

THE EFFECT ON RESPONSE RATES OF VARIOUS  
CONTROL DATA MAIL QUESTIONNAIRE DESIGNS - COLORADO

Sample Survey Research Branch  
Research Division  
Statistical Reporting Service  
U.S. Department of Agriculture  
Washington, D.C.

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By

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CONTENTS

	Page
SUMMARY .....	ii
INTRODUCTION.....	1
Results of the Survey on Colorado Cattle List .....	2
OBJECTIVES.....	2
PROCEDURES.....	4
ANALYSIS .....	5
CONCLUSION AND RECOMMENDATIONS .....	13
APPENDIX A.    Questionnaire Versions, Letter Insert and Reminder Card	
APPENDIX B.    Tables 7-16: Summaries and Analysis	

## SUMMARY

A project to study the effect of questionnaire design on response rates in a mail control data survey was conducted in Colorado. The research was conducted in conjunction with SSO efforts to obtain current operation descriptions and cattle information for list building and stratification in multiple frame surveys. Of the 17,766 potential respondents presumed to have received questionnaires, 10,218 or 57.5 percent returned a questionnaire in response to one of three mailings. A total of 2,894 questionnaires or 14.0 percent were returned as not deliverable by the Postal Service.

Four factors were tested as to their effect on response rates. Significantly higher response rates were indicated for two: (1) asking the respondent to report on a single operation description question instead of the concept presently used on multiple frame questionnaires, and (2) asking the respondent to report cattle data in ranges rather than in actual numbers. No significant differences in response rates were indicated for the remaining two factors: (1) asking the respondent to report for several livestock species rather than cattle only, and (2) including a personal letter and brochure with the questionnaire.

In both the first and second non-response follow-ups, half the non-respondents were sent a questionnaire and half a reminder card. The indication from both mailings is that a second questionnaire will obtain a highly significant increase in response rate over a reminder card.

# THE EFFECT ON RESPONSE RATES OF VARIOUS CONTROL DATA MAIL QUESTIONNAIRE DESIGNS - COLORADO

## INTRODUCTION

The Statistical Reporting Service makes extensive use of mail questionnaires in various types of surveys. This project was focused on the use of questionnaires to obtain control data and operation description information for livestock list frame development. Most state list sources don't have current livestock data for stratification or information concerning the structure of the operating unit. Several states conduct surveys for the purpose of obtaining this information. Criterion letters or pre-survey questionnaires are two of the more common designations for questionnaires used for this purpose.

This project had its start in late 1973. The Colorado SSO was seeking a method to improve the list they used for multiple frame sampling. State brand inspection records were the basic source of names for the multiple frame list. Each month the inspectors certificates for country points and auctions were mailed to the Denver Brand Inspectors Office. At that time, the Colorado SSO keypunched each inspection certificate. The process of obtaining control data was costing approximately a dollar per name for a total list size of around 23,000 names. Even after collecting these data, they still had a stratum described as "zero cattle inspected or unknown" consisting of approximately 13,500 names. In 1973, the unclassified stratum of approximately 13,500 names had a sample of nearly 500 names allocated to it. The 1973 multiple frame estimate had a relative sampling error of 5.4 percent as compared with 5.1 percent from the area frame. The Colorado office was not satisfied with a costly procedure which was providing an estimate with relative sampling errors of over 5 percent. They were interested in obtaining control data in some manner to increase sampling efficiency. It was at this time the Sample Survey Research Branch and the Colorado SSO developed this project.

A mail questionnaire survey was the method adopted to obtain control data. Over the years, several states have used control data questionnaires, many of which were copied from a design first used in Texas. States also have attempted several different procedures to increase mail response. The effectiveness of questionnaires and procedures implemented to increase mail response had not been measured; thus one of the major objectives of this project was to test different questionnaire designs and procedures to see which, if any, would maximize response.

### Results of the Survey on the Colorado Cattle List

As a result of the control data survey in Colorado, the list size dropped from 23,511 to 19,547 names of which only 3,724 remained classified as "unspecified". Also the relative sampling error for the June 1974 multiple frame estimate dropped substantially to 3.7 percent, while the area frame estimate was at 6.6 percent. A great deal was learned about types of questionnaires and procedures to maximize response for control data surveys. These results should benefit many other SSO's. The lists Colorado used for multiple frame purposes were vastly improved and provided an estimate of greater precision. The success of this endeavor is largely due to the cooperation and effort put forth by the Colorado SSO and its personnel.

### OBJECTIVES

The problem of obtaining control data is important for the construction, maintenance and use of list frames. The major objective of the research aspect of this project was to determine if questionnaire design and the use of a letter-brochure materially affect the response rate for obtaining control data via mail questionnaires. The following is a listing and discussion of the five specific factors which were tested in terms of response by this research project.

1. The use of a letter-brochure insert mailed with the first questionnaire versus mailing the questionnaire only with no letter-brochure. A standard practice used to increase response rates for general mail surveys is the use of a letter or letter and brochure as devices to generate interest in the respondents. While this has been adopted as a standard practice there has been no measure of it's success on increasing response. Thus this project attempted to measure if this technique was successful.

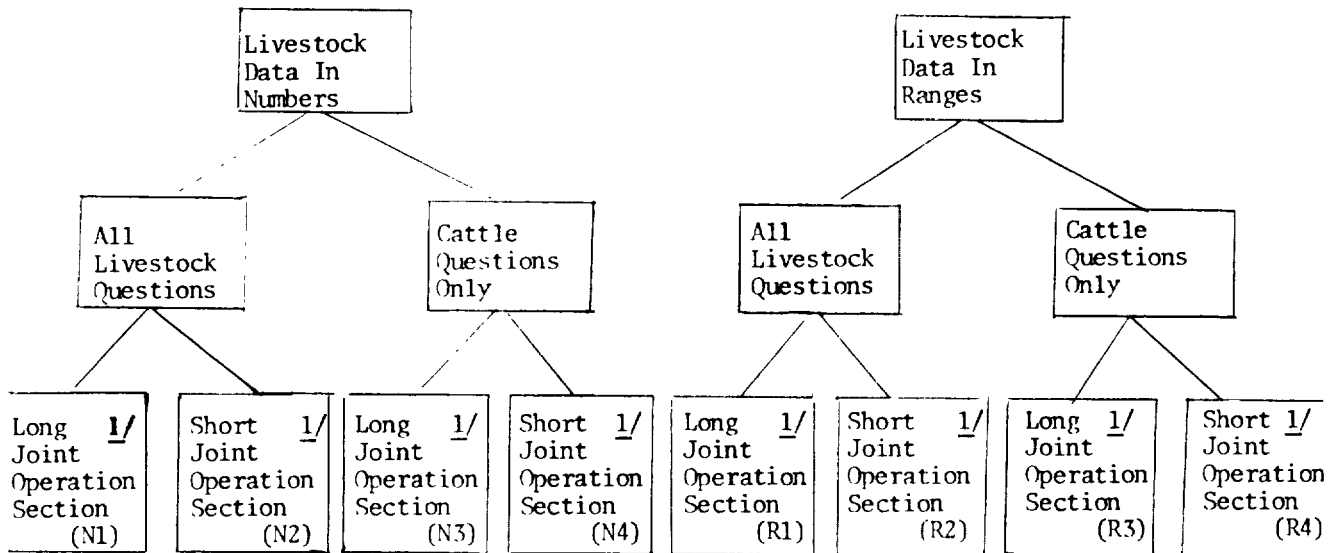
2. Obtaining livestock data in ranges versus actual numbers. Two types of questions were used to ask livestock data. One type required an actual number of livestock as the response, whereas the other asked the respondent to indicate the appropriate range covering his livestock peak number. Since the data from criterion letters are used for stratification purposes, there should be little loss of value from range answers.
3. Asking for data on several kinds of livestock versus asking cattle data only. Since control data was being obtained in Colorado for use in multiple frame cattle surveys, it was mandatory to include various questions on cattle. The other livestock questions might be useful, but they were not of primary importance in building a list frame of cattle operations. They were also included to test the concept that several livestock species questions would encourage better response. That is, if a respondent did not have cattle but did have other livestock or poultry, he might tend to return the questionnaire more frequently.
4. The use of a complete set of operation description questions versus asking only the type of operation. On half the questionnaires the SRS standard operation description section was used which includes obtaining the names and addresses of all other people concerned with a joint operation. On the remaining questionnaires, the respondent was asked only to indicate whether the reported operation could best be described as individual, partnership or other.
5. The use of a second request questionnaire versus a reminder card. The reminder card involves less cost, but also runs the risk that the respondent discarded the original questionnaire or preferred not to look for it. The project was designed to provide a measure of the difference in response rates when using a reminder card versus additional questionnaires.

