Extension Education

Nurturing International Graduate Students for a More Diversified and Inclusive Extension Workforce

Yangxuan Liu[a] and Wendong Zhang[b,c]
University of Georgia[a], Cornell University[b], Iowa State University[c]

JEL Codes: A23, Q16, Q18
Keywords: Economic education, Extension, diversity, graduate education, international graduate student, land-grant university

Abstract: The United States exports over 20 percent of its agricultural products; thus, agricultural trade and understanding global markets and partner countries' agricultural policies is increasingly important to its continued success. International graduate students represent a significant portion of agricultural economics students at many land-grant universities; however, many international graduate students do not receive exposure to Extension. We argue this creates an untapped resource to integrate graduate education and Extension services; thus, Extension misses opportunities to recruit top talent to serve the agricultural industry, and international graduate students have less job market success. Leveraging a survey of department heads and Extension economists in agricultural economics departments, our research documents the status of international Extension agricultural economists, identifies hidden and perceived barriers for international graduate students pursuing academic Extension careers, and provides insights into appropriate education and training programs in university graduate curricula to increase international graduate students' awareness of and interest in Extension.

1 Introduction

The United States exports more than 20 percent of its agricultural products (USDA-FAS 2018), making agricultural trade critical for the well-being of the U.S. agricultural economy and farmers and ranchers. International markets provide additional opportunities for many U.S. agricultural products, and trade is a topic of interest for both producers and policy makers, especially since the World Trade Organization's (WTO) formation and NAFTA (North America Free Trade Agreement) negotiations (Glauber 2021; Sumner 2000; Sumner 2003). Understanding global markets and key partner countries' consequent agricultural policies is important for the U.S. agricultural industry's continued success.

Heightened demand for trade-related knowledge creates opportunities and challenges for land-grant university (LGU) Extension and outreach services in agriculture. Using research-based knowledge, agricultural Extension provides nonformal education and learning opportunities for the general public, farmers, and rural and urban residents (Lawrence, Hadley, and Henderson 2019). Globalization is increasingly important for U.S. agriculture and increases the need for Extension to facilitate the exchange of trade-related information. There are relatively few studies on the integration of graduate education and Extension, yet it is critical to LGUs (Bagdonis and Dodd 2010).

We argue that integrating international graduate student education and Extension services at LGUs is a critical untapped resource. International graduate students, who typically require an F-1 or J-1 visa to study in the United States, represent a significant and sometimes dominant portion of the graduate student population in many LGUs' agricultural economics and economics departments (FWD 2021). However, many international graduate students do not receive exposure to Extension, though it is arguably the hallmark of the tripartite goals of U.S. LGUs (Taylor and Zhang 2019). We argue this creates a missed opportunity for Extension services to recruit top international graduate students to serve the needs of the agricultural industry, especially in the areas of trade, nutrition and health, and agriculture

and the environment. This missed opportunity also results in less job market success for international graduate students in U.S. academia.

Leveraging two separate surveys of department heads and Extension faculty in agricultural economics departments, our research helps document the status of international Extension agricultural economics professionals, helps identify the hidden and perceived barriers for international graduate students who would like to pursue academic careers in the United States, and provides insights into the appropriate education and training programs in university graduate curricula to increase international graduate students' awareness of and interest in Extension. International graduate students' increased interest in Extension could create the workforce that LGUs need to continue the Extension mission. Even though our research focuses on international graduate students studying in U.S. graduate programs, it applies to similar challenges and opportunities for students from non-English speaking households and nontraditional students.

2 Explaining the Profession of Agricultural Economics Extension and Outreach

The Morrill Acts of 1862 and 1890 established LGUs. In 1914, the Smith-Lever Act created the U.S. Cooperative Extension Systems, which is a federal (U.S. Department of Agriculture), state (LGUs and state governments), and local (city or county governments) partnership (Wang 2014). In 1994, tribal colleges and universities were added to the LGU systems. The LGU system in the United States includes 112 universities or colleges, including 57 units of the 1862 public universities, 19 units of 1890 historically black colleges and universities (HBCUs), and 36 units of the 1994 tribal colleges and universities. The tripartite mission of LGUs includes research, teaching, and Extension.

Extension, sometimes referred to as Outreach, directly interacts with the public and distributes vital and practical research-based knowledge to address public needs and create positive changes (Taylor and Zhang 2019). The Extension mission requires Extension professionals to translate science or research findings into understandable and applicable formats that the general public can use to improve their lives and/or livelihoods. Extension usually includes Extension specialists (faculty members, researchers, regional educators, etc.) and county Extension agents and staff. In the rest of this article, we refer to faculty, agents, and staff working in Extension as Extension professionals, and we refer to specialists in agricultural economics as Extension economists.

2.1 What Are Extension Economists' Job Responsibilities?

The primary role of Extension economists is to provide scientific research-based information and education covering topics from production to risk management, trade, agricultural policy, crop insurance, environmental and resource issues, agribusiness, finance, farm management, and rural communities and development to empower producers and policy makers to make more economically informed decisions and improve the resilience of agricultural operations. Extension economists work closely with a diverse set of audiences and stakeholders, including agricultural producers, agribusiness, policy makers, and researchers at local, state, national, and international levels.

Applied research is a critical part of Extension professionals' responsibilities. Extension professionals use a bottom-up research approach, where they identify research questions through discussion with stakeholders and then apply research conducted by Extension economists to solve real-world challenges. Successful Extension professionals must respond quickly to emerging issues and provide the information their target audiences need. They must also be able to educate themselves on a new topic and deliver necessary programs in a timely manner, which requires a broad knowledge base that mirrors the evolving needs of stakeholders (Burkhart-Kriesel, Weigle, and Hawkins 2019). Accountability and trustworthiness are key—through this trust relationship, Extension professionals are able to develop long-term relationships and expand their networks.

