

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

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**Nurturing international graduate students for a more diversified and inclusive extension workforce**

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1 **Nurturing international graduate students for a more diversified and inclusive extension**  
2 **workforce**

3

4 **Abstract**

5 Over 20 percent of U.S. agricultural products are exported; thus, agricultural trade and  
6 understanding global markets and agricultural policies in partner countries are increasingly  
7 important for the continued success of the U.S. agricultural economy and farmers and ranchers.  
8 Heightened demand for trade-related knowledge has created new opportunities and challenges  
9 for Extension services—international graduate students represent a significant portion of the  
10 student population at many land grant universities; however, many are not exposed to Extension.  
11 We argue this creates an untapped resource to integrate graduate education and Extension  
12 services. The net effects of this untapped resource are Extension missing opportunities to recruit  
13 top talents to serve the agricultural industry and less job market success for international  
14 graduate students.

15 Leveraging a survey of department heads and Extension faculties in agricultural economics  
16 departments, our research helps document the status of international Extension professionals in  
17 our profession, helps identify hidden and perceived barriers for international students pursuing  
18 academic Extension careers, and provides insights into appropriate education and training  
19 programs in university graduate curricula to increase the awareness and interests of international  
20 students in Extension.

21

22 **Keywords**

23 Extension; Land Grant university; international graduate student; economic education; diversity;  
24 graduate education

25

26 **JEL Codes**

27 A23, Q16, Q18

28

29 **1. Introduction**

30 With the United States exporting more than 20 percent of its agricultural products (USDA-FAS  
31 2018), agricultural trade is increasingly important for the wellbeing of the U.S. agricultural  
32 economy and farmers and ranchers. International markets have provided additional market  
33 opportunities for many U.S. agricultural products. Understanding global markets and  
34 consequential agricultural policies in key partner countries is important for the continued success  
35 of the U.S. agricultural industry.

36 This heightened demand for trade-related knowledge has created new opportunities and  
37 challenges for the land grant university Extension services. Extension has served as the media of  
38 non-formal education and provided learning opportunities to the general public, including  
39 farmers, and rural and urban residents (Lawrence et al. 2019). It takes knowledge gained through  
40 research and brings it directly to its target audiences. With globalization becoming increasingly  
41 important for U.S. agriculture, the need for talents to facilitate this exchange of information is  
42 rising for the U.S. Extension services. Integration of graduate education and Extension is a  
43 relatively understudied topic albeit Extension’s critical role for the Land Grant Universities  
44 (Bagdonis and Dodd 2010). Despite the rising importance of international graduate students in  
45 many agricultural economics departments, consideration of international graduate student  
46 education and Extension has been even more inadequate.

47 We argue that integrating graduate education and Extension services at land-grant universities is  
48 a critical untapped resource. On the one hand, international graduate students represent a  
49 significant and sometimes dominant portion of the graduate student population in both  
50 agricultural economics and economics departments at many land-grant universities (FWD 2021).  
51 However, many international graduate students are not exposed to or simply unaware of  
52 Extension throughout their studies, despite the fact that Extension is arguably the hallmark of the  
53 tripartite goals of U.S. land-grant universities (Taylor and Zhang 2019). We argue that the net  
54 effect is missed opportunities for U.S. Extension services to recruit top talents to serve the needs  
55 of the agricultural industry, especially in the areas of trade, nutrition and health, and agriculture  
56 and the environment. This missed opportunity also results in less job market success for  
57 international graduate students in U.S. academia.

58 Leveraging two separate surveys of department heads and extension faculties in agricultural  
59 economics departments, our research helps document the status of international Extension  
60 professionals in our profession, helps identify the hidden and perceived barriers for international  
61 students pursuing academic careers involving Extension and helps provide insights into the  
62 appropriate education and training programs in university graduate curricula to increase  
63 international students’ awareness and interest in Extension. The increased interests of  
64 international students in Extension could bring the workforce needed by the land grant  
65 universities to continue serving the extension purposes of the land grant mission, which would  
66 also benefit the U.S. agriculture industry in better understanding the global market.

67

68 **2. Explaining the Profession of Extension in Agricultural Economics to International**  
69 **Graduate Students**

70 Land Grant Universities and Colleges were established by the Morrill Act of 1862 and 1890. In  
71 1914, the Smith-Lever Act created the U.S. agricultural Cooperative Extension Systems, which  
72 is a partnership among federal partners (the U.S. Department of Agriculture), state partners  
73 (Land Grant Universities and State Governments), and local partners (city or county  
74 governments) (Wang 2014). In 1994, tribal colleges and universities were added to the land grant  
75 systems. The Land-Grant University (LGU) System in the U.S. includes 112 Universities or  
76 colleges, including 57 units of the 1862 public universities, 19 units of 1890 historically black  
77 colleges and universities (HBCU), and 36 units of the 1994 tribal colleges and universities. The  
78 tripartite mission of land-grant universities includes research, teaching, and extension, which is  
79 transformed into teaching excellence, conducting relevant research, and engaging with  
80 stakeholders and the general public.

81 Of the tripartite mission of land-grant universities, extension directly interacts with the general  
82 public, bringing vital and practical knowledge gained through research and education to people  
83 to address public needs and create positive changes (Taylor and Zhang 2019). The mission of  
84 extension requires extension professionals to translate science or research findings into  
85 understandable and applicable formats that the general public uses to improve their lives and/or  
86 livelihoods (ECOP 2015). The Land Grant University Cooperative Extension Service usually  
87 includes extension specialists (faculty members, researchers, regional educators, etc.), and  
88 county extension agents and staff. Extension in agricultural economics works closely with  
89 agricultural producers, agribusiness, policymakers, natural resources, and communities to  
90 provide scientific research-based information and education and deliver timely and accurate  
91 economic analysis in a variety of topics and formats.

92 ***2.1 What are the job responsibilities of Extension Professionals?***

93 Agricultural and applied economics Extension covers a wide array of issues from production and  
94 consumption, development, risk management, trade, policy, insurance, macroeconomics policy  
95 implications, environmental and resource issues, agribusiness, finance, farm management, to  
96 rural communities and development. The primary role of extension is to provide information to  
97 improve producer decision-making and skills needed to improve profitability. Extension  
98 professionals work together with a diverse set of audiences and stakeholders, including  
99 producers, agribusiness professionals, policymakers, and other researchers.

100 Extension professionals develop the programs needed by their target audiences and depending on  
101 the target audiences, these programs are usually held at the off-season of the target audiences,  
102 such as during the winter season when crop producers are less busy. Extension as informal  
103 teaching, the teaching models developed need to have sufficient understandings of how  
104 producers learn to build farmers' capacity and serve educational purposes. Working in extension  
105 is a highly rewarding career. Extension professionals are able to develop long-term relationships  
106 and networks with stakeholders. Extension professionals developed self-satisfaction through  
107 meeting the needs of their stakeholders and helping people.

108 Extension emphasis on accountability and being a trusted source of information for their target  
109 audiences, being able to respond quickly to emerging issues. An analogy used very often by  
110 extension professionals, extension professionals oftentimes are fire fighters, whenever there is an  
111 emerging need that is critical to the livelihood of people, extension professionals need to respond  
112 quickly and provide the information needed by their target audiences. This requires extension  
113 professionals to have a broad base of knowledge and their knowledge base has mirrored the  
114 evolving needs of stakeholders (Burkhart-Krjesel et al. 2019). There are always new topics that  
115 extension professionals need to address. For the field of agricultural and applied economics, the  
116 economy changes constantly, any types of events happening from home or abroad can induce  
117 new emerging needs by stakeholders. A lot of times, extension professionals are expected to be  
118 able to educate themselves with a new topic on the first day, build the PowerPoint materials, and  
119 present to the audiences the next day.