## PROCEDURES

Questionnaires were mailed to 20,660 of the 22,693 names on the Colorado cattle brand registration list. The 2,033 names excluded were those that had been selected for the multiple frame cattle survey in June or December 1973. The list was sorted alphabetically within county and 64 systematic samples of 322 or 323 names were selected.

The 16 treatments for the first mailing were created by the use of the first four factors listed under objectives. This required the use of eight questionnaire versions, each being mailed with a letter-brochure in half the samples (see Diagram 1). The treatments used corresponded to those in a  $2^4$  factorial experiment. A completely randomized design was used by randomly assigning 4 of the 64 samples to each of the 16 treatments. On a specified date, non-respondents in two of the four samples receiving each treatment were mailed a second request questionnaire identical to the one they received initially. The other two samples in each treatment were mailed only a reminder card. A few days later the procedure was reversed for those still not responding, that is samples having received a second questionnaire were mailed a reminder card and those having received a reminder were now mailed a second questionnaire.

DIAGRAM 1: Questionnaire Treatment Design



1/ One half of sample received a letter insert - the other half received the questionnaire only.



Copies of the questionnaires, letter-brochure insert, and reminder card used are shown in Appendix A. The letter-brochure insert included in half the original mailings consisted of a personal letter from Floyd Rolf, Statistician in Charge of the Colorado SSO, as well as some selected outlook information from the Economic Research Service, USDA.

The questionnaires were designed by the Sample Survey Research Branch with inputs from the Livestock Branch, Data Collection Branch, Methods Staff and Colorado SSO. Sample selection, coordination of non-response mailing and keypunching were all performed by the Colorado SSO. The following timetable was followed for this project:

<u>DATE</u>	<u>EVENT</u>
March 13, 1974	Mail first request
March 25, 1974	Mail first non-response follow-up
April 4, 1974	Mail second non-response follow-up

#### ANALYSIS

Responses were tabulated for the original questionnaire mailing, first non-response mailing and second non-response mailing. After the first non-response mailing, incoming mail was screened for questionnaires marked "second request". Questionnaires received prior to finding the first "second request" questionnaire were credited to response from the first mailing. Everything coming in after that was credited to the first non-response follow-up. After the second non-response mailing, the same procedure was used to determine if a return should be credited to the first or second non-response follow-up.

Response rates for testing the differences in questionnaire design were based on returns prior to non-response follow-up for each of the 64 samples. The numerator of the response rate calculated for each sample is the number of usable questionnaires returned. The denominator is the number mailed minus the number returned by the Postal Service marked deceased or undeliverable. This was done since it was believed that questionnaire design would not affect the number of questionnaires returned marked deceased or undeliverable. This assumption was verified using a Chi-square test of independence ( $\alpha = .25$ ) on the number of deceased addressees or undeliverable questionnaires by sample (see Table 14 in Appendix B).

Table 1 give the total and percent returned by mailing for all treatments combined. Of the 17,766 questionnaires mailed and not returned marked deceased or undeliverable, 10,218 useable questionnaires were returned yielding an overall response rate of 57.5 percent. Response rates decreased slightly on successive mailings from an initial response of 28.1 percent to a final mailing response of 20.1 percent.

TABLE: Total Returns and Response Rates by Mailing

<u>Mailing</u>	<u>Number Mailed</u>	<u>Number Returned</u>	<u>Percent Returned</u>
First	17,766	4,999	28.1
First Follow-up	12,767	3,318	26.0
Second Follow-up	9,449	1,901	20.1

NOTE: The initial number mailed indicated in the table equals the actual number mailed minus the returned marked deceased or undeliverable (20660-330-2564 = 17,766).

The response rates for those questionnaires received prior to non-response follow-up are given in Table 2 (see Table 7 in Appendix B for response rates by sample). The highest response rate of 32.1 percent was for Treatment 1 which consists of no letter, cattle only questions in ranges and a single operation description question. The lowest response rate of 22.6 percent was for Treatment 16 which contains the alternative option in each case of Treatment 1. The table also shows that in each case the single operation description question obtained a higher response rate than the complete operation description section.

Response rates by sample prior to non-response follow-up for the four main effects are shown in Table 9 in Appendix B. The differences in response rates were 4.3 percentage points favoring a single joint operation question, 1.7 percentage points favoring ranges over numbers, .6 percentage points favoring no letter, and .5 percentage points favoring asking cattle only. Again, this indicates that the operation description section is having the greatest effect on response rate.

In order to test for differences in response rates due to these main effects and their interactions, an analysis of variance was performed (see Table 15 in Appendix B). At the five percent level, it was found that two of the main effects were significant. The analysis indicates that asking for data in ranges obtained a significantly higher ( $\alpha = .05$ ) response rate due to a single joint operation question rather than a complete operation description section was highly significant ( $\alpha = .01$ ). The remaining main effects and all interactions were non-significant.

