

Using Analysis of Field Test Results to Evaluate Questionnaire Performance

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I. Introduction

The Census of Agriculture (COA) is conducted by the U.S. Department of Agriculture's (USDA) National Agricultural Statistics Service every five years, collecting data for reference years ending in 2 and 7. Questionnaires are mailed to all known and potential farm operations, approximately 3 million addresses. The questionnaire collects data on agricultural land, production, inventories, production practices, economics, and operator demographics.

In preparation for the 2017 COA, the National Agricultural Statistics Service (NASS) conducted a large-scale field test. The field test was conducted for two purposes: (1) to determine the optimal content and layout of the COA questionnaire and (2) to create a donor pool for imputation for the 2017 COA. This paper only addresses the first objective of using the field test to evaluate the questionnaire performance.

Six versions of the questionnaire were developed to test issues related to question and section order, question format, and a short versus long form questionnaire. The field test included approximately 30,000 agricultural operations who were divided into treatment groups and mailed one of the six questionnaire versions. Data were collected using procedures similar to those used in the previous COA and then evaluated to measure data quality. Along with the evaluation results, this paper discusses differences among the questionnaires, the methods and research objectives of the field test, and how the results of the field test were applied to improve the questionnaire.

II. Description of Census of Agriculture Content Test Experimental Design

Data Collection Procedures

Data collection procedures for the 2015 Census Content Test included an initial mailing of a questionnaire and cover letter, a postcard reminder, a second mailing, and telephone follow-up for non-respondents. The initial mailing packet was sent in early January 2016 with telephone follow-up ending in May 2016.

Questionnaire Design Differences

During the field test, six questionnaire versions were tested across ten treatment groups. Questionnaire version 1 was the base questionnaire, a 28 page version of the traditional Census form from which the other versions were created. Additional versions of the form differed in several ways, including: (1) the placement of the personal characteristics section in the front vs. the back of the questionnaire; (2) the format of the commodity sections with a listing of commodities and codes printed on the form vs. printed in an instruction booklet; and (3) the length of the form ("short" form vs. "long" form). To attempt to reduce the size of the questionnaire for at least part of

the population, a “short” form was developed by removing certain detailed commodity sections of the form and replacing them with yes/no screener questions for those commodities.

Universe creation and sample selection

The analysis of this separate “short” form required that we use two universes to select the sample for the field test. Control data on NASS’s list frame was used to determine which operations had the specific commodities replaced with a screener and thus weren’t eligible to receive a short form (i.e., the “long form universe”). The second universe, referred to as the “short form universe,” contained all other records which did not have list frame data for these commodities and represents those who were eligible to receive a short form. This allowed us to test the use of a questionnaire to be mailed only to operations with specific characteristics, as identified by our list frame. In addition, we mailed the long form to a sample of operators in the short form universe to test whether they would report any information in the detailed commodity sections that only had screeners on the short form.

For logistical reasons, the universes, and therefore, the samples selected from those universes, do not represent the usual Census population because before creating either universe, some operations were removed. To prevent overburdening respondents, operations were removed from both universes if they were in any other NASS Survey from January through May 2016. In addition, operations with complex reporting situations or previously arranged special handling were removed. After those operations were removed, the two universes were created.

Using the six questionnaires and the two universes, a sample was selected for the ten treatment groups. Table 1 summarizes the experimental design of the 2015 Census Content Test, detailing the differences of the treatment groups and questionnaire versions.

Table 1: Summary of Treatment Groups and Questionnaire Form Versions for this analysis

Treatment Group	Form Version	Sample Size	Pages	Personal Characteristics Placement	Commodity Code Listing for Field Crops on Form?	Universe
1	1	6,500	28	Back	Yes	Long
2	2	3,250	24 – Long	Front	No	Long
3	3	3,250	20 – Short	Back	Yes	Short
4*	4	3,250	24 – Long	Back	No	Long
7	4	3,250	24 – Long	Back	No	Short
8	5	3,250	20 – Short	Front	Yes	Short
9	6	3,250	24 – Long	Front	No	Short
10	6	3,250	24 - Long	Front	No	Long

* Note: Treatment group 4 is combined with treatment groups 5 and 6 for the analyses in this paper.