120 Traveling and in-person training has been and still is a major tool extension professionals use in  
121 delivering materials to stakeholders. However, new communication technologies have lowered  
122 barriers to information dissemination and made information more accessible to farmers (Norton  
123 and Alwang 2020). In the modern era, education and applied research programs are delivered to  
124 clientele and stakeholders through multiple delivery mechanisms, such as presentations at the  
125 county, state, national, international, and industry meetings, extension and journal article  
126 publications, web-based materials, video recordings, PowerPoint slide sets, and computerized  
127 decision aids. The county delivery systems in extension are a powerful tool for extension  
128 professionals, where the information is disseminated through county extension agents to the  
129 general public.

130 In addition to working closely with county Extension educators and agents to meet local needs,  
131 many Agricultural Economics Extension faculty hold classroom teaching and research  
132 appointments. Extension faculty use their Extension experiences to bring real-life examples of  
133 economic principles into classroom teaching and conduct applied research to answer relevant  
134 questions which are virtual to the stakeholders. Applied researches are conducted by extension  
135 professionals in extension with a bottom-up approach, where extension faculty identify the  
136 research questions through the discussion with stakeholders and use scientific research methods  
137 to answer the questions from stakeholders. Extension professionals utilize a timely research-  
138 based method to address relevant, critical, and emerging issues to meet the needs of stakeholders  
139 and engage with the industry. Extension professionals in agricultural economics applied research  
140 programs integrate economic concepts and methods to solve the real-world challenges that  
141 agricultural stakeholders face. The goal of this applied researches is to integrate  
142 research/extension programs that empower producers and policymakers to make more  
143 economically informed decisions and improve the resilience of agricultural operations.

## 144 ***2.2 Challenges in Recruiting Talents by Extension in Agricultural Economics***

145 The changing times and landscapes in the global economy signify the importance of public  
146 scholarship and engagement for the future of higher education institutions. Agricultural  
147 economists should consider how to continue attracting talents needed to fulfill the mission of  
148 land-grant universities to meet the needs of its partners and stakeholders. With the change in

149 focus of the land grant mission more towards research and teaching, extension suffers from  
150 disciplinary divisions, and downsizing (McDowell 2001). Oftentimes, extension faculty feel left  
151 out or less appreciated by their peers in their institution. Moreover, graduate education is focused  
152 almost exclusively on teaching and research. Less focus has been put in training on translating  
153 and disseminating the results of research to the general public and involving graduate students in  
154 extension efforts (Bagdonis and Dodd 2010). This brings a challenge for continuing nurturing  
155 talents to fill the needs of land grant extension systems for the field of agricultural economics  
156 (Lawrence et al. 2021).

157 In addition, domestic American students' interest in pursuing a Ph.D. degree in agricultural  
158 economics has been declining. Many domestic students choose to join the workforce after  
159 receiving their master's degree and forgo pursuing a Ph.D. degree in agricultural economics. In  
160 addition, facing many career choices after graduation and oftentimes with better pay and less  
161 stress than working in academia, many domestic American students with a doctoral degree  
162 choose to work in nonacademic settings. Competing of talents from the agribusiness industry,  
163 land grant universities face the challenge in recruiting talents in the field of agricultural and  
164 applied economics. Consequently, universities have the challenge of filling the vacant of  
165 extension professionals with a limited of applicants and a lot of times not qualified applicants.

### 166 **3. Methods**

167 Our data were collected using an online survey instrument to department heads and extension  
168 faculties in agricultural economics at Land Grant Universities in the United States during  
169 December 1 - 21, 2021. We conducted two rounds of surveys, first with department heads from  
170 land grant university about their department resources in Extension and how they incorporate  
171 Extension into their graduate programs. Followed by an in-depth survey of extension  
172 professionals within the land grant university for their insight about the extension resources  
173 within the department and students' involvements in Extension. This study aims to compare the  
174 insight from the department heads and faculty members in bringing more international students'  
175 interests in Extension and prepare them in the skills needed by Land Grant Extension systems.

176 The first round of surveys was sent to 59 department heads with 22 valid responses. Email  
177 contact of the department heads of Land Grant Universities in the U.S. was collected through  
178 searching of agricultural economics programs at the 1862 public universities, 1890 historically  
179 black colleges and universities (HBCU), and the 1994 tribal colleges and universities. In addition  
180 to standard demographic data, the survey collected information about the current number of  
181 faculty with or without extension appointments, the number of faculty coming from an  
182 international background, and also the current number of graduate students with or without  
183 international background. We also asked about how many graduate students were placed in  
184 extension positions in the past five years, the strength of the extension program, and the action  
185 taken in training graduate students pursuing a career in extension.

186 The second round of surveys was sent via a generic link to the listserv distribution of extension  
187 professionals within the agricultural and applied economics organizations. In total, we collected  
188 54 valid responses from extension faculties with formal extension responsibilities. We asked the

189 appointment split among research, teaching, and extension, graduate students advised with and  
190 without international background, and job placement in extension for graduate students. We also  
191 asked the insight from extension faculty about the strength of extension programs in their  
192 department, the training taken to prepare graduate students in extension, and the role  
193 international students could play in extension.

## 194 **4. Results**

### 195 *4.1 Descriptive Statistics of the Sample*

196 22 out of the 55 department heads at Land Grant Universities with agricultural or applied  
197 economics departments responded to our survey, resulting in a 40% response rate. All surveyed  
198 respondents reported that they obtained their terminal degrees in the United States, with 17 from  
199 land grant universities. Of the 18 department heads who reported demographic information, four  
200 identify as women, and three are not White or Caucasian.

201 Table 1 presents the summary statistics of the quantitative questions of the survey. In particular,  
202 it shows the relative share of extension faculty or staff in the department, the international  
203 backgrounds of extension faculty, and gender of extension faculty, as well as the departmental  
204 track record in placing Ph.D. or M.S. students in faculty or staff positions with extension  
205 responsibilities. On average, there are 20 tenure-track faculty positions in a Land Grant  
206 University, with 4.4 (21%) having a formal extension appointment. In addition, on average, there  
207 are 4.5 non-tenure-track faculty with 1.1 (22%) non-tenure-track faculty with extension  
208 appointments, and 7 professional or scientific staff with 1.6 (33%) professional or scientific staff  
209 having an extension appointment. For those tenure-track extension faculties, on average, 23% are  
210 female, and only 13% have international backgrounds, 71% have extension as their primary  
211 responsibility. Females tend to work more as extension staff than tenure-track or non-tenure-  
212 track extension faculty members, with over half of extension staff being female. International  
213 scholars, working in extension, are a small set of the workforce of extension professionals, and  
214 they work more in the tenure-track faculty positions, than non-tenure-track positions, or  
215 extension staff positions.

