

# Research Support Services for Agriculture

University of Georgia Libraries

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## **Introduction**

In 2016 the University of Georgia Libraries joined 18 other academic libraries serving as local research partners for the project titled “Research Support Services for the Field of Agriculture,” organized by Ithaka S+R, a not-for-profit service that helps the academic community navigate economic and technological change. Having already conducted similar studies in fields ranging from art history to chemistry, Ithaka S+R turned its sights to agriculture for this project, posing the question “What resources and services do your faculty members need to be successful in their teaching and research?”

The University of Georgia Libraries are a large academic research library system with a general collection of over 4 million titles; access to thousands of scholarly journals in electronic and print format; a regional repository for U.S. Federal government documents; and special collections for rare books and manuscripts focused on Georgia history and culture, performing arts, and natural history; a center for research and study of the modern American political system with emphasis on the roles of Georgia and the U.S. Congress; and the third largest media archive in the country. The Libraries also provide space to facilitate collaboration, innovation and learning, including study space, instructional classrooms, and Digital Humanities Lab, GIS Lab, and MakerSpace.

Members of the study team for the University of Georgia Libraries were Nan McMurry, Director for Collection Development, and Liz Holdsworth, Reference Librarian with liaison responsibilities for the University of Georgia College of Agricultural and Environmental Sciences. After the summer of 2016 Liz left the University of Georgia Libraries for a new library position at the Georgia Institute of Technology, but she continued to consult on this project as much as her new responsibilities permitted.

## **Study Methodology and Subject Population**

In order to address the overarching study question, “What resources and services do your faculty members need to be successful in their teaching and research?” the study team relied upon ethnographic research through in-depth interviews with selected agriculture scholars. Training in ethnographic research methods was provided by Ithaka S+R personnel through webinars and an in-person workshop in April 2016. IRB approval for research with human subjects was obtained for the study.

Ithaka S+R offered the following definition of agriculture to aid in identification of the subject population:

The field of Agriculture encompasses research into the science and practice of farming, both crops and animals, to provide food and for other purposes. Scholars who study agriculture fall on a disciplinary spectrum that encompasses the sciences, social sciences, economics and business. They may be found in academia in schools, departments and colleges that seek to bring together scholars in such related areas as the applied and life sciences, engineering, and resource economics, among other areas. Agriculture scholars’ research is increasingly interdisciplinary and includes areas of thematic focus such as food security, nutrition and health, profitability and sustainability, and environmental impacts.

The agriculture scholars we invited to participate in the study were drawn primarily from the University of Georgia College of Agricultural and Environmental Sciences (CAES), founded in 1887 to fulfill the university's land-grant mission through teaching, research, and extension service in support of agriculture. CAES is organized into nine departments: Agricultural and Applied Economics; Agricultural Leadership, Education and Communication; Animal and Dairy Science; Crop and Soil Sciences; Entomology; Food Science and Technology; Horticulture; Plant Pathology; and Poultry Science, offering 22 majors, four undergraduate degrees, four masters programs, and doctorates in more than 10 areas. In addition to the main campus in Athens, Georgia, CAES operates two additional research campuses, five branch stations, and a research farm. The UGA Cooperative Extension Service, founded in 1914 to communicate research-based information on agriculture to the citizens of Georgia, is administered through CAES as well.

Although CAES was the obvious place to begin our search for agriculture scholars, we also targeted faculty doing agriculture-related research in agricultural engineering, large animal medicine, geography, sociology, and environment and design. After sending out approximately 90 invitations to participate in the study, we received 10 acceptances and conducted semi-structured interviews using a script prepared by Ithaka S+R with these faculty members. The interview script appears in the appendix. The semi-structured approach allowed us freedom to ask follow-up questions and to conduct the interview as more of an informal conversation. The interviews ranged from half an hour to two hours and were audio-recorded, transcribed, coded for recurrent themes, and analyzed for this report.