There are both free and fee-based Extension programs developed by Extension professionals with sufficient understanding of how target audiences learn and receive information. County delivery systems, in which Extension agents disseminate information from Extension economists to the general public, are a powerful tool, as are traveling and in-person training. Furthermore, new communication technologies have increased information dissemination, making it more accessible to farmers (Norton and Alwang 2020). In the modern era, Extension professionals deliver education and applied research programs to clientele and stakeholders through multiple delivery mechanisms, such as presentations, webinars, Extension and journal article publications, web-based materials, video recordings, PowerPoint slides, and computerized decision aids.

2.2 Extension's Challenges Recruiting Agricultural Economics Talent

Agricultural economists should consider how to continue attracting talent needed to fulfill the mission of LGUs. As the focus of the LGU mission moves toward research and teaching, Extension suffers from disciplinary divisions and downsizing (McDowell 2001). This downsizing lowers the visibility of Extension and the chances for Extension professionals to mentor graduate students and be involved in graduate education. However, mentorship and apprenticeship are important factors for career trajectory, as mentors or advisors serve as most students' role models. Moreover, graduate education focuses almost exclusively on teaching and research, with less focus on training students to translate and disseminate research results to the general public or involving graduate students in Extension efforts (Bagdonis and Dodd 2010). This brings a challenge for continuing to nurture talents to fill the needs of Extension systems in the field of agricultural economics (Lawrence et al. 2021).

In addition, traditional Extension workforce recruitment focuses on domestic U.S. students; however, those students show declining interest in pursuing a PhD in agricultural economics. Domestic agricultural economics PhD students face various career choices, and many choose to work in nonacademic settings as they feel those jobs offer better pay and less stress. International graduate students focus more on PhD program rankings, dominated by program research outputs, when applying for doctoral programs in their home country. Many international graduate students choose to return to their home country for various reasons. However, for the international graduate students who would like to peruse academic positions in the United States, many international graduate students are unaware of Extension throughout their studies (Taylor and Zhang 2019). Consequently, universities must meet the challenge of filling vacant agricultural economics Extension positions from limited, and sometimes unqualified, applicants.

3 Methods

Our data come from an online survey of department heads and Extension economists at U.S. LGUs from December 1 to 21, 2021. We conducted two rounds of surveys; the first asked department heads about Extension resources in their department and how they incorporate Extension into graduate programs. The second asked Extension economists about Extension resources within their department and student involvement in Extension. This study aims to compare insights from department heads and Extension economists about growing international graduate students' interest in Extension and preparing them with the necessary skills.

We sent the first survey to 55 department heads and received 22 valid responses (a 40 percent response rate). We chose department heads by searching agricultural economics programs at public universities, HBCUs, and tribal colleges and universities identified as LGUs by the 1862 and 1890 Morrill Acts and the 1994 Equity in Educational Land-Grant Status Act, respectively. In addition to standard demographic data, we collected information about the current number of faculty with and without Extension appointments, the number of Extension faculty with international backgrounds, and the current number of graduate students with and without international backgrounds. We also asked about

the number of graduate students placed in Extension positions in the past five years, the strength of the Extension program, and the actions taken in training graduate students pursuing a career in Extension.

We sent the second survey via generic web link to the Extension economist listserv within agricultural and applied economics organizations. In total, we collected 54 valid responses from Extension economists with formal Extension responsibilities. We asked about formal appointment split among research, teaching, and Extension, graduate students advised with and without international backgrounds, and job placement in Extension for graduate students. We also asked Extension economists about the strength of Extension programs in their department, the training taken to prepare graduate students in Extension, and the role international graduate students could play in Extension.

4 Results

Among the 22 department head respondents, 21 are from LGUs identified in the 1862 Act, and one is from an LGU identified in the 1890 Act. Respondents are a good representation of the LGU system and cover the geographic regions of the United States, with one respondent from the Northeast region, six from the Midwest region, nine from the South region, and six from the West region. Supplemental Table S1 shows summary statistics of department head responses.

Supplemental Table S2 shows summary statistics of Extension economists' survey results. Of the 54 respondents, 38 Extension economists advise MS students in agricultural and applied economics with an average of 1.5 students per respondent, and 39 advise PhD students in agricultural and applied economics with an average of 0.7 students per respondent. Eight and 11 surveyed Extension economists reported that their PhD or MS students, respectively, successfully obtained an Extension faculty or staff position. On average, Extension economists have 11 years of experience in their current department.

4.1 Current Employment Situation in the Agricultural Economics Profession

Among the 54 Extension economists who responded with their formal split between research, teaching, and Extension, 24 percent (13 respondents) have 100 percent Extension appointments, 22 percent (12 respondents) have a two-way split between Extension and research, 22 percent (12 respondents) have a two-way split between Extension and teaching, and 26 percent (14 respondents) have a three-way split between Extension, research, and teaching. Six percent (three respondents) have administrative duties. The difference in appointment splits is largely due to the philosophy and needs of the department (Boland 2009).

As Figure 1 shows, for those who have Extension appointments, Extension is often the predominant responsibility and accounts for at least half of the appointments. Extension economists without formal research appointments mentioned that research is still a job responsibility. Extension economist's appointment split is the basis for annual evaluation of their work performance, with some additional expectations on research outputs. At many LGUs, the funding stream for Extension economists might not match their appointment split. When their appointment split directs an Extension economist's focus away from their original funding source, it might result in them exerting less effort for Extension activities.

