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Research Support Services in Agriculture

Megan Sheffield
Clemson University, msheff@clemson.edu

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Survey results from faculty with implications for library services

Clemson University Libraries

Megan Sheffield

msheff@clemson.edu

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Executive Summary

In 2016, Clemson University Libraries (CUL) participated in a study through Ithaka S+R about research support services in the field on agricultural research. Eight researchers in Clemson University's Department of Agricultural Sciences participated in a semi-structured interview (see Appendix) with the library liaison to the life sciences. Responses were transcribed and coded to identify themes and ways the library can further support agricultural research at CU.

The first major theme identified was that agricultural research overlaps with a stunning variety of subject areas and, as such, the research methods vary extensively. The projects are also widely collaborative with other departments on campus as well as with industry, practitioners, and educators around the state. This diversity makes it difficult to pinpoint anything specific that applies to all agricultural researchers equally, with the exception that they all feel the need for more time and money to complete their research. There were common themes dealing with the scholarly publishing process, especially with regard to open access.

While the library generally cannot help directly with obtaining more money or time, these findings have distinct implications for CUL services and resources. Although CUL does already provide many scholarly resources as well as a handful of services that assist with getting grants, publishing, and demonstrating value, these services need deeper support, and CUL must find novel ways to publicize such offerings and educate their constituents on what is available to them from the Libraries beyond books.

Recommendations:
- Improve communication with and resources for agricultural researchers in other parts of the state, not just the ones here on campus
- Make online content (eBooks and journal articles) easier to access by streamlining the process for off-campus users
- Continue to provide access to a variety of high-quality agricultural resources online, and evaluate these resources on an annual basis
- Strengthen existing CUL programs to educate researchers about their rights as authors and open access publishing
- Strengthen CUL's data management services by educating additional library employees and devoting more resources to this emerging service
- Create outreach plan for the College of Agriculture, Forestry, and Life Sciences (CAFLS), focusing on educating researchers about existing library resources and services and supporting all researchers regardless of their physical location
- Create instruction plan for CAFLS that goes beyond basic information literacy to include topics like Open Access, Data Management, Animal Welfare Literature Searches, and other topics that directly relate to the research process

Introduction

In January 2016, Clemson University Libraries (CUL) joined 20 other university libraries to investigate the practices and needs of agriculture researchers in a project sponsored by the US Agriculture Information Network (USAIN) and coordinated by Ithaka S+R. The data gathered from CUL's local iteration of this project will be reported in this paper; in addition, transcripts from CUL's interviews with researchers will contribute to the larger report that Ithaka S+R will release in early 2017.

Although this report will be publicly available and copies will be sent to the Department of Agricultural Sciences at Clemson University, the intended primary audience of this report is CUL. The information gleaned from interviews with research and teaching faculty in the College of Agriculture, Forestry, and Life Sciences (CAFLS) will be used to shape our library services going forward. Therefore, although this report will contain basic background information about the project, Clemson University, the CU Libraries, and key points from the interviews themselves, the goal of this report is to determine how all of these things work together and how library services can better serve our agricultural researchers.

Stakeholders at Clemson University

Clemson University is a public land-grant university in the upstate region of South Carolina that serves over 17,000 undergraduate students and over 4,500 graduate students. Agriculture-related fields of study are united in the College of Agriculture, Forestry, and Life Sciences, which is one of seven colleges within the university system. CAFLS is the home to the departments of: Agricultural Sciences; Animal and Veterinary Sciences (AVS); Food, Nutrition, and Packaging Sciences; Forestry and Environmental Conservation; and Plant and Environmental Sciences. Clemson University also has robust cooperative extension programs and a PSA (Public Service and Agriculture) network with offices and field sites throughout the state. The university also has several sites for hands-on research and teaching, including dairy, poultry, beef, and swine research farms as well as the 17,500 acre Experimental Forest. Areas of specialization and research are agribusiness productivity and profitability; agricultural education, and agricultural mechanization (Clemson University 2016a). CAFLS employs 120 full-time faculty members and 19 part-time faculty members. In 2016, CAFLS enrollment was 1,810 undergraduate students and 243 (139 Masters, 97 doctoral, and 7 non-degree seeking) graduate students (Clemson University 2016c).

The CU Libraries has one main location (Robert Muldrow Cooper Library) and three smaller branch libraries. Cooper Library is by far the largest, and consists of six floors of collections (including materials relating to the study of agriculture and government documents from the FDA, USDA, etc), study space, and office space.

