Incorporating Mobile Mapping Instruments in the June Area Survey Data Collection Effort

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Abstract
The National Agricultural Statistics Service (NASS) conducts the June Area Survey (JAS), which interviews farm operators to obtain the agricultural information for each of their fields. The JAS is based on an area sampling frame comprised of segments of land that make up the sampling units. Traditionally, the JAS field enumerators use a hard copy aerial photograph to locate and interview all operators within the segment boundary. Then, they draw off all fields by hand on the aerial photograph and fill out a paper questionnaire. In an effort to incorporate newer technologies in the agency's data collection activities, NASS is evaluating the use of an electronic mobile mapping instrument running on an iPad that would replace the aerial photograph and the paper questionnaire. Research conducted in 2014, using a mobile mapping prototype, indicated that drawing fields during the interview took longer than is operationally feasible even when enumerators are proficient with use of the instrument. Testing in 2015 focused on using JAS segments with pre-delineated fields in the mobile mapping instrument in order to reduce interview time. Fields were delineated using a variety of sources such as topology maps, satellite derived Cropland Data Layer (CDL) information and Common Land Units (CLUs) from the Farm Service Agency (FSA). Enumerators were then provided with prepared field boundaries in the mobile mapping instrument to compare completion times to current procedures using the paper aerial photograph. Enumerators recorded previous year's JAS data using a mock interview format. Research results and the future direction of NASS's data collection activities are discussed.

Key Words: mobile mapping, interface design, area frame, data collection, Geographic Information System (GIS)

1. Introduction and Background

The June Area Survey (JAS) is the National Agricultural Statistics Service's (NASS) largest survey. It is based on an area frame and collected via in-person interviews utilizing pencil and paper procedures. Traditionally, the JAS field enumerators use a hard copy aerial photograph to locate and interview all farm operators within the segment boundary. Then, they draw off all the fields by hand on the aerial photograph and fill out a paper questionnaire. In an effort to incorporate newer technologies in its data collection activities, NASS is evaluating the use of a mobile mapping instrument that would replace the aerial photograph and paper questionnaire.

In 2012, a team of researchers from NASS and Iowa State University's (ISU's) Center for Survey Statistics and Methodology, developed a prototype mobile mapping instrument, called Geographic Information Running Area Frame Forms Electronically (GIRAFFE) (Gerling et. al, 2015). The instrument was used to evaluate a new sampling frame approach based on the Public Land Survey System (PLSS). The sampling units on the proposed frame were roughly equal-sized and shaped areas called grid cells or grids, which lacked any physically identifiable boundaries. In the current JAS process, segments of land comprise the sampling units and the borders follow physical features on the ground (i.e., an edge of a field, a road, a river, etc.). Figure 1 shows the grid frame concept (outlined in yellow) compared with a traditional JAS segment (outlined in red).

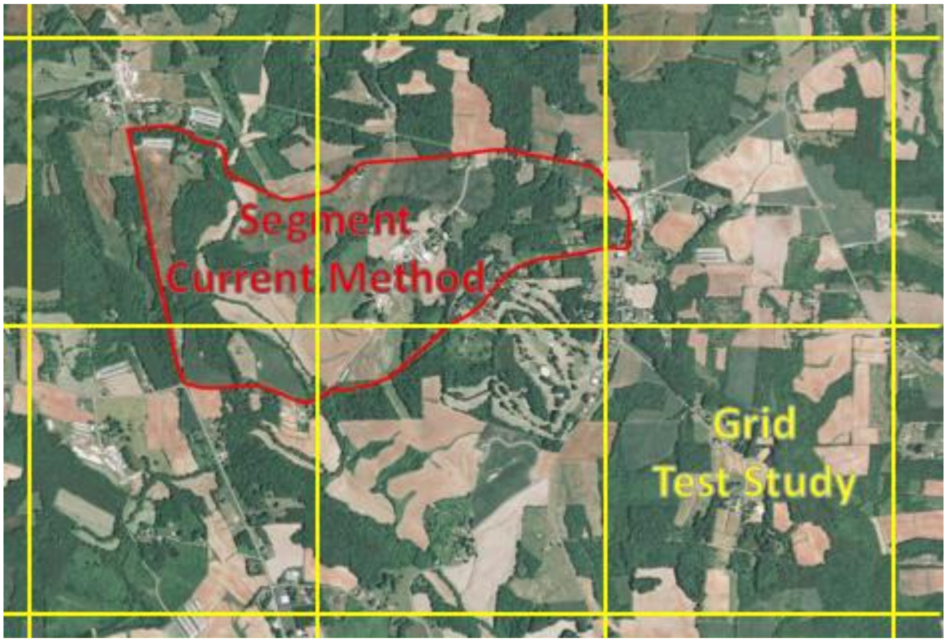

Figure 1: Grid cells (outlined in yellow) vs. JAS segment (outlined in red)