TABLE 2: Response Rates in Percents Excluding  
Non-response Follow-up by Treatment

<u>Insert</u>	<u>Livestock Specie</u>	<u>Livestock Data In</u>	<u>Operation Description</u>	<u>Percent Response</u>
NO LETTER BROCHURE	CATTLE ONLY	RANGE	SINGLE	32.1
			COMPLETE	27.5
		NUMBER	SINGLE	28.5
			COMPLETE	24.7
	ALL LIVESTOCK	RANGE	SINGLE	30.9
			COMPLETE	25.7
		NUMBER	SINGLE	31.5
			COMPLETE	26.9
LETTER- BROCHURE	CATTLE ONLY	RANGE	SINGLE	30.0
			COMPLETE	28.1
		NUMBER	SINGLE	30.8
			COMPLETE	25.5
	ALL LIVESTOCK	RANGE	SINGLE	31.0
			COMPLETE	26.8
		NUMBER	SINGLE	27.8
			COMPLETE	22.6

To compare pairs of treatment response rates, a Duncan's New Multiple Range Test was performed. In Table 3, the means are ranked and treatments are described for comparison purposes. In addition, the standard graphical summary of the results of the Duncan five percent level test is presented.

Again with respect of response rate, each of the ten highest ranked treatments was significantly better than the lowest ranked treatment. In addition, each of the top five treatments obtained significantly better response rates than the bottom four. It should be noted that those treatments using a single operation description question have ranks one through seven and nine, giving a good indication as to why this effect was highly significant. However, even though the operation description effect was highly significant in the analysis of variance, the Duncan's test did not find significant differences between the top treatment and the two treatments using questionnaires differing only in the operation description (Treatments 7 and 15).

TABLE 3: Ranking of Response Rates Prior to Non-Response Follow-up by Treatment, Description of Treatment and Duncan's 5% Level New Multiple Range Test

<u>RANK</u>	<u>TREATMENT</u>	<u>RESP. RATE</u>	<u>QUEST</u>	<u>LETTER-BROCHURE</u>	<u>NO. OR RANGE</u>	<u>LIVESTOCK OR CATTLE ONLY</u>	<u>COMPLETE OR SINGLE OPERATION DESCRIPTION</u>
1	16	.3206	R4	NO	RANGE	CATTLE	SINGLE
2	10	.3147	N2	NO	NUMBER	LIVESTOCK	SINGLE
3	6	.3098	R2	YES	RANGE	LIVESTOCK	SINGLE
4	14	.3091	R2	NO	RANGE	LIVESTOCK	SINGLE
5	4	.3077	N4	YES	NUMBER	CATTLE	SINGLE
6	8	.3001	R4	YES	RANGE	CATTLE	SINGLE
7	12	.2849	N4	NO	NUMBER	CATTLE	SINGLE
8	7	.2806	R3	YES	RANGE	CATTLE	COMPLETE
9	2	.2778	N2	YES	NUMBER	LIVESTOCK	SINGLE
10	15	.2746	R3	NO	RANGE	CATTLE	COMPLETE
11	9	.2691	N1	NO	NUMBER	LIVESTOCK	COMPLETE
12	5	.2682	R1	YES	RANGE	LIVESTOCK	COMPLETE
13	13	.2567	R1	NO	RANGE	LIVESTOCK	COMPLETE
14	3	.2552	N3	YES	NUMBER	CATTLE	COMPLETE
15	11	.2470	N3	NO	NUMBER	CATTLE	COMPLETE
16	1	.2263	N1	YES	NUMBER	LIVESTOCK	COMPLETE

Those treatments connected by a line segment are not significantly different ( $\alpha = .05$ ).

A second aspect of this project was to test the effect of using a reminder card as opposed to a second request questionnaire for non-response follow-ups. The numerator for the response rate was the number of questionnaires returned credited to the first follow-up. The denominator was obtained by subtracting the number returned in the first mailing from the denominator of the response rates calculated for the first mailing (overall 17,766 - 4,999 = 12,767) Tables 10 and 11 in Appendix B give the follow-up response rates by sample.

On the first non-response follow-up, the mean response for the 32 samples receiving the second questionnaire was 32.8 percent (see Table 4). The mean response for the 32 samples receiving only a reminder card was 19.1. A t-test was performed to test the differences between the means. The test statistic value of 6.962 is highly significant ( $\alpha = .001$ ). In addition to the the t-test, a distribution free rank sum test (Wilcoxon) was performed which also indicated a highly significant ( $\alpha .001$ ) difference between the two means ( $W^* = 6.875$ ).<sup>1/</sup> The ranges of response rates for the two follow-up techniques do not overlap, that is all 32 samples receiving a second questionnaire obtained a higher response rate than the 32 samples receiving a reminder card.

TABLE 4: Response Rates in Percents for Three Mailings by Non-response Follow-up Technique

<u>MAILING</u>	<u>NUMBER</u>	<u>TECHNIQUE</u>	<u>PERCENT RETURNED</u>
First Mailing	17,766	Questionnaire	28.1
Second Mailing	12,767	Reminder Card	<b>19.1</b>
		Second Request Questionnaire	<b>32.8</b>
Third Mailing	9,449	Second Request Questionnaire	26.4
		Reminder Card	12.6

<sup>1/</sup> Miles Hollander and Douglas A. Wolfe, Nonparametric Statistical Methods (New York: John Wiley & Sons, Inc., 1973), page 68.

This analysis was repeated on the results of the second non-response follow-up. The response rates were calculated by dividing the number of returns credited to the second follow-up by the denominator of the first non-response follow-up minus the number returned in the first follow-up. The means of the samples now receiving a second questionnaire was 26.4 percent and those receiving reminder cards averaged 12.6 percent. The computed test statistics of  $t=16.9$  and  $W^*=6.875$  were highly significant ( $\alpha = .001$ ). The ranges of response rates again did not overlap for this mailing as they did not for the previous one.

In addition to looking at these non-response follow-ups separately, we also tested to see if there was a difference in using a reminder card followed by a questionnaire or a follow-up questionnaire followed by a reminder card. Table 12 (Appendix B) gives these response rates for the two non-response mailings by sample. The means of 41.2 and 40.5 percent were not significantly different ( $\alpha = .10$ ).

With this knowledge of non-significance in overall non-response follow-up rates, the analysis conducted on response rates for the first mailing was repeated on the total response rates determined by all three mailings. Table 8 (Appendix B) gives these total response rates by sample within treatment. Table 5 shows the ranking of these rates. There was some minor shifting but no major changes were found between the rankings for overall response and first-mailing response. Treatment 16 again obtained the best response of 62.2 percent and Treatment 1 the worst of 53.0 percent compared with the overall response rate of 57.5.

It is again the case that those treatments having a single operation description obtained ranks of one through seven. The analysis of variance (Table 15, Appendix B) gives the same results of a highly significant operation description effect, a significant range-number effect, and all other effects and interactions non-significant. Finally, the Duncan's Test (Table 5) indicated thirteen significant ( $\alpha = .05$ ) pairs of treatments, all but two of which were found in the previous test. Each of the five highest ranked treatments obtained significantly better response rates than the lowest ranked treatment. In addition, each of the top three treatments obtained significantly higher response rates than the bottom three.

