
List-Str. 6,5,1-3	550.3	36.6	6.7	550.3	36.6	6.7	2,286	166
NOL+Str. 6,5,1-3	2,502.2	209.2	8.4	2,404.1	244.0	10.1		1,191
Total	3,052.5	212.4	7.0	2,954.4	246.7	8.4		
List-Str. 1-6	74.2	6.6	8.9	74.2	6.6	8.9	95	39
NOL+Str. 1-6	2,899.7	250.0	8.6	2,782.8	289.3	10.4		1,222
Total	2,973.9	250.1	8.4	2,857.0	289.4	10.1		
List-Str. 1-7	58.7	5.4	9.2	58.7	5.4	9.2	54	10
NOL+Str. 1-7	2,899.7	250.0	8.6	2,782.8	289.3	10.4		1,223
Total	2,958.4	250.1	8.5	2,841.5	289.4	10.2		

Table 8--List and area frame estimates by livestock strata - Illinois, June 1973

Multiple frame sample	List		List sample size	Tract		No. of tracts	Farm		List as % of tract	List as % of farm
	DE	CV		DE	CV		DE	CV		
Hogs & pigs	(000)	(%)		(000)	(%)		(000)	(%)	(%)	(%)
Nonoverlap	812.7 1/	25.8	103	1,041.0	33.5	314	1,384.0	36.4	78.1	58.7
26 (no livestock)	899.5	18.8	553	923.2	26.3	369	792.5	29.8	97.4	113.5
25 (0 hogs)	204.7	48.5	108	154.0	49.8	226	73.9	49.5	132.9	277.0
21 (1-124)	1,081.7	10.3	224	1,560.2	19.7	174	1,613.6	19.4	69.3	67.0
22 (125-249)	1,043.4	7.7	210	918.8	22.7	91	1,171.0	42.7	113.6	89.1
23 (250-449)	1,037.9	5.5	215	1,471.0	33.2	53	1,257.4	37.0	70.6	82.5
24 (450-999)	843.4	4.9	204	798.6	42.9	21	801.6	45.6	105.6	105.2
Cattle & calves										
Nonoverlap	295.2 1/	19.7	103	480.0	17.5	314	358.5	24.5	61.5	82.3
6 (no livestock)	471.3	13.1	559	367.4	24.0	369	344.2	31.1	128.3	136.9
5 (0 cattle)	75.8	33.7	72	79.4	34.4	114	64.1	47.8	95.5	118.3
1 (1-49)	542.7	6.9	290	647.0	14.0	225	782.8	16.1	83.9	69.3
2 (50-99)	615.8	5.6	209	529.5	19.1	113	453.0	23.3	116.3	135.9
3 (100-199)	500.2	6.1	141	409.8	23.0	82	401.6	29.4	122.0	124.6
4 (200-999)	476.1	7.6	127	397.4	32.8	35	378.6	42.1	119.8	125.7
7 (1,000+)	15.5	24.5	10	0.0	0.0	1	0.0	0.0	0.0	0.0

1/ The weighted nonoverlap estimate from the area frame as computed for the multiple frame survey indication.

Table 9--Summary of estimates as list becomes smaller - Nebraska 1973 JES and Multiple Frame hog and pig estimates