Because grid cells do not follow the infrastructure on the ground and often cut across fields, the Geographic Information Systems (GIS) capabilities on the mobile mapping instrument were necessary to calculate the acreage for the portion of the field that was included in the sampled area. The instrument was designed to operate on an iPad and to collect data for either grid cells or traditional JAS segments. A series of studies were conducted to test the usability of the mobile mapping instrument at NASS (Boryan et. al, 2016). The research, conducted in 2014, focused on collecting data using grid cells with the mobile mapping prototype instrument. Enumerators in North Carolina (NC), Pennsylvania (PA), and South Dakota (SD) visited with farm operators during the summer of 2014. A sample of 20 grid cells was selected in each state based on the enumerator's location. Field enumerators identified a total of 917 unique farm operations. For each operation, they delineated all the fields and attempted to conduct interviews with farm operators. In addition, the enumerators recorded any challenges while enumerating the grid cells, time spent with and without the farm operator, and any issues related to the use of a mobile mapping instrument, such as connectivity or glare on the iPad. Results indicated that the lack of physically identifiable boundaries for grid cells presented a substantial problem for both enumerators and farm operators. Enumerators had difficulty identifying the actual sampled area based on the imaginary grid boundaries. The study also revealed that it took enumerators too long to draw off the fields within the mobile mapping instrument, even when the enumerators were proficient with the instrument (Abreu et. al, 2015; Lawson et. al, 2015). But, overall, the mobile mapping instrument proved to be a promising tool for modernizing the agency's data collection activities. Since the instrument can be used with both grid cells and traditional JAS segments (which are based on physical boundaries), it was proposed that research on the mobile mapping instrument should continue with an emphasis on collecting data utilizing JAS segments. This paper documents the results of the research conducted in 2015, which evaluated data collection on the JAS segments utilizing the mobile mapping instrument. The primary research objective was to compare interview times using the mobile mapping instrument with the prepared pre-delineated boundaries to times using the current paper data collection method. A secondary objective was to evaluate differences between the GIS acreage calculated within the instrument to the JAS acreage reported on the paper questionnaire. First, the JAS and the mobile mapping instrument are described.

2. June Area Survey (JAS)

The JAS is conducted annually and utilizes an area frame, which ensures complete coverage of all land in the United States. Land within the area frame is divided into homogeneous strata based on percent cultivated land and further into substrata based on similarity of agricultural content. Within each stratum, the land is divided into primary sampling units (PSUs). A sample of PSUs is selected within substrata and smaller, similar-sized segments of land (about one square mile) are delineated within these selected PSUs. One segment is randomly sampled from each selected PSU to be fully enumerated during the JAS (See Figure 2).

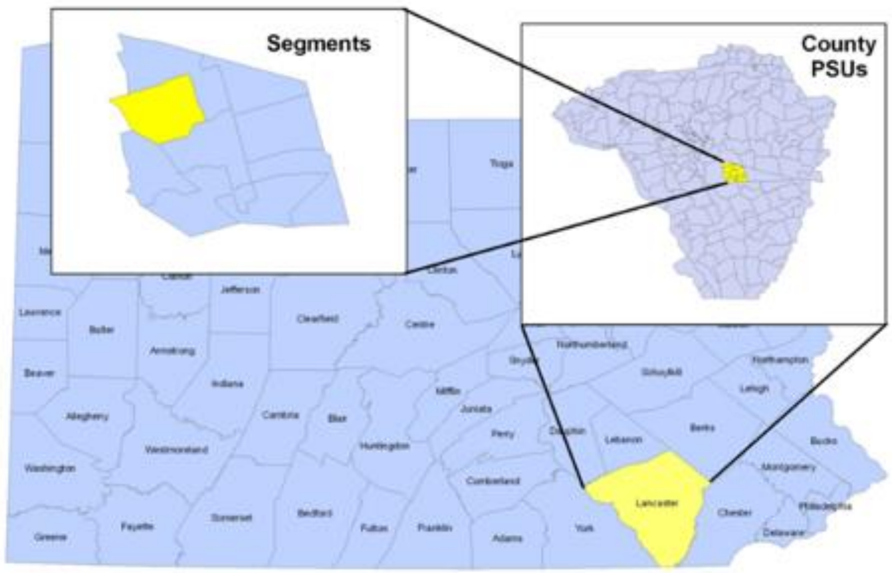

Figure 2: NASS area sampling frame for Pennsylvania

Selected JAS segments (outlined in red in Figure 3) usually have physical boundaries that follow the infrastructure on the ground (See Cotter et. al 2010 for further details on the JAS design). These are pre-screened in May prior to the June data collection period. JAS enumerators are provided a paper aerial photograph showing the sampled segment area and must account for all land inside the segment boundary. They divide each segment into tracts of land (outlined in blue in Figure 3). Obvious non-agricultural areas, such as roads, rivers, etc., are assigned a tract letter and automatically classified as a non-agricultural tract (non-ag tract). Each of the remaining tracts of land is assigned a tract letter that represents a unique land operating arrangement. These tracts are then screened for agricultural activity and classified as either an agricultural tract (ag tract) or a non-agricultural tract (non-ag tract). Actual JAS data collection is conducted during the first two weeks of June when field enumerators return to interview the ag tract farm operators. A separate paper questionnaire is completed for each agricultural operation within the segment. Farm operators identify all field boundaries (outlined in red in Figure 4) on the aerial photograph and report acreage, crops planted or other land use of each individual field (pasture, woods, wasteland, etc.) within the segment using Section D of the paper questionnaire.