216



217 **Table 1. Results of the Survey of Department Heads**

<b>Variable</b>	<b>N</b>	<b>mean</b>	<b>sd</b>	<b>min</b>	<b>p25</b>	<b>p50</b>	<b>p75</b>	<b>max</b>
% of tenure-track faculty having extension appointment	22	21%	16%	0%	12%	17%	25%	52%
% of non-tenure-track faculty having extension appointment	19	22%	29%	0%	0%	14%	33%	100%
% of staff having extension appointment	14	33%	40%	0%	0%	18%	50%	100%
% of tenure-track extension faculty is female	20	23%	33%	0%	0%	15%	33%	100%
% of non-tenure-track extension faculty is female	10	38%	40%	0%	0%	33%	67%	100%
% of extension staff is female	10	52%	42%	0%	0%	50%	100%	100%
% of tenure-track extension faculty has an international background	20	13%	20%	0%	0%	0%	25%	75%
% of non-tenure-track extension faculty has an international background	9	15%	34%	0%	0%	0%	0%	100%
% of extension staff has an international background	9	8%	17%	0%	0%	0%	0%	50%
% of tenure-track extension faculty having a primary extension appointment	20	71%	35%	0%	45%	93%	100%	100%
% of non-tenure-track extension faculty having a primary extension appointment	10	75%	42%	0%	50%	100%	100%	100%
% of extension staff having a primary extension appointment	10	73%	42%	0%	50%	100%	100%	100%
% of economics MS students are international	21	39%	23%	5%	22%	38%	50%	87%

% of non-economics MS students are international	4	37%	40%	0%	3%	36%	71%	75%
% of economics PhD students are international	13	71%	20%	22%	60%	73%	87%	94%
Number of PhD students placed with an extension position in the past five years	18	0.4	0.7	0	0	0	1	2
Number of MS students placed with an extension position in the past five years	21	0.3	0.7	0	0	0	0	2
Age	16	57.4	7.7	43	53	58	63	71
Experience as chair at current institution	21	4.6	3.9	0	2	4	6	14

218 Note: sd, p25 p50, and p75 represents the standard deviation, 25<sup>th</sup> percentile, median and 75<sup>th</sup>  
219 percentile of the responses.

220

221 54 extension faculties responded to our survey. Of the 43 who provided demographics  
222 information, 26 identify as man, and 34 reported white or Caucasian as their race. The vast  
223 majority of respondents obtained their terminal degrees in the U.S., with three exceptions  
224 reporting obtaining Ph.D. from Africa, Canada or Europe. In contrast, eight of 44 reported  
225 obtaining undergraduate degrees from outside the United States. Among the 54 extension faculty  
226 who responded with their split between research, teaching, and extension, 24% (13 respondents)  
227 indicated that they have 100% extension appointments, 22% (12 respondents) indicated that they  
228 have extension and research two-way split, and 12% (12 respondents) indicated that they have  
229 extension and teaching two way split, and 26% (14 respondents) indicated that they have  
230 extension, research, and teaching three way split. Some faculty without formal research  
231 appointments mentioned that research is expected in their job responsibilities.

232 Table 2 shows the results of the survey of extension faculty. On average, they have already  
233 accumulated 11 years of experience at their current department. Out of the 54 respondents, 38-39  
234 are currently advising economics MS or PhD students, and over 20 extension faculties also  
235 advise non-economics graduate students as well as undergraduate students. Eight and eleven  
236 surveyed faculties also reported that they successfully placed Ph.D. or Masters students with  
237 extension faculty or staff positions, respectively.

238

239 **Table 2. Results of the Survey of Extension Faculty**

<b>Variable</b>	<b>N</b>	<b>mean</b>	<b>sd</b>	<b>min</b>	<b>p25</b>	<b>p50</b>	<b>p75</b>	<b>max</b>
% of Extension Appointment	54	70%	24%	10%	55%	73%	90%	100%
# advised economics MS students	38	1.5	2.0	0.0	0	1	2	10
# advised non-economics MS students	24	0.9	1.9	0.0	0	0	0.5	7
# advised economics PhD students	39	0.7	1.0	0.0	0	0	1	4
# advised non-economics PhD students	26	0.2	0.4	0.0	0	0	0	1
# advised undergraduate students	27	3.6	7.9	0.0	0	0	4	33
# PhD students placed with extension positions	8	1.1	0.8	0.0	0.5	1	2	2
# MS students placed with extension positions	11	2.6	2.0	0.0	1	2	3	7
% of advised economics MS students is international	22	38%	42%	0%	0%	32%	100%	100%
% of advised non-economics MS students is international	5	3%	6%	0%	0%	0%	0%	14%
% of advised economics PhD students is international	17	65%	43%	0%	25%	100%	100%	100%
% of advised non-economics PhD students is international	2	50%	71%	0%	0%	50%	100%	100%
Age	37	46	10	29	38	43	54	66
Experience at current institution	54	12	11	0	3	9	20	42

240 Note: sd, p25 p50, and p75 represents the standard deviation, 25<sup>th</sup> percentile, median and 75<sup>th</sup>  
 241 percentile of the responses.

242

243 Compare the statistics from Table 1 and Table 2, 71% of Ph.D. students in the field of  
244 agricultural and applied economics are international students. 65% of the Ph.D. students advised  
245 by extension faculty in the fields of agricultural and applied economics are international students.  
246 The proposition of international students in the master's program is significantly lower, with an  
247 average of 39% in the field of agricultural and applied economics, and 38% master students  
248 mentored by extension faculty. This shows that the potential workforce for extension  
249 professionals and partially explains the challenges of recruiting tenure-track or non-tenure-track  
250 faculty positions by Land Grant Universities in the field of agricultural and applied economics.  
251 The recruiting efforts for extension faculty at Land Grant University needs to be adjusted from  
252 mainly focused on recruiting domestic Ph.D. students to a more diverse pool of international  
253 students.

