ARMS Progress Report

USDA's National Agricultural Statistics Service
and Economic Research Service
Respond to Recommendations by the
Agricultural Resource Management Survey Review Panel

July 2015

United States Department of Agriculture

National Agricultural Statistics Service

Economic Research Service

In 2008, the Committee on National Statistics (CNSTAT) of the National Research Council released the findings and recommendations of an independent review of USDA's Agricultural Resource Management Survey in *Understanding American Agriculture*.[1] The review was requested by the National Agricultural Statistics Service and the Economic Research Service as part of a program of continuous improvement for ARMS.

Senior executives at the National Agricultural Statistics Service (NASS) and the Economic Research Service (ERS), two USDA agencies that jointly manage the Agricultural Resource Management Survey (ARMS), reviewed the recommendations and developed an implementation strategy based on a cost/benefit analysis. NASS and ERS continually reevaluate resources and priorities and will continue to respond to the recommendations as resources allow.

The ERS/NASS ARMS Steering Committee was formed based on the numerous recommendations from this review. The committee, whose members are ARMS managers and specialists from both agencies, meets monthly to discuss survey issues and solutions.

RECOMMENDATIONS and RESPONSES

In the pages that follow, the review panel's recommendations are presented as they appeared in the report along with actions NASS and ERS have taken in response as of February 2014. Updates will be issued at least annually, and more frequently as progress warrants, and will be posted to the "Independent Reviews" box on the NASS Surveys Web page.

Data Integration and Relevance

CNSTAT Recommendation 2.1: The Natural Resources Conservation Service [NRCS], NASS, and ERS should engage in a focused research and testing program and use experience with integrating the Conservation Effects Assessment Project and ARMS to assess the feasibility of integrating ARMS with other surveys and data sources.

> NASS/ERS Response: The team formed to examine ARMS/census of agriculture integration succeeded in improving the joint ARMS/census data set for 2012. After an extensive effort that looked at all data items common to ARMS and the census, the team proposed ways to align the concepts and questions asked on the two data collection instruments. The recommendations were accepted by NASS and ERS senior management, and

[1] National Research Council (2008). *Understanding American Agriculture: Challenges for the Agricultural Resources Management Survey.* Panel to Review USDA's Agricultural Resource Management Survey. Committee on National Statistics, Division of Behavioral Social Sciences and Education. Washington, DC: The National Academies Press.

resulted in a shortened form for 2012. The link with the Conservation Effects Assessment Project was facilitated at the time by new funding from the Natural Resource Conservation Service (NRCS). The current work with NRCS on watersheds does not easily fit into the context of the ARMS program.

Status: Completed. Integration with census was of high importance and has been completed for the 2012 Census of Agriculture. No other integration is relevant in the current NASS program. If additional funding is received for other survey programs that address ARMS-related content, NASS will pursue opportunities for survey integration.

CNSTAT Recommendation 2.2: In preparation for funds becoming available for a longitudinal design of ARMS, ERS and NASS should systematically conduct research and explore the need for and feasibility of obtaining panel data from ARMS. Furthermore, as a test of the power of such information, more use should be made of the existing longitudinal microdata from the census of agriculture. One possible approach would be to create a pseudopanel of such data. Another would be to make a retrospective link between the census of agriculture and a year of ARMS.

NASS/ERS Response: ERS has done some research on linking ARMS and census in the context of measuring structural change in lieu of pursuing a panel data collection. Additional work will be primarily done by ERS with access to NASS ARMS and census data. NASS recently obtained access to census of agriculture data prior to 1974; once NASS finishes converting them into a compatible file format, they will be available for ERS research in structural change.

Examples of ERS research projects using linked census records and research projects that link ARMS and census of agriculture records include:

Linked Census Records:

T. Kirk White, B, Kirwan, and Y. Uchida. "Aggregate and Farm-level Productivity Growth in Tobacco: Before and After the Quota Buyout". Amer. J. Agricultural Economics, forthcoming (2012).

Weber, Jeremy, and Nigel Key. "How Much Do Decoupled Payments Affect Production?" Amer. J. Agricultural Economics 94 (2012).

Hoppe, Robert, J. MacDonald, and P. Korb. "Small Farms in the United States: Persistence Under Pressure." USDA Economic Research Service Economic Information Bulletin No. EIB-63. 2010.

O'Donoghue, Erik, Michael Roberts, and Nigel Key. "Did the Federal Crop Insurance Act Alter Farm Enterprise Diversification?" J. Agricultural Economics 60 (2009).

Key, Nigel, and Michael Roberts. "Government Payments and Farm Business Survival." Amer. J. Agricultural Economics 88 (2006).

Linked ARMS and Earlier Census Records:

Kirwan, Barrett. "The Incidence of Agricultural Subsidies on Farmland Rental Rates." J. Political Economy 117 (2009).

Status: Completed for post-1974 Census of Agriculture data. Linkage has been completed between the current ARMS sample and previous censuses of agriculture back through 1974. Linked data sets are available, with approved written agreements, for ongoing analyses by ERS and academic researchers using the NORC Data Enclave at the University of Chicago. Once census data prior to 1974 are available in a compatible file format, additional linkages will be made available to researchers.

Survey Management

CNSTAT Recommendation 3.1: The ARMS program should have structured mechanisms in place for stakeholder feedback and discussion on ARMS, beyond what is currently done, such as organized stakeholder forums, with some obligation to respond. Specifically, USDA should solicit input in developing the survey from stakeholders from within USDA and from other government agencies, universities, professional associations, and the private sector.

NASS/ERS Response: An ARMS data users' conference was held in conjunction with the February 2009 Ag Outlook Forum. A webinar was conducted in spring 2009 and a data users forum was held at the Agricultural and Applied Economics Association (AAEA) in August 2009. The NASS Long-Range Planning Team requested input from data users in the agricultural community during 2009. Stakeholders provided significant input both before and after the chemical use component of ARMS was reinstated in summer 2009. NASS continually seeks input from data users at various trade association meetings, often setting up forums at those meetings to discuss surveys relevant to the stakeholder group. Comments on the three phases of ARMS are also accepted at NASS annual Data Users' Meetings.

The ARMS briefing room on the ERS Web site provides an opportunity for stakeholder feedback regarding data characteristics, use of the information for statistical purposes, and questionnaire content. ERS receives 40 to 60 inquires annually from this facility. Feedback is systematically reviewed by the ERS/NASS ARMS Steering Committee.

In 2011, an external panel of experts in farm financial analysis was assembled to conduct a comprehensive review of the ARMS process for constructing financial statements and to provide recommendations regarding

possible changes to questionnaire content, variable summarization methods, and data collection procedures. The external panels received briefings on the ARMS process, asked questions of the process, and then met to discuss possible recommendations. An AAEA symposium was held to further vet recommendations. A special issue of the *Agricultural Finance Review* is in progress to publish the outcome of the review and panel recommendations and the ERS/NASS ARMS Steering Committee will develop a response to the panel.

ERS staff contacts academic animal scientists and economists, extension staff, other government agencies, and commodity groups during the development of community of practice livestock versions, and solicits their advice on pressing issues and specific question formulations. The efforts have been expanded and systematized since the ARMS review.