This paper discusses results from an analysis of all questionnaire versions, except version 1. We excluded form version 1 from our analyses since the differences in the design of that form were not applicable for the research objectives of this paper. Based on the characteristics of each questionnaire, the length ranged from 20-24 pages. Throughout this paper, the 20 page questionnaire will be referred to as the short form, while the 24 page questionnaire will be referred to as the long form.

III. Research Questions

All data analysis was conducted using unedited, mail returned records only, unless otherwise specified.

We discuss three research questions in this paper:

- Can we reduce unit, section, and item nonresponse on the personal characteristics section, but not impact nonresponse on the rest of the questionnaire, if we move that section towards the front of the questionnaire?
- Can we make a shorter form for some respondents by replacing sections that are not relevant to them with yes/no screener questions, without losing data?
- Can we save space on the questionnaire, but maintain data quality, by moving field crop listings to a separate instruction booklet?

A. Research Question 1 - Can we reduce unit, section, and item nonresponse on the personal characteristics section, but not impact nonresponse on the rest of the questionnaire, if we move that section towards the front of the questionnaire?

NASS collects information on crops and livestock routinely, but the Census of Agriculture is the primary source of demographic information on farmers. The personal characteristics section, which collects the demographic information for up to four people involved in farm decisions, has historically been placed toward the end of the Census questionnaire because of perceived sensitivity of this section. Indeed, this section has traditionally had quite high section nonresponse in past Censuses.

The placement of the personal characteristics section was tested to determine whether placing this section earlier in the questionnaire would have an impact on overall nonresponse, section nonresponse, or item nonresponse rates to data items collected elsewhere in the form. When the section was in the front of the questionnaire, it was Section 6 of 34 sections on the long form or Section 6 of 21 sections on the short form. When the section was at the end of the questionnaire, it was Section 32 of 34 on the long form or Section 19 or 21 on the short form.

All data shown for this research question are from unedited, mail return records from the long forms, sent to the long form universe. Specifically,

comparisons are shown between the long form with the personal characteristics section in the front of the questionnaire (Treatment Group 4 from Table 1) and the long forms with the personal characteristics in the back (Treatment Groups 2 and 10 from Table 1).

1. Unit response rates

The unit response rate for the long form with the personal characteristics in the front was 52.36%, compared to a unit response rate of 53.80% for the forms with the personal characteristics in the back. This difference was not statistically significant.

2. Section Nonresponse

Section nonresponse was lower for the personal characteristics section when it was placed in the front of the questionnaire. When the section was placed near the front, the section nonresponse rate was 5.90%, while the section nonresponse rate when the section was placed near the back was over three percentage points higher at 9.04%. This difference is statistically significant.

3. Item nonresponse for key demographic variables

For those respondents who filled out at least one question in the section, item nonresponse for all of the key demographic variables of race, ethnicity, age, and gender was lower for the personal characteristics section when the section was placed in the front of the questionnaire. None of these differences were statistically different, but all were in the same direction. Only the data for the first person listed in the section were used for this analysis. Table 2 shows the percentage of missing demographic items for those respondents who answered at least one question in the section.

Table 2: Percent of records missing key demographic variables (for those who answered at least one question in the section)

Variable	Front - % missing	Back - % missing
Race	4.51	5.47
Ethnicity	5.46	5.83
Age	4.60	5.18
Gender	4.19	4.82
N	2,217	1,389

4. Nonresponse to other questions on the form

There was concern that placing the personal characteristics section at the front of the form would cause increased item nonresponse to questions in the remainder of the form. Therefore, in addition to the missing rates for data in the personal characteristics section, we also looked at the missing rates for data items in other sections of the form. For example, do respondents report more information in the personal

characteristics section but then report fewer items in the remaining sections? To evaluate this, we looked at the 20 section screener questions and calculated the average number of these screeners that were answered with a “yes” or “no”. In addition, we looked at 51 other key variables from the form that all respondents should answer, and calculated the average number of these key variables that were filled. The 20 screeners and the 51 variables included in the analysis are shown in Table 3.