Multiple frame	Direct expansions using tract and farm estimates of nonoverlap domain						Universe and sample size	
	Tract			Farm			N	n
	DE	SE	CV	DE	SE	CV		
	(000)	(000)	(%)	(000)	(000)	(%)		
List (Orig.)	2,601.1	82.7	3.2	2,601.1	82.7	3.2	54,193	1,748
NOL "	470.1	97.2	20.7	517.2	103.5	20.0	-	350
Total "	3,071.2	127.6	4.2	3,118.3	132.5	4.2		
List-Str. 1	2,559.2	81.0	3.2	2,559.2	81.0	3.2	45,795	1,554
NOL+Str. 1	607.0	109.2	18.0	621.2	114.6	18.4	-	493
Total	3,166.2	136.0	4.3	3,180.4	140.3	4.4		
List-Str. 1,2	2,468.0	77.6	3.1	2,468.0	77.6	3.1	24,877	1,286
NOL+Str. 1,2	684.1	112.7	16.5	701.1	117.8	16.8	-	886
Total	3,152.1	136.8	4.3	3,169.1	141.1	4.5		
List-Str. 1-3	1,931.3	69.9	3.6	1,931.3	69.9	3.6	11,130	773
NOL+Str. 1-3	1,336.2	180.6	13.5	1,342.1	185.4	13.8	-	1,104
Total	3,267.5	193.7	5.9	3,273.4	198.1	6.1		
List-Str. 1-4	1,440.5	63.6	4.4	1,440.5	63.6	4.4	6,359	546
NOL+Str. 1-4	1,914.2	234.3	12.2	2,014.9	249.9	12.4	-	1,180
Total	3,354.7	242.8	7.2	3,455.4	257.9	7.5		
List-Str. 1-5	1,023.3	58.1	5.7	1,023.3	58.1	5.7	3,362	360
NOL+Str. 1-5	2,410.6	278.0	11.5	2,627.0	325.3	12.4	-	1,234
Total	3,433.9	284.0	8.3	3,650.3	330.4	9.1		
List-Str. 1-6 (EO)	492.3	48.9	10.5	492.3	48.9	10.5	840	144
NOL+Str. 1-6	3,024.3	343.7	11.4	3,255.5	447.6	13.8	-	1,279
Total	3,516.6	347.2	9.9	3,747.8	450.3	12.0		
JES Area Frame	3,516.6	347.2	9.9	3,747.8	450.3	12.0		
Bd.	3,250			3,250				

Table 10--Summary of estimates as list becomes smaller - Nebraska 1973 JES and Multiple Frame cattle and calf estimates

Multiple frame	Direct expansions using tract and farm estimates of nonoverlap domain						Universe and sample size	
	Tract			Farm			N	n
	DE	SE	CV	DE	SE	CV		
	(000)	(000)	(%)	(000)	(000)	(%)		
List (Orig.)	5,947.5	163.1	2.7	5,947.5	163.1	2.7	54,180	1,418
NOL "	1,661.3	214.1	12.9	1,370.9	339.5	24.8	-	350
Total "	7,608.8	269.1	3.5	7,318.4	376.6	5.1		
List-Str. 1	5,851.7	160.3	2.7	5,851.7	160.3	2.7	45,814	1,275
NOL+Str. 1	1,990.7	257.4	12.9	1,869.7	382.4	20.4	-	493
Total	7,842.4	303.2	3.9	7,721.4	414.6	5.4		
List-Str. 1,2	4,926.5	139.6	2.8	4,926.5	139.6	2.8	21,003	964
NOL+Str. 1,2	3,273.5	288.3	8.8	3,016.2	445.7	14.8	-	820
Total	8,200.0	320.3	3.9	7,942.7	467.1	5.9		
List-Str. 1-3	3,999.5	130.2	3.3	3,999.5	130.2	3.3	10,467	731
NOL+Str. 1-3	4,226.3	327.3	7.7	3,813.6	470.6	12.3	-	997
Total	8,225.8	352.2	4.3	7,813.1	488.3	6.2		
List-Str. 1-4	2,948.4	121.1	4.1	2,948.4	121.1	4.1	4,097	503
NOL+Str. 1-4	5,427.6	371.1	6.8	5,208.0	615.8	11.8	-	1,159
Total	8,376.0	390.4	4.7	8,156.4	627.6	7.7		
List-Str. 1-5	1,976.8	112.4	5.7	1,976.8	112.4	5.7	1,357	303
NOL+Str. 1-5	6,187.8	397.8	6.4	5,757.3	698.7	12.1	-	1,234
Total	8,164.6	413.4	5.1	7,734.1	707.7	9.2		
List-Str. 1-6	1,042.0	105.7	10.1	1,042.0	105.7	10.1	220	83
NOL+Str. 1-6	6,887.3	411.8	6.0	6,222.6	764.1	12.3	-	1,293
Total	7,929.3	425.1	5.4	7,264.6	771.4	10.6		
JES Area Frame	7,929.3	425.1	5.4	7,264.6	771.4	10.6		
Bd.	7,300			7,300				

Table 11--List and area frame estimates by livestock strata - Nebraska, June 1973