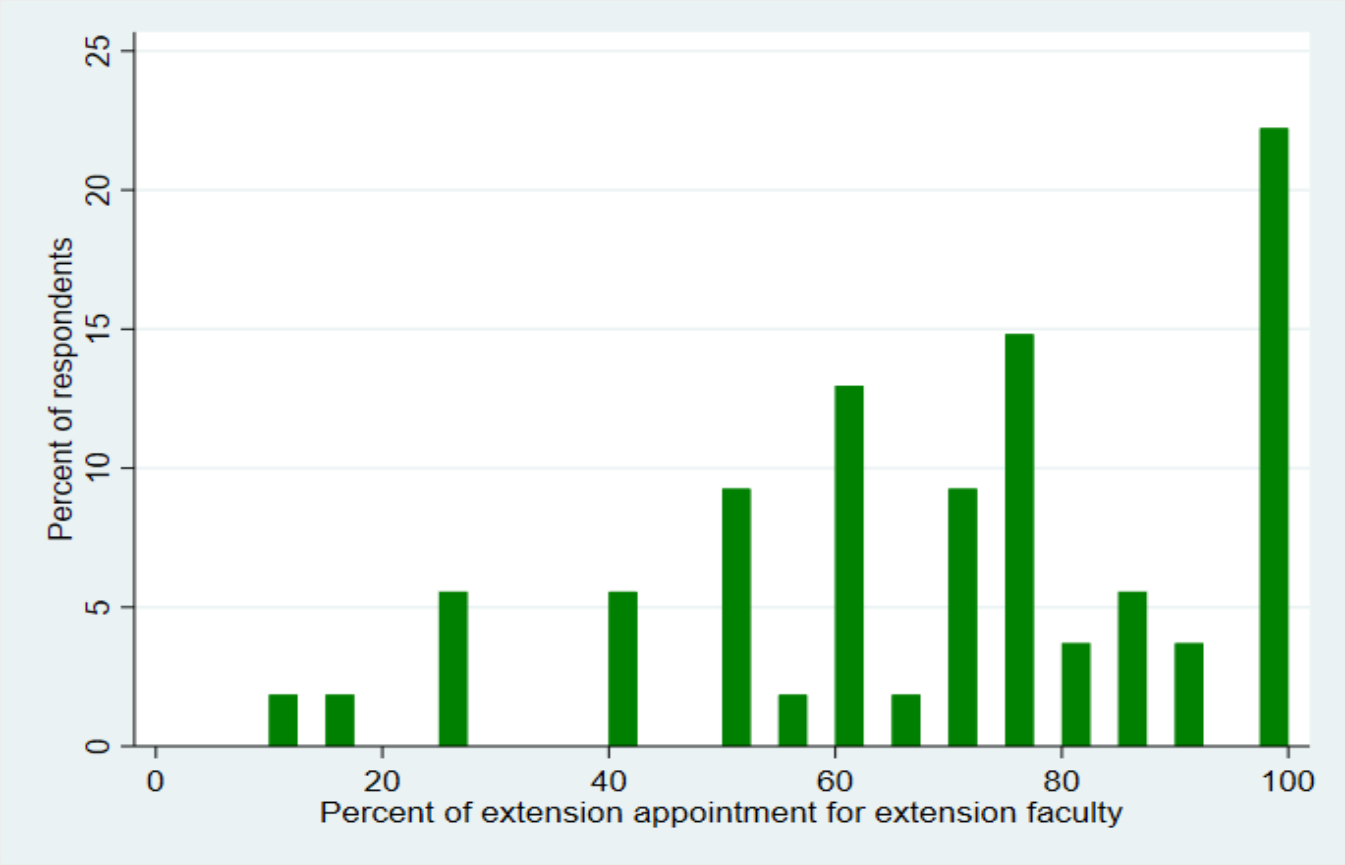

Figure 1. Percentage of Extension Appointment Reported by Extension Faculty

Supplemental Table S1 shows that LGUs have an average of 20 tenure-track positions with 4.4 (21 percent) including Extension appointments, 4.5 non-tenure-track positions with 1.1 (22 percent) including Extension appointments, and 7 professional or scientific staff positions with 1.6 (33 percent), including Extension appointments. For tenure-track positions, including Extension appointments, on average, 71 percent have Extension as the primary responsibility, 23 percent are female, and 13 percent have international backgrounds. Female employees tend to hold more Extension staff positions than tenure-track or non-tenure-track Extension faculty positions—females hold 23 percent of tenure-track Extension positions and 38 percent of non-tenure-track Extension positions, but constitute 52 percent of Extension staff. International scholars constitute a small portion of agricultural economics Extension professionals, holding 13 percent of tenure-track Extension faculty positions, 15 percent of non-tenure-track Extension faculty positions, and 8 percent of Extension staff positions. Figure 2 further illustrates faculty with an international background and their participation in Extension, which highlights the missed opportunities for LGUs to leverage and utilize the talents of international graduate students and scholars in Extension. Sixty percent of the department heads that responded to our survey indicated all current tenure-track Extension faculty are from the United States.