Table 3: The 20 Screener Questions and 51 Key Items Analyzed for Nonresponse on the Remainder of Form

Section/Questions
<p>20 Screener Questions</p> <p>Were any of the following crops grown or harvested from this operation in 2015:</p> <ul style="list-style-type: none"> • Field crops • Hay and Forage Crops • Vegetables, potatoes, or melons • Fruit or nut trees • Berries • Nursery, floriculture, or greenhouse crops • Cultivated Christmas trees, short rotation woody crops, or maple syrup <p>Did you or anyone else have any of the following livestock species on this operation in 2015?</p> <ul style="list-style-type: none"> • Cattle and calves • Equine • Hogs and pigs • Aquaculture • Poultry • Honey bees • Sheep and goats • Other livestock and livestock products <p>During 2015, did you:</p> <ul style="list-style-type: none"> • Have any production contracts? • Grow any organic products according to the USDA’s National Organic Program (NOP) standards or have acres transitioning into USDA NOP production? • Have any renewable energy producing systems, regardless of ownership, on this operation? • Produce, raise, or grow any crops, livestock, poultry, or agricultural product that was sold directly to individual consumers for human consumption? • Use any fertilizers, manure, herbicides, insecticides, fungicides, nematicides, other pesticides, growth regulators, or other chemicals used on this operation?

Section/Questions
51 Key Items from Various Sections on the Questionnaire <ul style="list-style-type: none"> • 8 Practices Questions • 4 Market Value of land, Buildings, Machinery, and Equipment Questions • 8 Machinery and Equipment Questions • 7 Income From Farm-Related Sources Questions • 4 Farm Labor Questions • 20 Production Expenses Questions

The average number of screener questions that were completed by respondents is shown in Table 4. When the personal characteristics sections was placed in the front on the questionnaire, the average number of screener questions completed was only slightly higher than when placed in the back.

Table 4: Average number of 20 screener questions answered

Placement of Personal Characteristics Section	Average # of Screener Questions Completed	Average # of Blank Responses to Screener Questions	Number of Respondents
Front	18.14	1.86	2,356
Back	17.83	2.17	1,527

The average number of the 51 key items that were completed by respondents is in Table 5. Similar to the results for the screener questions, we only see a fractional increase in the average number of questions completed when the personal characteristics sections was placed in the front of the questionnaire versus the back.

Table 5: Average Number of Completed and Blank Questions for the 51 Key Questions

Placement of Personal Characteristics Section	Average # of Key Questions Completed	Average # of Blank Responses to Key Questions	Number of Respondents
Front	42.78	8.22	2,356
Back	42.63	8.37	1,527

Given that there were minimal differences in unit nonresponse rates, less section nonresponse, less item nonresponse for the key demographic variables, and minimal differences in the nonresponse for other screeners and key items on the questionnaire, we recommended placing the personal characteristics section toward the front of the questionnaire.

B. Research Question 2 - Can we make a shorter form for some respondents by removing sections that are not relevant to them, without losing data?

Another objective of the field test was to assess the performance of the short form and whether or not we could reliably identify operations who should receive it. We sent the long form to a sample of operations from the short form universe to determine what information would be reported in the sections missing from the short form. As previously discussed, the short form was developed by removing certain commodity sections and replacing them with screener questions. These screening questions were intended to verify that the respondent did not have those commodities or practices. The 14 sections removed were: Vegetables, Potatoes, and Melons; Fruit and Nuts; Berries; Nursery, Floriculture, and Greenhouse Crops; Cultivated Christmas trees, Short Rotation Woody crops, and Maple Syrup; Hogs and Pigs; Aquaculture; Sheep and Goats; Honey Bees; Other Livestock and Other Livestock Products; Production Contracts; Agricultural Labor; Renewable Energy; and Organic Agriculture.