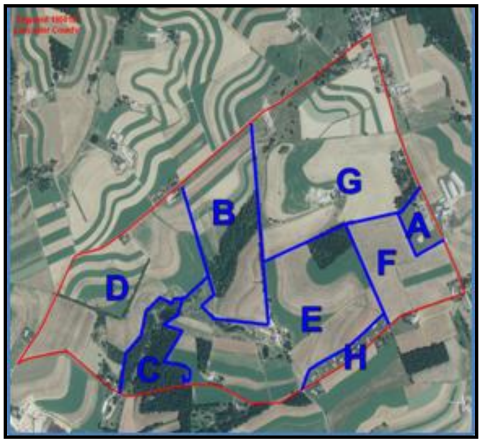

Figure 3: The area outlined in red is the segment. Tracts are outlined in blue and labeled with letters.

Figure 4: Tracts are outlined in blue and labeled. Individual fields are outlined in red within the tracts and labeled with numbers.

3. Overview of the Prototype Mobile Mapping Instrument

The mobile mapping instrument is a web application designed to run within the Safari browser on an iPad. The instrument has two main parts (Figure 5). The left side of the screen contains the aerial imagery where fields are delineated in place of the paper aerial photograph. The right side of the screen displays general field information and contains a streamlined electronic version of Section D of the paper questionnaire (See Attachment A).

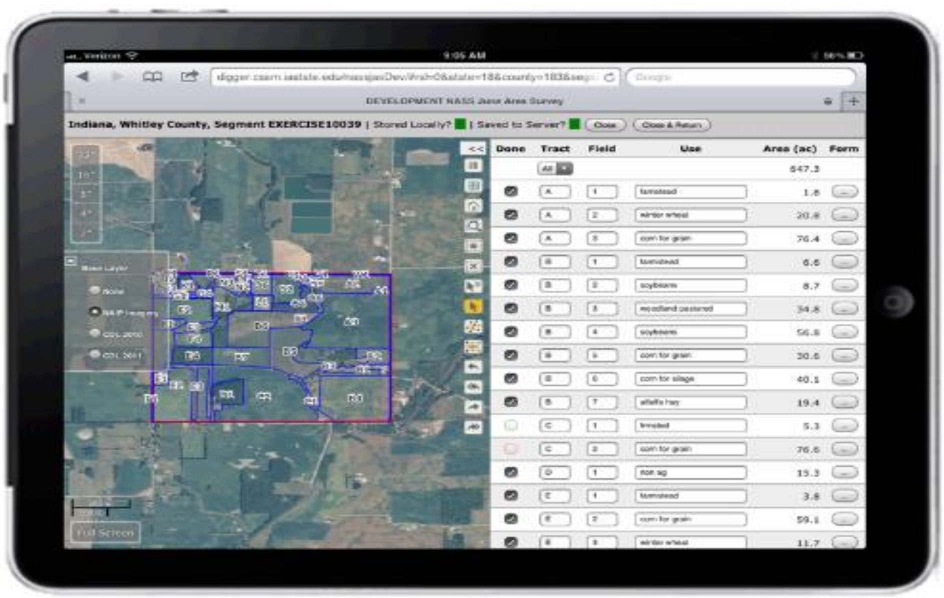

Figure 5: Mobile Mapping Instrument

The mobile mapping instrument is offline-capable. A substantial amount of the JAS data collection takes place in rural areas that tend to have intermittent signal; therefore, it was essential that the instrument be able to operate without an Internet connection. Prior to data collection, enumerators run a cache routine to store the required imagery in the iPad's memory. If a wireless connection is available, the instrument transmits a copy of the data to the web server as it is entered or modified by an enumerator. Otherwise, the data remains stored locally on the iPad. All data are automatically transmitted to the web server whenever a wireless connection is available. Up-to-date traffic light symbols are displayed to indicate if the data has been stored locally on the iPad, saved to the server, or both.

The instrument contains a wide range of GIS tools and features. The aerial imagery on the left side of the main instrument screen can also be displayed in full screen mode (Figure 6). In Figure7, the red segment boundary is overlaid on digital imagery that is obtained from the National Agricultural Imagery Program (NAIP), which acquires aerial imagery during the agricultural growing seasons in the continental United States. Typically, this digital ortho-rectified aerial photography is available to governmental agencies and the public within two to four months after acquisition.