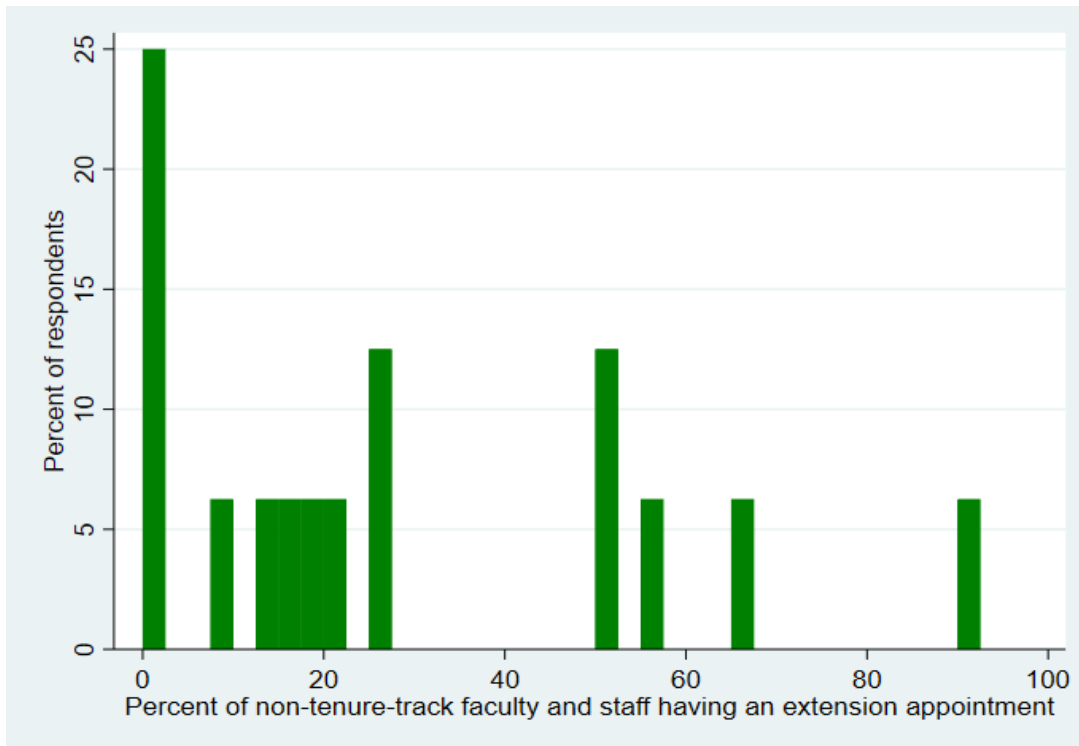
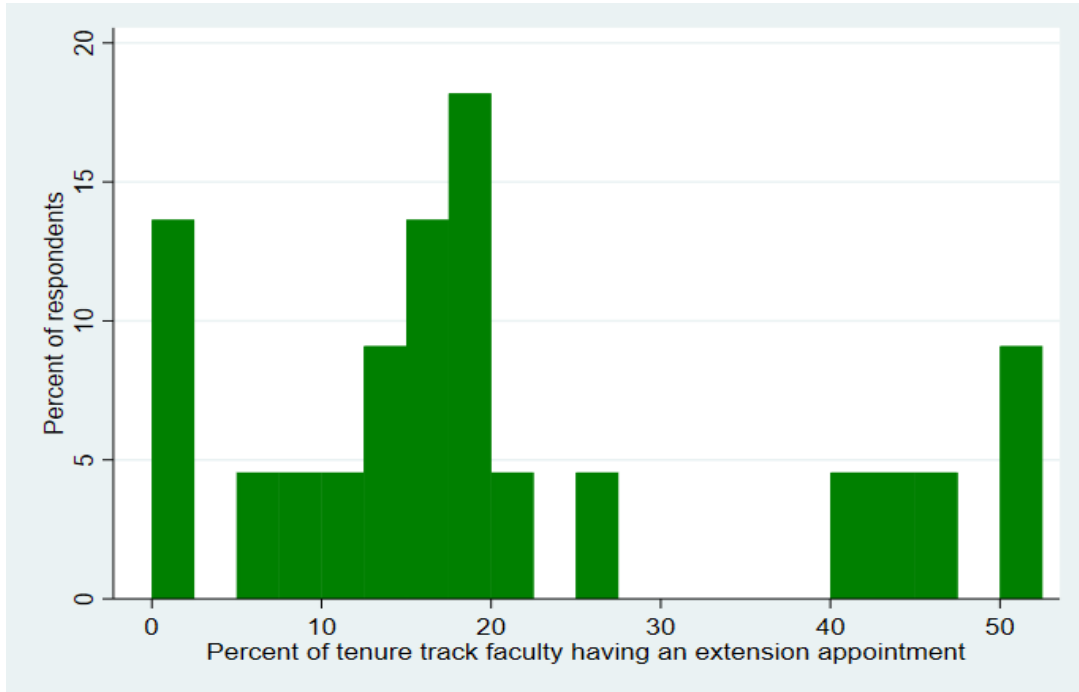
254 We noticed from the results that the percentage of international graduate students in the field of  
255 agricultural and applied economics is higher than the percentage of international graduate  
256 students mentored by extension faculty. This implies that there are fewer international students  
257 working with extension faculty and getting exposed to extension. This could be caused by the  
258 self-selection of international students in more of a research advisor instead of an extension  
259 advisor or could result from extension faculty tending to work more with domestic students for  
260 their better understanding of U.S. agriculture. Even with the lower percentage of international  
261 students mentored by extension faculty, they still consist on average with 65% of the entire Ph.D.  
262 student mentee population by extension faculty. Mentorship and apprenticeship are important  
263 factors for career trajectory. As a profession, we are training the future workforce of extension  
264 faculty with international students. But mystery stills exists about the job placement of these  
265 international students. Only 8 extension faculty responded that in their career they have  
266 successfully placed their Ph.D. student in extension positions, and 11 extension faculty  
267 responded that they have successfully placed their master students in extension positions.

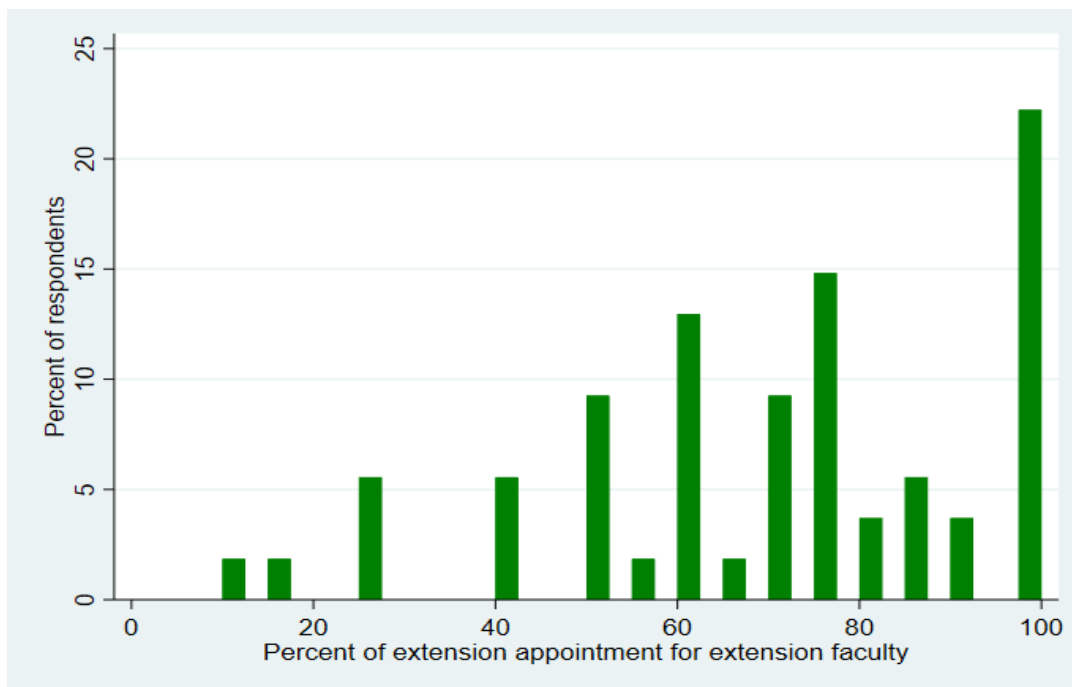
#### 268 ***4.2 Current Employment Situation in the Profession of Agricultural Economics***

269 Figure 1 builds on Tables 1 and 2, and further shows the distribution of the share of extension  
270 faculty in each department and the share of their extension appointment. It shows that in most  
271 departments, tenure-track faculties with formal extension appointments account for less than  
272 20% of the total tenure-track faculties in the department. Figure 1b) also reveals that at some  
273 departments, there are non-tenure-track faculty or staff who assist in the extension mission area  
274 as well. As shown in Figure 1 c), for those who have extension appointments, they often have  
275 extension as their predominant responsibility with extension accounting for at least half of their  
276 appointment.