TABLE 5: Ranking of Overall Response Rates  
by Treatment, Treatment Descriptions  
and Duncan's 5% Level New Multiple  
Range Test

<u>RANK</u>	<u>TREATMENT</u>	<u>MEAN</u>	<u>QUEST.</u>	<u>LETTER</u>	<u>NUMBER OR RANGE</u>	<u>LIVESTOCK OR CATTLE ONLY</u>	<u>COMPLETE OR SINGLE OPERATION DESCRIPTION</u>
1	16	.6219	R4	NO	RANGE	CATTLE	SINGLE
2	14	.6000	R2	NO	RANGE	LIVESTOCK	SINGLE
3	8	.5987	R4	YES	RANGE	CATTLE	SINGLE
4	10	.5968	N2	NO	NUMBER	LIVESTOCK	SINGLE
5	6	.5910	R2	YES	RANGE	LIVESTOCK	SINGLE
6	12	.5851	N4	NO	NUMBER	CATTLE	SINGLE
7	2	.5837	N2	YES	NUMBER	LIVESTOCK	SINGLE
8	5	.5788	R1	YES	RANGE	LIVESTOCK	COMPLETE
9	15	.5787	R3	NO	RANGE	CATTLE	COMPLETE
10	4	.5778	N4	YES	NUMBER	CATTLE	SINGLE
11	9	.5687	N1	NO	NUMBER	LIVESTOCK	COMPLETE
12	13	.5614	R1	NO	RANGE	LIVESTOCK	COMPLETE
13	7	.5521	R3	YES	RANGE	CATTLE	COMPLETE
14	11	.5400	N3	NO	NUMBER	CATTLE	COMPLETE
15	3	.5354	N3	YES	NUMBER	CATTLE	COMPLETE
16	1	.5299	N1	YES	NUMBER	LIVESTOCK	COMPLETE

Those treatments connected by a line segment are not significantly different ( $\alpha = .05$ ).

The final interest of the project is the distribution of cattle among the various mailings and treatments. Table 6 gives a breakdown between cattle reported in ranges and numbers by mailings. The number of cattle reported in ranges was greater than those in numbers for all three mailings. This can be attributed to the increased number of responses for range questionnaires as seen in Table 13 (Appendix B). This table gives the number of questionnaires returned by mailing within cattle size group for the number questionnaires, range questionnaires, and all questionnaires.

TABLE 6: Number of Cattle Reported in Ranges and Numbers  
Cattle Reported In

<u>Returns From</u>	<u>Ranges</u> <sup>1/</sup>	<u>Numbers</u>	<u>Total</u>
First Mailing	261,127	230,457	491,584
First Follow-up	141,292	123,714	265,006
Second Follow-up	74,156	66,061	140,217
<b>TOTAL</b>	<b>476,575</b>	<b>420,232</b>	<b>896,807</b>

1/ Cattle reported in ranges are assumed to be the midpoint of the range with the exception of those 1500 or more for which the mean (2076) for the cattle reported in numbers of 1500 or more was used.

The total number of cattle reported by the questionnaires returned was approximately 900,000. Based upon past multiple frame surveys using the 3,033 names not sampled in this project, if all questionnaires had been returned, a total of approximately 1.7 million cattle would have been reported. Approximately 54 percent of the "available" cattle were reported by those who responded to the survey. Thus, in this survey, the larger cattle operators did not tend to respond at a higher rate than others.



## CONCLUSION AND RECOMMENDATIONS

The evidence from this survey indicates that questionnaire design and subsequent request procedures do materially affect the response rate for obtaining control data via a mail questionnaire survey. The specific conclusions are as follows:

1. There was a highly significant increase in response rate due to the use of a single operation description question rather than a complete operation description.
2. There was a significant increase in response rate due to asking livestock questions in ranges rather than actual numbers.
3. Response rate was not significantly different between questionnaires with several types of livestock questions and those with only cattle questions.
4. Response rate was not increased by including a personal letter-brochure with the initially mailed questionnaire.
5. There was a highly significant increase in response rates for non-response follow-ups due to sending a questionnaire rather than a reminder card.

From the viewpoint of maximizing response rates, it is recommended that control data questionnaires be patterned after R-2 or R-4, and that questionnaires be used instead of reminder cards for all non-response follow-ups. In addition, the cost of letter-brochures is not justified by increased response rates.

APPENDIX

QUESTIONNAIRE VERSIONS, LETTER INSERT,  
AND REMINDER CARD

COLORADO CROP AND LIVESTOCK REPORTING SERVICE

U. S. Dept. of Agriculture  
STATISTICAL REPORTING SERVICE

in cooperation with

State of Colorado  
DEPARTMENT OF AGRICULTURE  
March 6, 1974

The questions below are to improve the usefulness of the information we provide about Colorado agriculture. Please answer the questions even if you do not have a farm or ranch operation and return in the enclosed envelope. Information will be kept confidential.

*Floyd E. Rolf*  
Floyd E. Rolf  
Statistician in Charge

Please make corrections in name, address and zip code, if necessary.

Is your operation known by another name, other than printed above?

NO

YES Enter name \_\_\_\_\_

1. Do you operate a farm or ranch or have livestock or poultry?

YES - If yes, answer questions below

NO - If no, please sign and return this questionnaire

2. Acres of all land in the farm or ranch you operate (include land rented from others but exclude land rented to others) . . . . . Acres \_\_\_\_\_

LARGEST NUMBER OF EACH KIND OF LIVESTOCK ON THE LAND YOU OPERATED IN 1973.  
INCLUDE YOUR LIVESTOCK ON PUBLIC GRAZING LAND.

3. Horses . . . . . Number \_\_\_\_\_

4. Chickens . . . . . Number \_\_\_\_\_

5. Hogs and pigs . . . . . Number \_\_\_\_\_

6. Sheep . . . . . Number \_\_\_\_\_

7. All cattle and calves . . . . . Number \_\_\_\_\_

Check type(s) of cattle:  Beef  Cattle on feed  Milk cows

8. In what county or counties is your operation located? List in order of importance:

a. \_\_\_\_\_ b. \_\_\_\_\_ c. \_\_\_\_\_ d. \_\_\_\_\_  
(Principal county)

9. Do you operate any agricultural land in a joint arrangement with another person? Exclude landlord-tenant arrangements. (Check one)  YES - Continue.  
 NO - Please sign and return this questionnaire.

10. Who are the person(s) in the joint land arrangement with you?

a. Full Name \_\_\_\_\_  
b. Complete Address \_\_\_\_\_ Zip \_\_\_\_\_  
c. Is he a:  Partner  Corporate Member  Manager  Other \_\_\_\_\_  
d. Partnership or Corporation Name \_\_\_\_\_

(IF MORE THAN ONE PARTNER OR MEMBER, RECORD ON BACK OF QUESTIONNAIRE)

11. Are any cattle involved in this joint arrangement?

YES - Continue  NO - Please sign & return this questionnaire.