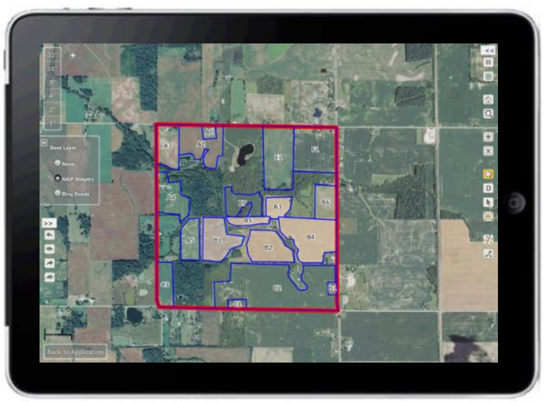

Figure 6: Instrument shown in full screen mode

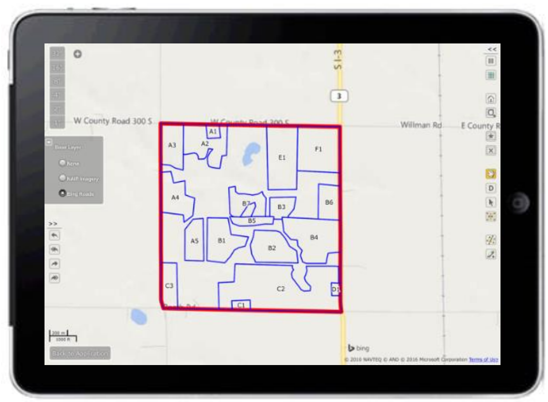

Figure 7: Displaying the Bing roads layer

The instrument is capable of presenting additional resource material using Web Map Service (WMS) overlays so the NAIP imagery can be replaced with another layer, such as Bing roads (Figure 7). The Bing roads layer is similar to a road map, which shows road names, parks, golf courses, cemeteries, etc. This is helpful in locating fields and identifying land features.

The majority of the functions are performed within the aerial imagery part of the instrument using the various tools created within OpenLayers, which is an open-source JavaScript mapping library and provides basic web and GIS functionality.

In the current JAS enumeration process, enumerators use a blue grease pencil to outline tracts and a red grease pencil to outline fields on the paper aerial photograph. Although fields are pre-delineated within the mobile mapping instrument, a farmer may report that a field is actually comprised of two fields. In that case, the mobile mapping instrument requires "splitting" the field into two fields instead of outlining them. The polygons representing each of the fields are created by using the "Split Features" tool. Splitting ensures that all land parcels are accounted for within the segment boundary.

The right side of the mobile mapping instrument's main screen (Figure 8) displays the calculated GIS acreage, column heading "Area (ac)", along with general information about all of the polygons or fields that have been delineated on the aerial imagery. A button to the right of each field is used to open the electronic field-level data collection form, referred to as Section D (Figure 9).

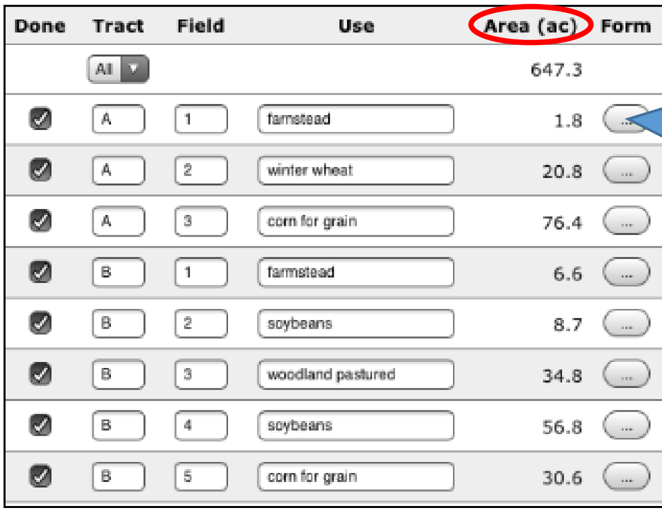

Figure 8: The right side of main screen displays the calculated GIS acreage and general field information

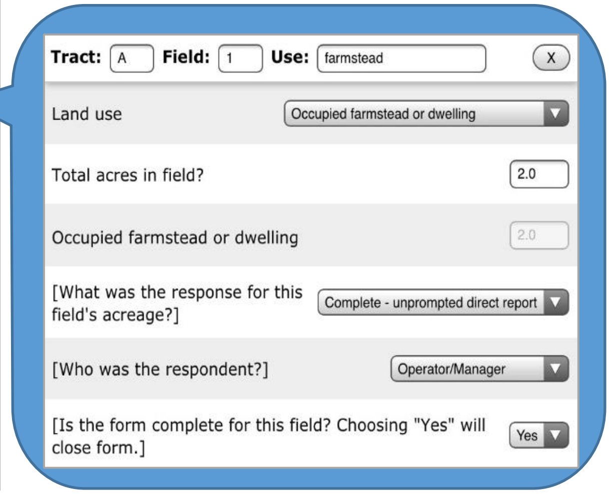

Figure 9: A view of the opened Section D form for the first field in the table

The mobile mapping instrument provides a highly optimized version of the paper Section D form. The specific details for each field are captured in a survey-like format containing drop down menus and basic edit checks. Skip rules and validation logic are specified per question dynamically. This effectively reduces the complex paper table as shown in Attachment A, to a handful of questions that relate to the specific crop or land use.

4. Study Design

The primary research objective was to compare interview times using the mobile mapping instrument with the prepared pre-delineated boundaries to the current paper data collection method. A secondary objective was to evaluate differences between the GIS acreage calculated within the instrument to the JAS acreage reported on the questionnaire. Segments from the 2014 JAS were selected in Indiana (IN), North Carolina (NC) and South Dakota (SD). In each state, 15 segments were selected at random and delineated utilizing a variety of sources. First, JAS segments were intersected with Farm Service Agency (FSA) Common Land Unit (CLU) polygons. Then, NASS cartographers delineated additional areas using available topology, road maps, and imagery from the Cropland Data Layer (CDL) and the National Agricultural Imagery Program (NAIP). In Figure 10, a JAS segment before and after the pre-delineated boundaries is shown.