277

278 **Figure 1. Extension faculty and their appointment: (a) distribution of the percent of tenure-**  
 279 **track faculty in each department having an extension appointment; (b) distribution of**  
 280 **percent non-tenure-track faculty and staff in each department having an extension**  
 281 **appointment; (c) percent of extension appointment reported by extension faculty.**





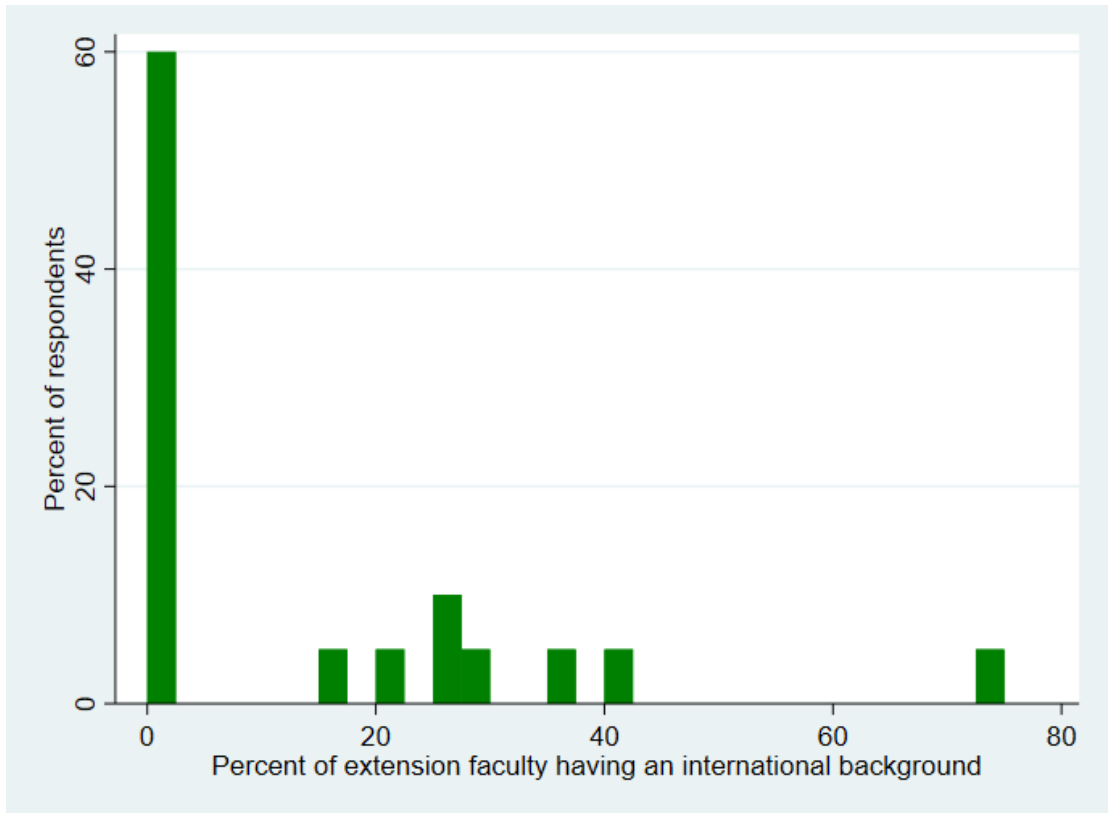
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285 Figure 2 shows that in 60% of surveyed departments, all current tenure-track extension faculty  
 286 are domestic with none having an international background. For the departments with  
 287 international extension faculty, they account for 20-45% of all tenure-track extension faculties.  
 288 Similarly, 80% of department heads reported no international non-tenure-track extension  
 289 faculties.

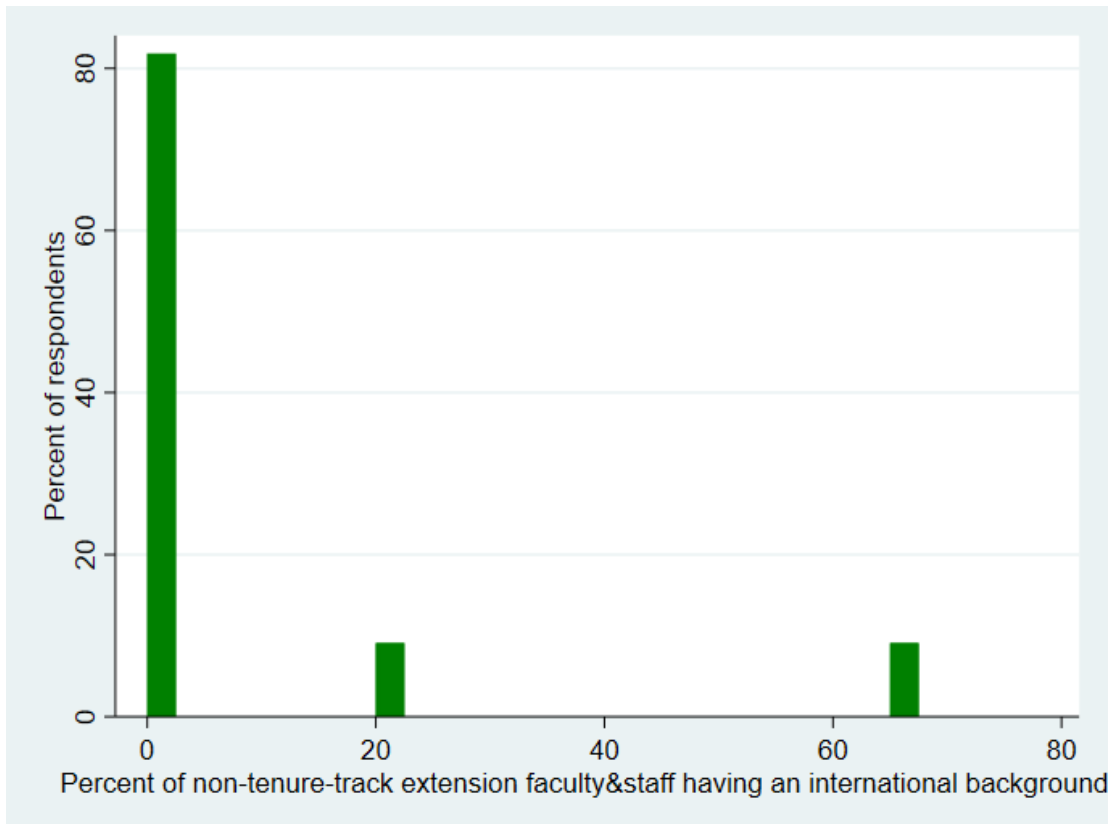
290 The statistics revealed from Figure 2 highlights the missed opportunities for U.S. land grant  
 291 universities to leverage and utilize the talents of international graduate students in fulfilling the  
 292 mission of extension. This creates additional challenges for international graduate students in the  
 293 U.S. job market: although they account for the majority of graduate students in many agricultural  
 294 economics departments, many international graduate students did not receive the training and  
 295 mentoring to effectively compete the extension faculty or staff positions in the job market. In  
 296 many departments, extension faculties do not necessarily teach in graduate classes, and  
 297 sometimes are detached from the research and teaching functions of the departments. For  
 298 international graduate students graduated from land grant universities, many never had a chance  
 299 to know what extension is, let alone participated in extension presentations or other activities. In  
 300 addition, this means that the departments and universities underutilize the talents and experiences  
 301 of international graduate students to help create an inclusive and enriching experience for them.  
 302 International graduate students not only could help provide unique perspectives on international  
 303 trade and international agriculture as the U.S. agriculture increasingly rely on global markets,  
 304 they are often well-versed in burgeoning research and extension topics such as climate change  
 305 and carbon policies, local and sustainable food, adoption of technologies such as precision  
 306 agriculture, and innovation and entrepreneurship in U.S. agriculture.

