

COGNITIVE RESEARCH FOR THE 1997 CENSUS OF AGRICULTURE REPORT FORM

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1. Introduction

The Bureau of the Census conducts a census of agriculture in the United States every five years. The Agriculture Division began to plan and implement research aimed at improving the 1997 Census of Agriculture report form before the 1992 census forms were mailed out. As part of the development of the 1997 report form, cognitive interviews were conducted using selected sections from the 1992 Census of Agriculture report form as the test instrument. Twenty-four farm and ranch operators from six areas of the United States were recruited to participate in the interviews. The results of these interviews are discussed in this paper.

Valuable insights were gained in the cognitive interviews that could not be obtained from other types of research. They were just one step in questionnaire design research for the 1997 Census of Agriculture. The information gained, along with other findings (e.g. understandings or reinforced observations obtained through prior experience, research, or contacts with respondents or Census Bureau staff who process the forms), help identify characteristics and design features of the report form that need attention in subsequent research and redesign. The Agriculture Division will develop the agenda for this research.

2. Methods

2.1. Cognitive Interviewing Techniques

Pretesting is an important part of questionnaire design and development. It allows for identification of problem areas on the questionnaire prior to large scale distribution. The major method for field pretesting of the census of agriculture report form has been analysis of returns from mailings of alternate forms to large samples

during the years between censuses. While this questionnaire design approach provides information on differences in respondents' responses associated with design and wording alternatives, it does not provide much on the respondent's recall and response processes. Cognitive interviewing can provide this information. The goal of cognitive research is to understand how respondents conceptualize a task so that the task can be modeled after the respondents' own thinking patterns.

The theoretical foundations of this report's cognitive techniques were integrated by Tourangeau (1984) into a model he named "the respondent's task" and by Forsyth and Lessler (1991), who describe the question-answering process. These models draw attention to the series of activities a person goes through to answer a question. First, respondents try to understand the question. Then, they decide how to develop an answer. They try to remember relevant information. They select an answer. They may decide to go back to any of the preceding steps and go through the process again. Finally, they express an answer. If the question requires only minimal recall or retrieval to get satisfactory information, as, for example, when asked for name and address, they can immediately express the answer. If the respondent is having difficulty, cycling through these steps can take a lot of time. Awareness of the steps in this process helps an observer understand and describe the difficulties respondents experience in generating responses.

Forsyth and Lessler also developed a taxonomy of cognitive laboratory methods that may be used to elicit more of the details of respondents' response processes. One of those methods, the concurrent think aloud interview format was chosen for this study because it provides a more direct view of the process. In this method, interviewees say aloud everything they read or

¹This paper reports the general results of research undertaken by Census Bureau staff. The views expressed are attributable to the authors and do not necessarily reflect those of the Census Bureau.

contemplate as they fill out the report form. The interviewee's spoken thoughts show how much of the questions or instructions are read, how much they deliberate, what strategies they form to answer the question, and what information is recalled or retrieved to formulate a response. Interviewers prompted the interviewees to reveal as much as possible of these processes and probed them when clarification was needed or when interviewees seemed to be having difficulties. The probes were done immediately to avoid problems with recall after the interviews were complete.

2.2 Test Instrument

Due to the anticipated length of the interviews, it was decided that not all sections of the report form could be included. Seven sections, identified by those who work with the data as not causing many problems, were ignored in the interviews. Other sections that were not necessarily problematic were included because the section order and meaning of remaining sections would be adversely affected by deleting them. Interviewees were given, along with the report form, an information sheet to use at their own discretion without any specific mention or direction.

2.3 Interviewee Recruitment

To ensure that each major section of the form would be completed by at least some interviewees, several specific types of farms were targeted. Areas with as large a number of the specific operations and as many variations in the report form content as possible were selected. Recruitment aimed to include interviews of poultry operators in Maryland, grain crop farmers in Michigan, cattle feedlot operators in Texas, ranch operators in Colorado, nursery operators in Washington, and fruit and nut growers in California.

Interviewees were recruited from lists of farm operators whom heads of farm organizations in these states thought might agree to participate in the interviews. A total of twenty-four interviews, four in each of the six states, were conducted and recorded on audio tape in the interviewee's home or office during November and December of 1992.

3. Interview Findings

The interviews produced many findings. Some major findings are presented here, grouped by type of issue: definitions, instructions, or sequence.

Understanding interviewees' difficulties naturally leads to ideas about how to improve the situation. However, any such ideas presented here are not statistically proven better alternatives to what is currently done. They will not be adopted automatically. They will be seriously considered in future forms design efforts. Specifically, they are recommendations for alternative forms designs that can be subjected to more rigorous testing.

Excerpts from the first two pages of the form used in the cognitive interviews are included in this paper. Many, but not all, of the findings discussed below relate to those sections.

