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Theme Overview: The Future of Farm Management Extension

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The idea for this *Choices* theme was born out of a strategic planning session held by the North Central Farm Management Extension Committee. We have many issues to deal with in coming years, and giving some thought to and opening discussion of these topics could benefit the entire agricultural economics profession. Change tends to happen gradually in academia, but the demands from the industry for education and engagement can arrive quickly on our doorstep. We have to be ready to meet those needs so we can train the next generation of extension economists and design our programs to remain relevant to our audiences in the face of new and emerging technologies.

The first article in this series describes the farm management audience of the future, its challenges, and its opportunities. Changes are occurring in the demographics of farm and ranch clientele as the producer cohort ages and fewer young people enter the farming profession due to farm consolidation and high costs of entry. With farmers able to farm more acres with less labor, the demands on their time will tighten and extension will have to be flexible to deliver high-quality, timely information. How will technology in education affect program delivery? Will in-person meetings be feasible with smaller audiences and fewer resources for extension at universities? Plastina, Leibold, and Stockton address these questions and discuss future extension audiences and their needs.

The second article addresses the impact of changing technology in agriculture on farm management. Cost economies and the reconfiguration of the value chain are accelerating farm consolidation and structural change in production agriculture. Many economists have described scenarios in which key innovations and technologies could revolutionize business organization and productivity. Langemeier and Shockley address how an individual farm's management team copes with these changes. This article has three main sections: the first highlights major current upcoming technological developments, the second discusses the importance of technological change for productivity and financial performance, and the third discusses challenges faced by farm managers when dealing with new technologies, farm consolidation, and growth.

The third article focuses on training future extension economists for engagement and applied research in the field of farm management. Taylor and Zhang look at the changing faces of extension farm management specialists and recognize that most of our faculty and graduate students do not come from farm and ranch backgrounds. How effectively we recruit professionals for extension positions will depend on our willingness to work with previously nontraditional candidates such as women, minorities, and foreign students. The discussion centers around recruitment, resources, and training for applied research to prepare the next generation of farm management extension professionals.

The series concludes with a unique perspective from three extension directors on the coming changes in farm management extension. Lawrence, Hadley, and Henderson describe the roles of extension specialists in the future and how they will deliver their educational materials. They also discuss future farm management economists and how administrators can actively recruit, incentivize, and support extension faculty in their execution of the land grant mission.

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The Farm Management Extension Audience of 2030

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Introduction

During the halftime of his son's football game, Farmer Brown asks his smartphone for a real-time cost-effectiveness analysis of three alternative treatments to suppress weeds in two acres over the Missouri River, where remote imagery technology identified weed pressure trending up and nearing 90% of the acre- and corn-stage-specific weed threshold. The device calculates real-time partial budget analyses using acre-specific weather forecasts, soil conditions, labor and machinery costs, corn growth stage and projected yields, weed species, and cutting-edge technology to respond with information about the cost-effectiveness of reducing weed pressure to 75%, 80%, and 85% of the threshold as well as leaving it at 90% or letting increase to the threshold before treatment. Mr. Brown activates his remote office via voice recognition and submits a request for the automated system to implement the most cost-effective option. After receiving immediate confirmation that his selection will be implemented within 24 hours, he is ready to continue rooting for his son's team.

This is just one example of the kinds of surprises in the way business and farming will be done that the future likely holds. Producers are likely to use and access education and information differently, making the future both exciting and challenging for farmers and educators.

As thought leaders, land grant universities are tasked with developing forward-looking plans that help them maintain the relevance of research and extension. To meet these responsibilities, universities must identify characteristics of current and future extension clientele and consider the increasing relevance of private–public collaboration.

Current Farm Management Extension Audience

The U.S. Department of Agriculture (2017a) estimates that 90% of U.S. farms are small family farms with an annual gross cash farm income (GCFI) of less than $350,000. These small farms operate half the land operated by all farms but only account for 23% of the value of U.S. agricultural production (U.S. Department of Agriculture, 2017a). In the Corn Belt, a 500-acre corn farm with an average production of 200 bushels/acre at a value of $3.50/bushel would represent the largest possible small farm, with a GFCI of exactly $350,000.