Multiple frame sample	List		List sample size	Tract		No. of tracts	Farm		List as % of tract	List as % of farm
	DE	CV		DE	CV		DE	CV		
Hogs & pigs	(000)	(%)		(000)	(%)		(000)	(%)	(%)	(%)
Nonoverlap	445.5 1/	19.0	349	470.1	20.7	349	517.2	20.0	93.9	85.4
1 (no livestock)	41.9	40.5	194	136.9	38.4	147	104.1	40.2	30.6	40.2
2 (0 hogs + cattle)	91.2	25.3	268	77.1	40.8	409	79.8	40.6	118.3	114.3
3 (1-124)	536.7	6.3	513	652.1	21.1	226	641.1	21.4	82.3	83.7
4 (125-199)	490.8	5.9	227	577.9	22.7	77	672.8	21.6	84.9	72.9
5 (200-299)	417.2	6.2	186	496.5	31.2	55	612.1	32.6	84.0	68.2
6 (300 +)	533.3	6.0	216	570.6	33.1	47	585.4	36.0	93.5	91.1
Cattle & calves										
Nonoverlap	1,398.6 1/	9.7	357	1,661.3	12.9	357	1,370.9	24.8	84.2	102.0
1 (no livestock)	95.8	31.0	143	329.4	27.6	147	498.8	37.0	29.1	19.2
2 (0-24)	925.2	8.5	311	1,282.9	11.0	334	1,146.5	13.2	72.1	80.7
3 (25-49)	927.0	5.4	233	952.8	14.3	182	797.5	17.5	97.3	116.2
4 (50-99)	1,051.1	4.6	228	1,206.5	16.4	170	1,394.4	18.8	87.1	75.4
5 (100-199)	971.6	4.6	200	755.0	21.1	76	549.3	36.3	128.7	176.9
6 (200 +)	940.8	4.3	220	631.3	24.1	63	465.3	51.2	149.0	202.2

1/ The weighted NOL estimate as computed for the multiple frame survey indication.

Table 12--Summary of estimates as list becomes smaller - South Dakota 1973 JES and Multiple Frame hog and pig estimates

Multiple frame	Direct expansions using tract and farm estimates of nonoverlap domain						Universe and sample sizes	
	Tract			Farm			N	n
	DE	SE	CV	DE	SE	CV		
	(000)	(000)	(%)	(000)	(000)	(%)		
List (Orig.)	1,968.0	57.6	2.9	1,968.0	57.6	2.9	41,298	1,688
NOL	158.7	50.2	31.6	121.2	42.8	35.3	-	215
Total	2,126.7	76.4	3.6	2,089.2	71.8	3.4		
List-Str. 1	1,828.1	47.5	2.6	1,828.1	47.5	2.6	16,025	1,083
NOL+Str. 1	362.7	95.0	26.2	340.0	92.8	27.3	-	885
Total	2,190.8	106.2	4.8	2,168.1	104.2	4.8		
List-Str. 1,2	1,262.5	35.8	2.8	1,262.5	35.8	2.8	7,025	740
NOL+Str. 1,2	891.1	124.8	14.0	831.6	123.2	14.8	-	1,076
Total	2,153.6	129.8	6.0	2,094.1	128.1	6.1		
List-Str. 1-3	784.6	28.5	3.6	784.6	28.5	3.6	3,023	466
NOL+Str. 1-3	1,445.3	173.8	12.0	1,321.9	162.2	12.3	-	1,179
Total	2,229.9	176.1	7.9	2,106.5	164.7	7.8		
List-Str. 1-4 (EO)	308.0	19.4	6.3	308.0	19.4	6.3	618	220
NOL+Str. 1-4	1,936.0	215.9	11.2	1,683.9	190.0	11.3	-	1,274
Total	2,244.0	216.8	9.7	1,991.9	191.0	9.6		
JES Area Frame	2,244.0	218.4	9.7	1,991.9	192.3	9.6		

Table 13--Summary of estimates as list becomes smaller - South Dakota 1973 JES and Multiple Frame cattle and calf estimates