Status: Completed. NASS will conduct an ongoing annual program to solicit stakeholder input on the ARMS three-phase program and report to the Office of Management and Budget (OMB) in its Paperwork Reduction Act (PRA) submissions. The special issue of the *Agricultural Finance Review* was published in July of 2012 and is available via *Emerald* Subscription http://www.emeraldinsight.com/journals.htm?issn=0002-1466.

CNSTAT Recommendation 3.2: The NASS Advisory Committee on Agriculture Statistics should expand its scope to include an annual review of ARMS.

NASS/ERS Response: The NASS Advisory Committee is organized to review ARMS content and methodology. In addition, a subgroup was formed in February 2008 to strengthen outreach efforts. The 2010 Advisory Committee meeting was not held because it had not yet been re-chartered by USDA. The ARMS was reviewed at the 2012 Advisory Committee meeting in March.

Status: Completed. NASS will continue to conduct a review of the ARMS program at annual meetings of the NASS Advisory Committee on Agriculture Statistics and report to OMB in its PRA submissions.

CNSTAT Recommendation 3.3: ERS and NASS should establish an ongoing, jointly sponsored, and appropriately funded methodology research and development program. Such a program should provide adequate resources to support current and future research, development, and statistical analysis needs throughout the implementation of ARMS and to assess and manage the quality of the data. If new funds cannot be obtained, funds from existing programs must be reallocated.

NASS/ERS Response: In FY 2009 – FY 2011, NASS redirected funds to invest $1.2 million in a cooperative agreement with the National Institute of

Statistical Sciences to address three high-priority projects. Two had particular impact on ARMS – one looked at a multivariate approach to imputation for the ARMS Phase III data (to which ERS staff contributed); the other investigated the large difference between farm numbers in the 2007 June Area Survey (JAS) and the 2007 Census of Agriculture (JAS farm numbers are the sample control for ARMS estimates). Both projects involved NASS staff working with academics, doctoral candidates, and recent post-docs in an effort to bring in technical expertise that NASS did not have. Both projects were successfully completed in June 2011. NASS is in the process of developing implementation plans for the multivariate imputation; changes have already been made in operational procedures relevant to the JAS.

NASS has additionally developed cooperative agreements with the University of Florida (Malay Ghosh and Linda Young), Iowa State University's Center for Survey Statistics and Methodology (Sarah Nusser, Jae, Kwan Kim, Cindy Yu, and Zhengyuan Zhu), the Joint Program in Survey Methodology (Frauke Kreuter), Washington State University (Don Dillman and Dana Moore), University of Nebraska (Jolene Smyth and Kristen Olson), American Statistical Association Research Fellowship (Partha Larhiri), and others to continue to bring in academic experts to enhance research contributions and to develop NASS staff. In 2010-11, NASS successfully recruited six doctoral-level mathematical statisticians or survey methodologists to build a stronger research base in the organization; the agency expects to hire three more in 2012. These researchers are working on a number of projects to strengthen NASS's general foundation for statistical and survey research. Some are specifically assigned to ARMS-related research.

In April 2012, NASS and ERS finalized a joint multi-year (2012-2016) ARMS Research Plan.

Status: ***Completed.*** See the ARMS Research Plan. **Update as of May 2014:** NASS processed both 2011 and 2012 ARMS Phase III data through both Iterative Sequential Regression (ISR) Imputation Methodology and operational imputation methodologies. Summarized results under these methodologies were compared, with favorable results. A similar comparison is currently being conducted using 2013 ARMS Phase III data. Assuming favorable results are again obtained, ISR imputation methodology will be operational for the 2014 ARMS III data.

Update as of March 2015: ERS has conducted research on use of multivariate imputation for missing items that are not imputed by NASS. Initial results, for farm debt, were presented at the 2014 AAEA meetings (See: http://ageconsearch.umn.edu/handle/169401). A team consisting of two recently hired ERS economists and two North Carolina State faculty are currently working under a cooperative agreement to develop procedures for household items that can be effectively implemented in the survey process.

ERS is also embarked upon a project to assess non-response bias in the household section of ARMS. Farms that do not respond to the household section of ARMS do provide demographic and other household information on the Census of Agriculture, and the project will use that information to evaluate systematic differences in household attributes among respondents and non-respondent to the ARMS household section.

CNSTAT Recommendation 3.4: NASS and ERS should commit resources to developing a five-year plan tied to the census of agriculture for ARMS content, coverage, and methodology. The agencies should develop measures to control changes during the five-year period to minimize disruptions to the time series of the core content in ARMS.

NASS/ERS Response: The **content** of Version 5 of the questionnaire for ARMS Phase III (commonly referred to as the CORE version), which is designed for mail, has been stable for almost ten years. Solicitation for input to the content for the 2012 Census of Agriculture was done in 2009/2010 and ERS took the opportunity to respond. A large ERS-NASS effort examined the content of both data collections to align similar data items. These changes have been made in the 2012 Census of Agriculture and will be made in the 2012 ARMS.

The time series disruptions after the 2007 Census of Agriculture were primarily due to a shift in the number of farms from previously published estimates. The June Area Survey is the primary survey source for establishing the annual number of farms estimates. To address this issue, NASS now: 1) puts increased emphasis during enumerator training on screening the JAS frame tracts for agricultural production, 2) provides additional administrative information to the enumerators that may be useful during screening, and 3) provides additional time for screening data collection. NASS has also implemented list frame maintenance procedures that will facilitate better tracking of changes over time to the list frame records. This will enhance the **coverage** and quality of the NASS frame for all NASS surveys including, in particular, ARMS and the census of agriculture.

See responses to recommendations 5.1, 5.2, 5.3, 5.4, 5.5, 6.3, 6.4, 6.5, 6.6, 6.7, 6.9, 7.3 and the ARMS Research Plan for information on **methodology** research.

Status: Completed. See the ARMS Research Plan. **Update as of May 2014:** After the 2007 Census, a Farm Number Research Project was conducted that focused on identifying why the farm number indications from the June Area Survey were low. A key findings from the project indicated

that our field enumerators were not following the instructions consistently across all states in the screening of tract operators. As a result Agricultural tracts were being coded up as Non-Ag Tracts. Several national training schools were held to re-iterate the June Area Frame methodology and the proper procedures needed to be followed for screening area segments to identify tract operators. As a result of the training the number of agricultural tracts has increased over the last several years which in turn led to an increase in the number of farms direct expansions.

The largest undercount is for the number of farms. As measured in the 2012 Census 12.3 percent of the total adjustment is from undercoverage, while only 3.4 percent of the Land in Farms adjustment is from undercoverage. The JAS is critical in the measurement of the coverage for the Census of Agriculture and for several other agriculture surveys. Major research efforts have been conducted by the Research and Development Division during the past four years to understand and model the undercount, misclassification and non-response. As a result of the research, new methodologies to adjust farm counts based on a Capture-Recapture methodology have been implemented for the Census of Agriculture. The methodology encompasses four sources of error, non-response, imputation, misclassification and coverage. The work is now being extended into the estimation process for the annual number of farms publications.