An example of a section that was removed to create the short form is shown in Figure 1. The section on the short form that asked the screener questions for all removed sections is shown in Figure 2.

Figure 1: Example of section removed from short form

SECTION 13 BERRIES							
1. Were any strawberries or other berries grown on this operation in 2015? Report crops grown under glass or other protection in SECTION 10.							
<i>INCLUDE</i> • crops grown under contract				<i>EXCLUDE</i> • home garden, personal or home use crops			
1041	1	<input type="checkbox"/>	Yes - Complete this section	3	<input type="checkbox"/>	No - Go to SECTION 14	
		Acres Grown		Acres Irrigated			
		Acres	Tenths	Acres	Tenths		
2. Acres on which berries were grown in 2015.....		1045					
3. Report gross value of berries sold from this operation in 2015. Include the value of your landlord's share, marketing charges, taxes, hauling, etc. Exclude value of items produced under production contracts.....						1330	
						Mark "X" if None	
						Gross Value of Sales (Dollars)	
						\$00	
4. Fill in the columns below for all berries grown on this operation in 2015. Refer to the commodity listing and codes in the instruction booklet to fill in the berry name and code. • For two or more pickings of the same crop, report the acres only once.							
Enter Berry Name	Enter Code	Total Acres		Acres Harvested		Acres not Harvested	
		Acres	Tenths	Acres	Tenths	Acres	Tenths
If more space is needed, use a separate sheet of paper.							

Figure 2: Screener questions asked on the short form for removed sections

SECTION 11		OTHER CROP AND LIVESTOCK COMMODITIES			
1. Were any of the following crops grown or harvested on this operation in 2015?					
a. Vegetables, potatoes, sweet corn, or melons?	1101	1	<input type="checkbox"/> Yes	3	<input type="checkbox"/> No
b. Fruit or nut trees, including grapevines?	1047	1	<input type="checkbox"/> Yes	3	<input type="checkbox"/> No
c. Strawberries or other berries?	1041	1	<input type="checkbox"/> Yes	3	<input type="checkbox"/> No
d. Nursery, floriculture, or greenhouse crops, including ornamental plants, flowers, mushrooms, aquatic plants, sod, food crops under protection, vegetable seeds, flower seeds, or other propagative materials?	1032	1	<input type="checkbox"/> Yes	3	<input type="checkbox"/> No
e. Christmas trees or short rotation woody crops?	1208	1	<input type="checkbox"/> Yes	3	<input type="checkbox"/> No
f. Maple syrup?	1209	1	<input type="checkbox"/> Yes	3	<input type="checkbox"/> No
2. Did this operation own or custom feed for others any sheep, lambs, goats, or kids in 2015, regardless of location?					
	1102	1	<input type="checkbox"/> Yes	3	<input type="checkbox"/> No
3. Did this operation own honey bees in 2015, regardless of location?					
	1104	1	<input type="checkbox"/> Yes	3	<input type="checkbox"/> No
4. Did you or anyone else have any of the following livestock species on this operation in 2015?					
a. Hogs and pigs?	1211	1	<input type="checkbox"/> Yes	3	<input type="checkbox"/> No
b. Aquaculture?	1157	1	<input type="checkbox"/> Yes	3	<input type="checkbox"/> No
c. Any other livestock or livestock products not already mentioned?	1239	1	<input type="checkbox"/> Yes	3	<input type="checkbox"/> No

As you can see in the figures above, when the section was included on the form (as in Figure 1), the respondent had a lot of information available to them to determine how to answer the screener, such as include and exclude instructions, and more detailed breakdowns of the topic or commodity production.