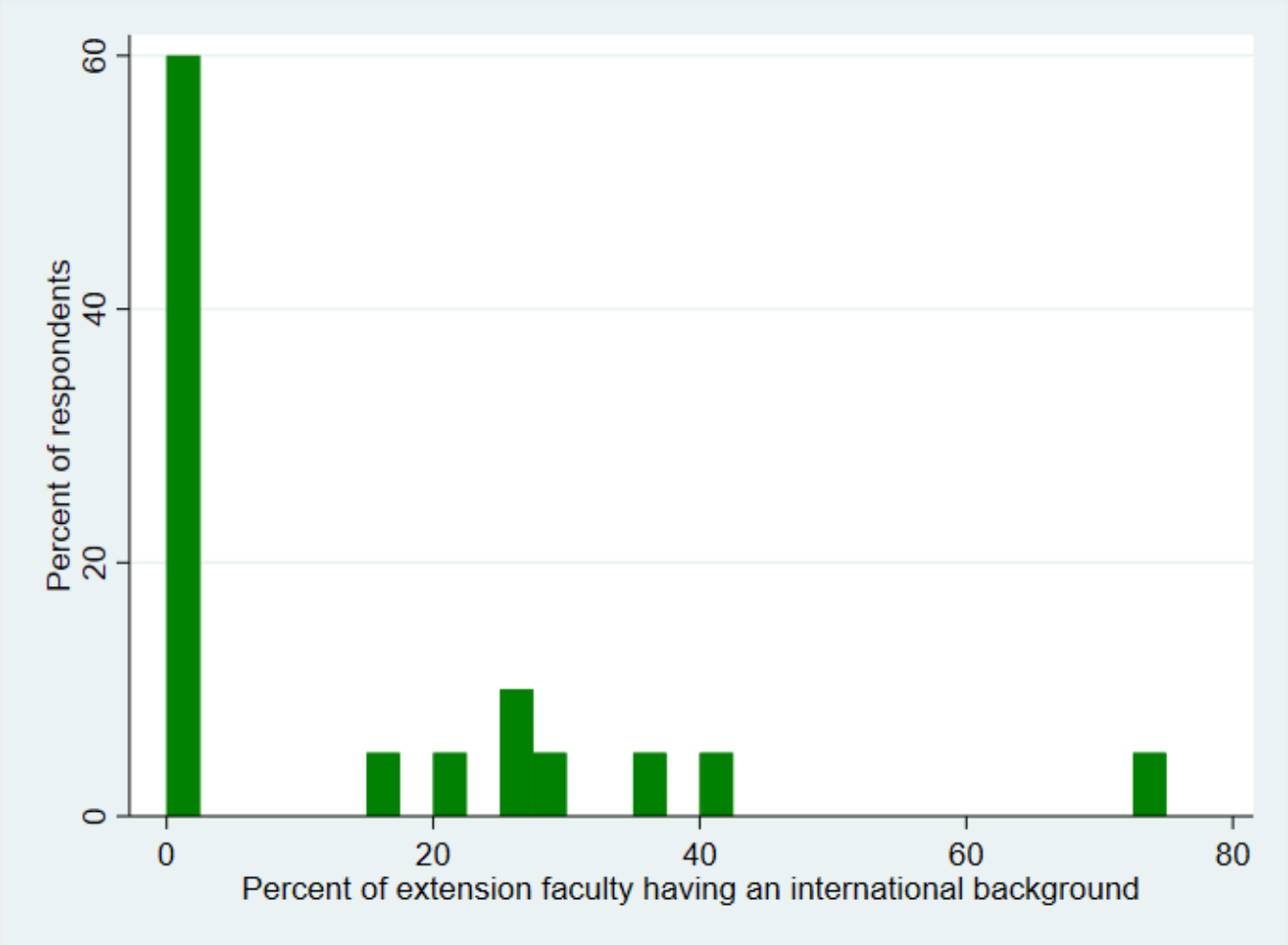

Figure 2. Percentage of Extension Faculty with International Backgrounds in an Agricultural and Applied Economics Department

4.2 Current Graduate Student Pool in the Field of Agricultural Economics

Figure 3 shows the proportion of international graduate students in the current graduate student pool in the field of agricultural economics. Although there is a larger variation in the share of MS students with an international background, in most departments, over 60 percent of economics or applied economics PhD students are international. On average, 71 percent of agricultural and applied economics PhD students are international, compared with 39 percent of MS students (Supplemental Table S1).

However, only 65 percent of PhD students advised by Extension economists are international graduate students (Supplemental Table S2). Note that, in terms of percentage, Extension economists advise more international PhD students than international MS students. On average, 38 percent of MS students advised by Extension economists are international (Supplemental Table S2). The percentage of international graduate students in the field of agricultural and applied economics is higher than the percentage of international graduate students mentored by Extension economists, which implies few international graduate students receive exposure to Extension. Self-selection of international graduate students as research advisors instead of Extension advisors could be the cause, as Boland and Crespi (2010) find that graduate students' areas of research have moved away from traditional farm economics to more general and applied agricultural economics topics, such as natural resources and environmental economics. Extension faculty tending to work with domestic students could also be the cause.