The Libraries employ 28 faculty, 62 staff, and over 70 student workers (Clemson University 2016b). The employees are divided into five different units based on their job duties; each unit reports to a unit head, who reports to the Dean of Libraries. The largest units are Information & Research Services (I&RS, which consists of circulation, reference, and Interlibrary Loan) and Technical Services & Collection Management (TS&CM). Special Collections is a standalone unit, functioning out of the Special Collections Library. Library Technology maintains the software and hardware within the library, and also administers the institutional repository and other digital projects. The Administrative Services unit contains human resources and administration.

The main points of contact between CAFLS and CUL are through the faculty and staff of the I&RS unit within Cooper Library, particularly the subject liaison for the life sciences, Megan Sheffield (the author of this report). Subject liaisons have a large role in creating and maintaining relationships with their departments, and are usually the person within the library that faculty, staff, and students go to for assistance with a variety of requests. In addition to serving as the subject liaison to the life sciences, Megan also serves as the head of Data Management Services within the library, and is involved in many campus-wide projects regarding research data and compliance. This combination of job duties is particularly suited to library liaisons in the sciences, as they are typically the departments with the most pressing data concerns, which is one area the CU Libraries hopes to address.

Overview of Study Methodology

In April 2016, Ithaka S+R held training workshops for the 20 participating universities. Each university sent at least one member of their "team," which could be as small as a single person (such as the CU Libraries' team) or as many as five people. The training workshops were held in 2 different locations; teams were allowed to choose whichever location or date best suited their needs. The workshops lasted two days each, and covered the study methodology, analytical techniques, and instructions for fulfilling duties as participating institutions. Ithaka S+R provided each team with a packet of information that included specific instructions for filling out the Institutional Review Board (IRB) application, the survey instrument itself (Appendix A), and sample recruitment messages to send to agricultural researchers.

Approval was granted from IRB in April 2016, and initial recruitment emails were sent out that same month, with some follow-up messages sent in May, June, and July. A total of eight agricultural researchers agreed to participate in the project and were interviewed in summer 2016. Each interview took place in the researchers' office or lab space and followed the questions on the survey instrument. Seven of the respondents also allowed photographs of their work area, some of which will be included in the "Findings" section of this report. The departmental affiliation and rank of each respondent can be found in the table below.

The survey took the form of a semi-structured interview that included questions broken down into sections for the respondents' research focus, research methods, dissemination practices, their thoughts on the future and state of the field of agriculture, and an open-ended follow up question. Typical interviews took about 30-45 minutes and were recorded using a digital voice recorder. Once all eight interviews were completed, these recordings were sent to a transcription service. One recording was rendered unusable due to machine malfunction, although notes from that interview were usable for identifying themes. The resulting transcripts were then analyzed using coding to identify common themes and challenges facing agricultural researchers.

Department/Rank	Assistant Professor	Associate Professor	Professor
Agricultural Sciences	2	1	1
Plant & Environmental Sciences	2	1	1

Findings

Agriculture is interdisciplinary and collaborative

The most striking finding from the eight interviews is the wide range of topics that are covered by the discipline of agriculture. Although all eight respondents are in the same college (CAFLS) and many were even within the Department of Agricultural Sciences, each was doing work that was completely and profoundly different from their colleagues. One researcher approached things from an economic standpoint, one worked primarily doing social science research with farmers, one studied agricultural education and career readiness. Some worked with crop breeding, one studied nutrition, some studied crop yield and pest control. Some studied molecular genetics. One uses techniques from engineering to create better farm equipment. When asked if their research was typical of the discipline, many pointed out that agriculture is highly interdisciplinary and there is no "standard" type of agriculture research.

> *"I mean, all of this goes under the agriculture [discipline]. But you could think of genetics, biochemistry, biology, statistics [as part of agriculture]... because today's agriculture has to go into these disciplines if we're going to be productive and make a change."*

In addition to (or perhaps because of) the wide variety of disciplines touched by agricultural research, many respondents indicated they had significant collaborations with others outside of their "area" such as chemists, economists, or geneticists. As one would expect from such variation, the typical methods by which

they gather their research data ranged from surveys to experimental crops to laboratory techniques such as PCR or nutritional analysis. One respondent described their lab's process as follows:

> *"We use DNA analysis, we use statistics, we use computational biology, we use advanced techniques of biochemistry and compositional analyses. We do disease resistance studies, we do grain quality [analyses], so a range of different things from basic molecular biology through sort of plant sciences."*

The data resulting from these methods is similarly varied, but there was some consensus about data sharing. Of the eight respondents, three regularly deposited their data; when asked about their primary motivation for doing so, all agreed that it was crucial for others doing similar research, and one mentioned that certain publishers require the data to be made available. These researchers also worked in areas that have strong, well-known disciplinary repositories such as GenBank. Two other respondents did not make data publicly available due to concerns about patentable ideas, privacy, or copyright, although they indicated they would be likely to do so if they knew of a "safe" way. The remaining three respondents indicated they would like to make their data available to other researchers, but either had not had the time or the knowledge to do so at this point.