Multiple frame	Direct expansions using tract and farm estimates of nonoverlap domain						Universe and sample sizes	
	Tract			Farm			N	n
	DE	SE	CV	DE	SE	CV		
	(000)	(000)	(%)	(000)	(000)	(%)		
List (Orig.)	4,991.0	139.9	2.8	4,991.0	139.9	2.8	41,298	1,497
NOL "	442.3	78.7	17.8	353.8	148.2	41.9	-	215
Total "	5,433.3	160.5	3.0	5,344.8	203.8	3.8		
List-Str. 1	4,602.8	125.0	2.7	4,602.8	125.0	2.7	31,669	1,082
NOL+Str. 1	905.2	137.3	15.2	762.6	222.5	29.2		391
Total	5,508.0	185.7	3.4	5,365.4	255.2	4.8		
List-Str. 1,2	3,594.3	113.4	3.2	3,594.3	113.4	3.2	14,043	781
NOL+Str. 1,2	1,817.8	159.0	8.8	1,595.4	242.4	15.2	-	698
Total	5,412.1	195.3	3.6	5,189.7	267.6	5.2		
List-Str. 1-3	2,451.0	101.0	4.1	2,451.0	101.0	4.1	6,398	528
NOL+Str. 1-3	3,268.8	238.5	7.3	2,931.0	298.1	10.2	-	948
Total	5,719.8	259.0	4.5	5,382.0	314.7	5.8		
List-Str. 1-4	1,232.0	40.6	3.3	1,232.0	40.6	3.3	2,121	345
NOL+Str. 1-4	4,459.2	287.7	6.5	4,328.6	381.0	8.8	-	1,151
Total	5,691.2	290.6	5.1	5,560.6	383.2	6.9		
List-Str. 1-5 (EO)	333.1	20.8	6.2	333.1	20.8	6.2	192	76
NOL+Str. 1-5	5,377.5	328.3	6.1	5,182.1	439.0	8.5	-	1,274
Total	5,710.6	329.0	5.8	5,515.2	439.5	8.0		
JES Area Frame	5,713.6	332.1	5.8	5,518.2	443.1	8.0		

Table 14--List and area frame estimates by livestock strata - South Dakota, June 1973

Multiple frame strata	List 2/		List sample size	Tract 3/		No. 3/ of tracts	Farm 3/		List as % of tract	List as % of farm
	DE	CV		DE	CV		DE	CV		
Hogs & Pigs	(000)	(%)		(000)	(%)		(000)	(%)	(%)	(%)
Nonoverlap	105.1	36.7	95	158.7	31.6	215	121.2	35.3	66	87
1 (No hogs)	139.9	23.4	605	204.1	40.3	686	218.7	38.5	69	64
2 (1-124)	565.6	5.5	343	528.3	16.7	193	491.6	17.9	107	115
3 (125-249)	477.9	4.5	274	554.2	20.9	104	490.3	20.0	86	97
4 (250+)	476.6	4.4	246	490.7	23.5	98	362.0	26.9	97	132
Cattle & Calves										
Nonoverlap	592.2	32.2	96	442.3	17.8	215	353.8	41.9	134	167
1 (No cattle)	388.2	16.2	415	463.0	25.3	178	408.8	41.6	84	95
2 (1-50)	1,008.5	5.2	301	912.5	9.7	309	832.8	11.7	111	121
3 (51-100)	1,143.3	4.5	253	1,451.0	12.3	256	1,335.7	13.8	79	86
4 (101-200)	1,219.0	7.6	183	1,190.5	14.1	208	1,397.6	17.2	102	87
5 (200+)	898.9	3.9	269	918.2	19.0	130	853.4	25.0	98	105

1/ In South Dakota the determination of the OL tracts was based on the new updated list for all of the June tracts. This does not really affect the strata-to-strata comparisons of Tables 1 and 2. However, the June NOL and list strata estimates are not strictly comparable to the farm and tract estimates based on the new list and all segments. The NOL domain in June was estimated from the nonrotated segments only.

2/ List NOL for 50% nonrotated segs checked against old list.

3/ New computations based on updated list checked against 100% of segs.

Table 15--Summary of estimates as list becomes smaller - Kentucky 1973 JES and Multiple Frame hog and pig estimates