During the 2017 Census processing, the proposal was that any respondents who reported positively to the screening questions on the short form would be re-contacted to obtain the information on those commodities since the detailed reporting section was removed. Because we used list frame data, we did not anticipate many respondents answering “yes” to these questions.

For this analysis, we used four treatment groups from the short form universe: Treatment groups 3 and 8 which received the short form and treatment groups 7 and 9 which received the long form.

1. Response Rates

To determine whether the short form collected comparable data, the first measure we computed was the response rate for the short form treatment groups (combined 3 and 8) as compared to the response rate for the long form treatment groups (combined 7 and 9). For this analysis, only unedited mail records are included. Response rates for those treatment groups are shown in Table 6.

Table 6: Response rates for the short form and long form

Form	Treatment Groups	Number of completes	Response Rate	N
Short form sent to short form universe	3 and 8	2,998	61.05%	4,911
Long form sent to short form universe	7 and 9	2,955	60.47%	4,887

As shown in Table 6, the response rate for the short form in treatment groups 3 and 8 is only 0.58 percentage points higher than the long form in treatment groups 7 and 9. This difference is not statistically significant.

2. Positive reporting of commodities and topics

During the Content Test, short forms (questionnaire versions 3 and 5) were mailed to two samples of short form universe operations (treatment groups 3 and 8). The two versions of the form differed only in the placement of the personal characteristics section, either near the front or back of the form. In addition, long forms (questionnaire versions 4 and 6) were also sent to two short form universe samples in order to measure response rates and the amount of commodities reported in the sections that were replaced with a screener question on the short form (treatment groups 7 and 9).

Next, we assessed whether the short form universe operations reported having the commodities when sent the short form vs. when sent the long form. To do this, we calculated the percentage of short form universe operations who answered “yes” to the commodity screener question in the short forms and in the long forms. Table 7 shows the percentage of operations who answered yes to the screener questions on the paper questionnaire for the short form when sent to the short form universe, and for the long form when sent to the short form universe.

Table 7: Percentage of operations who answered “Yes” to the screener question

Screener Question Topic	Long Form	Short Form
Vegetables	0.89%	5.71%
Fruit and nuts	0.85%	4.20%
Berries	0.22%	2.87%
Nursery	0.07%	0.96%
Christmas trees/short rotation woody crops/maple syrup	0.26%	0.52%
Sheep and Goats	1.60%	1.07%
Honey Bees	0.89%	0.92%
Hogs and Pigs	0.93%	1.47%
Aquaculture	0.22%	0.29%
Other livestock and products	0.97%	1.66%
Organic Production	0.04%	0.18%
Renewable Energy	2.23%	1.10%
Labor	6.13%	4.31%
Production Contracts	0.15%	0.63%
N	2,692	2,716

As shown in Table 7, for almost all commodities and topics, when the entire section was included on the questionnaire on the long form, a lower percentage of respondents answered “yes” to the screener question. Exceptions to this are the sheep and goats, renewable energy, and labor questions, where a higher percentage of respondents answered “yes” when the entire section was on the form.

The percentage of respondents who answered “yes” to the screeners on the short form is quite high, considering we proposed conducting follow-up phone calls to all of them and the form will be sent to over 3 million records. Therefore, based on these results, we recommended changing the screener questions from yes/no answer options to questions that ask how many acres, or how many head of livestock the operation had so we can target the phone follow-ups to those operations that have higher acreage of a crop commodity and/or head of livestock. In addition, we decided to include the four question Labor section on the short form because of the higher percentage of people reporting labor, and also because the full section was only four questions.

C. Research Question 3 - Can we save space on the questionnaire, but maintain data quality, by moving field crop listings to a separate booklet?

The Census of Agriculture collects data on all acreage used for field crops and other commodities. There are hundreds of specific commodities that can be reported, making it challenging to provide respondents all the information they need to fill out the questionnaire for all commodities they

raise. One of the tradeoffs when working with paper forms is the restricted space that can be used for questions and supplemental information. In the past, and on other surveys, we list the commodities of interest for each section on the questionnaire. With increased data needs, and a restriction of a 24 page questionnaire (for processing and cost considerations), one way to save space would be to move the commodity listings to a separate booklet.