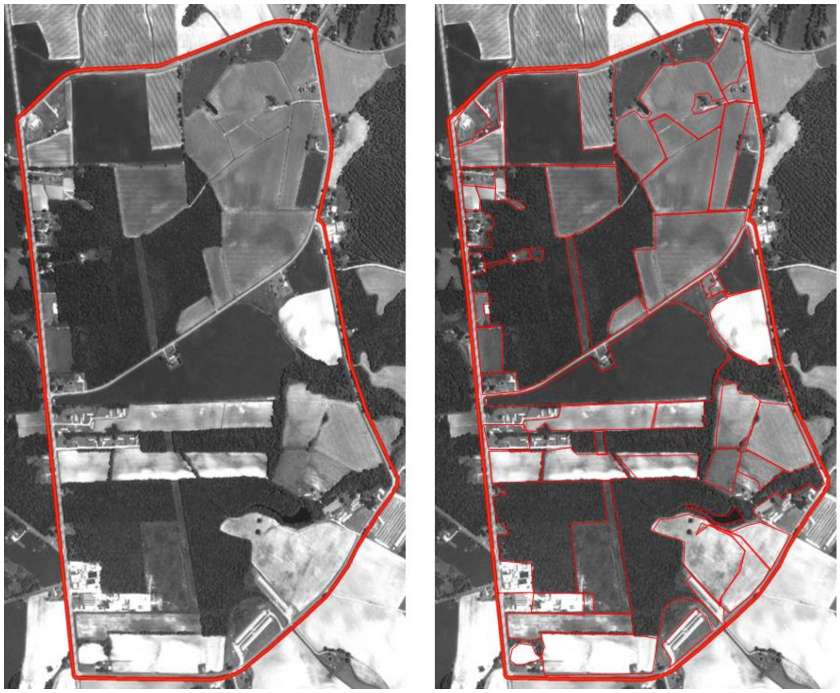

Figure 10: JAS segment without and with pre-delineated field boundaries

The final product loaded to the mobile mapping instrument was a segment with pre-delineated field boundaries. Enumerators were not be able to discern the difference between a cartographer's delineation and an FSA delineation. This process was implemented in all segments in the study.

Enumerators were trained on the instrument's functionality. The first part of their training consisted of an independent training course that each enumerator completed on their own. Enumerators were provided a manual along with instructional videos and completed practice exercises designed to teach them the basic fundamentals of the instrument. The second tier of training consisted of a training workshop. The workshop devoted 1.5 days for new enumerators and 1 day for enumerators with prior experience with the instrument. This included presentations and discussion of more complex functions of the instrument along with practicing interviewing techniques using the iPad.

Upon completion of the workshop, timed tests were conducted using a mock interview format that simulated actual live data collection activities. Field staff and other NASS personnel served in the role of the farm operator. No interviews were conducted with actual farm operators for this study. Instead, real-life situations were simulated in an effort to avoid respondent burden.

Under a controlled mock interview format, four interviews were conducted for each sampled segment as follows:

1. Indoors using the paper questionnaire
2. Indoors using the mobile mapping instrument
3. Outdoors using the paper questionnaire
4. Outdoors using the mobile mapping instrument

An enumerator completed all the interviews within each segment. In other words, if there were five operations in a given segment, the enumerator conducted five separate interviews. An answer key was prepared for each operation within a segment. Staff members acting in the role of the farm operator would study the answer key prior to survey administration. Within a segment, enumerators were to time each interview and record that time in a form that was provided (see Attachment B). The form was designed to record the interview time with the farm operator for each agricultural tract within a segment.

A total of 684 interviews were completed. Sixty-six of the interviews were removed due to a problem with the answer key, errors in the instrument, or related to a training issue that should have been resolved outside of interview time. A total of 618 interviews were utilized in the final analysis.

5. Results

Segments with pre-delineated field boundaries were to be automatically loaded to the mobile mapping instrument. NC was scheduled to be the first training workshop. Prior, to the workshop, the automatic field delineation process failed, and all the delineations (from intersecting with FSA CLUs and by cartographers), had to be manually replicated prior to starting any of the mock interviews. In order to compare interview times for JAS segments using the mobile mapping instrument with pre-delineated fields to the current pencil and paper procedures, the mean interview time was obtained from each state involved in the study (See Figure 11). Overall, the interview time increased about two minutes when the instrument was utilized as compared to the current pencil and paper procedures for all states involved in the study. NC had the largest difference, which was confounded with the order of interviews due to the automatic process failure. By the time the mock interviews in IN and SD were conducted, a number of the issues were resolved with the process, and the mock interviews went much smoother. The mean interview times were not tested for statistical significance due to the lack of randomization in the order in which the interviews were administered, primarily resulting from the issues encountered with the automatic loading process.