Multiple frame	Direct expansions using tract and farm estimates of nonoverlap domain						Universe and sample size	
	Tract			Farm			N	n
	DE	SE	CV	DE	SE	CV		
	(000)	(000)	(%)	(000)	(000)	(%)		
List (Orig.)	1,093.7	78.6	7.2	1,093.7	78.6	7.2	123,857	2,037
NOL "	234.1	54.3	23.2	315.1	104.7	33.2		758
Total "	1,327.8	95.5	7.2	1,408.8	130.9	9.3		
List-Str. 66	1,079.4	78.2	7.2	1,079.4	78.2	7.2	118,360	1,985
NOL+Str. 66	235.6	54.4	23.1	320.3	104.7	32.7		789
Total	1,315.0	95.3	7.2	1,399.7	130.7	9.3		
List-Str. 65	1,055.2	77.8	7.4	1,055.2	77.8	7.4	113,368	1,697
NOL+Str. 65	334.5	82.4	24.6	415.9	123.9	29.8		839
Total	1,389.7	113.3	8.2	1,471.1	146.3	10.0		
List-Str. 61	803.3	38.0	4.7	803.3	38.0	4.7	33,296	1,640
NOL+Str. 61	527.6	92.6	17.6	740.7	154.8	20.9		1,474
Total	1,330.9	100.1	7.5	1,544.0	159.4	10.3		
List-Str. 61,62	622.6	29.5	4.7	622.6	29.5	4.7	22,073	1,421
NOL+Str. 61,62	635.2	99.8	15.7	849.8	161.5	19.0		1,601
Total	1,257.8	104.1	8.3	1,472.4	164.2	11.2		
List-Str. 61,62,63	304.5	21.7	7.1	304.5	21.7	7.1	16,555	553
NOL+Str. 61,62,63	936.6	133.4	14.2	1,201.2	202.0	16.8		1,691
Total	1,241.1	135.2	10.9	1,505.7	203.2	13.5		
List (EO)	251.7	16.8	6.7	251.7	16.8	6.7	574	161
NOL (All area)	1,038.6	152.2	14.7	1,307.3	215.7	16.5		1,821
Total	1,290.3	153.1	11.9	1,559.0	216.4	13.9		

Table 16--Summary of estimates as list becomes smaller - Kentucky 1973 JES and Multiple Frame cattle and calf estimates

Multiple frame	Direct expansions using tract and farm estimates of nonoverlap domain						Universe and sample size	
	Tract			Farm			N	n
	DE	SE	CV	DE	SE	CV		
	(000)	(000)	(%)	(000)	(000)	(%)		
List (Orig.)	2,903.1	94.0	3.2	2,903.1	94.0	3.2	123,530	1,875
NOL "	796.7	75.2	9.4	792.9	109.8	13.9		758
Total "	3,699.8	120.4	3.3	3,696.0	144.5	3.9		
List-Str. 46*	2,801.4	92.3	3.3	2,801.4	92.3	3.3	118,036	1,763
NOL+Str. 46	859.2	77.4	9.0	839.9	110.9	13.2		789
Total	3,660.6	120.5	3.3	3,641.3	144.3	4.0		
List-Str. 45*	2,721.6	88.6	3.3	2,721.6	88.6	3.3	110,342	1,680
NOL+Str. 45	962.1	92.4	9.6	922.6	120.3	13.0		848
Total	3,683.7	128.0	3.5	3,644.2	149.4	4.1		
List-Str. 41*	2,578.4	81.7	3.2	2,578.4	81.7	3.2	71,323	1,561
NOL+Str. 41	1,021.9	82.8	8.1	1,082.7	130.4	12.0		1,058
Total	3,600.3	116.3	3.2	3,661.1	153.9	4.2		
List-Str. 41,42	1,609.0	65.0	4.0	1,609.0	65.0	4.0	33,705	915
NOL+Str. 41,42	1,850.9	124.3	6.7	1,920.4	187.2	9.8		1,447
Total	3,459.9	140.3	4.1	3,529.4	198.2	5.6		
List-Str. 41,42,43	434.0	36.9	8.5	434.0	36.9	8.5	19,023	422
NOL+Str. 41,42,43	2,967.5	186.4	6.3	2,960.3	297.3	10.0		1,689
Total	3,401.5	190.0	5.6	3,394.3	299.6	8.8		
List (EO)	150.8	8.6	5.7	150.8	8.6	5.7	341	115
NOL (All area)	3,195.5	191.8	6.0	3,137.8	298.0	9.5		1,821
Total	3,346.3	192.0	5.7	3,288.6	298.1	9.1		

Table 17--List and area frame estimates by livestock strata - Kentucky, June 1973