Relationship between researchers and publishers

The most common ways for researchers to come across new research is to either read about it in their favorite journal (usually via "Table of Contents" alerts) or to find it through Google or Google Scholar. Only one indicated regular use of library databases, but databases were not their first choice because there were "too many steps." Many used publishers' platforms such as ScienceDirect (Elsevier) because they provided a more direct link to full text, despite the fact that they did not provide access to relevant resources from other publishers.

Six of the survey respondents indicated that they were familiar and frequent users of the CU Libraries InterLibrary Loan and Document Delivery services. Other CUL resources mentioned by name were SciFinder, JSTOR, and PubMed. When asked about issues of access, either for themselves or for their colleagues at other institutions, many indicated that they engage in direct peer-to-peer sharing of publications via email.

When the topic of Open Access publishing came up, only two of the respondents indicated they regularly make an effort to publish in OA journals; one respondent specifically mentioned a need to ensure that their research was accessible to people in less developed countries. Four cited costs as the main barrier, but indicated they would otherwise consider OA journals. However, for six of the survey respondents, their primary considerations when selecting a journal were their audiences. Larger, more ambitious projects with wide appeal went to multidisciplinary high-impact journals; studies with a smaller potential audience went to society publications,

technical journals, or journals with a narrower focus. Assistant professors working toward tenure were aware of the need to demonstrate their impact by publishing in prestigious journals, but they also seemed to be more aware of issues surrounding OA publishing and academic publishing in general.

Common concerns

The relationship between academia and industry is pervasive in agriculture. There was a common thread through several interviews that there was some tension between the innovative ideas and techniques researchers are investigating and the adoption of new methods outside of academia. For example, a researcher might invent a new type of machine that is more efficient in some key ways than existing machinery, but farmers are slow to adopt this machinery because it comes at a significant up-front cost and the benefits may be small, or it may change some key element of their current business model. Several respondents noted that industry changes at a much slower pace than academia.

Every survey respondent indicated a profound need for more time and money to complete their research. While these needs may not be unique to the field of agriculture, it does impact the way they are able to conduct their research. Many mentioned that they would benefit from having extra people to help analyze their data so they had more time to write, or extra money to extend the timeframe of projects and collect more data.

Implications for Library Services

Collections and Access Needs

For the last several years, the CU Libraries have received an annual sum of money called the "Sandhill Electronic Library Endowment Fund" (Sandhill fund for short, named for Clemson's Sandhill Research & Education Center, one of five such Centers across the state). This fund is intended specifically for electronic resources and collections that support the work of agriculture research across the state at these REC stations. As an academic library supporting a land-grant university, CU Libraries is acutely aware of its role supporting South Carolina's agricultural scientists, extension agents, farmers, and educators. The Sandhill fund typically pays for database subscriptions and electronic journals in fields relevant to the types of agriculture work being done in South Carolina. CU Libraries also subscribes to other relevant content out its regular collection development funds, but the Sandhill fund ensures further coverage of areas that might otherwise be too costly.

As a result of the geographically widespread nature of Clemson University's agriculture researchers, CU Libraries could stand to improve services and resources to other areas of the state. Although the majority of researchers are local to the

campus and therefore the library, there are many researchers at the REC stations and other locations that need the same access to research afforded to locals. This can be accomplished not only by purchasing or subscribing to electronic content that can be accessed anywhere via the internet, but also by improving services such as InterLibrary Loan, chat, and email. Making the information available isn't enough; as the interviews clearly showed, many agriculture researchers (even those located just a short walk from the physical library) either don't know how to access library resources or find them too tiresome, and instead go with methods of obtaining scholarly research that they perceive to pose fewer hurdles.

It is important to note that this particular problem is not the fault of any particular person or organization, just a mismatch in expectations and reality. It is true that accessing library resources often includes knowing where to search and clicking through many screens to see if the item in question is available, and then many more clicks plus a form and a few days wait time to get items that are not available through InterLibrary Loan. It's no surprise that to many researchers, it seems easier to Google an article or send a quick email to the author for the full text. In this, the age of Google, many people expect to be able to access resources easily and quickly, and the library must demonstrate its value if it expects people to spend the extra time navigating library resources.