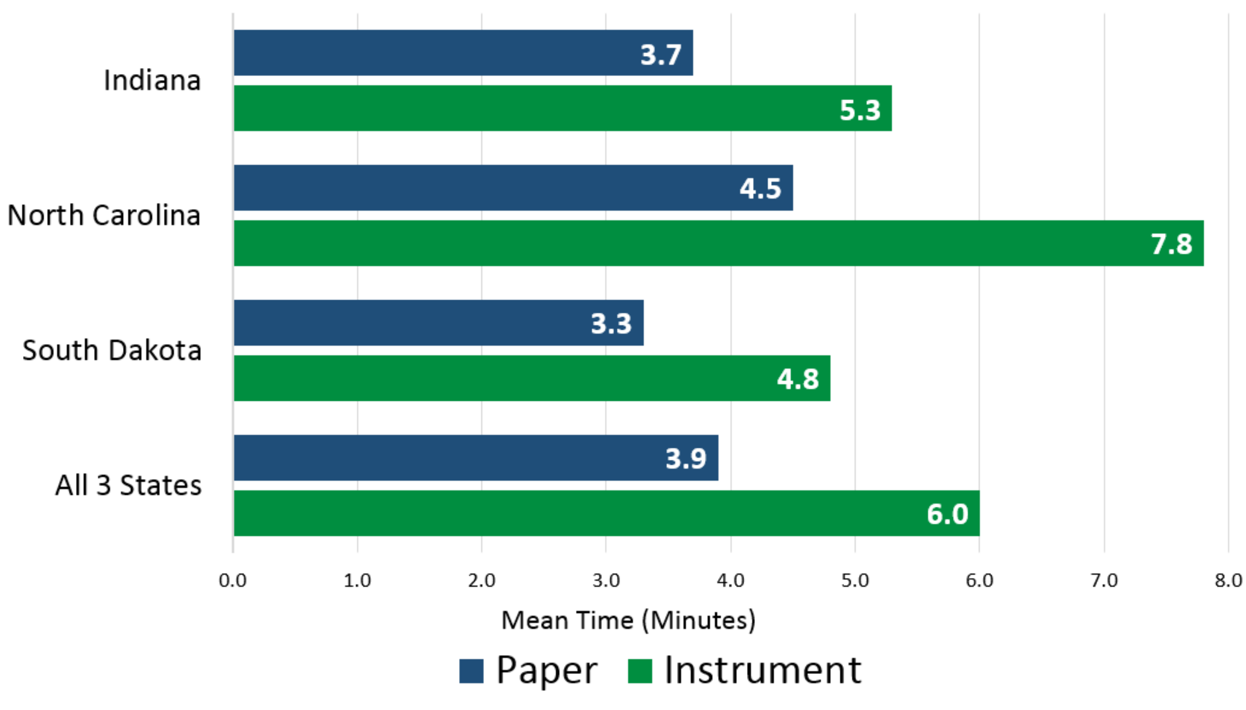

Figure 11: Mean Interview Time with Each Farm Operator == Paper vs. Instrument

Next, the GIS acreage calculated within the instrument and the JAS acreage reported by the farm operator were compared using regression models. Once the field boundaries were delineated in the mobile mapping instrument, the corresponding field acreages were calculated directly from the polygon data (field boundaries) using ESRI's ArcGIS software. The polygons drawn into the mobile mapping instrument were imported into ArcGIS and the areas calculated based on an appropriate projection and coordinate system.

The GIS calculation of area was conducted using a customized Albers Equal Area Projection for the specific areas of interest. The Albers Equal Area Projection is a geographic map projection used to convert the curved, 3-dimensional surface of the Earth into a flat, 2-dimensional map. As interest lies in determining the areas of agricultural fields, an "equal area" projection was used because it preserves accurate area measurements at the expense of some misrepresentation in the shape, distance, or direction of the polygons.

The paired acreage difference for each field was calculated as acres calculated in the instrument "minus" acres reported on the questionnaire. A regression model was fit to determine which factors are potential predictors of the field differences. The full model is described as follows:

$$\boldsymbol{y = \mu + \beta_{State} + \beta_{indoor} + \epsilon}$$

The dependent variable, *y*, is the difference between the field acreage calculated using the instrument and the acreage reported on the questionnaire. The two predictors in the model are *state* (IN and SD) and *indoor* (whether the interview was conducted indoors or outdoors). The purpose of this model is to determine whether average acreage differences differ based on the state that the segment is in or the location of the interview. If these covariates are not significant in predicting acreage difference, then all records can be used to test whether the mean acreage difference is equal to 0. One outlier was removed from the data prior to fitting the model. The acreage difference for this field was much greater than all other acreage differences and manual review of this field will take place to determine the reason for the large discrepancy. Results from the full model are presented in Table 1.

Table 1: Full Model Results

Coefficients	Estimate	Std. Error	t value	Pr(>|t|)
Intercept	-0.016493	0.114618	-0.144	0.886
factor(State)46	0.180712	0.133969	1.349	0.178
factor(indoor)1	-0.004317	0.132218	-0.033	0.974

The summary of the full model shows that *state* and *indoor/outdoor* are not significant in determining the acreage differences, indicating that the coefficients are not significantly different from 0. Thus mean acreage differences are not related to the state the segment is in or whether the interview was conducted indoors or outdoors. Student's t-statistics testing the null hypothesis that the coefficients are equal to zero resulted in *p*-values of 0.178 and 0.974 for *State* and *indoor* interview, respectively.