The comparatively small number of researchers who agreed to be interviewed raises the issue of how representative our findings are for the broader population of agriculture scholars at The University of Georgia. We cannot answer that question definitively, but the scholars who participated were very diverse in terms of their research areas, departmental affiliations, and stage of their academic careers, and yet a number of themes emerged as common perspectives among most or all of them. These are the themes we are reporting in our findings, as listed here:

Agriculture in the Academy  
The Spectrum of Agriculture  
A Multiplicity of Professional Roles  
Contacts and Conferences  
Hunting for Funding  
Accessing Scholarly Literature  
Producing Scholarly Literature  
Depositing Data  
Envisioning the Future

Each theme is prefaced by a brief quotation from one of our participants.

**“No one wonders why we’re here”: Agriculture in the Academy**

Amid the shifting sands of the contemporary higher education landscape, where some academic disciplines face existential questioning of their relevance and value, there is no identity crisis among

agriculture scholars. Almost every researcher we interviewed offered some variation of this credo: they are charged with figuring out how to feed the world, and how to continue doing so as population grows, available farmland shrinks, and climate changes. Agriculture is one of the original and most deeply embedded components of land-grant universities, and agriculture scholars embrace the land-grant mission wholeheartedly, proud to be working with real-life challenges.

### **“I am probably not very typical”: The Spectrum of Agriculture**

Agriculture research is highly interdisciplinary on every possible level. Many of those we interviewed prefaced their descriptions of their work by identifying themselves as unusual and noting that their research extends beyond the traditional borders of the field of agriculture. Being unusual appears to be quite common, suggesting that the general understanding of agriculture scholarship itself needs to be redefined and its interdisciplinary nature more widely recognized and promoted. Although the number of scholars we interviewed was small, the list of other disciplines with which they interact is long, including engineering, marine science, geology, meteorology, landscape architecture, economics, law, public policy, and sociology. Agriculture scholars’ primary collaborators are as likely to be found outside their home departments or even the entire college of agriculture as to be within these boundaries. Some scholars describe themselves as situated “upstream,” devoted to basic genetic or biochemical research that happens to focus on crop plants. Some are more closely connected to technology applications in bio-business, while others have ties to clinical settings. Several occupy a central position in a web of relationships that includes regulatory agencies, extension agents, non-profit organizations, and individual growers. The same scholar may be deeply involved in lab work, field work, and computer modeling, or engaged in both controlled experiments and observational studies. Taken as a whole, the range of diversity within a field often perceived as monolithic and traditional is both revelatory and compelling.

### **“And then I’m also overseeing...”: A Multiplicity of Professional Roles**

The roles that agriculture scholars play within their organizations is similar diverse and multi-faceted. They serve as researchers, lab directors, classroom teachers, consultants, mentors, and administrators. They design projects for undergraduate students to introduce them to the world of research while also contributing to the main projects of a lab. Interactions with graduate students are even more extensive: helping them to formulate good research questions, design workable studies to test these questions, conduct thorough literature searches and evaluate the studies they uncover, seek funding successfully, and publish their results. Managing students and staff from the human resources standpoint can claim significant and not fully anticipated amounts of researchers’ time. These challenges multiply for researchers who serve as principal investigators for multi-site projects and must keep everyone on task from a distance and cope with uneven rates of progress at interdependent sites. Administrative duties such as coordinating graduate or undergraduate studies programs, procuring and maintaining shared equipment, monitoring research compliance issues, and conducting performance evaluations also fall to agriculture scholars at various stages of their careers, as is common throughout the academic world. The pressure and temptation to overcommit is strong, and many of those we interviewed observed that lack of time is as significant an obstacle to their progress as lack of funding. This demanding work environment is also characterized by increasing requirements for documentation coming from departmental, university-level, and external funding agency sources. Agriculture scholars recognize and support the need for

accountability, but the duplicative nature of required paperwork and lack of feedback on its value and impact constitute additional burdens upon already hectic working lives.