Multiple frame sample	List		List sample size	Tract		No. of tracts	Farm		List as % of tract	List as % of farm
	DE	CV		DE	CV		DE	CV		
Hogs & pigs	(000)	(%)		(000)	(%)		(000)	(%)	(%)	(%)
Nonoverlap	207.0 1/	18.8	543	234.1	23.2	758	315.1	33.2	88.4	65.7
61 (0-9)	290.4	23.7	397	293.5	23.7	721	425.6	27.1	98.9	68.2
62 (10-49)	180.7	13.3	219	107.6	32.9	128	109.1	39.3	167.9	165.6
63 (50-499)	318.1	6.3	868	301.5	27.1	90	351.4	36.3	105.5	90.5
65 (Unknown)	38.5	28.5	340	100.4	49.3	81	100.9	53.3	38.4	38.2
66 (BRT)	14.3	58.3	52	1.5	73.3	31	5.2	88.5	953.3	275.0
Cattle & calves										
Nonoverlap	606.6 1/	8.8	533	796.7	9.4	758	792.9	13.9	76.1	76.5
41 (0-9)	324.7	14.3	314	225.2	15.4	302	289.8	21.1	144.2	112.0
42 (10-49)	969.4	5.1	646	829.0	10.3	391	837.7	12.5	116.9	115.7
43 (50-499)	1,175.0	4.6	493	1,116.5	11.7	244	1,039.9	19.2	105.2	113.0
45 (Unknown)	181.5	17.2	195	165.4	29.9	90	129.7	34.4	109.7	139.9
46 (BRT)	101.7	17.4	112	62.5	36.3	31	47.0	45.7	162.7	216.4

1/ The weighted nonoverlap estimate from the area frame as computed for the multiple frame survey indication.

Table 18--Summary of estimates as list becomes smaller - Idaho 1973 JES and Multiple Frame cattle and calf estimates

Multiple frame	Direct expansions using tract and farm nonoverlaps						Universe and sample size	
	Tract			Farm			N	n
	DE	SE	CV	DE	SE	CV		
	(000)	(000)	(%)	(000)	(000)	(%)		
List (Orig.)	1,928.8	52.0	2.7	1,928.8	52.0	2.7	16,817	1,366
NOL "	962.8	194.6	20.2	903.8	171.7	19.0		414
Total "	2,890.6	201.4	7.0	2,831.6	179.4	6.3		
List-Str. 1	1,841.3	46.7	2.5	1,841.3	46.7	2.5	14,285	1,298
NOL+Str. 1	1,001.2	195.8	19.6	974.3	175.4	18.0		433
Total	2,842.5	201.3	7.1	2,815.6	181.5	6.5		
List-Str. 1,2	1,558.4	38.7	2.5	1,558.4	38.7	2.5	6,938	1,038
NOL+Str. 1,2	1,139.9	201.6	17.7	1,194.8	192.9	16.1		535
Total	2,698.3	205.3	7.6	2,753.2	196.7	7.2		
List-Str. 1-3	1,229.6	29.2	2.4	1,229.6	29.2	2.4	3,594	739
NOL+Str. 1-3	1,247.9	213.8	17.1	1,381.6	214.0	15.5		586
Total	2,477.5	215.8	8.7	2,611.2	216.0	8.3		
List-Str. 1-4	902.4	23.9	2.7	902.4	23.9	2.7	1,561	507
NOL+Str. 1-4	1,470.3	232.2	15.8	1,584.1	237.8	15.0		636
Total	2,372.7	233.4	9.9	2,486.5	239.0	9.6		
List-Str. 1-5	702.7	21.8	3.1	702.7	21.8	3.1	875	358
NOL+Str. 1-5	1,527.0	235.3	15.4	1,655.9	255.1	15.4		646
Total	2,229.7	236.3	10.6	2,358.6	256.0	10.9		
List-Str. 1-6	517.9	19.6	3.8	517.9	19.6	3.8	403	211
NOL+Str. 1-6	1,621.1	236.0	14.5	1,793.0	259.2	14.4		658
Total	2,139.0	236.8	11.1	2,310.9	259.9	11.3		

Table 19--List and area frame estimates by livestock strata - Idaho, June 1973 2/

Multiple frame sample	List		List sample size	Tract		No. of tracts	Farm		List as % of tract	List as % of farm
	DE	CV		DE	CV		DE	CV		
	(000)	(%)		(000)	(%)		(000)	(%)	(%)	(%)
Cattle & calves										
Nonoverlap	829.3 1/	36.9 1/	301	962.8	20.2	414	903.8	19.0	86.1	91.8
1 (Unknown)	87.5	26.2	68	38.5	51.4	19	70.6	59.6	227.3	123.9
2 (1-49)	282.9	9.2	260	138.7	22.7	104	220.4	27.1	204.0	128.4
3 (50-99)	328.8	7.8	299	108.0	43.9	52	186.8	35.0	304.0	176.0
4 (100-199)	327.2	5.1	232	222.4	38.4	50	202.4	36.4	147.1	161.7
5 (200-299)	199.7	4.9	149	56.7	57.7	10	71.9	68.3	352.2	277.7
6 (300-699)	184.8	5.1	147	94.1	50.9	12	137.2	52.8	196.4	134.7

1/ The weighted nonoverlap estimate from the area frame as computed for the multiple frame survey indication.