Sample and Questionnaire Design

CNSTAT Recommendation 4.1: The methodology research and development program the panel recommends should systematically (1) evaluate current instruments and practices, (2) collect data that inform both the revision of existing items as well as the creation of new items, (3) test revised instruments before they are put into production, (4) use experimental control groups to evaluate the differences between the old and new questionnaires, (5) improve understanding of respondent record-keeping practices and their effect on survey quality, and (6) designate a subsample of the existing ARMS sample for research and testing purposes. Key parts of this work would best be conducted in a cognitive or usability laboratory facility. It would be enabled by obtaining a generic clearance from the Office of Management and Budget for testing of all phases of the survey to allow for broader cognitive testing, evaluate the quality of data reported in response to each question, and evaluate the impact of mode of data collection across the three phases.

NASS/ERS Response: NASS now has an OMB-approved generic clearance docket (OMB Control # 0535-0248), which is used to do testing and evaluation of NASS questionnaires. A variety of testing methods, including cognitive testing, focus groups, split sample field tests, etc., are used to test

ARMS and other NASS surveys. NASS does not plan to create a cognitive laboratory facility due to the geographic dispersion of farm operators needed for testing. As is typical in establishment surveys, most testing is conducted with onsite visits. NASS is using the OMB-approved generic clearance docket to evaluate current instruments and practices (item 1) and to test revised instruments before they are put into production (item 3).

NASS conducted an extensive analysis of imputation for the 2007 Census of Agriculture and then used the analysis to inform questionnaire design for the 2012 Census of Agriculture and the 2012 ARMS, which have many of the same questions (item 2). See also the response to Recommendation 3.4.

NASS currently uses an experimental control group to evaluate differences between data reported on ARMS mail and field versions to determine whether less detailed information obtained on mail can substitute for the disaggregated detail on the field version (for the 2011 data). NASS will continue to use the experimental design approach to assess questionnaire differences (item 4).

NASS has hired an individual with prior experience with agricultural data to lead a project on designing data collection methods for large and complex operations across its surveys, including ARMS. This could involve examination of respondent record-keeping practices, but past research in this area was not productive (item 5).

A subsample of ARMS for research and testing purposes will be considered when there are sufficient new ARMS initiatives to justify this mode of testing (item 6).

Update as of February 2014: ERS and NASS have research underway to study the challenges posed for USDA statistical survey programs by changing technology and farm structure, particularly the shift of production to larger and more complex farms. A case study was developed and presented to a workshop of large commercial farmers, held at UC/Davis in March of 2013. It identified the key issues and barriers in eliciting response from large and complex producers and alternative treatment paradigms. The presentation allowed ERS and NASS staff to engage with large and complex producers, to market our surveys to them, and to engage them in discussions on ways to elicit data more efficiently. Staff will continue these discussions with producers from the workshop, and we intend to explore further workshop opportunities in other programs.

Status: Completed. The ARMS Research Plan identifies the components of this recommendation that are of most importance in the next 5 years.

CNSTAT Recommendation 4.2: ERS and NASS should improve the consistency of variables across ARMS versions and over time.

NASS/ERS Response: NASS developed and expanded the Questionnaire Repository System that allows for improved standardization of variables across ARMS questionnaire versions and over time. Consistent master variable names are shared across questionnaire versions. The same master variable names that are used to generate questionnaires are used to populate the Data Warehouse. This also facilitates re-use of these master variable names from year to year, enabling researchers to consistently query using the same names.

ERS provides metadata and other documentation that informs ARMS data users on constructing variables across questionnaire versions. See, for example, this list of variables and the Phase III summary listing and description of classification variables in Attachment B.

Status: Completed. Current ARMS metadata are recorded in the NASS Questionnaire Repository System as part of the agency's operational efficiency measures. ERS provided historical information.

CNSTAT Recommendation 4.3: NASS and ERS should explore the collection of auxiliary information on a formal basis, as well as feasibility of enriching the ARMS data files with information from administrative data sources, geospatial data, and the like.

NASS/ERS Response: ERS and NASS are participating in an OMB-led initiative to incorporate selected administrative data into surveys, and will evaluate opportunities with regard to current ARMS questions. NASS is a key participant in a USDA effort to synchronize reporting of administrative (program) data for the Farm Service Agency (FSA), the Risk Management Agency (RMA), and the Natural Resources Conservation Service (NRCS) that is seeking common definitions and reporting. The NASS role has been to inform the data development process. Ultimately the administrative data will be of more value for developing agricultural production and conservation statistics – several components addressed by ARMS. NASS has also made progress in developing the Cropland Data Layer (CDL) using geospatial data that provide end-of-season crop acreage estimates, with staff researching the development of yield estimates for major commodities. These data could feed into the ARMS database**.**

Status: In progress. As administrative data from the USDA project become available, NASS will assess their use in ARMS. NASS continues to assess applications of its geospatial data for its survey programs, including ARMS

and will conduct relevant research as opportunities become available. See the ARMS Research Plan.

Data Collection

CNSTAT Recommendation 5.1: ARMS should use automated means to collect paradata on interviewer assignments to cases, the relationship between the interviewer and the sample farm respondent (i.e., whether they know each other), demographic characteristics of the interviewer and the characteristics of the sample farms for nonrespondents that are coordinated with information obtained for respondents, either through the interview or interviewer observation. These paradata could be used to determine the need for additional research on the impact of the relationship between the interviewer and the respondent on the quality of answers. This data collection can best be facilitated using computer-assisted technologies.

NASS/ERS Response: The use of paradata in managing the respondent-interviewer interaction is best accomplished using computer-assisted technologies. NASS initiated an operational efficiency in FY 2010 to pilot the use of computer-assisted reporting in the field using personal enumeration devices. The Apple iPad was selected for this purpose, using wireless broadband transmission. Prototypes were developed; as of mid-2012field offices in 18 states are equipped with iPads. Initially the iPads are being used for questionnaires available with Web instruments. Once iPads are implemented in all states, it will be feasible to use paradata for managing field interviewing. During this implementation time-period, ARMS instruments will be designed for access on the iPad. NASS is also developing a system to facilitate the use of paradata on the iPADs. This can include scores from recently developed ARMS nonresponse propensity models. See recommendations 5.5 and 6.3.

Status: In progress. NASS has begun to develop the systems that will facilitate the use of paradata, designing the systems specifically for this use. As systems are implemented, paradata will be used in managing the interview process. See the ARMS Research Plan. . **Update as of May 2014:** All Field Offices are equipped with CAPI instruments but updates are needed to the system to allow for a more interview friendly application to complete the complex ARMS surveys. Less than 2% of the 2014 ARMS survey was completed using the CAPI instrument.

CNSTAT Recommendation 5.2: NASS should systematically explore the consequences of interviewer departures from standardization in the interview. To facilitate this, NASS should collect paradata on the frequency with which interviewers follow the order of the questionnaire, read questions as worded,

provide clarification, and similar indications of departures from standardized procedures.

NASS/ERS Response: To analyze departures from standardization by interviewers, the ARMS interviews would have to be recorded and analyzed. NASS currently does not have the systems in place to allow this, but is working with the Census Bureau to obtain the use of the computer audio-recorded interview (CARI) system developed by RTI International under contract to the Census Bureau. Once the system is available, it should be feasible to implement it on any NASS surveys collected by field enumerators on an iPad.

In the interim, NASS and ERS invest in an annual national workshop for the field statisticians that focus on standard data collection, edit, and analysis procedures. Participants at the national workshop in turn hold local workshops where standard procedures are taught to the interviewers. These workshops provide a platform to strengthen the standardization efforts and, in turn, result in improved data quality through standardized editing. Future costs analysis will also be improved through standard data collection procedures.