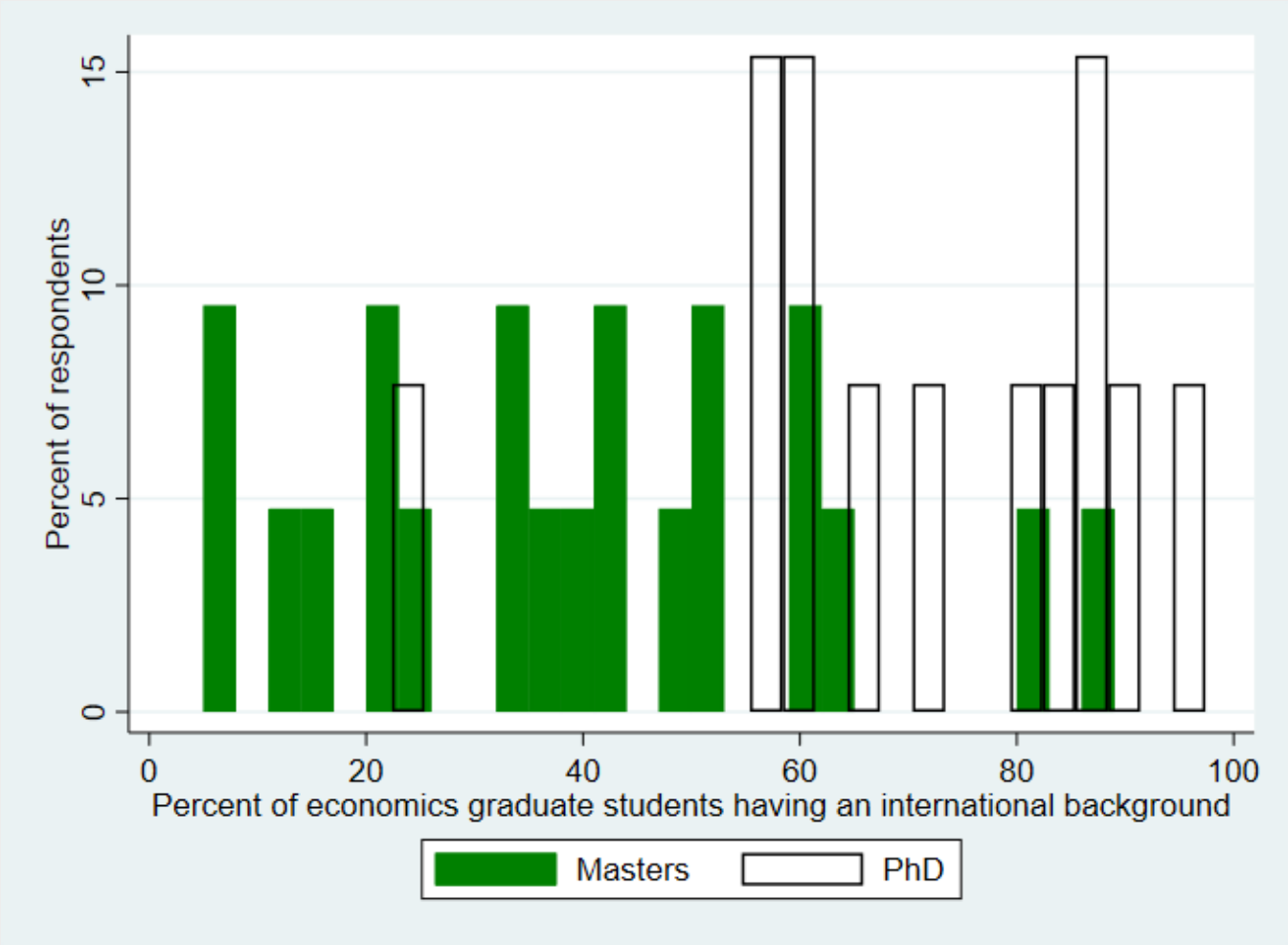

Figure 3. Percentage of Graduate Students with International Backgrounds in an Agricultural and Applied Economics Department

This creates additional challenges for international graduate students in the U.S. job market: although international graduate students account for the majority of graduate student populations in many agricultural economics departments, they do not always receive the training and mentoring to effectively compete for Extension positions. Extension faculty do not necessarily teach graduate classes and are sometimes detached from department research and teaching functions. Many international graduate students that graduated from LGUs do not know what Extension is, let alone participate in Extension activities, which means that departments and universities underutilize the talents and experiences of international graduate students when creating an inclusive and enriching experience.

Despite the low percentage of international graduate students mentored by Extension economists, on average, they constitute 65 percent of PhD students and 38 percent of MS students mentored by Extension economists. International graduate students mentored by Extension economists are a potential Extension workforce, which partially explains LGUs' challenges recruiting tenure-track and non-tenure-track faculty in the fields of agricultural and applied economics, as recruitment efforts mainly focus on domestic students. Figure 4 shows that few Extension economists report success placing graduate students in positions with Extension appointments. As Supplemental Table S2 shows, only 8 extension economists indicated successfully placing PhD students in Extension positions, with an average placement of 1.1 PhD students. Furthermore, only 11 Extension economists indicated success placing MS students in Extension positions, with an average placement of 2.6 MS students. As a profession, we are