307

308 **Figure 2. Extension faculty & staff having an international background**



309



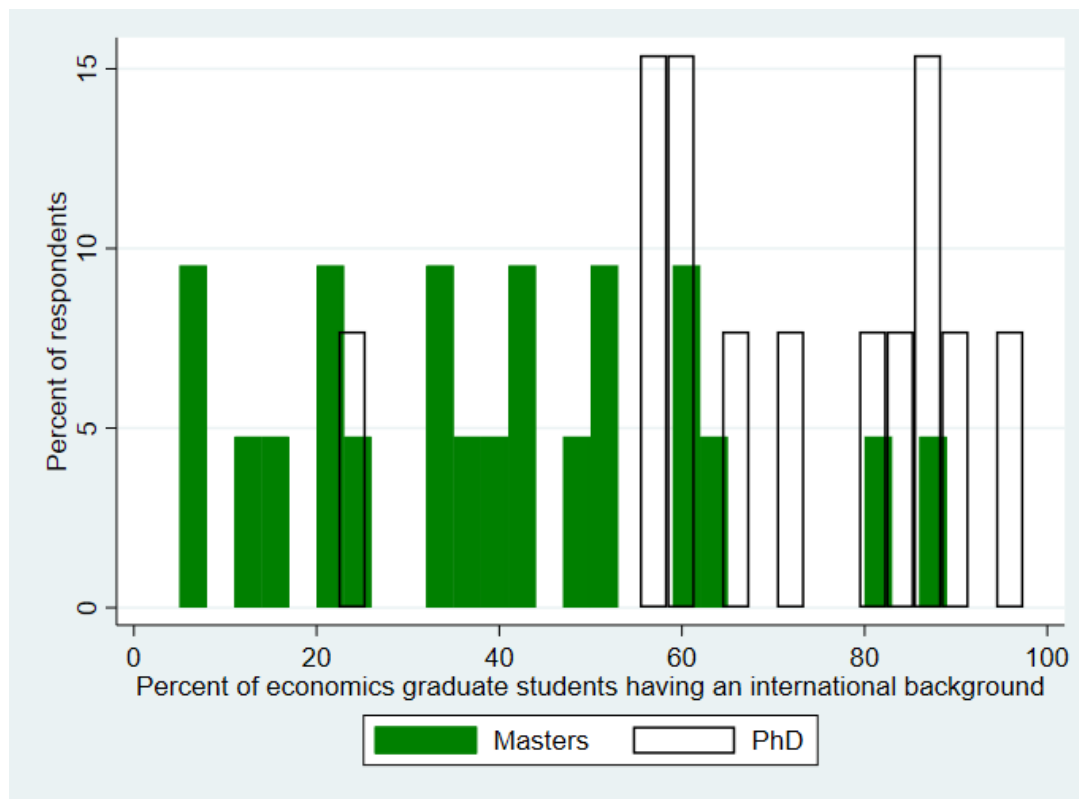
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311 **4.3 Current Graduate Student Pool in the Field of Agricultural Economics**

312 Figure 3 shows the current graduate student pool in the field of agricultural economics and the  
 313 potential of training international graduate students for careers with a component of extension  
 314 and outreach. It shows that while there is a larger variation in the share of Master's students with  
 315 an international background, in most departments over 60% of economics or applied economics  
 316 Ph.D. students are international. The proportion of international students in the Ph.D. program is  
 317 higher than what in the master's program as reported by department heads in the field of  
 318 agricultural and applied economics. Even for the graduate students advised by the extension  
 319 faculty, two-thirds of the respondents reported that over half of their Ph.D. advisees have an  
 320 international background; and one-third of the respondents reported that half of their Master's  
 321 advisees are also from outside the United States. It is also worth noticing that the proportion of  
 322 international students advised by extension faculty, Ph.D. students is higher than the master's  
 323 program. On average, 65% of Ph.D. students and 38% of master's students advised by extension  
 324 faculty are international, and over 50% of extension faculty reported that all their Ph.D. students  
 325 are international.

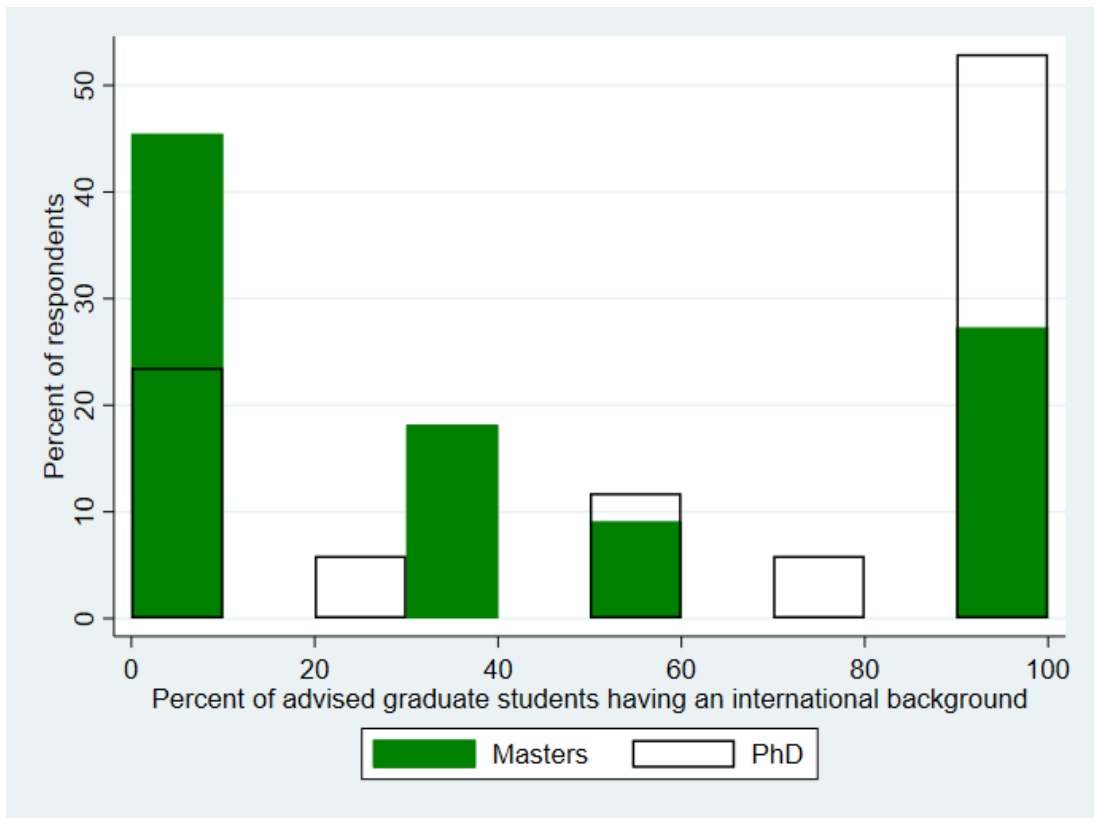
326 Figure 4 shows that very few extension faculties reported past successes in placing graduate  
 327 students in positions with extension appointments. With a low success rate in training and  
 328 placing graduate students in extension, better training in exposing graduate students in extension  
 329 is needed.