To assess the optimal way to format the commodity sections, we tested several options. We formatted the commodity sections using several methods to present respondents with the listing of commodity names and codes on different versions of the questionnaire. These methods included:

- Preprinting some commodity names in the response table.
- Displaying a completely blank table with four entry rows and providing the listing of the commodity names and codes on the questionnaire under the table. Refer to Figure 3 which shows the field crops section from the short form questionnaire used for treatment groups 3 and 8.
- Displaying a completely blank table with four entry rows and providing the listing of the commodity names and codes in a separate instruction booklet rather than in the questionnaire. Refer to Figure 4 which shows the field crops section from a long form questionnaire used for treatment group 7 and 9. Figure 5 shows a partial commodity code listing as it appeared in the separate booklet rather than on the questionnaire.

In this paper, we only discuss the placement of the commodity listings as described in the second and third bullets above and do not address the preprinted commodities as described in the first bullet above.

Figure 3: Example of field crops section with commodity listings for Treatment Groups 3 and 8

3. Fill in the columns below for all field crops harvested on this operation in 2015. For those commodities not listed, enter the crop name and code from the table below or the commodity listing and codes in the instruction booklet.

- Include the value of your landlord's share, marketing charges, taxes, hauling, etc.
- Exclude from sales the value of items produced under contracts.

Enter Field Crop Name	Enter Code	Acres Harvested	Total Quantity Harvested	Acres Irrigated	Gross Value of Sales (Dollars)	Amount used or to be used on this operation for feed, seed, etc.
					\$.00	
					\$.00	
					\$.00	
					\$.00	

If more space is needed, use a separate sheet of paper.

FIELD CROPS	CODE	FIELD CROPS	CODE	FIELD CROPS	CODE
Alfalfa seed (pounds)	0542	Herbs, dried (pounds)	0620	Safflower (pounds)	0692
Bahia grass seed (pounds)	0551	Hops (pounds)	0623	Sorghum for grain or seed (bushels) – Include milo	0062
Barley for grain or seed (bushels)	0079	Kentucky bluegrass seed (pounds)	0629	Sorghum for silage or greenchop (tons)	0065
Beans, dry edible (hundredweight)	0554	Lentils (hundredweight)	0635	Sorghum for syrup (gallons)	0704
Beans, Lima (hundredweight)	0557	Mint, peppermint (pounds of oil)	0047	Soybeans for beans (bushels)	0068
Buckwheat (bushels)	0575	Mint, spearmint (pounds of oil)	0050	Sugarbeets for sugar (tons)	0719
Canola, edible (pounds)	0614	Mustard seed (pounds)	0650	Sugarcane for seed (tons)	0725
Chickpeas, all / Garbanzo (hundredweight)	2816	Oats for grain or seed (bushels)	0076	Sugarcane for sugar (tons)	0722
Clover, crimson clover seed (pounds)	0593	Peanuts for nuts (pounds)	0656	Sunflower seed, oil variety (pounds)	0773
Clover, red clover seed (pounds)	0671	Peas, dry edible (hundredweight)	0659	Sunflower seed, non-oil variety (pounds)	0776
Corn for grain or seed (bushels)	0067	Peas, dry Southern/cowpeas (bushels)	0584	Tobacco-all types (pounds) – Report acres to the nearest tenth.	0094
Corn for silage or greenchop (tons)	0070	Popcorn (pounds shelled)	0662	Triticale for grain (bushels)	0749
Cotton, Pima (bales) – Include cottonseed in gross value of sales only.	0644	Proso millet for grain or seed (bushels)	0665	Wheat, Durum for grain or seed (bushels)	0578
Cotton, Upland (bales) – Include cottonseed in gross value of sales only.	0581	Rice (hundredweight)	0677	Wheat, Other Spring for grain or seed (bushels)	0728
Emmer and spelt (bushels)	0599	Rye for grain or seed (bushels) – Exclude ryegrass	0686	Wheat, Winter for grain or seed harvested in 2015 (bushels)	0572
Fescue seed (pounds)	0602	Ryegrass seed (pounds)	0689	Other field crop, specify above.	0752
Flaxseed (bushels)	0605				