12. How many cattle are involved? \_\_\_\_\_

13. Are these cattle included in your answer to question 7?  YES  NO

REPORTED BY \_\_\_\_\_ DATE \_\_\_\_\_ TELEPHONE \_\_\_\_\_  
Area code \_\_\_\_\_

COLORADO CROP AND LIVESTOCK REPORTING SERVICE

U. S. Dept of Agriculture  
STATISTICAL REPORTING SERVICE

in cooperation with

State of Colorado  
DEPARTMENT OF AGRICULTURE  
March 6, 1974

The questions below are to improve the usefulness of the information we provide about Colorado agriculture. Please answer the questions even if you do not have a farm or ranch operation and return in the enclosed envelope. Information will be kept confidential.



Floyd E. Rolf  
Statistician in Charge

Please make corrections in name, address and zip code, if necessary.

Is your operation known by another name, other than printed above?

No

Yes Enter name \_\_\_\_\_

1. Do you operate a farm or ranch or have livestock or poultry?

Yes - If yes, answer questions below

No - If no, please sign and return this questionnaire

2. Acres of all land in the farm or ranch you operate (include land rented from others but exclude land rented to others). . . . .Acres \_\_\_\_\_

3. Mark the box that best describes the operation of this land.

Individual  Partnership  Other (Specify) \_\_\_\_\_

LARGEST NUMBER OF EACH KIND OF LIVESTOCK ON THE LAND YOU OPERATED IN 1973.  
INCLUDE YOUR LIVESTOCK ON PUBLIC GRAZING LAND.

4. Horses. . . . .Number \_\_\_\_\_

5. Chickens. . . . .Number \_\_\_\_\_

6. Hogs and pigs. . . . .Number \_\_\_\_\_

7. Sheep. . . . .Number \_\_\_\_\_

8. All cattle and calves. . . . .Number \_\_\_\_\_

Check type(s) of cattle:  Beef  Cattle on feed  Milk cows

REPORTED BY \_\_\_\_\_ DATE \_\_\_\_\_ TELEPHONE \_\_\_\_\_

Area Code \_\_\_\_\_

COLORADO CROP AND LIVESTOCK REPORTING SERVICE  
U. S. Dept. of Agriculture in cooperation with State of Colorado  
STATISTICAL REPORTING SERVICE DEPARTMENT OF AGRICULTURE  
March 6, 1974

The questions below are to improve the usefulness of the information we provide about Colorado agriculture. Please answer the questions even if you do not have a farm or ranch operation and return in the enclosed envelope. Information will be kept confidential.

*Floyd E. Rolf*  
Floyd E. Rolf  
Statistician in Charge

Please make corrections in name, address and zip code, if necessary.

Is your operation known by another name, other than printed above?

- NO
- YES Enter name \_\_\_\_\_

1. Do you operate a farm or ranch or have livestock or poultry?

- YES - If yes, answer questions below.
- NO - If no, please sign and return this questionnaire.

2. Acres of all land in the farm or ranch you operate (include land rented from others but exclude land rented to others) . . . . .Acres \_\_\_\_\_

LARGEST NUMBER OF CATTLE AND CALVES ON THE LAND YOU OPERATED IN 1973.  
INCLUDE THOSE ON PUBLIC GRAZING LAND.

3. All cattle and calves . . . . .Number \_\_\_\_\_

Check type(s) of cattle:  Beef  Cattle on feed  Milk cows

4. In what county or counties is your operation located? List in order of importance:

- a. \_\_\_\_\_ b. \_\_\_\_\_ c. \_\_\_\_\_ d. \_\_\_\_\_  
(Principal county)

5. Do you operate any agricultural land in a joint arrangement with another person? Exclude landlord-tenant arrangements? (Check one)  YES - Continue  
 NO - Please sign and return this questionnaire.

6. Who are the person(s) in the joint land arrangement with you?

a. Full name _____
b. Complete address _____ Zip _____
c. Is he a: <input type="checkbox"/> Partner <input type="checkbox"/> Corporate member <input type="checkbox"/> Manager <input type="checkbox"/> Other _____
d. Partnership or corporation name _____

(IF MORE THAN ONE PARTNER OR MEMBER, RECORD ON BACK OF QUESTIONNAIRE)

7. Are any cattle involved in this joint arrangement?

- YES - Continue  NO - Please sign and return this questionnaire.

8. How many cattle are involved? \_\_\_\_\_

9. Are these cattle included in your answer to question 3?  YES  NO

REPORTED BY \_\_\_\_\_ DATE \_\_\_\_\_ TELEPHONE \_\_\_\_\_  
Area code

N-4

COLORADO CROP AND LIVESTOCK REPORTING SERVICE

U. S. Dept. of Agriculture  
STATISTICAL REPORTING SERVICE

in cooperation with

State of Colorado  
DEPARTMENT OF AGRICULTURE  
March 6, 1974

The questions below are to improve the usefulness of the information we provide about Colorado agriculture. Please answer the questions even if you do not have a farm or ranch operation and return in the enclosed envelope. Information will be kept confidential.

*Floyd E. Rolf*  
Floyd E. Rolf  
Statistician in Charge

Please make corrections in name, address and zip code, if necessary.

Is your operation known by another name, other than printed above?

No

Yes Enter name \_\_\_\_\_

1. Do you operate a farm or ranch or have livestock or poultry?

Yes - If yes, answer questions below

No - If no, please sign and return this questionnaire

2. Acres of all land in farm or ranch you operate (include land rented from others but exclude land rented to others). . . . .Acres \_\_\_\_\_

3. Mark the box that best describes the operation of this land.

Individual  Partnership  Other (Specify) \_\_\_\_\_

LARGEST NUMBER OF CATTLE AND CALVES ON THE LAND YOU OPERATED IN 1973.  
INCLUDE THOSE ON PUBLIC GRAZING LAND.

4. All cattle and calves. . . . .Number \_\_\_\_\_

Check type(s) of cattle:  Beef  Cattle on feed  Milk cows

REPORTED BY \_\_\_\_\_ DATE \_\_\_\_\_ TELEPHONE \_\_\_\_\_  
Area code \_\_\_\_\_

COLORADO CROP AND LIVESTOCK REPORTING SERVICE

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Is your operation known by another name, other than printed above?

NO  
 YES Enter name \_\_\_\_\_

- Do you operate a farm or ranch or have livestock or poultry?  
 YES - If yes, answer questions below.  
 NO - If no, please sign and return this questionnaire.
- Acres of all land in the farm or ranch you operate (include land rented from others but exclude land rented to others) . . . . . Acres \_\_\_\_\_

PLEASE PLACE AN "X" IN THE COLUMN FOR THE LARGEST NUMBER OF EACH KIND OF LIVESTOCK ON THE LAND YOU OPERATED IN 1973. INCLUDE YOUR LIVESTOCK ON PUBLIC GRAZING LAND.