Status: In progress. See ARMS Research Plan for research NASS and ERS will conduct prior to implementing CARI. In the interim, NASS continues to instruct NASDA Supervisors to monitor data collection procedures and re-interview a small percentage of respondents for quality check purposes. NASDA Supervisors must complete the quality check forms and return them to the NASS Regional Field Office for review. **Update as of May 2014:** The ARMS User's Guide is published and available on the ERS website. In 2014, NASS conducted a proof of concept project using the Census Bureau's CARI system for the Agricultural Labor Survey. Although the project showed that a CARI system can provide beneficial information about the quality of questionnaire instruments and interviewer behavior, that particular CARI system does not fit into NASS's information technology infrastructure. NASS is currently looking at other CARI systems that may fit our needs and integrate with our call centers' telephone systems.

CNSTAT Recommendation 5.3: NASS should use available analytic tools, for example, cognitive interviews, interviewer debriefing, recording and coding of interviews, and re-interviews, to investigate the quality of survey responses.

NASS/ERS Response: Enumerator training and quality assurance follow-ups have been expanded.

NASS plans to initiate methodological research on total survey error once a PhD statistician is hired with this competency. The Research and Development Division has added a PhD statistician whose background is in quality control. One of his assignments is to assist in setting up quality control measures for our data collection process, especially with respect to the newly established NASS National Operations Center (NOC), which began collecting data during the last quarter of 2011 on a limited number of surveys.

In FY 2013, NASS expects to use the NOC in lieu of the Census Bureau's National Processing Center to process the ARMS data. Thus NASS will implement quality procedures developed for the NOC. Once CARI is operational and NASS has developed a computer-assisted interview instrument for ARMS, it will be feasible to record and code interviews. This may not occur until after the 2012 Census of Agriculture. See also the response to Recommendation 5.2.

To complement the longer-term CARI solution and supplement cognitive interviews, NASS will utilize interviewer debriefing and training for field staff and interviewers to investigate and address the quality of survey responses.

Status: In progress. Staff are in place to address this recommendation as the required systems become operational. See the ARMS Research Plan. **Update as of June 2015:** In May 2014, NASS trained field staff in several states on cognitive interviewing methods and procedures. Having a trained cadre of cognitive interviewers makes conducting cognitive interview projects more cost and time effective. So far, these trained staff have conducted cognitive interviews for several NASS surveys, and will likely be used for ARMS cognitive interviews in the future. Additional NASS field staff will be trained on cognitive interviewing in July 2015.

CNSTAT Recommendation 5.4: NASS should move to computer-assisted interview and possibly Web-based data collection, after research and testing to determine possible effects of the collection mode on the data. Computer-assisted personal interviews and Web-based data collection will provide opportunities to increase timeliness, improve data quality, reduce cost, and obtain important paradata.

NASS/ERS Response: Web-based data collection is available to about one half of the ARMS sample nationally. NASS utilized Morae usability testing software to test computer- based instruments. Implementation and testing of computer-assisted personal interviewing (CAPI) began in fall 2009 with the assignment of a CAPI project manager. Due to the complex nature of ARMS, with numerous tables and interrelated instrument designs, CAPI implementation will be incremental over the next few years.

Status: In progress. NASS is in the process of putting this recommendation in place with its operational efficiency measures. The application of CAPI to ARMS is addressed in the ARMS Research Plan.
Update as of June 2015: ***Completed.*** Web-based and CAPI data collection was available for all the 2014 ARMS sample and will be available in all future ARMS surveys.

CNSTAT Recommendation 5.5: NASS and ERS should develop a program to define metadata and paradata for ARMS so that both can be used to identify measurement errors, facilitate analysis of data, and provide a basis for improvements to ARMS as part of the broader research and development program the panel recommends.

NASS/ERS Response: Start-up activities on defining and using paradata have begun with a preliminary literature search to determine state of the art, current applications, and general trends. This information will be used to inform decisions about how to organize this effort.

Research has been directed to developing predictive models to identify operations highly likely to be non-respondents in ARMS and other surveys. These models use census of agriculture data as a proxy for ARMS respondents and non-respondents. During the 2011 ARMS, NASS is collecting information on how the data from the predictive models can be used in ARMS data collection. The potential impact of identified subsets of these likely non-respondents on non-response bias has been evaluated and results have been documented in research reports and external conference presentations.

In the future, expanded use of CAPI data collection on iPads and development of an ARMS CAPI questionnaire should facilitate the capture of additional paradata both directly and from interviewer observation. However, current ARMS data collection does not include the routine capture of paradata. Ultimately, NASS hopes to be able to use paradata to reduce non-response bias.

Interim and complementary responses to recommendations 5.2 and 5.3 will be employed to provide a basis for improvement to ARMS until the longer-term solution can be implemented.

Status: In progress. Technology is being developed to move this initiative forward. Until those systems are in place the use of paradata will not be very effective. Testing will continue on how to best use the information from the predictive models in data collection. See the ARMS Research Plan.

Nonresponse, Imputation, and Estimation

CNSTAT Recommendation 6.1: NASS should routinely report ARMS case dispositions linked across survey phases to provide the foundation for appropriate response rate calculations for Phases II and III.

NASS/ERS Response: This information has been reported in past years for specific commodity versions of the ARMS Phase III survey in an internally published document. This information will be expanded to cover all versions of ARMS and will also be included in the Methodology and Quality Measures document released to the public in August 2012 and annually thereafter.

The Farm Production Expenditures report published in August 2011 contains a statement and link to additional information on survey methodology and quality measures. Quality metrics include sample size, response rates, coefficients of variation, and percent of estimate from respondents.

Status: Completed. ARMS case dispositions linked across survey phases have been compiled and maintained within NASS since 2006. Starting in August 2012, these tables will be included in the ARMS Phase III Survey Methodology and Quality Measures document that is published along with the Farm Production Expenditures report. These documents will be available to the general public through the NASS Web page.

CNSTAT Recommendation 6.2: All published ARMS response rates for Phase II and III should be calculated to reflect the nonresponse from the preceding phase(s).

NASS/ERS Response: A new method of calculating the response rates to reflect the nonresponse from previous phases will be developed. NASS has always reported response rates for each individual phase of ARMS independently, but this new method will provide a response measure that covers all three phases. This information will be considered for inclusion in the Methodology and Quality Measures document released to the public in August 2012.

Status: Completed.

Update May 2014: NASS has calculated multiple "cumulative" response rates and will evaluate those response rates and will be considered for publication (pending any unforeseen issues) in the August 2014 Farm Production Expenditures Methodology and Quality Measures Document.
Update June 2015: NASS will publish a "cumulative" response rate to the data user's manual on http://www.max.gov

CNSTAT Recommendation 6.3: The nature of the ARMS nonresponse bias should be a key focus of the research and development program the panel recommends. This research and development program should focus initially on understanding the characteristics of nonrespondents.

NASS/ERS Response: NASS has and will continue to explore nonresponse bias using predictive models built using census of agriculture data with the current year ARMS data. These analyses have evaluated bias for key survey estimates and the effect of NASS weighting procedures on bias. These studies of nonresponse bias and additional analysis of respondent incentives have been conducted and results have been published. NASS continues to assess nonresponse bias. Studies to date have shown that current NASS weighting procedures reduce or eliminate bias for most key survey items, although, as described below in research conducted by ERS, the impact of nonresponse adjustment on estimates is sizeable for some measures.