3.1 Definitions

In this group of findings the issue is what a specific term means to respondents.

3.1.1 Designating the reporting unit --

Respondents need a concept of what does and does not belong to that farm or ranch operation for which they should answer. The term "THIS PLACE", used throughout the form to designate the unit, was not clear and stable. The finding in 3.2.2 is related.

The report form is meant to lead the respondent to identify the reporting unit in a series of questions on the first page of the form. The strategy of these questions is to determine how many acres of land are managed by the family, partnership, corporation or organization for which the respondent is reporting. Acres owned by the family or company are added to acres rented from someone else. Acres rented out to another operation are subtracted from those acres. The statement "For this census report, these are the acres in "THIS PLACE"" is printed next to this answer space and is meant to define for the respondent the term defining the reporting unit. Interviewees were probed at the end of the interview to determine how "THIS PLACE" had been perceived. There was evidence then and throughout the interviews that "THIS PLACE" was often misinterpreted by twelve of the twenty-four interviewees.

"THIS PLACE" has for some interviewees a connotation of local vicinity. One interviewee said that if someone rented land in another county it would not necessarily be part of "THIS PLACE." Three interviewees thought "THIS PLACE" meant only "their farm" -- not to include land rented in.

We found that four interviewees' definitions of

"THIS PLACE" changed while they were filling out the form. The evidence for that is in discrepancies between responses in different sections of the form. Five made erroneous adjustments so the amount of acres they reported would agree from section to section.

Interviewees were distracted by a reminder in the middle of the series defining "THIS PLACE" to answer a question beyond that series. Two had difficulty refocusing and left the important "Acres in THIS PLACE" question blank as a result.

Four interviewees made errors in arithmetic, affecting answers throughout the entire form.

To help respondents better identify the reporting unit, the first section's question wording, skip patterns, and content need to be redeveloped and tested. For example, a notice here that the answer to the question is the acreage for which they will be reporting throughout the form might be made more prominent. Questions might be introduced to lead respondents through difficulties such as involvement in more than one operation. Alternative terms to designate the reporting unit may be developed. The text, "Also complete item 6 below," can be removed from the midst of these questions.

3.1.2 Definition of lime -- Interviewees said they tend to think of lime as a fertilizer. Five of fourteen interviewees who answered lime and fertilizer questions thought of them together, partly because they are applied in the field together and reported together on the tax form .

3.2 Instructions

Instructions include the report form wording and format attributes intended to guide respondents. They are the focus of many of the difficulties observed in the interviews.

3.2.1 Where to begin? -- Several interviewees seemed overwhelmed by the first page of the report form. Thirteen of the twenty-four interviewees showed some sign of disorientation or confusion before reading the first question. A few interviewees read the confidentiality statement at the top of the form and the bold bullets below the logo: reasonable estimates, time extension, etc. Some of them noted the due date on the form. Two interviewees were unsure what to enter in the spaces for reporting duplicate forms. One thought maybe they were spaces for putting in a telephone number. He found nothing in the information

sheet to correspond to the boxes. Most looked at the mail label and made corrections to names and addresses as necessary. Some interviewees began by briefly reading the information sheet, although, in a few cases, they hinted that they would not read it if the interviewer were not present. Seven interviewees set aside the information sheet and did not look at it at all during the interview, even when the report form referred them to it.

One design alternative worth considering and testing is to reserve the front page of the form for basic information and instructions necessary to answer the census, perhaps in the form of a cover letter, usually printed separately from the form. The first question would be placed on page two.

3.2.2 What is the reporting unit? -- Interviewees involved in more than one farm or business operation did not always think of them distinctly in day-to-day planning and were often confused about what to include or exclude from the report.

Six of seven interviewees involved in managing more than one business operation either did not understand how they were expected to report for multiple operations, or they did not have separate figures for what they considered to be distinct operations. In one case, the interviewee began reporting for the partnership he had with his two sons, but ended up reporting for the partnership and the individual operations that each of his sons had. In another instance, the interviewee had multiple operation expense figures combined for some responses and separate for others. Although he realized the error after he had completed the expenses section, he failed to return to make necessary corrections.

This issue often compounded the difficulty with "this place", the term used on the form to identify the reporting unit, as described in 3.1.1.

3.2.3 Presenting instructions for related sections of the report form -- Directions intended to describe and guide respondents through seven crops sections were seldom read or understood, resulting in confusion, errors, or waste of time.

The instructions for these crops sections were printed just before the first crops section at the top of page two of the report form (see excerpts). Twelve interviewees did not read or even seem to notice the instructions. One of them initially thought the first crops section had all the crop questions on the form.