### **“The face of where science is going”: Contacts and Conferences**

Agriculture research takes place in a thoroughly collaborative environment. Almost every scholar we interviewed stressed the importance of colleagues and conferences as sources of new ideas and cooperative projects. At the local level, organizations such as the University of Georgia’s Plant Center draw together scholars with common interests from a range of colleges and departments across campus, while conferences perform a similar function beyond the confines of any single institution. Scholars have a wealth of conference choices to serve their interests: state, regional, national, or international conferences; meetings organized around disciplines; or those devoted to a particular commodity like peanuts or soybeans. But all agree that conference attendance, with the opportunities it offers for direct contacts and informal interactions, is vital for staying current in their fields and forming or maintaining working relationships with colleagues and collaborators across and beyond geographical and disciplinary borders. In this context formal publications may represent the final rather than first step in the introduction of new findings: many scholars told us that they learn about new studies at meetings well before any results appear in publication, and that exposure to new research at conferences can be equally or more important than a literature search in scholars’ preparation for undertaking their own new projects. Conferences also provide the setting for connecting with partners outside the scholarly framework, such as growers, government agents, and representatives from non-profit organizations.

### **“Keeping the lab financed is a major, major challenge”: Hunting for Funding**

The necessity of acquiring funding from external sources, most typically government agencies, but also private foundations and industries, and the competitive nature of the funding search are realities so deeply ingrained in the agriculture research community that our conversations with researchers initially centered on the “how” of the process and only gradually opened to questions of “why.” Scholars are acutely aware that only a small number of the many research questions they would like to pursue can be shaped into fundable proposals, and a smaller number yet will actually receive funding. Their strategies include forming teams of collaborators with successful funding track records and getting to know the “personalities” of funding agencies and the various flavors of basic and applied research they tend to support. Research proposals are thus a tailored blend of the scholar’s own interests and those identified as priorities for the funding agency.

While the competitive pursuit of funding is the standard model for research in most if not all scientific disciplines, the costs of this approach are troubling to scholars even as they enjoy its benefits. All of the researchers we interviewed noted that, regardless of their own success in obtaining support, funding rates, reported to us as 5-15%, are too low. While not all proposals are worthy of support, and a competitive process weeds out the least promising, it strains credulity that such a low percentage of research ideas generated by scholars hired specifically for their depth of knowledge, skill, and ingenuity merit funding. Politicians are criticized for beginning their re-election campaigns the day after they take office, but the same pattern is forced upon scientific researchers: time they could spend on the research itself is diverted into the preparation of a never-ending succession of grant proposals. Each unfunded project represents a lost opportunity to expand knowledge and reap its benefits. Each underfunded project results in a deficit of staff or students to perform routine but essential tasks and to contribute to the refinement of research

design or interpretation of results. Lack of ongoing funding creates hardships for long-term equipment maintenance or replacement. Lack of predictability in funding hampers efforts to plan future collaborations. All of these issues are familiar complaints in the scientific research realm, but the consensus among the scholars we interviewed is that funding has become less available over time, necessitating increasing amounts of time and paperwork to pursue and manage it, and the scarcity of funding represents a real and serious obstacle to scientific progress as many projects languish from lack of funding rather than lack of research quality.

**“If you have a question, do a literature search and make sure that somebody else hasn’t answered the same question”: Accessing Scholarly Literature**

Whether searching for specific items or conducting a broader literature search, the scholars we interviewed reported little difficulty in identifying or obtaining what they need. They rely most heavily on a small number of large databases: Google Scholar, Web of Science, Agricola, PubMed, and Medline, suggesting that some of the more specialized databases that libraries offer may not be essential. When the full text is not available in the UGA Libraries collection, a relatively infrequent occurrence, scholars turn to interlibrary loan and/or colleagues who have access at other institutions. Many employ these alternative access methods interchangeably, and the use of one does not indicate dissatisfaction with the other. While of course scholars would like to find every item they seek immediately available online, they did not suggest that having to take additional steps to obtain an article from a print journal or borrow from another institution represents a serious impediment to their work. Older scholars, though thankful to be living in an age where so much information is available electronically, recall the print journal world with a touch of nostalgia. Going to the library to peruse the latest or back issues was a pleasant ritual that took them away from the immediate demands of their individual labs and offices to a communal space where they often met colleagues engaged in the same activity. Accessing scientific literature online is far more efficient, but they miss the break in routine and concentrated focus on reading produced by the necessity of going in person to the library.