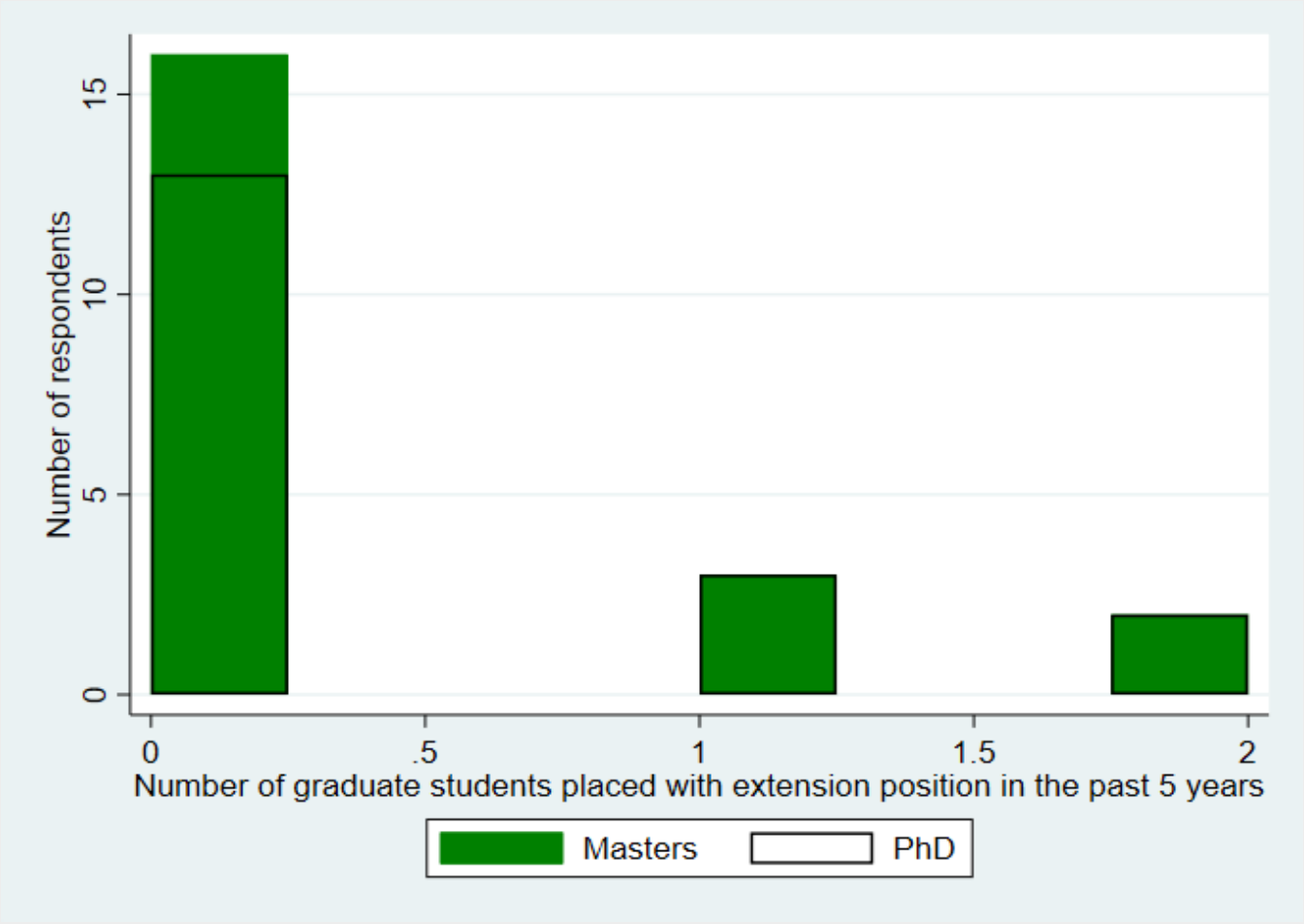

Figure 4. The Number of Graduate Students Placed in an Extension Position (Responses from Extension Faculty)

training the future Extension economist workforce. LGUs need to adjust recruiting efforts for Extension economists to recruit a more diverse pool of international graduate students.

4.3 Efforts to Expose Graduate Students to Agricultural and Applied Economics Extension

In both surveys, we specifically asked about the strength of Extension in each department and departments' efforts to help graduate students pursue Extension careers. When we surveyed Extension economists, we asked about the changes that they would like to see in their department to further help graduate students pursue Extension careers.

Table 1 summarizes the categories department heads and Extension economists consider as the strengths of Extension programs. Extension economists stressed strong college/university support and Extension funding support (both public and private funding) as strengths. Some department heads report a strong Extension program supported by a large number of Extension faculty, allowing them to cover all the important subject areas needed by their stakeholders. However, other department heads noted a lack of Extension positions to support Extension efforts or the loss of Extension positions at their university as current Extension challenges. Strong Extension leadership and organizational structure at both the college and departmental level is critical for the success of Extension programs. Universities with a strong focus on Extension tend to have stronger Extension programs, and departments with active Extension

Table 1. Categories Department Heads and Extension Faculty Consider Extension Program Strengths

Extension Program Strengths Reported by Department Heads
Relevance and visibility to the industry in the state, addressing real-world and community-based programs and local issues, close connection and support of stakeholders, engagement and collaboration with county agents, modern communication and information dissemination methods in Extension, scholar basis of the Extension program, strong and active research programs in support of Extension efforts, multistate programs in Extension and research, interdisciplinary projects and programs, sponsored funding support for Extension, real-world credibility in teaching by Extension faculty, the informal line between Extension and outreach/engagement, strong Extension program supported by a large number of Extension faculty.
Extension Program Strengths Reported by Faculty
Good relationship with growers and industry partners, stakeholder engagement, strong reputation across the state, knowledge of agricultural systems, strong ties with agricultural producers to address relevant issues, a critical mass of faculty to develop in-depth programs, specializations in Extension topics, strong relationship with county Extension agents to meet local needs, strong support for Extension across the college and university, strong funding support in Extension at the college level, integration of the land-grant mission (research, Extension, and teaching), strong and active research programs in support of Extension efforts, multidiscipline collaboration, branding of Extension program supported by a hosting website and strong online presence, a mix of online deliverables with in-person meetings.

coordinators participating in faculty meetings helps increase the visibility of department Extension programs.

As Table 2 shows, department heads and Extension economists stressed the importance of allowing and encouraging graduate students to present at Extension or stakeholder meetings and publish Extension outputs. Some departments reported funding graduate student participation in the Agricultural and Applied Economics Association's (AAEA) Extension graduate competition, and some potentially offer Extension-track graduate assistantships.

However, department heads and Extension faculty both reported the lack of a systematic program to expose graduate students to Extension career opportunities. Seven of the 17 department heads who responded to this question stated that they currently do not have a systematic program to do so. Three department heads stated they have started putting more effort into exposing graduate students to Extension—efforts that range from a formal class to an Extension-based track graduate program and more targeted and individualized graduate student mentoring. Sixteen of the 37 Extension faculty that responded to this question reported no formal department-level graduate student training for Extension careers. Extension faculty also noted changes they would like to see at the department level in training graduate students to pursue an Extension career (Table 3). One way of including Extension curriculum and training is to recruit field specialists working in Extension and county Extension agents to the graduate program. Their involvement on campus would bring a different aspect to the graduate program and expose the other graduate students with Extension.

Table 2. Department-Level Efforts Reported by Department Heads and Extension Faculty to Train Graduate Students to Pursue Extension Careers

Graduate Student Training Efforts Reported by Department Heads
Student present at Extension meetings, student publishes Extension output, student participation in the editing process of Extension publications, mentorship and collaboration with Extension faculty, encourage and fund participation students in AAEA Extension competition.
Graduate Student Training Efforts Reported by Extension Faculty
Involve students in Extension and outreach projects, take students to Extension events and on field trips, student present at Extension events, mentorship and collaboration with Extension faculty, Extension assistantships and professional development grants, curriculum development focused on Extension, incorporating Extension-focused topics in thesis/dissertation, Extension internship programs.

Table 3. Suggested Changes at the Department Level in Training Graduate Students in Pursuing a Career in Extension Reported by Extension Faculty

Changes in Graduate Student Training Suggested by Extension Faculty
Invite graduate students to Extension programs and events, offer seminars or courses on Extension work and methods, more graduate student exposure to Extension faculty, continued and/or expanded graduate student funding in Extension, emphasize the need for dissemination of research results, formal Extension track for graduate programs, involve graduate students in applied research with Extension outreach and stakeholder engagement opportunities, educate students in translating research in layman's terms, more active recruiting of graduate students interested in Extension, networking opportunities for Extension, opportunities to publish Extension publication, and present at Extension events.