Repositories, Open Access, and Data Services

One of the easiest ways CU Libraries can demonstrate their value to researchers in all fields is to leverage its services relating to OA publishing, the TigerPrints repository, and its new data management services. These are all issues of growing interest in the sciences, including agriculture research.

Many agricultural researchers interviewed for this project showed little awareness of broader OA issues such as the rising cost of serials, predatory OA journals, and the difference between "gold" and "green" OA publishing models. Their knowledge about OA issues seems to be vague concerns about the legitimacy of OA journals and their peer review practices. In general, they trust the big names such as Elsevier, Springer, and Wiley both for academic rigor and to widely disperse scholarship. However, one survey respondent researches topics that are of great interest to developing nations, and was concerned that her collaborators and other people interested in this work were located across the globe in countries that don't have as much access to scholarly research as we do here. This respondent often makes the choice to publish in "gold" OA journal or to pay the extra fee to make her work open in "green" OA journals, at great personal expense.

In these types of situations, CU Libraries needs to provide more information and assistance. For example, last year CU Libraries launched an Open Access Publishing Fund, which is a small grant to offset the fees associated with publishing in OA journals (Wesolek 2016). The program is not widely known, and more publicity would help to change the conversation and hopefully get CU Libraries included in

the discussion. CU Libraries also administers an institutional repository called *TigerPrints*. This repository is completely open, and the CU Libraries has staff available to help researchers check their author rights and assist them in depositing materials. *TigerPrints* can also serve as a host for journals and conference proceedings at very low cost. CU Libraries also offers educational workshops on topics such as Open Access, Authors' Rights, and Copyright/Intellectual Property.

The area that survey respondents had the least awareness was surrounding their data sets and sharing data. This is yet another opportunity for the library to assist researchers. Many researchers view their data sets as almost a byproduct of the research endeavor; the desired end product is a publication, and few people outside the core research team ever see the raw data. However, this is changing due to federal funding mandates. Since 2013, federal grant proposals have required a data management plan (DMP) that address how data will be created, stored, protected, shared, and preserved. Now, the requirements are not just that researchers write a plan, but that data will be made publicly available at the conclusion of the project (Obama 2013, 2). Many researchers aren't yet aware of this new requirement, or how the library can help in this regard. Although outsiders typically see the library as just a "box of books," the truth is that librarians are already experts at many of the issues concerning data management; librarians know how to describe items and store them safely. Librarians know how to make items available electronically while still protecting copyright and maintaining appropriate safeguards. Librarians understand the value of preserving information and sharing it, which is what the new "Open Data" movement is all about.

CU Libraries is already offering a Data Management Plan Service, which has two basic options. The first is a one-on-one consultation to help researchers write a DMP; the second is a review service to proofread a draft DMP. These are gaining in popularity, but both are relatively minor library services right now. In order to grow these services to better serve agricultural researchers and all of Clemson University, more manpower is needed on these groups, as well as more education for the liaison librarians. Shared data is evidence of research output; openly sharing data, even from projects that produce negative results, can help other researchers avoid unnecessary duplication and increase the impact of Clemson researchers at the same time. Agricultural research, as shown in the results of this study, is highly collaborative; researchers need to be able to easily share their data, and they need education about the best practices involved in doing so. Many top-tier research universities are already offering robust data services through their libraries, because libraries are a natural fit for managing and preserving access to information of all types. Right now data management services is still a young field and CU Libraries has the opportunity to be a leader among its peer institutions by offering guidance in this area. In addition to the OA Publishing Fund and our new Data Management Plan Service, we could potentially offer help with creating metadata for research data sets and selecting appropriate repositories for data to comply with funder mandates. In cases where publishers require data sets alongside articles for

publication, we could advise authors of their rights and determine if the publisher is the best place for that data on a case-by-case basis.

Instruction and Outreach Opportunities

Many of the previous implications for library services hinge on one central idea: CU Libraries must do more to educate Clemson agricultural researchers about the services and resources it already offers. Instruction and outreach have become increasingly difficult in recent years; everyone (not just agricultural researchers) gets an overwhelming amount of daily email, which makes it hard to inform them of key services and new resources. Library workshops (both face-to-face and online) have had declining attendance statistics for several years at CU Libraries despite a variety of new approaches and marketing techniques. As a result, there is no obvious way forward, but it is clear from the lack of awareness about available library services that something must be done.