The scholars we interviewed discussed literature searches primarily in the context of teaching students about their importance. For many students, identifying a few relevant articles in a Google search constitutes successful and complete research. That more or better literature might be found in additional databases or by differently constructed searches; that older (sometimes print-only) literature can still be valid and relevant in some areas of agriculture research; and that developing awareness of the overall shape of the literature universe surrounding an area of research is essential to be able to identify new avenues for investigation are concepts that take root only gradually in students’ minds and must be intentionally cultivated by their mentors.

Even with the maximum efficiency afforded by the online world, scholars still struggle to keep up with new literature in their field, adopting and discarding one scheme after another. Some identify a small number of the most important and relevant journals for their work and concentrate on reading their contents thoroughly. Some search databases and skim through the abstracts of many different articles to get a sense of trends and identify a smaller subset to read in their entirety. Some employ table-of-contents or other alert services to bring certain categories of articles to their attention. Some have found scholar-driven sites such as Research Gate to be more helpful in connecting them to the best literature and contacts. Some are even exploring social media sites like Twitter as sources of timely notices of new and

relevant literature. And most employ a combination of these approaches. All agree that keeping up is essential, but none claim to be doing it as successfully as they believe they should.

### **“I’m trying to just find the right fit”: Producing Scholarly Literature**

Although an article in an academic journal is the most typical form of publication authored by agriculture scholars, they produce a wide variety of publication types, including research articles, review articles, white papers, conference reports, news articles, book chapters, and full-length monographs. While publication is a required activity that scholars support, some observed that quantity appears to be valued over quality in the tenure and promotion arena; that pressure to be productive doesn’t allow them to invest sufficient “think time” in any individual publication; and that publishing to secure tenure can operate at odds rather than in concert with publishing to advance knowledge.

In determining where to publish, most of the scholars we interviewed emphasized intended audience, whether by discipline, degree of specialization, or academic level, as the most important factor influencing their choice. In their view, all journals have “personalities,” and becoming familiar with them aids in achieving a good fit for a new article. Other scholars noted that choosing the journal that would provide the most useful criticism in the peer-review process is also a valuable strategy. Seeking out journals with high impact factors, by contrast, does not appear to be a common approach among the scholars in our interview group. They observed that few agriculture journals have high impact factors anyway; that they already know which journals command the most respect among their peers; that finding the best match between the article content and the intended readership constitutes a superior strategy; and that alternative measures such as dollars generated in the growing community as a result of new research should be developed for assessing the impact of research publications.

A more minor but still significant step that publishers could take to help researchers increase their efficiency would be to standardize article formatting requirements among journals. Most researchers publish in a variety of journals or submit the same manuscript to more than one journal if it is not accepted at first. Having to adapt their manuscripts to multiple sets of formatting rules consumes time without producing meaningful benefits.

Agriculture scholars had much to say about the peer-review process itself. While they consider it essential for upholding the quality of publications, they argue that continuing to provide peer review without financial compensation from for-profit publishers and without recognition as a contribution towards promotion in their own institutions creates significant delays in the appearance of new research and may render peer review an unsustainable model. “The system is not broken,” one scholar observed, “but it is stretched.” Receiving payment and/or credit towards promotion would encourage scholars to give manuscript reviewing higher priority among their professional activities. Some scholars also proposed making the peer-review process more interactive. The current practice of making the process “blind” by not revealing authors’ and reviewers’ identities is intended to promote objectivity, but sharing names and encouraging more extensive interaction could result in improved research, and including reviewers’ names as contributors could do more to justify the significant investment of time that reviewing consumes and increase reviewers’ incentive to participate.