Because *State* and *indoor/outdoor* interview are not useful predictors of acreage differences between the instrument calculated and reported field acreages, these covariates can be ignored in testing whether the mean acreage difference = 0. The *t*-test for the intercept only model (Table 2) shows that the intercept is not significantly different than zero (*p*-value 0.488). This further emphasizes that there is no significant bias between the acres calculated using the mobile mapping instrument and those reported by farm operators.

Table 2: Intercept-Only Model Results

Coefficients	Estimate	Std. Error	t value	Pr(>|t|)
Intercept	0.04442	0.06398	0.694	0.488

The full model's F-test (F: 0.1902, DF: 2, 852) shows that the full model does not explain significantly more of the variation compared to an intercept only model (p-value = 0.4028), further supporting the conclusion that the differences in farmer-reported and GIS-supplied acreages are not significantly affected by the factors *State* and *indoor/outdoor* interview.

6. Conclusions

In conclusion, utilizing a mobile mapping instrument shows promise in modernizing NASS's data collection efforts. However, pre-delineated field boundaries within the JAS segments are essential in order for this effort to be operationally successful. The primary research objective was to compare interview times using the mobile mapping instrument with the prepared pre-delineated boundaries to times with current paper data collection method to be able to arrive at this conclusion.

The results showed that it took on average of about two minutes longer to collect data with the mobile mapping instrument compared to current pencil and paper procedures. Even though it took slightly longer to conduct interviews, utilizing mobile mapping technology to conduct the interviews provided a number of benefits. First, using a mobile mapping instrument will allow for a longer data collection window as it eliminates shipping time, field office hand editing and numerous hours of data entry when the questionnaire is returned to the field office. The quality of the data collected is improved because the instrument has embedded edit checks. When enumerators go into the field with the aerial photograph, they may miss some sections of land. In other words, not all land in the sampled segment is always accounted for using the current method. This would not be the case with the mobile mapping instrument, as ALL land within the sampled segment is accounted for and identified.

The use of mobile mapping technology allows for flexibility with field enumerator assignments. For example, currently, if a field enumerator is unable to complete his/her workload, the information needs to be mailed to the supervisor in order to be given to someone else. With the mobile mapping instrument, field enumerators only need to return a segment to the server and another staff member can work on and continue where the first enumerator left off. Finally, upon completion of their work, enumerators need to mail the aerial photographs and all questionnaires back to the field office. Utilizing mobile mapping technology eliminates this cost.

A secondary research objective was to evaluate differences between the acres calculated using the instrument and the acres reported on the questionnaire. The study results indicate that the mean acres calculated using the instrument are not significantly different from the acres reported on the questionnaire. This is helpful because the acres calculated using the instrument can be used in place of asking the farm operator to report the acreage for each individual field. This will shorten interview times and help to reduce respondent burden. Another benefit is that it will save enumerators time when estimating for nonresponse. Currently, enumerators have to use a grid to approximate the acreage of fields if the respondent refuses or does not know the acreage. The instrument provides a more accurate calculation of acres in the fields. This is especially useful for oddly-shaped areas.

7. References

Abreu D., Lawson L., Boryan C., Gerling M., Hardin R., (2015) "*Using a Mobile Mapping Instrument to Evaluate a Permanent Grid Sampling Frame*", Proc. In the 2015 Federal Committee on Statistical Methodology.

Boryan, Claire, Lawson, L., Abreu, D.A., Weaber, J., Gerling, M., Hyman, M., and Hardin, R. (2016). Comparing Geographic Information System (GIS) Calculated Acres to Farmer Reported Acreage Utilizing a Mobile Mapping Instrument. Research and Development Division. RDD Research Report #RDD-16-XX. Washington, DC: USDA, National Agricultural Statistics Service. Pending internal review.

Cotter, J. Davies, C., Nealon, J., & Roberts R. (2010). Area Frame Design for Agricultural Surveys in Agricultural Survey Methods (eds R. Benedetti, M. Bee, G. Espa and F. Piersimoni), John Wiley & Sons, TD, Chichester, UK, doi:10.1002/9780470665480.ch11

Gerling M., Lawson L., Weaber J., Dotts A., Vardeman A., Wilson E. (2015) "Field Data Collection Using Geographic Information Systems Technologies and iPads on the USDA's June Area Frame Survey", Research and Development Report RDD-15-03, United States Department of Agriculture, National Agricultural Statistics Service.

Lawson, Linda A., Abreu D.A., Boryan, C., Gerling, M., and Hardin, R., 2015. A Summary of Issues Associated with the Modernization of Data Collection. Proceedings of the 2015 Federal Committee on Statistical Methodology.

USGS (2016). The U.S. Map: *The Public Land Survey System.* <http://nationalmap.gov/small_scale/a_plss.html> last accessed 02/24/16.

USDA FSA (2015). *National Agricultural Imagery Program (NAIP) Imagery,* <http://www.fsa.usda.gov/programs-and-services/aerial-photography/imagery-programs/naip-imagery/> (last accessed 02/24/2016)

Attachment A

SECTION D – CROPS AND LAND USE ON TRACT

How many acres are inside this blue tract boundary drawn on the photo (map)?....................... | . |

Now I would like to ask about each field inside this blue tract boundary and its use during (year).