In 2008, research projects were completed to examine reasons for nonresponse in Phase III of the 2006 ARMS. Studies were completed in Washington and Louisiana, providing an opportunity to examine regional differences. Item nonresponse tabulations are routinely circulated among ARMS managers, and summary analyses are disseminated through a survey research Web page).

Research is currently underway to evaluate the use of the information from predictive models in data collection both to increase response and to decrease non-response bias. Based on the results of current research, future activities may focus on ways to use the nonresponse models to supplement the current ARMS weighting procedures.

ERS research on nonresponse bias has focused on economic variables that influence nonresponse, and the effects of nonresponse on economic analyses using ARMS data. The research uses census responses from ARMS nonrespondents, and finds that farm size plays an important role in nonresponse. Accounting for nonresponse has very minor effects on most coefficients analyzed in several econometric papers, but important (50%-100%) impacts in a few. Moreover, standard econometric corrections for bias do not work in all cases of concern. Continuing work aims to isolate the types of measures for which bias will be important.

Status: Completed. **Update February 2014:** NASS is currently using the nonresponse propensity models to identify likely non respondents. This information is utilized when assigning data collection methods. Targeted methods used for operations that were identified as likely non respondents included in-person recruitment by more experienced NASS staff and interviewers, providing publications and brochures, a drop off/pick up

methodology and emphasizing data uses that apply to specific types of operations.

CNSTAT Recommendation 6.4: The research and development program should continue NASS's work on both public relations and incentives, and it should do so with a focus on nonresponse bias, not simply nonresponse rate.

NASS/ERS Response: Much work has been done over the years on targeting public relations materials toward specific groups in ARMS—in some cases, those with historically low response rates. For several years, monetary incentives have been used and researched for the ARMS core sample with some success in incremental response rate increases. However, with the use of nonresponse propensity scores (see recommendation 6.3), we plan to utilize the incentive funds to conduct more targeted nonresponse avoidance activities in lieu of its use to manage the debit cards.

Nonresponse propensity models can be used to identify highly likely non-respondents before data collection begins. The models developed by NASS identify multiple subgroups of highly likely non-respondents according to farm production or operator characteristics. This will allow NASS to alter data collection procedures, develop targeted publicity materials and incentives, or alter interviewer assignments in focused nonresponse avoidance. Likely non-respondents are currently being identified and a split sample experiment is being conducted to evaluate whether response rates can be improved for these operations. Similar to prior research, the impact of these non-respondents on bias in key survey estimates will also be included. Results may indicate that some groups of likely non-respondents have greater impact on data quality and these would be the focus of future efforts.

***Status: Completed*. Update February 2014:** *The models are being utilized in planning data collection and for follow-up non respondents.*

CNSTAT Recommendation 6.5: The research and development program should analyze whether there are differences in ARMS unit and item nonresponse rates between census and non-census years, with an eye toward deciding whether making ARMS mandatory would improve data quality.

NASS/ERS Response: The Research and Development Division performed a detailed analysis of the item nonresponse rates for the 2006 and 2007 ARMS Phase III. The report summarizing the analysis, published June 2012, looks at item nonresponse in two different ways to account for the fact that collection procedures at the time did not permit differentiating between valid zeros, zeros that are imputed by an analyst, or zeros that were filled in by data entry staff when no value was available during keying. In addition, a change rate was calculated to examine the total number of changes to an item. The report contains these three calculations for all variables collected in ARMS Phase III and identifies the problematic items.

A relatively small number of items did not meet the OMB threshold. However, the items that fell short were consistent across years. Most of these items dealt with landlord and contractor expenses, values that may not be readily available (or available at all) to the respondent (the operator). Some manually imputed items were imputed one hundred percent of the time, while one machine-imputation-eligible item, landlord's property tax expense, was imputed over half the time. The analysis also discovered several dozen items that always get zero responses and many more that get only a few responses. These variables are being or have been addressed by the NASS/ERS Steering Committee in questionnaire design and editing procedures; they will be evaluated annually as part of post-data-collection and summary evaluation procedures. At this time, the Committee believes ARMS should remain a voluntary survey.

Status: Completed. There is no current initiative or external effort to evaluate mandatory reporting (nor is there expected to be) on ARMS.

CNSTAT Recommendation 6.6: The research and development program should examine how questionnaire design and interviewing changes could reduce item nonresponse.

NASS/ERS Response: Questionnaires are routinely pretested to ensure that respondents can understand and answer ARMS items. In addition, field office staff submit comments and suggestions for changes after data collection that are used in the design of subsequent ARMS questionnaires and data collection procedures.

Many questions that were the focus of testing and redesign on the 2012 Census of Agriculture also appear on ARMS questionnaires. Work on the census has been done to identify the items with the most nonresponse and this was used to determine the areas of the questionnaire that were the focus of redesign. Item nonresponse in the 2012 Census of Agriculture will be compared to the 2007 Census to determine the impact of those changes.

Status: Completed. **Update February 2014:** *The testing and redesign of questions from the 2007 Census were integrated into the ARMS questionnaire. NASS and ERS continue to evaluate and make adjustments as needed.*

CNSTAT Recommendation 6.7: NASS and ERS should consider approaches for imputation of missing data that would be appropriate when analyzing the data using multivariate models. Methods for accounting for the variability due to using imputed values should be investigated. Such methods would depend on the imputation approach adopted.

NASS/ERS Response: NASS and ERS staff have worked together over the past two years, and with academia as members of a cooperative research

venture with the National Institute of Statistical Sciences (NISS), to develop an improved, multivariate approach to imputation for the ARMS Phase III data. They have developed new imputation methodology that will be incorporated operationally in the near future. The imputation procedure samples imputations from a joint model that is constructed from a sequence of conditional regression models known as iterative sequential regression. The procedure is conducive for high dimensional problems since it allows for flexible selection of a predictor function in each conditional model while maintaining a valid joint distribution. The procedure will jointly impute for more than 150 ARMS variables using models that were created using a combination of economic expertise and automated variable selection procedures. The product of the research is a system written in R programming language that will incorporate multivariate imputation for key ARMS variables into the NASS processing system.

ERS has developed a cooperative agreement with researchers at North Carolina State University, to assist us in developing analyses and routines in support of the implementation of improved imputation methodologies for the variables that ERS imputes in the ARMS survey. These variable tend to be non-negative, clustered at zero, and highly skewed, and are therefore not directly amenable to the sort of iterative procedures being implemented by NASS for imputation. However, there are a set of transformations that may allow us to follow the NASS approach. ERS will engage with the NC State team during the Spring of 2013.

Status: Research completed. R routine is being incorporated into the NASS processing system. **Update as of February 2014:** Testing is expected to occur in 2014 with implementation in 2015. **Update as of June 2015:** Multivariate imputation was used operationally for the 2015 survey.

CNSTAT Recommendation 6.8: All missing data that are imputed at any stage in the survey should be flagged as such on files to be used for analysis.