2/ Analysis in Tables 18 and 19 based on 48% of total segments (nonrotated segments).

Table 20--Summary of estimates as list becomes smaller - Colorado 1973 JES and Multiple Frame cattle and calf estimates

Multiple frame	Direct expansion using tract and farm estimates of nonoverlap domain											
	List N	Tract			List names, area tracts n:	Farm			Farm		
		DE	SE	CV		DE	SE	CV	DE	SE	CV
		(000)	(000)	(%)		(000)	(000)	(%)	(000)	(000)	(%)
List (orig.)	25,325	4,165.2	235.7	5.7	1,595	4,165.2	235.7	5.7	4,165.2	235.7	5.7
NOL "		463.3	84.4	18.2	635	556.0	109.5	19.7	575.8	114.8	19.9
Total "		4,628.5	250.4	5.4		4,721.2	259.9	5.5	4,741.0	262.2	5.5
List-Str. 1	12,062	3,139.6	110.7	3.5	1,171	3,139.6	110.7	3.5	3,139.6	110.7	3.5
NOL+Str. 1		839.5	116.9	13.9	812	1,156.6	184.4	15.9	1,185.0	189.7	16.0
Total		3,979.1	161.0	4.0		4,296.2	215.1	5.0	4,324.6	219.6	5.1
List-Str. 1&2	2,825	1,967.9	51.6	2.6	705	1,967.9	51.6	2.6	1,967.9	51.6	2.6
NOL+Str. 1&2		1,817.1	146.0	8.0	1,065	1,850.0	245.1	13.2	1,962.5	256.2	13.1
Total		3,785.0	154.9	4.1		3,817.9	250.5	6.6	3,930.4	261.3	6.6
List-Str. 1-3	1,951	1,630.4	24.6	1.5	625	1,630.4	24.6	1.5	1,630.4	24.6	1.5
NOL+Str. 1-3		2,043.6	170.4	8.3	1,108	2,050.2	261.3	12.7	2,218.4	278.6	12.6
Total		3,674.0	172.2	4.7		3,680.6	262.5	7.1	3,848.8	279.7	7.3
List-Str. 1,2,3,11	1,184	1,530.7	22.7	1.5	559	1,530.7	22.7	1.5	1,530.7	22.7	1.5
NOL+Str. 1,2,3,11		2,096.6	174.7	8.3	1,127	2,091.8	261.9	12.5	2,260.1	279.2	12.4
Total		3,627.3	176.2	4.9		3,622.5	262.9	7.3	3,790.8	280.1	7.4
List-Str. 1,2,3,11,23	877	1,476.3	21.1	1.4	512	1,476.3	21.1	1.4	1,476.3	21.1	1.4
NOL+Str. 1,2,3,11,23		2,150.5	175.6	8.2	1,144	2,284.5	289.8	12.7	2,452.7	305.4	12.5
Total		3,626.8	176.9	4.9		3,760.8	290.6	7.7	3,929.0	306.1	7.8
List-Str. 1,2,3,11, 23,22	745	1,425.1	16.7	1.2	484	1,425.1	16.7	1.2	1,425.1	16.7	1.2
NOL+Str.1,2,3,11,23, 22		2,162.0	175.7	8.1	1,147	2,296.0	289.9	12.6	2,464.2	305.5	12.4
Total		3,587.1	176.5	4.9		3,721.1	290.4	7.8	3,889.3	303.0	7.9
List-All but EO's	608	1,338.8	16.4	1.2	357	1,338.8	16.4	1.2	1,338.8	16.4	1.2
Area frame		2,322.9	185.1	8.0	1,206	2,310.4	290.5	12.6	2,478.7	306.1	12.3
Total		3,661.7	185.8	5.1		3,649.2	291.0	8.0	3,817.5	306.5	8.0

Table 21--List and area frame estimates by livestock strata - Colorado, June 1973