Field Number			01	02	03	04	05
1.	Total acres in field		828 .	828 .	828 .	828 .	828 .
2.	Crop or land use. [*Specify*]						
3.	Occupied farmstead or dwelling		843 .				
4.	Waste, unoccupied dwellings, buildings and structures, roads, ditches, etc.		841 .	841 .	841 .	841 .	841 .
5.	Woodland	**NP = Not Pastured** **P = Pastured**	83_ . ☐ NP ☐ P	83_ . ☐ NP ☐ P	83_ . ☐ NP ☐ P	83_ . ☐ NP ☐ P	83_ . ☐ NP ☐ P
6.	Pasture	Permanent (not in crop rotation)	842 .	842 .	842 .	842 .	842 .
		Cropland (used only for pasture)	856 .	856 .	856 .	856 .	856 .
8.	Idle cropland – idle all during (year)		857 .	857 .	857 .	857 .	857 .
9.	Two crops planted in this field or two uses of the same crop.		☐ **Yes** ☐ **No**	☐ **Yes** ☐ **No**	☐ **Yes** ☐ **No**	☐ **Yes** ☐ **No**	☐ **Yes** ☐ **No**
		[*Specify second crop or use.*]					
		Acres	844 .	844 .	844 .	844 .	844 .
10.	Acres left to be planted		610 .	610 .	610 .	610 .	610 .
11.	Acres irrigated and to be irrigated [*If double cropped, include acreage of each crop irrigated.*]		620 .	620 .	620 .	620 .	620 .
16.	**Winter Wheat**	Planted	540 .	540 .	540 .	540 .	540 .
17.	(*include cover crop*)	For grain or seed	541 .	541 .	541 .	541 .	541 .
20.	**Oats**	Planted and to be planted	533 .	533 .	533 .	533 .	533 .
21.	(*include cover crop*)	For grain or seed	534 .	534 .	534 .	534 .	534 .
24.	**Corn**[*exclude popcorn and*	Planted and to be planted	530 .	530 .	530 .	530 .	530 .
25.	*sweet corn*]	For grain or seed	531 .	531 .	531 .	531 .	531 .
29.	**Other uses** of grains planted (*Abandoned, silage, green chop, etc.*)	Use					
		Acres	.	.	.	.	.
30.	**Hay**	Alfalfa and Alfalfa Mixtures	653 .	653 .	653 .	653 .	653 .
31.	[*Cut and to be cut*	Grain	656 .	656 .	656 .	656 .	656 .
33.	*for dry hay.*]	Other Hay	654 .	654 .	654 .	654 .	654 .
34.	**Soybeans**	Planted and to be planted	600 .	600 .	600 .	600 .	600 .
35.		Following another harvested crop	602 .	602 .	602 .	602 .	602 .
51.	**Other crops**	Acres planted or in use	_ _ _ .	_ _ _ .	_ _ _ .	_ _ _ .	_ _ _ .

Attachment B

ENUMERATOR'S DATA COLLECTION FORM (Front)

Area Frame Modernization Research Team 2014 JAS-CAPI Phase 3Test Enumerator Evaluation Form Project Code: 504	State	Segment	USDA	National Agricultural Statistics Service	U.S. Department of Agriculture Rm 5030, South Building, 1400 Independence Ave., S.W. Washington, DC 2025,0-2000 Phone: 1-800-727-9540, Fax: 202-690-2090 Email: nass@nass.usda.gov
	__ __	000__ __ __ __ __ __			

Item	Description	TRACT																
	TRACT LETTER	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
		Enter: 1-Yes, 3-No, 2-Sometimes																
101	Problems with Grid Segments (Partial field problems, etc.)																	
102	Problems with Aerial Imagery Part (Zooming, Splitting, Functionality, NAIP, etc)																	
201	Any Problems with Section D Form Experienced (Navigation, Questions, Drop Downs, etc.)																	
301	Connectivity Problems (3G/4G)																	
302	Screen Visibility Problems (glare, sunlight, etc.)																	
		Enter: Number of Minutes																
406	Time spent <u>with</u> the farmer completing Section D & Photo?																	
407	Time spent <u>without</u> the farmer completing Section D & Photo?																	
		Enter: 1-Morning, 2-Afternoon, 3-Evening																
401	Time of Day that the interview was Conducted																	
		Enter: 1-Indoors, 2-Outside, 3-Other																
402	Where was the interview Conducted																	
		Enter: 1-Enthusiastic, 2-Ambivalent, 3-Reluctant																
403	Respondent's Receptiveness to <u>this Technology</u> in data collection																	

Attachment B

ENUMERATOR'S DATA COLLECTION FORM (Back)

Please Comment on All Aspects of this Data Collection Process with Comments as Detailed as Possible for this Segment.

099 Grid Segments: If Item 101 is" Yes" or "Sometimes", please comment and include tract letter where applicable.
100 GIS/Aerial Imagery: If Item 102 is" Yes" or "Sometimes", please comment and include tract letter where applicable.
200 Section D Form Comments: If Item 201 is" Yes" or "Sometimes", please comment and include tract letter where applicable.
300 iPAD Specific Comments: If any of items 301-302 are " Yes" or "Sometimes", please comment and include tract letter where applicable.
400 General Comments: Relating to Items 401-407, Respondent Burden, Training, or Anything else.

Enumerator Name:	501 Enumerator ID ______	502 MM DD YY Date: __ __ __