Kind	Number of livestock							
	0	1-49	50-99	100-199	200-499	500-999	1000-1499	1500+
3. Horses								
4. Chickens								
5. Hogs and pigs								
6. Sheep								
7. All cattle and calves								

Check type(s) of cattle  Beef  Cattle on feed  Milk cows

- In what county or counties is your operation located? List in order of importance:  
a. \_\_\_\_\_ b. \_\_\_\_\_ c. \_\_\_\_\_ d. \_\_\_\_\_  
(Principal county)
- Do you operate any agricultural land in a joint arrangement with another person? Exclude landlord-tenant arrangements? (Check one)  YES - Continue  
 NO - Please sign and return this questionnaire.
- Who are the person(s) in the joint land arrangement with you?

a. Full name _____
b. Complete address _____ Zip _____
c. Is he a: <input type="checkbox"/> Partner <input type="checkbox"/> Corporate member <input type="checkbox"/> Manager <input type="checkbox"/> Other _____
d. Partnership or corporation name _____

(IF MORE THAN ONE PARTNER OR MEMBER, RECORD ON BACK OF QUESTIONNAIRE)

- Are any cattle involved in this joint arrangement?  
 YES - Continue  NO - Please sign and return this questionnaire.
- How many cattle are involved? \_\_\_\_\_
- Are these cattle included in your answer to question 7?  YES  NO

REPORTED BY \_\_\_\_\_ DATE \_\_\_\_\_ TELEPHONE \_\_\_\_\_  
Area code

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Please make corrections in name, address and zip code, if necessary.

Is your operation known by another name, other than printed above?

- No
- Yes Enter name \_\_\_\_\_

1. Do you operate a farm or ranch or have livestock or poultry?

- Yes - If yes, answer questions below
- No - If no, please sign and return this questionnaire

2. Acres of all land in the farm or ranch you operate (include land rented from others but exclude land rented to others). . . . . Acres \_\_\_\_\_

3. Mark the box that best describes the operation of this land.

- Individual  Partnership  Other (Specify) \_\_\_\_\_

PLEASE PLACE AN "X" IN THE COLUMN FOR THE LARGEST NUMBER OF EACH KIND OF LIVESTOCK ON THE LAND YOU OPERATED IN 1973. INCLUDE YOUR LIVESTOCK ON PUBLIC GRAZING LAND.

Kind	Number of livestock							
	0	1-49	50-99	100-199	200-499	500-999	1000-1499	1500+
4. Horses								
5. Chickens								
6. Hogs and pigs								
7. Sheep								
8. All cattle and calves								

Check type(s) of cattle:  Beef  Cattle on feed  Milk cows

REPORTED BY \_\_\_\_\_ DATE \_\_\_\_\_ TELEPHONE \_\_\_\_\_  
Area code \_\_\_\_\_



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Is your operation known by another name, other than printed above?

- NO
- YES Enter name \_\_\_\_\_

1. Do you operate a farm or ranch or have livestock or poultry?  
 YES - If yes, answer questions below.  
 NO - If no, please sign and return this questionnaire.
2. Acres of all land in the farm or ranch you operate (include land rented from others but exclude land rented to others) . . . . . Acres \_\_\_\_\_

PLEASE PLACE AN "X" IN THE COLUMN FOR THE LARGEST NUMBER OF CATTLE AND CALVES ON THE LAND YOU OPERATED IN 1973. INCLUDE THOSE ON PUBLIC GRAZING LAND.

KIND	Number of cattle							
	0	1-49	50-99	100-199	200-499	500-999	1000-1499	1500+
3. All cattle and calves								

Check type(s) of cattle:  Beef  Cattle on feed  Milk cows

4. In what county or counties is your operation located? List in order of importance:  
a. \_\_\_\_\_ b. \_\_\_\_\_ c. \_\_\_\_\_ d. \_\_\_\_\_  
(Principal county)

5. Do you operate any agricultural land in a joint arrangement with another person? Exclude landlord-tenant arrangements. (Check one)  YES - Continue  
 NO - Please sign & return this questionnaire

6. Who are the person(s) in the joint land arrangement with you?

a. Full name _____
b. Complete address _____ Zip _____
c. Is he a: <input type="checkbox"/> Partner <input type="checkbox"/> Corporate member <input type="checkbox"/> Manager <input type="checkbox"/> Other _____
d. Partnership or corporation name _____

(IF MORE THAN ONE PARTNER OR MEMBER, RECORD ON BACK OF QUESTIONNAIRE)

7. Are any cattle involved in this joint arrangement?  
 YES - Continue  NO - Please sign and return this questionnaire.
8. How many cattle are involved? \_\_\_\_\_
9. Are these cattle included in your answer to question 3?  YES  NO

REPORTED BY \_\_\_\_\_ DATE \_\_\_\_\_ TELEPHONE \_\_\_\_\_  
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Floyd E. Rolf  
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No

Yes Enter name \_\_\_\_\_

1. Do you operate a farm or ranch or have livestock or poultry?

Yes - If yes, answer questions below

No - If no, please sign and return this questionnaire

2. Acres of all land in the farm or ranch you operate (include land rented from others but exclude land rented to others). . . . .Acres \_\_\_\_\_

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Individual  Partnership  Other (Specify) \_\_\_\_\_

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Kind	Number of cattle							
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4. All cattle and calves								

Check type(s) of cattle:  Beef  Cattle on feed  Milk cows

REPORTED BY \_\_\_\_\_ DATE \_\_\_\_\_ TELEPHONE \_\_\_\_\_  
Area code \_\_\_\_\_

## COLORADO CROP AND LIVESTOCK REPORTING SERVICE

OFFICE OF THE AGRICULTURAL STATISTICIAN, 2490 West 26th Ave., Rm. 245  
DENVER, COLORADO 80211  
PHONE: 837-3037

March 6, 1974

Dear Sir:

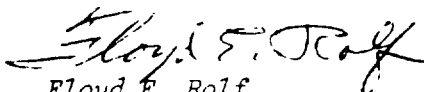
Everything seems to be becoming more complex and agriculture is no exception. Reliable information, as you well know, is a necessity in developing good judgment and plans for farm and ranch operations. We in the Colorado Crop and Livestock Reporting Service are especially concerned with improving the usefulness of information we provide.

We need your help to do this job. Your answers on the enclosed questionnaire, even if you have no livestock, will underwrite a better program of information and statistics for Colorado.

Please return this questionnaire; it will be kept confidential in this office. I have drawn together some brief notes from recent USDA releases on the reverse side of this letter which may be of interest to you.

Thank you for your assistance.

Sincerely,

  
Floyd E. Rolf  
Statistician in Charge

## BRIEF FACTS TAKEN FROM DEPARTMENT PUBLICATIONS FOR YOUR INFORMATION.

### Fuel Fuss Digs into Diesel:

Diesel fuels in '74 may be tighter than gasoline because both farmers and industry want to use more. Farm use of diesel has been growing about 7 percent annually for over a decade. Gasoline use on the farm has held steady. About four-fifths of the new tractors bought in '72 and over half the new combines moving out in '73's first half were diesel powered.