NASS/ERS Response: After the ARMS review, NASS initiated tracking of all item imputation computed by the **machine imputation** process. Any **manual imputation** currently done by a field office statistician is not traceable. If a field office statistician makes an update to the questionnaire before the data are entered into our system, that update cannot be differentiated from a value reported by the respondent. NASS business processes are being updated and it is anticipated that in the future original data will be captured before analyst review, which will result in all changes to the data being captured. This will occur as NASS moves to using Apple iPads for field interviewing, and as editing in CAPI becomes the same as editing by field office statisticians through training and supporting documentation. Forms returned by mail are scanned and keyed at a processing center so no editing occurs by a field office statistician.

Status: Partially completed. System changes for machine imputation have been made to respond to this recommendation. Training procedures have been enhanced to emphasize appropriate use and notation of manual imputation. Development of a CAPI instrument for the Apple iPad is planned for 2015. See the ARMS Research Plan. **Update as of June 2015:** ***Completed.*** As of 2015, NASS systems allow for the tracking of the origin of the "current value" on the dataset for ARMS. This allows us distinguish between reported, updated, imputed, and edited values on the dataset moving forward.

CNSTAT Recommendation 6.9: NASS and ERS should provide more clarification and transparency of the estimation process, specifically the effect of calibrations on the assignment of weights and the resulting estimates.

NASS/ERS Response: NASS has assessed the impact of calibration weighting used for nonresponse adjustment on nonresponse bias for several years using census of agriculture data. These analyses show that calibration substantially reduced bias for most key ARMS estimates. NASS specialists have conducted seminars at ERS on the subject of calibration.

The ARMS Phase III Methodology and Quality Measures document published for the first time for the 2010 survey contains a table that displays the percent of the survey estimate that came directly from the respondents. The converse of that number is the percent of the estimate that resulted from weight adjustments due to calibration, indicating the impact that calibration has on the survey estimates. Also included in the document are overall survey response rates and the coefficients of variation for each published estimate. Each provides the data user with a level of quality and precision in the ARMS Phase III estimates. The document is available to the public at the same time as the Farm Production Expenditures publication. Prior to this complete quality measures and methodology document, the coefficients of variation for the national estimates were included in the annual publication since the 2008 survey release.

ARMS data summaries made available on the ERS Web site include a measure of statistical reliability for each variable presented. In addition, the site provides survey documentation including enumerator manuals, survey procedures, data dictionary, and other reference material. A data user's guide is under development, chapters of which are available upon request.

Status: Completed. Update as of February 2014: See quality measures on the NASS and ERS Web sites. **Update as of May 2014:** The ARMS User's Guide is published and available on the ERS website.

Methods of Analysis

CNSTAT Recommendation 7.1: NASS should continue to provide sampling weights with the ARMS data set, combined with replication weights for variance estimation.

> NASS/ERS Response: A complete set of weights that include the calibrated weights, version specific weights, and masked weights along with their respective sets of replicate weights have been made available for many years and this practice will continue.
>
> ***Status: Completed***.

CNSTAT Recommendation 7.2: NASS and ERS should continue to recommend the design-weighted approach as appropriate for many of the analyses for users of ARMS data and as the best approach for univariate or descriptive statistics.

> NASS/ERS Response: NASS always recommends using the design-weighted approach when data users attempt to utilize micro level ARMS data in other research and analysis. All data requests are accompanied by an explanation of the weights we recommend and why utilizing another weighting method may not be accurate in representing the total population of farms at the state, regional, or national level.
>
> ***Status: Completed***.

CNSTAT Recommendation 7.3: NASS should investigate and implement improvements to the current jackknife replicates to make them more useful for the types of analyses performed by users in ERS and other organizations. In particular, NASS should increase the number of replicates and apply bounds to the magnitude of the weight adjustments.

> NASS/ERS Response: Based on research it conducted on this issue, NASS has taken several steps to improve the jackknife replicate method of variance estimation. Specifically: increasing the number of jackknife replicates from 15 to 30, limiting the magnitude of weight adjustments in calibration and in the creation of replicate weights, posting a document describing methods that may be employed to sharpen analyses derived from the method, and undertaking research on improvements to the current method, with a particular focus on the applicability of the estimator for analyses of subsamples of the database.
>
> ***Status: Completed.***

CNSTAT Recommendation 7.4: NASS and ERS should investigate the feasibility of providing sufficient information on the design and nonresponse characteristics of ARMS, in order to perform design-based statistical analysis without using the replicate weights and to allow users to incorporate design and nonresponse information in model-based analyses.

NASS/ERS Response: Documentation is planned that will serve as a guide for data users. (See response to recommendation 7.6.) A section of the guide will address alternative statistical procedures reflecting the improvements in imputation methods and use of replicates currently being investigated.

Status: In progress. NASS and ERS will report on the status of this documentation to OMB in its PRA submission. This status document will be updated annually or more frequently as progress warrants. It will be posted to "the Independent Reviews" box on the NASS Surveys Web page. **Status Change: Completed. Update as of February 2014:** ARMS User's Guide is in pre-publication phase at ERS and should be published online by May 2014.

CNSTAT Recommendation 7.5: ERS should build an enhanced level of in-house survey statistics expertise, in cooperation with NASS. The specialized expertise in both econometrics and survey statistics needed to accomplish this is currently not present in ERS and is likely to require a significant effort in recruiting and training.

NASS/ERS Response: ERS has hired new staff with survey research expertise and is continuing to recruit with econometric and survey research expertise in mind. Since the ARMS review, ERS has hired two economists with extensive survey experience or training, who have devoted part of their time to survey research efforts (on imputation and on nonresponse). ERS has hired a third economist with extensive survey experience to work on database development and integration at ERS.

NASS has hired five doctoral-level survey statisticians and one survey methodologist. NASS has also used a PhD economist in ongoing research projects.

Status: Initial effort completed. ERS and NASS will continue to build on this resource in accordance with other agency priorities. **Update as of June 2015: *Completed.*** NASS and ERS completed a joint training in June of 2015 for ERS researchers.

CNSTAT Recommendation 7.6: ERS and NASS should collaborate on writing a Guide for Researchers for performing multivariable analyses using data from complex surveys, particularly data from ARMS. In areas in which expertise is not available for writing parts of such a guide, expertise should be sought from the statistics and economics community, especially those with experience in the analysis of survey data from complex survey designs.

NASS/ERS Response: ERS now provides copies of the interviewer's manual, as well as copies of the questionnaires, for each year of ARMS as part of the documentation on the public Web site. ERS also provides all users with a set of file documents on variable listings and definitions, estimation procedures, and the structure of financial accounts. An ARMS User's Guide, which combines existing documentation memos and programs with new material and an annotated table of contents along with an executive summary in an organized framework, is being developed by ERS. Completed chapters are already offered to data users. Chapters are posted on the ERS intranet site for easy access by ERS staff, and are provided directly to external data users, who receive some chapters when they first inquire about data access and the others once they are granted access.

In addition the DaTUM committee identified three types of users: 1) The casual user who wants to simply know what the survey is and wants access to basic public data; 2) the advanced user of public data who digs deeper into the data and studies more about the survey; 3) the researcher (both at ERS and outside of ERS) that is authorized to use record level data. As a departure from earlier work shown to OMB, the team now is working toward a substantial update to the website to address the needs of users 1 and 2. Mockups should be available for internal ERS review by the end of April 2013. The website will provide a basic overview of the survey and a clear pathway to the data for type 1 users and point to the large amount of publicly available information for type 2 users. The type 3 user will have all the public website material available and will be provided with additional resources that address all in-depth issues of record level data use at the password-protected site Max.gov. New documents are planned where needed and the team maintains its goal of launch no later than December 2013.