Multiple frame sample	List		List sample size	Tract		No. of tracts	Farm 2/		Farm 3/		List as % of tract	List as % of farm 2
	DE	CV		DE	CV		DE	CV	DE	CV		
Cattle	(000)	(%)		(000)	(%)		(000)	(%)	(000)	(%)	(%)	(%)
Nonoverlap (No control) 1	506.8	42.4	289	463.3	18.2	635	556.0	19.7	575.8	19.9	109.4	91.2
(1-274) 2	1,025.6 1/	20.3	424	376.3	22.5	181	600.5	24.9	609.1	24.6	272.5	170.8
(275-1,299) 3	1,171.7	8.4	466	977.6	12.0	256	693.5	22.8	777.6	21.4	119.9	169.0
(1-199 milk cows) 11	337.5	13.5	80	226.4	39.7	43	200.1	49.6	255.9	46.1	149.1	168.7
(1-499 COF) 23	99.7	9.6	66	53.0	39.8	19	41.6	47.4	41.6	47.4	188.1	239.7
(500-999 COF: 22	54.4	15.4	47	53.9	39.5	18	192.7	66.3	192.7	66.3	100.9	28.2
(1,300) 4	51.2	25.2	28	11.5	99.1	3	11.5	99.1	11.5	99.1	445.2	445.2
	86.3	3.4	127	84.4	61.8	7	0.0	0.0	0.0	0.0	102.3	0.0

1/ The weighted nonoverlap estimate from the area frame as computed for the multiple frame survey indication.

2/ Does not include livestock on public land.

3/ Does include livestock on public land.

Table 22--Summary of estimates as list becomes smaller - North Dakota 1973 JES and Multiple Frame cattle and calf estimates

Multiple frame	Direct expansion using tract and farm nonoverlaps						Universe and sample size	
	Tract			Farm			N	n
	DE	SE	CV	DE	SE	CV		
	(000)	(000)	(%)	(000)	(000)	(%)		
List (Orig.)	2,929.2	69.8	2.4	2,929.2	69.8	2.4	41,736	1,768
NOL "	144.3	42.4	29.4	59.6	27.8	46.6		95
Total	3,073.5	81.7	2.7	2,988.8	75.1	2.5		
List-Str. 1	2,806.4	63.8	2.3	2,806.4	63.8	2.3	25,348	1,572
NOL+Str. 1	261.3	46.4	17.8	260.9	65.3	25.0		623
Total	3,067.7	78.9	2.6	3,067.3	91.3	3.0		
List-Str. 1,2	2,800.4	63.6	2.3	2,800.4	63.6	2.3	25,042	1,562
NOL+Str. 1,2	269.1	47.0	17.5	275.1	65.7	23.9		628
Total	3,069.5	79.1	2.6	3,075.5	91.4	3.0		
List-Str. 1-3	1,611.4	37.0	2.3	1,611.4	37.0	2.3	7,432	937
NOL+Str. 1-3	1,334.1	107.7	8.1	1,157.6	117.2	10.1		1,224
Total	2,945.5	113.9	3.9	2,769.0	122.9	4.4		
List-Str. 1-4	284.4	10.9	3.8	284.4	10.9	3.8	363	168
NOL+Str. 1-4	2,583.8	169.2	6.5	2,303.1	204.7	8.9		1,557
Total	2,868.2	169.6	5.9	2,587.5	205.0	7.9		

Table 23--List and area frame estimates by livestock strata - North Dakota, June 1973

Multiple frame sample	List		List sample size	Tract		No. of tracts	Farm		List as % of tract	List as % of farm
	DE	CV		DE	CV		DE	CV		
	(000)	(%)		(000)	(%)		(000)	(%)	(%)	(%)
Cattle										
Nonoverlap	147.0 1/	26.7	48	144.3	29.4	95	59.6	46.6	101.9	246.6
1 (0 cattle)	122.8	23.1	196	117.0	18.6	529	201.4	29.5	105.0	61.0
2 (unknown)	6.0	75.1	10	7.9	92.4	5	14.2	68.3	75.9	42.3
3 (1-499)	1,189.0	4.4	625	1,065.0	9.5	597	882.5	10.8	111.6	134.7
4 (500+)	1,327.0	2.7	769	1,249.6	11.4	333	1,145.5	15.7	106.2	115.8

1/ The weighted nonoverlap estimate from the area frame as computed for the multiple frame survey indication.