Figure 4: Example of field crops section with no commodity codes in the questionnaire for Treatment Groups 7 and 9

3. Fill in the columns below for all field crops harvested on this operation in 2015. Refer to the commodity listing and codes in the instruction booklet to fill in the crop name and code.

- Include the value of your landlord's share, marketing charges, taxes, hauling, etc.
- Exclude from sales the value of items produced under production contracts.

Enter Field Crop Name	Enter Code	Acres Harvested	Total Quantity Harvested	Acres Irrigated	Gross Value of Sales (Dollars)	Amount used or to be used on this operation for feed, seed, etc.
					\$.00	
					\$.00	
					\$.00	
					\$.00	

If more space is needed, use a separate sheet of paper.

Figure 5: Partial listing of commodity codes in the instruction booklet for Treatment Groups 7 and 9

Commodity Code and Unit Tables for Sections 6, 9, 10, 11, 12, 16, 17 and 20

Field Crops	Code	Unit	Field Crops	Code	Unit
Alfalfa seed	0542.	pounds	Rapeseed	0668	pounds
Bahia grass seed	0551.	pounds	Rice	0677	hundredweight
Barley for grain or seed	0079.	bushels	Rye for grain or seed		
Beans, dry edible - kidney, black, etc. (<i>exclude limas and chickpeas</i>)	0554.	hundredweight	(exclude ryegrass)	0686	bushels
Bentgrass Seed	0560.	pounds	Ryegrass seed	0689	pounds
Bermuda Grass Seed	0563.	pounds	Safflower	0692	pounds
Birdsfoot trefoil seed	0566.	pounds	Sesame	0701	pounds
Bromegrass seed	0569.	pounds	Sorghum for grain or seed		
Buckwheat	0575.	bushels	(include milo)	0082	bushels
Camelina	0608.	pounds	Sorghum for silage or greenchop		
Canola, edible	0614.	pounds	(exclude Sorghum-Sudan crosses)	0085	tons
Chickpeas, all (Garbanzos)	2816.	hundredweight	Sorghum for syrup	0704	gallons
Clover, crimson clover seed	0593.	pounds	Soybeans for beans	0088	bushels
Clover, red clover seed	0671.	pounds	Spearmint	0050	pounds of oil
Clover, white clover seed	0761.	pounds	Sudangrass seed	0713	pounds
Corn for grain or seed	0067.	bushels	Sugarbeets for seed	0716	pounds
Corn for silage or greenchop	0070.	tons	Sugarbeets for sugar	0719	tons
Cotton, Pima	0644.	bales	Sugarcane for seed	0725	tons
Cotton, Upland (<i>include cottonseed</i> <i>in value of sales only</i>)	0581.	bales	Sugarcane for sugar	0722	tons
Dill, for oil	0596.	pounds	Sunflower seed, non-oil variety	0776	pounds
Emmer and spelt	0599.	bushels	Sunflower seed, oil variety	0773	pounds
Fescue seed	0602.	pounds	Sweet corn for seed	0740	pounds
Flaxseed	0605.	bushels	Switchgrass	0647	tons
Guar	0617.	pounds	Timothy seed	0746	pounds
Herbs, dried	0620.	pounds	Triticale for grain	0749	bushels
Hops	0623.	pounds	Tobacco	0094	pounds
			Vetch seed	0755	pounds
			Wheat, Durum for grain		

1. Commodities reported

We looked at several measures to assess the number of commodities reported, including the percentage of respondents who reported at least one field crop, the average number of field crops reported per respondent, the average number of field crops reported for respondents who reported at least one field crop, and the total number of field crop lines reported. Table 8 shows these measures. We see that across all three of these measures, there is more reporting of field crops when the field crop commodities are listed on the questionnaire.