Midsize family farms have an annual GCFI greater than $350,000 but less than $1,000,000. These farms account for about 6% of U.S. farms, operate 21% of U.S. farmland, and account for 23% of the value of all production (U.S. Department of Agriculture, 2017a). Given the same yield and market price for corn, a 1,428-acre corn farm would be the largest possible midsize farm in the Corn Belt. Small and midsize farms account for a declining share of production and, especially, cropland (MacDonald, Hoppe, and Newton, 2018), due mainly to the introduction of labor- and time-saving technologies such as larger field machinery and precision agriculture equipment (MacDonald, Korb, and Hoppe, 2013; Sumner, 2014; Schimmelpfennig, 2016) and productivity-enhancing confinement feeding practices for livestock production (Allen and Lueck, 2002; McBride and Key, 2013; MacDonald, 2014) with high fixed costs that favor consolidation in agricultural production.

Large-scale family farms with annual GCFI of at least $1,000,000 account for 3% of all U.S. farms and generate 45% of the value of production (U.S. Department of Agriculture, 2017a). Obviously, these farms are all larger than the midsize farms, which, continuing our example, would be those corn farms in the Corn Belt of more than 1,428 acres. According to the 2017 Census of Agriculture, the number of farms with market value of agricultural products sold and government payments totaling at least $1,000,000 declined by 2.8%, while their aggregate receipts increased by 2.0% between 2012 and 2017.

Based on anecdotal evidence, the 2019 farm management extension audience and clientele in the North-Central Region could be characterized as primarily small and midsize commercial farmers and ranchers who own a substantial portion of the acres they operate and tend to specialize in cash crops such as corn, soybean, and/or small grains (primarily wheat) or in livestock production, including hogs and pigs, beef cattle and calves, chickens for eggs, or dairy (U.S. Department of Agriculture, 2017b). In addition to producers, other industry-related individuals participating in farm management extension programs include nonoperating landowners, agricultural lenders, input and technology suppliers, and custom service providers, which jointly account for about one-third of the total audience. Other relevant stakeholders and participants include commodity groups, farm organizations, regulatory groups, and related government agencies. The areas of farm management extension services in highest demand are typically those related to farm financing, marketing, and leasing.

Anecdotal evidence from extension program evaluations suggests that more than half of the farm management extension audience in the North-Central region are white males at least 65 years old. However, recent extension surveys indicate that an increasing number of senior women as well as male and female farmers in their 20s have joined the ranks. A double-hump type of age distribution presents several challenges to the delivery of educational programs, such as participants' preference for in-person versus online/virtual presentations or workshops. The "dip in the middle" of the age distribution (30–50-year-olds), is believed to be a by-product of the farm crisis of the 1980s. The population tends to be highly educated and to rely on off-farm work for income or to provide supplemental benefits to the farm business.

Only a small fraction of the current farm management extension audience (on topics other than farmland leasing) comes from urban settings. This group is generally interested in horticulture, and extension programming for this group is usually delivered through local service groups such as Kiwanis, Lions, and Rotary clubs.

The more commercial and "larger" the farm, the more likely it is to employ consultants or professionals to make management decisions rather than relying on land grant university extension services. However, ag consultants typically update their knowledge base through educational programs organized by extension services, providing an indirect link between extension and large and commercial farms.

Face-to-face meetings and field days are the most dominant method of extension program delivery nowadays, followed by published materials, both printed and online as well as topical websites. While online video streams, webinars, and virtual conferencing (such as Zoom and Skype) are becoming more common, they remain unpopular with a large portion of the extension audience (Arbuckle, 2017).

Characteristics of the Farm Management Extension Audience by 2030

As long as efficiency gains, returns to specialization, technology intensity, production complexity, and capital intensity continue to increase (MacDonald, Hoppe, and Newton, 2018), farm consolidation should be expected to continue. Small and midsize family farms will represent a smaller share of total farmers, a diminishing share of the value of farm production, and a smaller audience for farm management extension programs. The enterprises least affected by consolidation over the last three decades are cattle (excluding feedlots) and hay production, pasture, and rangeland (MacDonald, Hoppe, and Newton, 2018). Provided no major technological breakthrough or structural change in the U.S. cattle market occurs by 2030 to accelerate consolidation, it seems logical to expect a rebalancing of extension programs in favor of these enterprises and against those programs targeting the more consolidated productions.