Status: Completed. **Update as of February 2014:** ARMS User's Guide is in pre-publication phase at ERS and should be published online by May 2014. **Update as of May 2014:** The ARMS User's Guide is published and available on the ERS website.

Dissemination

CNSTAT Recommendation 8.1: ERS should continue to improve the ARMS Web tool by providing summaries on more variables and more subsets from ARMS, and to improve the ARMS extranet Web tool by adding the ability to link over years and to more sophisticated models.

NASS/ERS Response: An ERS-NASS team is preparing a research and documentation Web-based search tool that will enable interested users to

locate and download ERS and NASS survey research papers and annual ARMS metadata summaries. ERS recently added a new set of tables detailing participation in government programs to the Web tool. Additional tables are under consideration.

Status: Initial effort completed. NASS and ERS will report on the Web tool in its PRA submission to OMB.

CNSTAT Recommendation 8.2: USDA should consider extending the availability of ARMS microdata through the Census Bureau research data centers to increase access opportunities for using additional data sets and enabling researchers to match ARMS files with other data sets.

NASS/ERS Response: ERS and NASS have joined the NORC Data Enclave program at the University of Chicago. The Data Enclave expands ARMS access opportunities for qualifying researchers in controlled on-campus environments. It provides a confidential, protected environment within which authorized researchers can access sensitive microdata remotely from their offices, an approach that combines good researcher access with researcher training and administrative support.

Currently 18 researchers representing 15 academic institutions are using the Data Enclave to accomplish their research, increasing the value added of the ARMS data collection through high-quality analysis, deeper insights into key issues, and by tapping into a broader analytic community. These researchers are presenting their findings at conferences and publishing them in proceedings and journals. They are able to address questions at a more local level than can be done directly at ERS. Participants have achieved greater efficiency and lower costs by not having to undertake the time and expense of travel to USDA offices, and the support burden on these offices has been reduced. The Data Enclave is better suited than the Census Bureau research centers for ARMS data. Researchers are enthusiastic about how their analyses are facilitated, enabling them to collaborate with ERS in a more productive way.

Status: Completed. NASS and ERS determined that the NORC Data Enclave program better suited the agencies' and their researchers' needs and have been developing this access mechanism.

CNSTAT Recommendation 8.3: ERS should provide more training for new data users, including developing a data user manual, which also includes the recommended guide on statistical estimation, and offering training workshops.

NASS/ERS Response: In 2010, ERS had an agency-wide two-day comprehensive training for ARMS users including participation from NASS and the Bureau of Economic Analysis. The workshop covered the uses of the survey, its components, the links between the survey's goals and

questionnaire design, and technical features of designing the survey, developing a research database, and analyzing the data. Topics included survey design and sample selection, weighting and calibration, data editing and imputation, inference with complex survey data, and the creation of farm income and wealth accounts from raw data. Another comprehensive training is planned for 2013.

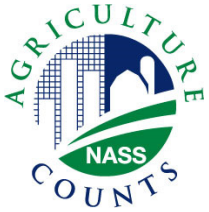
Status: Training will be offered based on demand and resources. NASS and ERS will report on training as applicable in its PRA submission. **Update as of May 2014:** The ARMS User's Guide is published and available on the ERS website.

Update as April 2015: ERS will be again be conducting a formal ARMS training workshop, focused on the needs of new users, in June of 2015, with presentations from NASS and ERS staff. The workshop will be aligned with material from the ARMS User's Guide, completed in 2014. ERS intends to post powerpoint presentations and record sessions, so that others can use the material.

CNSTAT Recommendation 8.4: Database management practices should include a system for managing and reporting errors found by users, for ensuring the consistent labeling of the codes for raw variables, and for using consistent names of the ERS-created summary variables over time.

NASS/ERS Response: ERS maintains the capability to receive email suggestions and notices regarding the ARMS data tool available on its home page. Responses are reviewed by staff. An email address and telephone number are provided for a member of the agency's team for specific questions regarding access, special tabulations, or other questions regarding access and use of the data. See the ARMS Briefing Room.

Status: Completed.



National Agricultural Statistics Service and Economic Research Service

Agricultural Resource Management Survey

Research Plan

FYs 2012 - 2016

June 2012

Timeline

2012

- Testing – Annual questionnaires are routinely pretested to ensure that respondents can understand and answer ARMS items. For 2012, conduct cognitive tests for soybeans and wheat.
- Nonresponse bias analysis – Annual studies are now part of the operational process by our methods staff; in 2012, test 2011 data.
- Test iterative sequential regression imputation methodology.
- Large and complex farm project – Initial planning has begun and continues.
- ERS and NASS will collaborate on research to explore the implications of expanding the value codes used in ARMS.
- ERS and NASS will analyze differences in questionnaire reporting for specific items related to mode of data collection (mail versus personal interview).

2013

- Large and complex farm project -- Begin testing for ARMS and census.
    - **Update February 2014:** Pilot procedures for this project were developed and an internal steering committee was formed.
- Testing – Annual questionnaires are routinely pretested to ensure that respondents can understand and answer ARMS items. For 2013, conduct cognitive tests for vegetables, rice, and peanuts.
    - **Update February 2014:** Testing was moved from Research and Development Division to the Standards and Survey Development Methodology Branch thus making it operational.
- Nonresponse bias analysis – In 2013, evaluate bias in 2012 data.
- Parallel test iterative sequential regression imputation methodology.
    - **Update February 2014:** Parallel testing is being conducting for the 2014 survey and will be operational in 2015.
- Begin computer audio-recorded interviewing (CARI) system development, integration, and testing. \
    - **Update February 2014:** NASS started exploring the feasibility of adoption of CARI and tested it on small surveys. Not operational at this time.
- Develop three-phase response rate for ARMS.

2014

- Begin animated graphical Internet displays for ARMS work.
- Nonresponse bias analysis – In 2014, test 2013 data.

- Initiate research on linking ARMS data to administrative data available through USDA's Acreage/Crop Reporting Streamlining Initiative (ACRSI).
- Complete historic census data conversion for complex analysis.
- Implement iterative sequential regression imputation methodology.
    - **Update June 2014:** Parallel test was conducted with iterative sequential regression imputation methodology and will be implemented for the ARMS 2015 survey.

2015

- Begin to implement computer assisted personal interviewing (CAPI) for ARMS questionnaires with table in Blaise IS (Internet Services) software for 2015 data year.
- Testing – Annual questionnaires are routinely pretested to ensure that respondents can understand and answer ARMS items. For 2015, the questions/commodities to be cognitive tested are still to be determined. Conduct census and ARMS evaluation for census year.
- Assess the coordination effort to synchronize ARMS questions with the 2012 Census of Agriculture report form. Use data from both the census of agriculture and ARMS to determine edit and imputation rates and evaluate nonresponse.
- Nonresponse bias analysis – In 2015, test 2014 data year.