The researchers we interviewed showed only minor interest in the open access publishing movement. They are aware of it and not opposed in theory, but they wonder how it could function in practice with

success on a large scale. The question of “who pays” has not yet been fully answered to their satisfaction. But the question of “who reads” is a more vital one for them in terms of making their findings accessible outside the confines of specialist research journals. One scholar proposed an intriguing three-tiered model for articles: 1. A brief summary aimed at general readers to help them become more familiar with scientific discoveries in the context of high-quality research; 2. A more extensive overview for academic but non-specialist readers who might find interdisciplinary applications for the research; and 3. The traditional detailed research article for specialists in the field.

### **“I still have spreadsheets that are in Lotus 1-2-3”: Depositing Data**

Agriculture scholars generate many kinds of data in their research, including quantitative, image, gene sequencing, qualitative, and ethnographic. Perhaps the greatest differences we encountered among the researchers we interviewed were their perspectives on how to manage and preserve (or not) their data. At one end of the spectrum are scholars, typically in areas of basic research like genetics, for whom an established infrastructure for “Big Data” already exists. These scholars are aware of data management requirements in their field and willingly comply with them. Data management is tied to publishing in their journals, and shared data repositories at the national or international levels are available to them for depositing their own data and for making use of others’ data stored there as well. At the opposite end are scholars who had never heard the term “Big Data” before we mentioned it, and for whom the only data they contemplate managing or preserving are the formal publications that result from their research. This wide variation does not reflect ignorance of or resistance to established standards, but the uneven degree to which the concept of data management is appropriate for or has been developed within their particular disciplines. Between the two ends of this spectrum lies a broad territory of partial awareness, confusion, and uncertainty about data management. Some scholars have difficulty imagining how their data could be re-used by others because it is so uniquely adapted to their own research aims. Some would not be permitted to share the proprietary industry data they have obtained, while others use ethnographic data protected by human subjects research confidentiality regulations. Some researchers are vaguely aware of data management requirements in neighboring disciplines, but state that there are no requirements tied to funding or publishing in their own areas (yet). Some have written data management plans as a requirement for funding, but regard them as yet another bureaucratic hoop to jump through rather than as useful tools. Some embrace the concept of data management, but struggle to implement it in fields where there are no standards for how to manage or preserve data or places to deposit it. Many have for a long time made data available on their websites or shared it informally when requested, and do not see a need for a more formal process. Some have attempted to use global data repositories, but found them to lag behind in adding data or to require the use of proprietary software that is not universally accessible or affordable. Some face a choice among multiple data repositories with differing requirements and standards, but no guidance about best practices. And some note that even if data currently being produced could be preserved and deposited, many years’ worth of previously collected data such as lab notebooks, not necessarily less valuable for being older, remains decentralized, unstandardized, and in danger of loss anytime a scholar changes research focus, changes jobs or retires, or simply cleans out file cabinets before moving to a new office. It is strikingly clear from our interviews that the issue of data management is in its earliest days, with much remaining to be settled. As one scholar told us, “this is what we’re going to do for the next... fifteen years is, we are going to figure out how to get data... into these big databases, and then the next generation can come up with the big... observations using metadata... we have to do the good work for the greater good, [but] that’s, like, not the fun part!”

## **“Little farms all throughout the city”: Envisioning the Future**

Even as agriculture scholars embrace the mission of feeding the world, they are well aware of the many and serious challenges they face. Population growth estimates predict the presence of over two billion more mouths to feed by mid-century, while expanding populations will simultaneously reduce the amount of land available for farming. Increasing water scarcity may have a severe impact on the ability to grow food, and shortages of fossil fuels may make the distribution of food more difficult. Climate change may affect growing conditions in unpredictable ways. The capacity for innovation may be limited by political and economic factors such as corporate control of genomic data or economic emphasis on crop profitability at the expense of crop versatility, sustainability, and nutritional value. Agriculture policy may be set by leaders lacking in basic knowledge of agriculture, and the agriculture research community has had mixed success in communicating core agricultural principles to the public.