### Farm Income to Tip Down in '74:

Net farm income is forecast at \$20 to \$23 billion this year, down from the record of over \$25 billion last year but still the second highest ever. USDA economists expect that, barring bad weather, farm prices of both crops and livestock will average about the same as in '73 while marketings may edge up. However, partially offsetting will be lower government payments and a roughly 5 percent rise in production expenditures.

### Beefing Up Beef Production:

USDA researchers see enough capacity for a 60% boost in beef and veal output by 1985, with the quantity climbing from about 21.7 million pounds last year to 35 million pounds if the economic incentive is strong enough. Most of this potential gain would come from a 40% boost in animal numbers; however, there is some potential for upping the output from each animal. Crossbreeding and artificial insemination of beef cows could result in up to 20% gains in beef production efficiency. Multiple births, or twinning, also offers a big potential for more production efficiency.

### Wool Upswing Fueled By Energy Crisis:

USDA says the energy shortage could increase the demand for natural fibers--cotton and wool. Man-made fibers from petroleum products will feel a tightening in the production situation because of reduced raw materials. Consider this: it takes about five times more energy to produce a pound of synthetics than it does a pound of wool.

REMINDER CARD

INFORMATION ON YOUR AGRICULTURAL OPERATION IS IMPORTANT

A FEW DAYS AGO WE SENT YOU A SPECIAL INQUIRY.

IF YOU HAVE ALREADY RETURNED YOUR QUESTIONNAIRE, THANK YOU.

IF NOT, PLEASE TAKE A FEW MINUTES TO COMPLETE AND RETURN THE INQUIRY.

AGR. STATISTICIAN'S OFFICE  
P.O. BOX 17066  
DENVER, COLORADO 80217

FLOYD E. ROLF  
AGRICULTURAL STATISTICIAN  
IN CHARGE

APPENDIX B

TABLES 7 - 16: SUMMARIES AND ANALYSIS

TABLE 7: Response Rates Excluding Non-response Follow-up  
by Sample Within Treatment

TREATMENT	1	2	3	4	MEAN
1	.2379	.2509	.2044	.2119	.2263
2	.2794	.2430	.2892	.2997	.2778
3	.2509	.3188	.2338	.2171	.2552
4	.3100	.3333	.2794	.3080	.3077
5	.2580	.2628	.3222	.2297	.2682
6	.3164	.3213	.3112	.2903	.3098
7	.3263	.2274	.2527	.3160	.2806
8	.3322	.3048	.2847	.2786	.3001
9	.2428	.3116	.2792	.2429	.2691
10	.2820	.3177	.3333	.3260	.3147
11	.2419	.2657	.2276	.2527	.2470
12	.2391	.2711	.3080	.3216	.2849
13	.2660	.2643	.2456	.2509	.2567
14	.3229	.3191	.2976	.2976	.3091
15	.2246	.2803	.3249	.2687	.2746
16	.2993	.3432	.3238	.3164	.3206

TABLE 8: Response Rate Including Non-response Follow-up  
by Sample Within Treatment

TREATMENT	<u>SAMPLE</u>				MEAN
	1	2	3	4	
1	.5576	.5636	.4818	.5167	.5299
2	.5441	.6232	.5610	.6062	.5837
3	.5387	.5399	.5612	.5018	.5254
4	.5720	.5971	.5625	.5797	.5778
5	.5689	.5730	.6185	.5548	.5788
6	.5964	.6390	.5909	.5376	.5910
7	.5649	.5126	.5196	.6111	.5521
8	.6184	.6506	.6146	.5115	.5987
9	.5688	.5870	.5618	.5571	.5687
10	.6015	.6318	.5714	.5824	.5968
11	.5162	.5498	.5345	.5596	.5400
12	.5145	.5775	.6232	.6254	.5851
13	.5638	.5643	.5333	.5842	.5614
14	.6250	.6332	.6332	.5568	.6000
15	.5616	.6101	.6101	.5485	.5787
16	.6387	.6547	.6547	.6026	.6219



TABLE 9: Response Rates Excluding Nonresponse Follow-Up  
by Sample for Main Effects

Sample	No		Numbers	Ranges	All Livestock	Cattle Only	Complete Operation Section	Sgi Joint Operation Question
	Letter	Letter						
1	.2379	.2428	.2379	.2580	.2379	.2509	.2379	.2794
2	.2509	.3116	.2509	.2628	.2509	.3188	.2509	.2430
3	.2044	.2792	.2044	.3222	.2044	.2338	.2044	.2892
4	.2119	.2429	.2119	.2297	.2119	.2171	.2119	.2997
5	.2794	.2820	.2794	.3164	.2797	.3100	.2509	.3100
6	.2430	.3177	.2430	.3213	.2430	.3333	.3188	.3333
7	.2892	.3333	.2892	.3112	.2892	.2794	.2338	.2794
8	.2997	.3260	.2997	.2903	.2997	.3080	.2171	.3080
9	.2509	.2419	.2509	.3263	.2580	.3263	.2580	.3164
10	.3188	.2657	.3188	.2274	.2628	.2274	.2628	.3213
11	.2338	.2276	.2338	.2527	.3222	.2527	.3222	.3112
12	.2171	.2527	.2171	.3160	.2297	.3160	.2297	.2903
13	.3100	.2391	.3100	.3322	.3164	.3322	.3263	.3322
14	.3333	.2711	.3333	.3048	.3213	.3048	.2274	.3048
15	.2794	.3080	.2794	.2847	.3112	.2847	.2527	.2847
16	.3080	.3216	.3080	.2786	.2903	.2786	.3160	.2786
17	.2580	.2660	.2428	.2660	.2428	.2419	.2428	.2820
18	.2628	.2643	.3116	.2643	.3116	.2657	.3116	.3177
19	.3222	.2456	.2792	.2456	.2792	.2276	.2792	.3333
20	.2297	.2509	.2429	.2509	.2429	.2527	.2429	.3260
21	.3164	.3229	.2820	.3229	.2820	.2391	.2419	.2391
22	.3213	.3191	.3177	.3191	.3177	.2711	.2657	.2711
23	.3112	.2976	.3333	.2976	.3333	.3080	.2276	.3080
24	.2903	.2967	.3260	.2967	.3260	.3216	.2527	.3216
25	.3263	.2246	.2419	.2246	.2660	.2246	.2660	.3229
26	.2274	.2803	.2657	.2803	.2643	.2803	.2643	.3191
27	.2527	.3249	.2276	.3249	.2456	.3249	.2456	.2976
28	.3160	.2687	.2527	.2687	.2509	.2687	.2509	.2967
29	.3322	.2993	.2391	.2993	.3229	.2993	.2246	.2993
30	.3048	.3432	.2711	.3432	.3191	.3432	.2803	.3432
31	.2847	.3237	.3080	.3237	.2976	.3237	.3249	.3237
32	.2786	.3164	.3216	.3164	.2967	.3164	.2687	.3164
Average	.2782	.2846	.2728	.2900	.2790	.2838	.2597	.3031