To that end, the Life Sciences liaison librarian (Megan Sheffield) has partnered with Clemson's Office of Research Compliance (OCR) to travel to REC stations around the state and meet with agricultural researchers on-site. The OCR has planned a whole-day program that will include two sessions taught by the liaison: the first will focus on techniques for performing literature reviews using library resources to comply with federal animal welfare regulations, and the second will demonstrate best practices for data management planning and review library data services. Although this approach will only reach a few researchers at a time, hopefully they will be those that were previously unaware of library resources and services.

For data management services, the library is planning to offer a pilot workshop in Spring or Fall 2017 aimed at faculty and graduate students on campus. Details are still under discussion, but this program will hopefully be an afternoon-long event with refreshments wherein participants are invited to write data management plans for their current projects and critique sample plans. To boost attendance, participants will be asked to register in advance and pay a small fee ($5-10) that will go toward refreshments and any supplies needed for the workshop.

In addition to these in-person opportunities, CU Libraries may also create a series of brief online videos to highlight data management concepts. These videos will be brief (no more than 3 minutes each) and will offer similar content to the workshops and seminars described above, but in a format that users can access at their leisure.

Conclusions

In early 2016, CU Libraries (along with the rest of the university) went through an extensive strategic planning and goal-setting process. During that time, the Libraries created several goals that directly relate to the findings of this study (Sheffield and others 2016):

- Offer the same level of service to distance learners that we offer to in-person patrons.
- Serve the unique needs of graduate students by expanding location, quantity, and quality of library services.
- Support the dual role of graduate students as instructors and researchers.
- Foster collaboration with research organizations on campus such as the Clemson Center for Geospatial Technologies, the Office of Sponsored Programs, the Office of Research Compliance, Clemson Digital Press, and CCIT.
- Support new models and tools for scholarly communication.
- Support CU's growing need for centralized research data services in collaboration with ORC and CCIT.
- Grow our research collections in the following areas... -Agriculture
- Increase awareness of library resources and services.

Although there are certainly areas in which the CU Libraries could improve research support services to agricultural researchers specifically, the library is well-positioned to implement positive changes within the next academic year. As a land-grant university, agricultural research is key to Clemson's mission, and the library has unique and innovative ways to offer support, such as providing better access to a variety of resources, providing leadership in the realm of digital academic publishing, providing leadership on data management, and providing education and outreach about current library offerings.

Summary of Recommendations:
- Improve communication with and resources for agricultural researchers in other parts of the state, not just the ones here on campus
- Make online content (eBooks and journal articles) easier to access by streamlining the process for off-campus users
- Continue to provide access to a variety of high-quality agricultural resources online, and evaluate these resources on an annual basis
- Strengthen existing CUL programs to educate researchers about their rights as authors and open access publishing
- Strengthen CUL's data management services by educating additional library employees and devoting more resources to this emerging service
- Create outreach plan for the College of Agriculture, Forestry, and Life Sciences (CAFLS), focusing on educating researchers about existing library resources and services and supporting all researchers regardless of their physical location
- Create instruction plan for CAFLS that goes beyond basic information literacy to include topics like Open Access, Data Management, Animal Welfare Literature Searches, and other topics that directly relate to the research process

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Appendix – Semi-Structured Interview Questions

Research focus
1. Describe your current research focus and how this focus is situated within the broader agriculture discipline and the academy more broadly. [Probe for whether/not they see themselves as located firmly within agriculture as a discipline or located across/between disciplines]

Research methods
2. What research methods do you currently use to conduct your research?
3. What kinds of data does your research typically elicit?
4. How do you locate the primary and/or secondary source materials you use in your research?
5. Think back to a past or ongoing research project where you faced challenges in the process of conducting the research.
    a. Describe these challenges.
    b. What could have been done to mitigate these challenges?
6. How do you keep up with trends in your field more broadly?

Dissemination Practices
7. Where do you typically publish your research in terms of the kinds of publications and disciplines? How do your publishing practices relate to those typical to your discipline?
8. Have you ever deposited your data or final research products in a repository?
    a. If so, which repositories and what has been your motivations for depositing? (i.e. required, for sharing, investment in open access principles)
    b. If no, why not?

Future and State of the Field
9. What future challenges and opportunities do you see for the broader field of agriculture?
10. If I gave you a magic wand that could help you with your research and publication process – what would you ask it to do?

Follow-up
11. Is there anything else about your experiences as a scholar of agriculture and/or the agriculture discipline that you think it is important for me to know that was not covered in the previous questions?