Yet to many agriculture scholars the future remains bright. They point to increasing opportunities to collaborate with engineers to design new cultivation environments and to new technologies that make gene editing quicker, less expensive, and less prone to unintended consequences. And while they continue to actively pursue technological innovations, researchers are increasingly aware that technology alone cannot solve all problems, and they are committed to finding collaborative solutions that take entire ecosystems in addition to individual crops into consideration. They are ready to work with economists and sociologists towards a better understanding of how technological advances affect the lives of growers; why some advances are adopted more readily than others; and how public narratives about the desirability and safety of new agricultural developments are shaped. Scholars are dedicated to finding new ways to feed people, especially in less thoroughly explored settings such as small-scale and urban agriculture. If the development of agriculture thousands of years ago marked the beginning of human civilization, it is possible that in its future everyone may in some sense return to farming.

## **Conclusion: Implications for Library Services**

In our interviews we encouraged researchers not to confine their remarks to library-related topics, but to answer our questions as broadly as they saw fit. As a result, many of their concerns go well beyond the library realm and may not be amenable to solutions the library could undertake. But to the extent that library topics did emerge, we offer these observations:

- **Databases:** the University of Georgia Libraries provide hundreds of individual databases, many of which include scientific literature, but the scholars we interviewed mentioned no more than a handful that they use regularly or consider important, not to mention their attraction to Google Scholar. This contradicts the common assumption that more databases and more specialized databases are better than fewer. Increased scrutiny of our existing science database subscriptions might uncover less essential ones that we could cancel in order to gain access to content that agriculture scholars and other scientists consider more important.
- **Online Access to Journal Articles:** our library already subscribes to large packages from major journal publishers as well as individual journals from scientific societies and other smaller providers. Our faculty appreciate the access they have and do not appear to consider the necessity of occasionally using print-only journals or resorting to interlibrary loan for items we do not hold at all to be a serious impediment to their work. But their almost exclusive dependence on journal literature and their perception that older scientific literature can still be valuable

suggest a goal for the UGA Libraries to find ways to make even more content available online. Money to spend on journal content might be redirected from database or book allocations if these categories are not considered as essential by scholars.

- **Instruction:** a number of the scholars we interviewed noted the time they spend attempting to help students with literature searches. The UGA Libraries already have an extensive instruction program, and librarians are ideally suited to provide this kind of help. Perhaps a program advertising help specifically for literature searches could enlighten faculty about what librarians can do and ease one burden that faculty carry.
- **Data Management:** the increasing emphasis from funding agencies on post-publication data management seems to be only just appearing on the radar for many of the faculty we interviewed, and they expressed much doubt and uncertainty about whether and how to incorporate it into their already overburdened workloads. The UGA Libraries have a scholarly communication program that already offers help with data management plans. Providing more guidance in this arena could be a very significant contribution that the Libraries could make to supporting scholars in the field of agriculture and beyond.

### **Acknowledgements**

We would especially like to thank the agriculture scholars who shared their time so generously with us during the interviews. Their remarks were full of wisdom, insight, and humor, and they spoke so articulately and persuasively about their work that we left every interview wondering if it might be possible for us to change professions and return to graduate school in their fields! We would also like to thank Ithaka S+R, most specifically Danielle Cooper, for providing the framework, training, and frequent guidance that we needed to succeed in this endeavor. And our own University of Georgia Libraries provided us with the support and flexibility necessary for undertaking this important project, and for that we are also very grateful.

**Appendix**  
**Research Support Services for the Field of Agriculture**  
**Semi-Structured Interview Guide**

**Research Focus**

1. Describe your current research focus and how this focus is situated within the broader agriculture discipline and the academy more broadly.

**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 of 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 of 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 (e.g., required, for sharing, investment in open access principles)
  - B. If no, why not?

**Current State and Future 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?