330 **Figure 3. Graduate Students with an International Background**



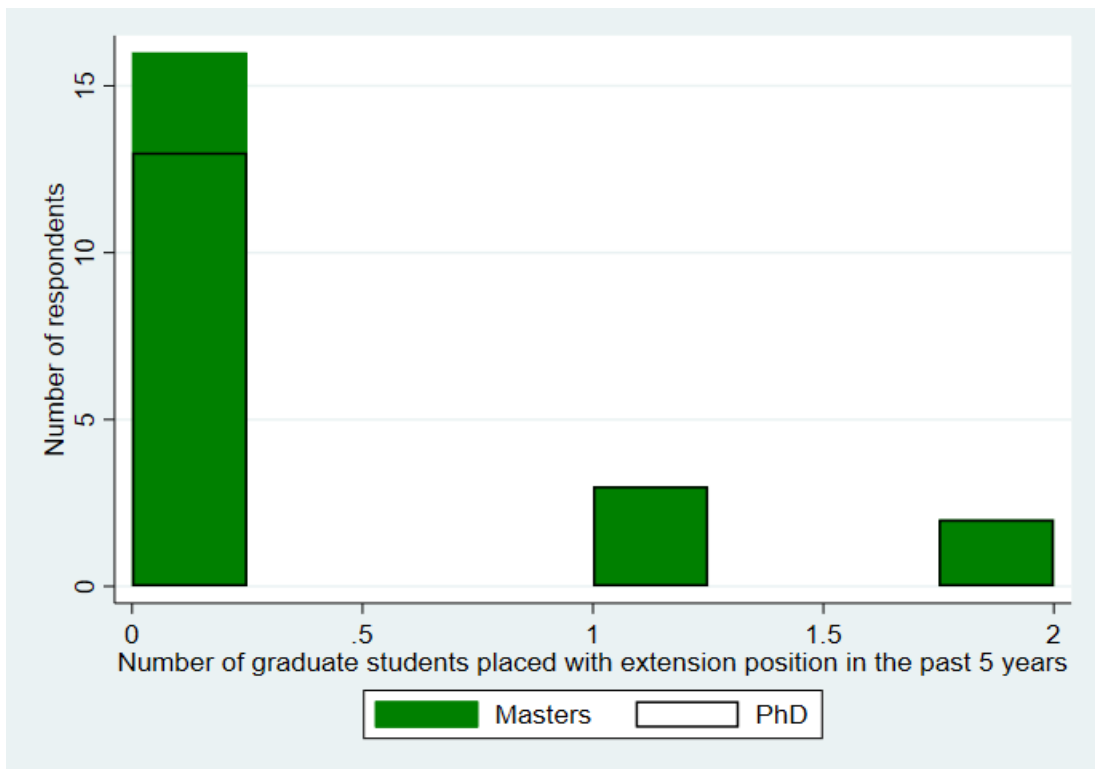
331





332

333 **Figure 4. The number of graduate students placed with an extension position responded by**  
 334 **extension faculty**



335

336 ***4.4 Efforts Taken in Expose Graduate Students in Extension***

337 In our surveys of the department heads and extension faculties, we also specifically asked the  
338 strength of the extension from in their departments and the efforts the departments have taken to  
339 help graduate students pursue a career in Extension. When we surveyed the extension faculty, we  
340 also asked them the share their thoughts about the changes that they would like to see in their  
341 department to further help graduate students pursue a career in extension.

342 Table 3 summarizes the categories considered as the strength of extension programs by both  
343 department heads and extension faculty. Similar viewpoints were observed between extension  
344 faculty and departments, while extension faculty stressed the strong support from the college and  
345 university and funding support in extension as the strength of their extension program. Some  
346 department heads reported that they have a strong extension program supported by a large  
347 number of extension faculty, allowing them to cover all the important subject areas needed by  
348 their stakeholders. However, other department heads shared their current challenges in extension  
349 are either lack of extension positions to support the extension efforts, or the loss of extension  
350 positions at their university. Some extension faculty shared the topic areas as the strength of  
351 their extension programs. These topics include land management, socially disadvantaged and  
352 minority farmers, crop and livestock marketing, environmental externalities, legal issues,  
353 agricultural policy, farm management, business planning, agricultural finance, risk management,  
354 economic development, leadership, and succession planning. Trust and relationship are very  
355 important in extension as one extension faculty shared “Extension is a trusted source of  
356 information, distributed through a diverse network of individuals, organizations, and businesses.”

357 Both department heads and extension faculties stressed the importance of allowing and  
358 encouraging graduate students to present at extension or stakeholder meetings and publish  
359 extension output. Some departments reported funding graduate student participation in  
360 Agricultural and Applied Economics Association (AAEA) extension graduate competition, and  
361 some potentially offer extension-track graduate assistantships.

362 However, both department heads and extension faculty reported the lack of a systematic program  
363 to expose graduate students to career opportunities in extension. Seven of the 17 department  
364 heads who responded to this question stated that they currently don’t have a systematic program  
365 to expose graduate students to career opportunities in extension. Three department heads shared  
366 that they have started putting more effort in exposing graduate students to extension, these  
367 efforts ranging from a formal class, extension-based track graduate program, and more targeted  
368 and individualized mentoring of the graduate student. Sixteen of the 37 extension faculty  
369 responded to this question reported that there is no formal training happens at the department  
370 level in training graduate students towards a career in extension. Extension faculty also made  
371 suggestions about what changes that they would like to see at the department level in training  
372 graduate students in pursuing a career in extension as shown in Table 5.

373

374

375 **Table 3. Categories Considered as the Strength of Extension Program by Department**  
376 **Heads and Extension Faculty**

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**Department Head Reported the Strength of their Extension Program**

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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, engage and collaboration with county agents, modern communication and information dissemination method in extension, scholar basis of the extension program, strong and active research programs in support of extension efforts, multi-state programs in extension and research, interdisciplinary projects and programs, sponsored funding support for the 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 Faculty Reported the Strength of their Extension Program**

---

Good relationship with growers and industry partners, stakeholder engagement, strong reputation across the state, knowledge of the 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 the 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 presents, a mix of online deliverables with in-person meetings.

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377

378 **Table 4. Efforts Taken at the Department Level in Training Graduate Students in**  
379 **Pursuing a Career in Extension Reported by Department Heads and Extension Faculty**

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**Department Head Reported Efforts in Training Graduate Students**

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Student present at extension meetings, student publish extension output, student participation in the editing process of extension publication, mentorship and collaboration with extension faculty, encourage and fund participation students in AAEEA extension competition.

---

**Extension Faculty Reported Efforts in Training Graduate Students**

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Involve students in extension and outreach projects, take students on extension events and 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.

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380

381 **Table 5. Suggested Changes at the Department Level in Training Graduate Students in**  
382 **Pursuing a Career in Extension Reported by Extension Faculty**

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**Extension Faculty Suggested Changes in Training Graduate Students**

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Invite graduate students in extension programs and events, offer seminars or courses on extension work and methods, more exposure of graduate students with extension faculty, continued and/or expanded graduate student funding in extension, emphasize the need in the dissemination of research results, formal extension track for graduate programs, involve graduate students in applied research with extension outreach and stakeholder engagement opportunity, 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

---

**Selected Quotes from Extension Faculty**

---

“I think we need to invest in communication skills and training for our international students. That is often their biggest hurdle -- language and communication skills.”

"More work study students"

“Stipends for graduate students through Extension"

“Offer a seminar on extension work”

"More participation in the AAEA extension competition”

---

383  
384 Our survey also reveals an interesting gap in the challenges reported by department chairs and  
385 extension faculties as shown in Table 6. In particular, the department heads noted the challenges  
386 in recruiting extension faculty and how to balance the need to meet stakeholder needs and the  
387 integration with research and teaching functions of land grant universities. Similar to the  
388 observation by at least one department chair of “leaving extension faculty on an island”, many  
389 surveyed extension faculty commented that extension and their own work are often undervalued  
390 in their department and across the land grant universities. This underappreciation of extension  
391 faculty makes it less appealing in attracting talented graduate students in extension, which could  
392 create a challenge in filling the future positions in extension. One department head recognized  
393 the importance of valuing of their extension faculty as “We strive for a culture in which  
394 Extension faculty are treated and considered as equals with teaching/research faculty.”