Instructions for related sections of the form could be made more obvious to the respondents with graphics or banners naming the focus of that portion of the form, i.e. crops, livestock, etc.

3.2.4 Reporting periods -- The reporting period or what was to be reported for that period were not always properly understood.

Respondents were asked to report acres and quantities of crops harvested in 1992. Seven of twenty-one interviewees reporting crops were unsure whether to report for crops harvested or for crops planted or for crops sold in 1992. They missed reporting crops that were planted in 1991 but not harvested until 1992 or tried to include crops that were planted in 1992 but not harvested until 1993. Some reported only for crops sold, omitting crops harvested but not sold in 1992.

Sales and expense questions also specified the whole year as the reporting period. Four of the twenty-one interviewees with crops had difficulty determining which crops to include as sold in 1992. One interviewee overlooked hay harvested in 1991 but sold in 1992. Another added the value of crops reported in previous crops sections and nearly failed to deduct the harvested crops not sold in 1992. Two interviewees were not clear if the property taxes question in the production expenses section was asking for taxes paid for the 1992 tax year or paid in 1992, perhaps for another tax year.

For the livestock sections, the reference date, December 31, for inventory questions was seldom read, in part because the date is printed in column headings rather than in the body of the question.

Reference periods might be emphasized in bullet format in banners or a cover page.

3.2.5 Fonts and Skipped instructions -- Italicized or parenthetical instructions were often overlooked. If a question was more than one line long, the second line was often skipped. Capitalized bold words were generally read.

Interviewers considered missed italicized or parenthetical instructions a problem in fourteen of twenty-four interviews. In just one example, four of five interviewees who were under contract with a company to produce poultry or some other commodity did not try, contrary to italicized instructions, to report expenses borne by the other company for their operation.

Important instructions could be incorporated succinctly and prominently in the question

wording without italics. Arrows leading from the previous question to an instruction may help.

3.2.6 Answer space size and location -- These layout attributes sometimes were related to errors in response.

Out of seventeen interviewees responding to questions where the end of the question wording was far from the box where the answer was to go, five skipped to the line above or below in tracking from the end of the question to the answer space. At least one did not realize and correct the mistaken entries. They skipped some questions entirely when the answer boxes were overshadowed by a large grid of other answer boxes. Oversized answer spaces at the bottom of an answer grid were twice interpreted as spaces for a total of answers above, instead of as new data.

Two interviewees questioned whether the large answer boxes for the last question in the hay section or the sales section were a place to supply a total of the answers above.

Answer boxes could be moved closer to the end of questions, realigned, or made equal in size to minimize such difficulties.

3.2.7 Screener or skip questions -- Most sections begin with a question that guides respondents to skip blocks of questions that do not pertain to them. Eight interviewees complained or were disrupted when a section did not have one.

3.2.8 Records of expenses -- Respondents do not organize their records to fit breakouts on the census form. More than half of the interviewees made strong negative comments at first glance of the section on expenses. When probed, the main concern, other than fatigue at this point of the interview, was the amount of work needed to produce accurate answers. Many interviewees kept their expense records broken down to fit IRS 1040, Schedule F format.

Fuel costs are an example. Most of the interviewees' records kept one total for all fuels, rather than separate totals for the different categories of fuel costs. That was all they needed for tax purposes.

3.2.9 Unlisted expense items -- When interviewees saw a recall list meant to prompt them to include all kinds of items in responding to the question, they sometimes doubted they should include an unmentioned item.

One interviewee debated including vegetable seed cost, since it was not among the listed seed costs. In five of the twenty-one interviews where the relevant question was encountered, the interviewer suspected accounting fees were left unreported, despite mentioning their accountants during the interview.

3.3 Sequence of Questions

In this group of findings the issue is the order in which the questions are presented.

3.3.1 Out-of-order crop sections -- A section asking about "any other crops" precedes one for fruit and nut crops. Some confusion and wasted time resulted.

Two interviewees thought the next-to-last crop section was the last crop section. Another interviewee was baffled by an instruction, discussed in 3.2.3 above, that was intended to address this issue.

Reversing the order of these sections may reduce confusion.

3.3.2 Location of an answer box for a total -- Usually, totals are requested below a series of entries that make up the total. There were missing responses or confusion when the total was first.

The line for total cattle inventories precedes the lines to be totaled. Nine of fifteen interviewees displayed signs of confusion or other difficulty with that. Interviewees took time studying the entire section before beginning or had to go back and correct the total after working through the other questions or just left the total blank.

The questions on cattle and calves inventory could be reordered so the total line follows the breakouts.