Our survey also reveals an interesting gap in the challenges reported by department chairs and Extension economists (Table 4). In particular, department heads noted the challenges in recruiting Extension faculty and balancing the needs of stakeholders and integrating with the research and teaching functions of LGUs. Many surveyed Extension faculty commented that departments and LGUs often undervalue Extension and their work. Under appreciation of Extension faculty makes it less appealing to graduate students, which could create challenges in filling future Extension positions.

4.4 International Graduate Students' Roles in Agricultural and Applied Economics Extension

We asked Extension economists about perceived roles international graduate students could play in Extension and to offer advice for graduate students, especially international graduate students, interested in Extension careers. Fifteen out of 34 Extension faculty stated that international graduate students could play the same Extension role as domestic students. However, Extension faculty did recognize international graduate students' lack of expressed interest working in Extension, making it difficult to identify and cultivate potential future Extension professionals.

Extension faculty also recognized the challenges facing international graduate students, from limitations in language and culture to a lack of knowledge of agricultural practices, agricultural community systems,

Table 4. Select Comments from Department Heads and Extension Faculty about Challenges Faced by Extension Professionals

Select Comments from Department Heads
"*At many universities, Extension can be overly bureaucratic and tradition-bound to be truly relevant to the modern needs of stakeholder groups; at other places it is often too disassociated with the main research and teaching missions of the university, leaving Extension faculty on an island*."
"*This is an important issue. Finding applicants for Extension faculty positions who understand Extension and U.S. agricultural/rural institutions has become a significant challenge*."
Select Comments from Extension Faculty
"*Extension is an undervalued core area of the land-grant mission across the United States. It is a critical area that distinguishes land-grants from other higher education entities. It provides those institutions with a comparative advantage with stakeholder engagement and grassroots impacts*."
"*It is challenging to cultivate future Extension professionals when there are many states/institutions with either limited agricultural economics Extension programs or limited graduate programs. There are relatively few with both a strong, vibrant grad program and a strong, productive cohort of Extension agricultural economists*."
"*I was a domestic PhD student with no farm background when I graduated. I knew very little about what our Extension faculty did since I never saw them in class nor read their materials. So it's not just foreign students who lack awareness. I'd say most graduate students are not exposed to Extension programming*."

local/state/federal institutions, and U.S. laws and regulations. This is particularly important because many Extension positions expect successful candidates to impact farmers and agricultural or food sector stakeholders in that particular state or region.

5 Tips for International Graduate Students Interested in Extension Careers

As for tips for international graduate students interested in Extension careers, many Extension economists stressed the importance of understanding U.S. agriculture and production systems to be able to meet the needs of agricultural community stakeholders. Extension economists suggest that increasing international graduate students' interactions with stakeholders can help increase their understanding of U.S. agriculture and provide training for applying economic theory to U.S. farms. Extension faculty also suggest exposing international graduate students to Extension activities, such as writing Extension publications, going on field trips, presenting at county production meetings, and facilitating workshops, to increase their understanding of U.S. agriculture and Extensions functions (Table 5). International graduate students can actively seek opportunities to collaborate and work on grants with Extension faculty. Doing so will enable Extension faculty to provide personalized mentoring.

Extension faculty noted the importance of investing in communication skills and training for international graduate students. Communication skills are a key to Extension professionals' success—Extension professionals must be able to talk to and relate to target audiences and adjust their delivery methods to meet the needs of clientele.

Table 5. Roles Extension Faculty Feel International Graduate Students Could Play in Extension

Roles International Graduate Students Can Play in Extension
Innovation in applied research that is relevant to producers, serving growers from different culture and language backgrounds, providing insight and lessons from other countries for U.S. agriculture, bringing different perspectives in engaging diverse audiences, Extension programs focusing on trade and international agriculture, assisting in Extension publication and data analysis, potential partnerships and market channels at the international level for U.S. agriculture.
Selected Quotes from Extension Faculty
"*Extension work comes down to personality more than anything and the ability to make a connection with stakeholders*."
"*The key variable is whether any student, foreign or domestic, has a background in agricultural production and/or working with agricultural producers*."
"*International students can be just as competitive as domestic students for Extension jobs as the most important defining characteristic of Extension training is assisting with the development of an ag background*."
"*As many lack any experience and understanding of U.S. (let alone state) agriculture and farming practices as well as the laws, regulation, and code, it is one thing to be taught the theory, and even using case studies surrounding the fundamentals of agribusiness and economics, it becomes more difficult for them to handle the application to U.S. farms and those farms within the state. This severely limits their usefulness to bringing impact to the state's farmers and ag/farming industry*."
"*Having graduate students receive training from Extension faculty would help them understand U.S. ag better. This training could occur by having graduate students go with Extension faculty to educational meetings. During these meetings, the international students could provide some perspective by giving an international perspective or by teaching on some of the latest economic ideas*."

Good oral and written English communication skills are critical for working in Extension—Extension professionals are liaisons between academia, government, and private industry. Interpersonal skills increase Extension professionals' success and effectiveness with stakeholders, their collaboration with research colleagues, and their ability to create value for the agricultural community. Extension professionals need the ability to build strong personal relationships with stakeholders to be a trusted source of information and increase the success of building and delivering Extension programs.

It is also important for international graduate students to acquire key skill sets in applied economic research, which facilitates their ability to respond rapidly to important issues from stakeholders. Facing multiple sources of sometimes conflicting information, stakeholders seek unbiased, research-based information from credible sources (Taylor and Zhang 2019). Extension professionals can provide unbiased research and Extension programming, which will help producers and consumers make informed decisions. Stakeholder engagement is a good venue to identify and define research questions with real-life application, pilot appropriate test tools, engage in data collection, and receive constructive feedback (Monroe, Ireland, and Martin 2015). Oftentimes, to address the needs of stakeholders, Extension professionals need to assemble research groups and work with both within- and cross-discipline researchers, and they need the ability to work with a diverse group of researchers and be a part of multistate or multidisciplinary teams to tackle the complexity of agricultural production systems.