TABLE 10 Response Rates for the First  
Nonresponse Follow-up

<u>Sample</u>	<u>Second Request Questionnaire</u>	<u>Reminder Card</u>
1	.3447	.1707
2	.3066	.1651
3	.3186	.1684
4	.3483	.2419
5	.3251	.1702
6	.2864	.1972
7	.3163	.1604
8	.3246	.1978
9	.3238	.2178
10	.3257	.2020
11	.3351	.2287
12	.3030	.1777
13	<u>.2656</u>	<u>.1542</u>
14	.2857	.2132
15	.3333	.2427
16	<u>.4011</u>	.1640
17	.3541	.2105
18	.3088	.1792
19	.3299	.1703
20	.3545	.1630
21	.3065	.1810
22	.3348	.2078
23	.3527	.1571
24	.3385	.1728
25	.3092	.1721
26	.3058	<u>.2615</u>
27	.3795	.1875
28	.3891	.1771
29	.3474	.2383
30	.2857	.1604
31	.2809	.1927
32	.3777	.2128
<hr/> Average	<hr/> .3281	<hr/> .1908

TABLE 11: Response Rates for the Second  
Nonresponse Follow-up

<u>Sample</u>	<u>Reminder Card</u>	<u>Follow-Up Questionnaire</u>
1	.1111	.3000
2	.1156	.2198
3	.0935	.2393
4	.1374	.3436
5	.0876	.1859
6	.1083	.2866
7	.1119	.2611
8	.1008	.2466
9	.1408	.2595
10	.1429	.2945
11	.1120	.3103
12	.0652	.2778
13	.1206	.2541
14	.1000	.2774
15	.1429	.2885
16	.1607	.1899
17	.1185	.2400
18	.1206	.2874
19	.1719	.2252
20	.1639	.2597
21	.1159	.2209
22	.0940	.2561
23	.1045	.2429
24	.1654	.3418
25	.1399	.2528
26	.1469	.2484
27	.1074	.2500
28	.1452	.2342
29	.1371	.2577
30	.1357	.3121
31	.1328	.3613
32	.1795	.2635
<hr/> Average	<hr/> .1260	<hr/> .2637

TABLE 12; Response Rates for Follow-up Using Questionnaire  
 Followed by Reminder Card Versus Reminder Card  
 Then Questionnaire

<u>Sample</u>	<u>Questionnaire - Reminder Card</u>	<u>Reminder Card - Questionnaire</u>
1	.4175	.4195
2	.3868	.3486
3	.3824	.3673
4	.4378	.5023
5	.3842	.3245
6	.3636	.4272
7	.3929	.3797
8	.3927	.3956
9	.4190	.4208
10	.4220	.4372
11	.4096	.4681
12	.3485	.4061
13	.3542	.3692
14	.3571	.4315
15	.4286	.4612
16	.4973	.3228
17	.4306	.4000
18	.3922	.4151
19	.4450	.3571
20	.4603	.3804
21	.3869	.3619
22	.3973	.4106
23	.4203	.3619
24	.4479	.4555
25	.4058	.3814
26	.4078	.4450
27	.4462	.3906
28	.4778	.3698
29	.4368	.4346
30	.3827	.4225
31	.3764	.4844
32	.4894	.4202
<hr/> Average	<hr/> .4124	<hr/> .4054

TABLE 13: Response By Cattle Group

CATTLE GROUP	FIRST MAILING			FIRST FOLLOW-UP			SECOND FOLLOW-UP			OVERALL		
	NUMBER	RANGE	TOTAL	NUMBER	RANGE	TOTAL	NUMBER	RANGE	TOTAL	NUMBER	RANGE	TOTAL
0	883	907	1790	662	675	1337	415	382	797	1960	1964	3924
1-49	648	716	1364	474	508	982	241	292	533	1363	1516	2879
50-99	293	335	628	175	178	353	83	94	177	551	607	1158
100-199	268	278	546	148	133	281	94	95	189	510	506	1016
200-499	248	244	492	135	125	260	83	77	160	466	446	912
500-999	64	61	125	42	38	80	15	20	35	121	119	240
1000-1499	16	10	26	6	7	13	6	3	9	28	20	48
1500+	12	16	28	5	7	12	1	0	1	18	23	41
TOTAL	2432	2567	4999	1647	1671	3318	938	1901	5017	5017	5201	10218

TABLE 14 : Number of Questionnaires Returned by Post Office Marked Deceased or Undeliverable - By Sample

Treatment	Sample				TOTAL
	1	2	3	4	
1	54	48	49	54	205
2	51	39	36	35	161
3	52	47	45	42	186
4	52	50	51	47	200
5	40	49	52	39	180
6	48	46	37	43	174
7	38	46	42	35	161
8	40	54	35	60	189
9	47	47	39	42	175
10	57	46	50	49	202
11	46	52	33	45	176
12	47	39	47	40	173
13	41	43	38	31	153
14	35	41	34	50	160
15	47	59	46	54	206
16	49	52	45	47	193
					2894

$$E = \bar{X} = \frac{2894}{64} = 45.22$$

$$\text{Test Statistic: } \chi^2 = \sum_{i=1}^{64} \frac{(O_i - E)^2}{E} = 61.63$$

$$\text{Critical Value } (\alpha = 0.25) = 70.16$$

TABLE 15 : Analysis of Variance on Response Rate of First Mailing

Source	df.	SS	MS	CALC F
		$\times 10^{-4}$	$\times 10^{-4}$	
Letter	1	6.5603	6.5603	.764
Range	1	46.9248	46.9248	5.462*
Livestock	1	3.8137	3.8137	.444
Joint	1	301.3938	301.3938	35.080**
Two-Way Interaction	6	30.4060	5.0676	.590
Three-Way Interaction	4	56.8689	14.2172	1.655
Four-Way Interaction	1	1.4889	1.4889	.173
Error	48	412.3921	8.5915	
Total	63	859.8484		

\* = Significant with  $\alpha = .05$

\*\* = Significant with  $\alpha = .01$

TABLE 16: Analysis of Variance on Overall Response Rate

Source	df	SS	MS	Calculated F
		$\times 10^{-4}$	$\times 10^{-4}$	
Letter	1	27.7291	27.7291	2.304
Range	1	68.1927	68.1927	5.667*
Livestock	1	1.0529	1.0529	.087
Joint	1	240.1693	240.1693	19.957**
Two-Way Interaction	6	18.4220	3.0703	.255
Three-Way Interaction	4	32.0418	8.0105	.666
Four-Way Interaction	1	8.5033	8.5033	.707
Error	48	577.6459	12.0343	
TOTAL	63	973.7560		

\* = Significant with  $\alpha = .05$

\*\* = Significant with  $\alpha = .01$