Table 8: Number of field crops reported

Commodity Code Placement	Percent of respondents who report at least one field crop	Average # of field crops reported per respondent	Average number of field crops reported for those that reported at least one	Total number of field crop commodity lines of data reported	Total number of respondents
Commodity codes listed on Questionnaire	17.05%	0.29	1.69	781	2,716
Commodity codes NOT listed on questionnaire	14.19%	0.22	1.52	580	2,692

2. “Other” Commodities

Respondents had the option to write in any commodity, using an “other” category in the field crops table. This is meant to allow for respondents to report rare commodities that they grow. When the commodity listings are on the questionnaire, 0.59% of the respondents reported at least one field crop as “other,” while 1.89% reported at least one field crops as “other” when the commodity listing was not on the questionnaire.

Based on these comparisons, we recommended keeping the commodity listings on the questionnaire and reducing other content or reformatting other sections to maintain the 24 page limit.

To look at the “other” commodities more closely, a random sample of 16 respondents that reported “other” field crops were selected so the questionnaires could be examined. In 10 of these 16 cases, the respondent reported a type of hay in the field crops section. There is a separate section for hay on the questionnaire, but it follows the field crops section. Therefore, we recommended moving the hay section to before the field crops section to help reduce misreporting of hay in the field crops section.

IV. Recommendations and Conclusions Based on the Results

The COA field test was a major component of the testing for the 2017 Census of Agriculture (COA). The large sample size of the test enabled us to use a split sample design to test multiple versions of the questionnaire to identify potential data quality problems. The analysis of the data was a complex and multifaceted effort to evaluate various aspects of the questionnaire. In this paper, we focused on three key research questions. Based on the results of the analysis for these questions, we recommended several changes to the paper questionnaire for the 2017 COA.

Our first research question studied the placement of the personal characteristics section of the questionnaire. When this section was placed in the front versus the back, we found minimal differences in unit nonresponse rates and in the nonresponse for other screeners and key items on the questionnaire. However, the results showed less section nonresponse and less item nonresponse for the key demographic variables when the personal characteristics section was placed in the front. Therefore, we recommended moving the personal characteristics section toward the front of the questionnaire for the 2017 COA.

In an effort to reduce respondent burden for operations which did not have list frame data for certain commodities, we created a short form in addition to our traditional Census form. Our second question studied how well our short form performed by looking at the percentage of respondents that positively reported the presence of those commodities. The results showed a higher than expected percentage of respondents who answered “yes” to the commodity screeners on the short form. Therefore, we recommended modifying the screener questions from yes/no answer options to questions that ask how many acres, or how many head of livestock the operation had. In addition, we recommended including the four question Labor section on the short form because of the higher percentage of people reporting labor.

Finally, we studied the impact of printing the commodity listings on the questionnaire versus printing the commodity listings in a separate booklet. Our findings showed a greater percentage of respondents who reported at least one crop in the section when the field crop commodities are listed on the questionnaire. The average number of field crops reported for those that with at least one was also higher when the listing was on the questionnaire. In addition, higher numbers of “other” crops were reported in the versions that did not have any commodities listed on the questionnaire. Therefore, these results supported keeping the commodity listings on the questionnaire.

The results from the COA field test demonstrate how beneficial quantitative data can be to understanding questionnaire performance, identifying potential problems, and recommending improvements. While the field test was a major component of the testing for the 2017 COA, the results from this test were used in combination with other evaluation methods, such as cognitive testing, to obtain a complete picture. A well-designed questionnaire is vital to ensure the quality and integrity of the data collected for the COA, the largest data collection effort of the USDA’s National Agricultural Statistics Service and the main source of comprehensive agricultural data for every state and county in the U.S.