As noted by several Extension faculty, bias is present and probably more salient for female, minority, and international Extension professionals. Many respondents also stressed the importance of international graduate students assembling and showcasing the "right signals" when pursuing an Extension position. The suite of "right signals" include knowledge of what Extension is and is not, evidence-based understanding of the U.S. agricultural and food sectors (preferably a specific region or state), solid oral and written English communication skills, strong interpersonal skills, and experience presenting at Extension meetings and/or writing Extension publications.

6 Conclusion

Our research leverages two rounds of surveys of department heads and Extension faculty in agricultural economics departments to shed light on understanding the current challenges faced by Extension and the methods for training talent as the future Extension workforce. Currently, international students in agricultural economics graduate programs outnumber domestic students. Even though a large proportion of graduate students in the field of agricultural and applied economics are international, on average, only 13 percent of the Extension faculty at LGUs have international backgrounds. Our research identifies a need to change perceptions about involving international graduate students in Extension and providing Extension career opportunities to international graduate students.

Our research also identifies the hidden and perceived barriers preventing international graduate students from pursuing academic Extension careers, and we provide tips for appropriate education and training programs in university graduate curricula to increase international graduate students' awareness of and interest in Extension. The challenges international graduate students face for successful Extension job placement range from limitations in language and culture to a lack of understanding of agricultural practices and agricultural community systems, local/state/federal institutions, and U.S. laws and regulations. Extension faculty suggest taking efforts to expose international graduate students to Extension opportunities to increase their understanding of U.S. agriculture and production systems, training students to apply economic theory to U.S. agriculture, and exposing students to Extension activities to increase understanding of Extension functions. In addition to working with agricultural producers, there are many other Extension opportunities (such as working with policy makers, consumers, etc.) for international graduate students in agricultural economics to peruse, and awareness of the other opportunities is needed to be raised among graduate students and LGUs. These efforts will increase international graduate students' awareness of Extension and provide possible Extension career opportunities.

About the Authors: Yangxuan Liu is an Assistant Professor at the University of Georgia (Corresponding author: yangxuan.liu@uga.edu). Wendong Zhang is an Assistant Professor at Cornell University (wendongz@cornell.edu) and an Associate Professor at Iowa State University.

Acknowledgments: Zhang acknowledges the base support of USDA National Institute of Food and Agriculture (NIFA) Hatch Projects IOW04099 and 1020261. The project has been declared exempt from most requirements of the human subject protections regulations by both Iowa State University (IRB ID: 21-398) and University of Georgia (IRB ID: PROJECT00005071).

References

Bagdonis, J.M., and A.H. Dodd. 2010. "Agricultural Science Graduate Student Education and Public Scholarship." *Journal of Agricultural Education* 51(1):99–112.

Boland, M.A. 2009. "Leadership Development in Agricultural Economics: Challenges for Academic Units." *Journal of Agricultural and Resource Economics*:367–382.

Boland, M.A., and J.M. Crespi. 2010. "From Farm Management to Agricultural and Applied Economics: The Expansion of a Professional Society as Seen through a Census of Its Dissertations from 1951 to 2005." *Applied Economic Perspectives and Policy* 32(3):456–471.

Burkhart-Kriesel, C., J.L. Weigle, and J. Hawkins. 2019. "Engagement to Enhance Community: An Example of Extension's Land-Grant Mission in Action." *Social Sciences* 8(27):1–15.

FWD. 2021, December 15. "International Students and Graduates in the United States: 5 Things to Know." https://www.fwd.us/news/international-students/.

Glauber, J.W. 2021. "U.S. Trade Aid Payments and the WTO." *Applied Economic Perspectives and Policy* 43(2):586–603.

Lawrence, J., G. Hadley, and J. Henderson. 2019. "The Future for Extension Farm Management Economists: The Director's Cut." *Choices* 34(2). http://www.choicesmagazine.org/choices-magazine/theme-articles/the-future-of-farm-management-extension/the-future-for-extension-farm-management-economists-the-directors-cut.

McDowell, G. 2001. *Land-Grant Universities and Extension in the 21st Century: Renegotiation or Abandoning a Social Contract*. Ames: Iowa State University Press.

Monroe, M.C., J. Ireland, and T.A. Martin. 2015. "Integration of Forestry Research and Extension in an Online Graduate Course." *Journal of Forestry* 113(2):240–247.

Norton, G.W., and J. Alwang. 2020. "Changes in Agricultural Extension and Implications for Farmer Adoption of New Practices." *Applied Economic Perspectives and Policy* 42(1):8–20.

Sumner, D.A. 2000. "Domestic Support and the WTO Negotiations." *Australian Journal of Agricultural and Resource Economics* 44(3):457–474.

Sumner, D.A. 2003. "Implications of the US Farm Bill of 2002 for Agricultural Trade and Trade Negotiations." *Australian Journal of Agricultural and Resource Economics* 47(1):99–122.

Taylor, M., and W. Zhang. 2019. "Training the Next Generation of Extension Economists." *Choices* 34(2). http://www.choicesmagazine.org/choices-magazine/theme-articles/the-future-of-farm-management-extension/training-the-next-generation-of-extension-economists.

U.S. Department of Agriculture Foreign Agricultural Service (USDA-FAS). 2018. "Percentage of U.S. Agricultural Products Exported." https://www.fas.usda.gov/data/percentage-us-agricultural-products-exported.

Wang, S.L. 2014. "Cooperative Extension System: Trends and Economic Impacts on U.S. Agriculture." *Choices* 29(1). http://choicesmagazine.org/choices-magazine/submitted-articles/cooperative-extension-system-trends-and-economic-impacts-on-us-agriculture.

4(2) doi: 10.22004/ag.econ.321908