395

396 **Table 6. Selected Comments from the Department Head and Extension Faculty about**  
397 **Challenges Faced by Extension Professionals**

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**Selected Comments from the Department Head**

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“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.”

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**Selected Comments from the Extension Faculty**

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“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 grass-roots 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 Ph.D. 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.”

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398

399 ***4.5 International Students' Role in Extension***

400 The surveyed extension faculties were also asked to share thoughts on their perceived roles  
401 international graduate students could play in Extension for the land grant mission, and offer  
402 advice for graduate students, especially international graduate students, interested in careers in  
403 Extension. 15 out of 34 extension faculty responded stated that international students could play  
404 the same role as domestic students in extension. However, extension faculty did recognize the  
405 lack of expressed interest by international students who want to work in extension, making it  
406 difficult to identify and cultivate potential future extension professionals.

407 Extension faculty also recognized the challenges international students face from being less  
408 familiar with agricultural practices and agricultural community systems, limited by language,  
409 culture, lack of knowledge of basic local/state/federal institutions, and lack of knowledge of law  
410 and regulation in the United States. Several also noted that currently many international graduate  
411 students, especially international students, lack a general understanding of the U.S., let alone

412 state, agricultural practices as well as the relevant regulations and institutions. This is particularly  
413 important because many extension positions expect the successful candidates to bring impact to  
414 the farmers and the agricultural or food sector stakeholders in that particular state or region.

415

416 **Table 7. The Roles that International Students could Play in Extension Responded by**  
417 **Extension Faculty**

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### **Role of International Students can Play in Extension**

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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 the U.S. agriculture, bringing different perspectives in engaging diverse audiences, extension programs focus 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**

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“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 US 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.”

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418

419

## 420 **5. Tips for International Graduate Students Interested in Careers in Extension**

421 As for tips for international graduate students interested in careers with Extension, first many  
422 extension faculties stressed the importance of understanding U.S. agriculture and productions  
423 systems to be able to meet the needs of stakeholders of the agricultural community. Extension  
424 faculty suggested that increasing the interaction and involvement of international students with  
425 stakeholders, can help increase the understanding of U.S. agriculture, and training needed for  
426 international students in handling the application of economic theory to U.S. farms. Extension  
427 faculty also suggested exploring international students in the extension activities to increase  
428 international students' understanding of U.S. agriculture and extension functions, such as writing  
429 extension publications, going on field trips, presenting at count production meetings, and  
430 facilitating workshops. Graduate students can actively seek the opportunity to collaborate with  
431 extension faculty in these efforts. Expressing the interests in extension by graduate students to  
432 extension faculty will enable personalized mentoring and coaching.

433 The extension faculty particularly noted the importance of investing in communication skills and  
434 training for international graduate students. Many noted the significance of good oral and written  
435 English communication skills overall, and the value of face-to-face interaction with stakeholders.  
436 Communication skills are the key to the success of extension professionals. It is important for  
437 extension professionals to be able to talk to and relate to target audiences and adjust their  
438 delivery methods to meet the needs of clientele and achieve education purposes.

439 Working in extension, interpersonal skills are critical. Extension professionals are the liaison  
440 between academic, government, and private industry. Interpersonal skills will increase the  
441 success and effectiveness with stakeholders, collaborate with research colleagues to conduct  
442 researches to address the needs of stakeholders, and create value for the agricultural community.  
443 The ability to build strong personal relationships with stakeholders is needed for being a trusted  
444 source of information and increasing the success of building and delivering extension programs.

445 It is also important for international students to acquire key skillset in applied economic research,  
446 which would facilitate the ability to respond rapidly to important issues from stakeholders.  
447 Facing multiple sources of sometimes conflicting information, stakeholders seek unbiased,  
448 research-based information from credible sources (Taylor and Zhang 2019). Extension  
449 professionals can provide unbiased research and Extension programming, which will help  
450 producers and consumers make informed decisions. Stakeholder engagement is a good venue for  
451 research to identify and define researchable questions with real life application, pilot appropriate  
452 test tools, engage in data collections, and receiving constructive feedbacks (Monroe et al. 2015).  
453 Oftentimes, to address the needs of stakeholders, extension professionals need to assemble  
454 research groups, working with researchers both within the discipline and cross-disciplines. The  
455 ability to work with a diverse group of researchers and be a part of multistate or multidisciplinary  
456 teams to tackle the complexity of the agricultural production systems is also needed.

457 As noted by several extension faculties, unfortunately bias will be present and probably more  
458 salient for female, minority and international extension professionals. Many respondents also  
459 stressed the importance of assembling and showcasing the "right signals" for international

460 graduate students when pursuing a position with extension responsibility at job market. The suite  
461 of “right signals” include knowledge of what Extension is and is not, evidence-based  
462 understanding of the agricultural and food sector in the U.S. and preferably a region or state,  
463 solid oral and written English communication skills, strong interpersonal skills, and experiences  
464 in presenting at extension meetings and/or writing extension publications.

465

## 466 **6. Discussion and Conclusion**

467 Our research leveraged two surveys of department heads and Extension faculties in agricultural  
468 economics departments, with the goal of understanding the current challenges faced by extension  
469 and the methods in training talents for the future workforce in extension. Even though extension  
470 is a critical part of the land grant mission, fewer efforts have been put in training graduate  
471 students in extension. Sixteen of the 37 extension faculty expressed the challenges in the  
472 graduate education program that there is no formal training that happens at the department level  
473 in training graduate students towards a career in extension. This brings a challenge for  
474 continuing nurturing talents to fill the needs of land grant extension systems for the field of  
475 agricultural economics.

476 In addition, the student population in terms of domestic and international students changed a lot,  
477 and currently, the proportion of international students in the graduate programs in the field of  
478 agricultural economics outnumbered domestic students. Even though a large proportion of  
479 graduate students in the field of agricultural and applied economics are international, on average,  
480 only 13% of the extension faculty at land grant universities have international backgrounds. Our  
481 research identified the need in changing perception in involving international students in  
482 extension and providing career opportunities for international graduate students in extension.  
483 Over 50% of extension faculty reported that all their Ph.D. students are international students,  
484 and many of these graduate students are currently heavily involved with extension, from  
485 participating in workshops, writing extension publications, to facilitating extension events.

486 Our research also identified the hidden and perceived barriers for international students pursuing  
487 academic Extension careers, and provides tips into appropriate education and training programs  
488 in university graduate curricula to increase the awareness and interests of international students  
489 in Extension. 15 out of 34 extension faculty responded stated that international students could  
490 play the same role as domestic students in extension. The challenges faced by international  
491 students for successful job placement in extension range from lack of understanding of U.S.  
492 agricultural practices and agricultural community systems, limited by language, culture, lack of  
493 knowledge of basic local/state/federal institutions, and lack of knowledge of U.S. law and  
494 regulation. Extension faculty suggested efforts could be taken to explore international graduate  
495 students in extension opportunities to increase their understanding of U.S. agriculture and  
496 productions systems, training students in handling the application of economic theory to U.S.  
497 agriculture, and exploring students in the extension activities to increase international students’  
498 understanding extension functions. These efforts will increase the awareness of international



499 graduate students in extension and provide possible extension career opportunities for  
500 international students.

501

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