2016

- Use CARI for quality control in ARMS.
- Testing – Annual questionnaires are routinely pretested to ensure that respondents can understand and answer ARMS items. For 2016, the questions/commodities to be cognitive tested are still to be determined.
- Nonresponse bias analysis – In 2016, test 2015 data.
- Automate collection of ARMS paradata.

Plan

1. Sample and Questionnaire Design

- Solicit stakeholder feedback
    - Prior to each reference period for data collection, NASS and ERS will engage stakeholders for input on the ARMS three-phase program. Resulting changes will be reported to the Office of Management and Budget (OMB) in its Paperwork Reduction Act (PRA) submissions. Public comments will be solicited from the Federal Register Notice, at NASS's annual Data User's Meeting, through the ERS ARMS Briefing Room, and other events and means. Internal comments are solicited through a formal request and response system and evaluated by the ERS/NASS ARMS Steering Committee.
- Test questionnaires
    - Questionnaires are routinely pretested to ensure that respondents can understand and answer ARMS items. Questions are considered for evaluation and redesign each year. Questions can change depending on agricultural policies and structural changes. In addition, field office staff submits comments and suggestions for changes using E-2 forms after each survey data collection period. This information is used to modify and make design changes to subsequent ARMS questionnaires and data collection procedures. The need for testing each year depends on content, timing, complexity, and resource constraints.

      When NASS conducts large-scale tests, we use an OMB-approved generic clearance docket (OMB Control # 0535-0248) to do testing and evaluation of NASS questionnaires. In years when only minor changes are made to any of the questionnaires, testing is limited to nine or fewer cognitive type interviews and is not submitted to OMB for approval. A variety of assessment methods, including cognitive testing, focus groups, split sample field tests, etc., are used to test ARMS and other NASS surveys. An experimental control group is used to evaluate differences between mail and field collected responses. Item nonresponse and survey design are examined. Varied data collection methods are evaluated for large and complex operations. The geographic dispersion of farm operators limits the use of cognitive laboratory testing. As is typical in establishment surveys, most testing is conducted with onsite visits. The OMB-approved generic clearance docket provides a venue to evaluate current instruments and practices and to test revised instruments before they are put into production.

      Prior to the 2012 Census of Agriculture, extensive coordination was done to synchronize questions on ARMS with the relevant census of agriculture questions. After the 2012 Census of Agriculture, NASS will assess these common questions using both census and ARMS data to determine edit and imputation rates and evaluate nonresponse in 2015.

- Develop CAPI instrument for Apple iPad (field data collection)
    - Research and Development Division (RDD) is developing a data collection instrument utilizing Blaise IS software for the area data collection in 2012. The software is currently a beta version. Once this software is in production version and NASS has tested questionnaires with table format questions, NASS will begin full development of CAPI ARMS questionnaires. The plan date is 2015 for 2014 data.
- Use administrative data in lieu of collecting data
    - NASS is one of the four agencies involved with the Acreage/Crop Reporting Streamlining Initiative within USDA. ACRSI is establishing data standards to be used for the annual acreage reports collected by the Farm Service Agency (FSA) and the Risk Management Agency (RMA). The data collected under ACRSI standards will be available to NASS; however, these data will not be fundamentally different from what's currently available from FSA and RMA. The challenge in using the data will be in mapping FSA data to specific NASS operations sampled for ARMS. The research required to link FSA data to ARMS operations will begin by April 2014.
- Analyze detail data to determine what questions work using CARI (2016) and paradata research related to the implementation of CARI.
    - RDD is currently investigating a beta version of CARI software. Once the Census Bureau accepts the software, NASS will integrate it into its system. NASS will begin to design procedures to select portions of CARI interviews for question review or interviewer coding as soon as software is available for research. Work is expected to be completed in 2016.

2. Data Collection

- Use of paradata
    - NASS does not yet have systems in place for the automated collection of paradata on interviewer assignments, interviewer characteristics, and their possible impact on data quality in the interview. Systems to allow this should be in place in 2015. NASS currently has little social science staff expertise to explore the impact of characteristics of interviewer and respondents. NASS expects to hire more research staff with this background and experience and to begin research in this area in 2016.
- Large and complex farm project
    - After hiring a new staff member, RDD began initial planning in 2012 to investigate alternative methods for collecting data on large and complex agricultural operations. Initial implementation of any program for data collection from impact operations will begin with a small pilot set of operations. These operations will be selected by field office directors and other NASS staff. In-depth interviews and reviews of their relevant records, operating structures, and

contact information could be conducted. Because all ARMS samples are coordinated with the census of agriculture in the census year, data collection for the pilot operations in 2013 will include ARMS and census data.

- Quality – Design quality control procedures with CARI for interview verification
    - Once CARI software is in place in NASS, ongoing review of ARMS interviews will be possible. Samples of interviews can be captured with CARI software and interviewer and respondent behavior can be coded and analyzed. This will allow evaluation of both questionnaires and interviewers. We expect this to begin in 2016.
- Quality – Develop three-phase response rate
    - The Statistical Methods Branch will use the 2011 ARMS survey data to derive and compute a multi-phase response rate that will accurately reflect the nonresponse from each preceding phase of the ARMS program. This new computation will also be tested on the 2009 and 2010 ARMS survey data. All testing will be completed by January 2013. Once successful tests have been executed for 2009 through 2011, this program will be implemented into the operational program for the 2012 ARMS survey cycle. Results will be published August 2013 in the 2012 ARMS Quality Measures and Methodology document, published annually.
- Quality – Conduct nonresponse bias analyses
    - Nonresponse bias analysis has been developed by research staff, and is now integrated into ongoing post-data-collection activities. Bias analysis can be conducted annually.

3. Nonresponse, Imputation, and Estimation

- Incorporate multivariate imputation into the edit/imputation system
    - Iterative Sequential Regression (ISR) imputation methodology. NASS will test ISR in 2012 after the 2011 ARMS Phase III data are processed. Parallel test ISR imputation methodology in 2013. Operational use of ISR is expected to start in 2014.

4. Analysis of Complex Systems, Data Preparation

- NASS obtained historic census of agriculture data files from the Census Bureau for the years 1964, 1969, 1974, and 1978. Before use, these data files need to be converted into formats that are readable by modern processing systems. Unfortunately, the conversion process is complicated by two facts: (a) the same conversion process is not workable for all years, and (b) the record layouts for the historic files are not always available. Work to convert the historic data files to the extent possible continues. However, data will probably not be recovered for all years or for all states. Also, once recovered, data may not be able to be mapped to more recent censuses and ARMS operations because of differences in

operation identification numbers. RDD expects to complete the process to convert the historic data files (to the extent possible) and map data to operations (also to the extent possible) by January 1, 2014.

5. Dissemination

- Work has begun on providing animated graphical displays of data for NASS's Web site. Once the technology has been adopted, ARMS Web-animated graphical displays will be a high priority. Work on ARMS is expected to begin in 2014.

6. Data User Resources

- ERS is developing an ARMS User's Guide. A topics-based outline is nearly Complete; ERS will evaluate whether to post the outline to its website.

7. Staff Development

- Managers in NASS and ERS will continue to support the Joint Program on Statistical Methodology or other professional associations and encourage staff involvement in the program to enhance staff skills.

ARMS

Listing and Description of Farm Business and Farm Operator Household

Summary and Classification Variables, 1991-2010