4. Further Research

The cognitive interviews were just one initiative for the 1997 Census of Agriculture. The insights gained complement and support other considerations to be applied to the agricultural census questionnaire design, including: (1) requests from data users, (2) legislative mandate, (3) concern for historical comparability in census published data, (4) the requirements of data capture technology, such as keying, filming, or optical scanning, (5) conventional subject matter wisdom, (6) past forms design experience, and (7) other forms design research and development initiatives. The Agriculture Division is developing

the agenda for these initiatives with activities such as: (a) obtaining recommendations from advisory board members representing varied data-user interests, including farmers' organizations, (b) soliciting suggestions for revisions of the form from universities and government agencies at various levels, (c) cataloguing the evidence of respondent difficulties observed by census clerks and analysts who process their returns, (d) a seminar or workshop to apply user-friendly questionnaire design techniques, and (e) testing alternative form designs. The cognitive interviews, especially because they were conducted early in the development of the next census form, point out valuable directions for more rigorous testing and development.

5. Acknowledgments

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6. References

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FORM 92-A0201 U.S. DEPARTMENT OF COMMERCE BUREAU OF THE CENSUS (10-1-91)

NOTICE - Response to this inquiry is required by law (title 13, U.S. Code). By the same law, YOUR REPORT TO THE CENSUS BUREAU IS CONFIDENTIAL. It may be seen only by sworn Census employees and may be used only for statistical purposes. Your report CANNOT be used for purposes of taxation, investigation, or regulation. The law also provides that copies retained in your files are immune from legal process.



UNITED STATES CENSUS OF AGRICULTURE

In correspondence pertaining to this report, please refer to your Census File Number (CFN)

EXCERPTS FROM THE FORM USED IN THE INTERVIEWS

- Use reasonable estimates - If records are not available.
- Time extension - Send request to address on bottom of page 11.
- Correspondence - Include 12-character Census File Number (CFN) found on address label.
- Duplicate forms - Enter extra CFN(s) below and return with your completed report.

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Please correct errors in name, address, and ZIP Code. ENTER street and number if not shown.

CENSUS USE ONLY	035	036	037	038	039	040	041	042
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SECTION 1

ACREAGE IN 1992 - Report land owned, rented, or used by you, your spouse, or by the partnership, corporation, or organization for which you are reporting. Include ALL LAND, REGARDLESS OF LOCATION OR USE - cropland, pastureland, rangeland, woodland, idle land, house lots, etc.

S1

If the acres you operated in 1992 changed during the year, refer to the INFORMATION SHEET, section 1.

- All land owned
- All land rented or leased FROM OTHERS, including land worked by you on shares, used rent free, in exchange for services, payment of taxes, etc. Include leased Federal, State, and railroad land. (DO NOT include land used on a per-head basis under a grazing permit.) Also complete item 5 below.
- All land rented or leased TO OTHERS, including land worked on shares by others and land subleased. Also complete item 6 below.
- Acres in "THIS PLACE" - ADD acres owned (item 1) and acres rented FROM OTHERS (item 2), then SUBTRACT acres rented TO OTHERS (item 3), and enter the result in this space. →

None	Number of acres
<input type="checkbox"/>	043
<input type="checkbox"/>	044
<input type="checkbox"/>	045
<input type="checkbox"/>	046
None	Number of landlords
<input type="checkbox"/>	065

For this census report, these are the acres in "THIS PLACE." If the entry is zero, please refer to the INFORMATION SHEET, section 1.

- If you rented land FROM OTHERS (item 2), how many landlords did you have?

INSTRUCTIONS - Please report your crops in the appropriate section. Use section 7 to report ONLY these CROPS NOT listed in sections 2 through 6 and section 8. (DO NOT include crops grown on land rented to others.)

SECTION 2

Were any of the following CROPS harvested from "THIS PLACE" in 1992?

S2

- Corn (field) for grain or seed (Report quantity on a dry shelled-weight basis.)
- Corn (field) for silage or green chop
- Soybeans for beans
- Beans, dry edible
- Wheat for grain
- Oats for grain
- Barley for grain
- Rye for grain
- Sorghum for grain or seed
- Sorghum for silage or green chop (DO NOT include sorghum-sudan crosses.)
- Tobacco - all types

None	Acres harvested	Quantity harvested	Acres irrigated
<input type="checkbox"/>	067	068 Bu.	069
<input type="checkbox"/>	070	071 Tons, green	072
<input type="checkbox"/>	088	089 Bu.	090
<input type="checkbox"/>	554	555 Cwt.	556
<input type="checkbox"/>	545	546 Bu.	547
<input type="checkbox"/>	076	077 Bu.	078
<input type="checkbox"/>	079	080 Bu.	081
<input type="checkbox"/>	686	687 Bu.	688
<input type="checkbox"/>	082	083 Bu.	084
<input type="checkbox"/>	085	086 Tons, green	087
<input type="checkbox"/>	094	095 Lbs.	096 /10