The extension audience is likely to see an increased share of a younger clientele, with increased participation among women and a wider focus on more diverse interests, including a mix of farm management, agribusiness, and agricultural development. The "dip in the middle" of the age distribution will fill as parents pass away. Furthermore, we anticipate that the share of technology suppliers, lenders, and other related industries will increase among extension stakeholders as well as consumers. While the first group will be served by extension through "train the trainer" programs, consumers will be more interested in learning directly about food, fiber, and fuel production, the sustainability of production methods, and the linkages between food production, water quality, and health. Direct communication with consumers through social media or nonfarm specialized outlets will present an opportunity to raise societal awareness about challenges and opportunities faced by farmers and to increase the footprint of farm management extension economists.

With the arrival of new technologies and the adoption of improved versions of existing technologies (i.e., variable rate applicators, planting units and irrigation equipment, robots in vegetable and horticulture production), fewer hours of direct field work will be required from a more specialized labor force, who will likely have to become conversant in the technology as much as in production biology. Farm operators would need to keep up with technological developments affecting the flow of farm data (i.e., data generation, transmission, storage, security, ownership, uses, and potential misuses) as well as technological developments affecting their production practices. The additional training will likely involve frequent updates from the usual technology providers (seed, chemical, and machinery dealers) and a currently incipient industry of ag-specific hardware and software providers for integrated production–marketing–financial decision making. This comparatively more skilled future farm labor force would face more opportunities to diversify income sources. Farmers willing to devote themselves full-time to farming will be able to diversify their income through the provision of precision ag services and custom farming for nonoperator landowners and through crop-share leases and consultancies to other operators, especially part-time farmers. Farmers with access to new technologies, a network of consultants and custom service providers, and high earning potential in off-farm careers will likely be able to successfully farm on a part-time basis either on their own by hiring custom farming services or through shared-risk arrangements with full-time farmers. Additionally, if farmers are able to claim and keep ownership of the data generated on their farms, selling such data might become a nontrivial source of farm income for both full- and part-time farmers. Farm management extension services for the comparatively more skilled future farm labor force will likely have an increased focus on providing objective information about alternative technologies and their relative cost-effectiveness to achieve different goals. Another increasingly relevant role for farm management extension economists will be to provide background information and conceptual framework of analysis for companies developing technologies for the ag sector from a knowledge base deeply rooted in non-ag industries.

Notably, the demand for specialized technicians, engineers, and other professionals who provide on-farm and off-farm services will likely increase. Widespread broadband access and improving sensors and automated systems will result in added flexibility to remotely control and manage an increasing number of acres and animals using more mechanized farming and ranching methods (e.g., through driverless machines and robotic milkers). Consequently, the traditional in-person delivery of farm management extension education programs will become less effective and relatively more costly than online delivery methods.

Private–Public Collaborations Key to Future Extension Services

The 2017 Census of Agriculture reports that the share of U.S. farms with Internet access rose from 69.6% in 2012 to 75.4% in 2017. A higher prevalence of larger farms with better access to wireless services will attract private initiatives to develop progressively more encompassing and integrated platforms to help farmers make, first, mostly tactical decisions (such as choice and timing of inputs depending on weather forecasts, futures crop prices, and local input prices) and eventually strategic decisions (such as choosing the mix of enterprises to reach the operator's long-term financial goals). By principle, land grant universities are expected to avoid crowding out the development of integrated production–marketing–financial platforms by private profit-seeking entrepreneurs. Generalized adoption of encompassing farm management software targeting profit maximization subject to binding conservation rules, through data-driven production, marketing, and financial recommendations is expected to empower farm managers and supporting professionals. To continue to fulfill the land grant mission "to extend information and increase the success of its stakeholders," farm management extension programs will need to provide objective guidance on how to select an integrated production–marketing–financial platform that best

fits a particular farming or ranching operation. However, patents and intellectual property rights on such platforms will constitute a barrier to the evaluation of the algorithms used to generate management recommendations. Unless land grant universities develop long-term collaborative programs with private companies servicing the demand for integrated farm management software that allows them to evaluate and compare platforms beyond the "black box system" stage, the role of extension educators in this area will be limited to merely reproducing the advertised benefits of each platform in an echo chamber.

Farm management software companies collecting and analyzing in real-time big data generated by their clients will likely complement their tailored recommendations to each client with production and financial benchmarks derived from aggregating data across clusters of similar farms. Furthermore, 24/7 online customer support services remotely located will likely be available to help clients interpret and use those benchmarks. In turn, such benchmarks in real time might make current efforts to aggregate and analyze farm level data collected by farm management associations and land grant universities obsolete or cost-ineffective. Without access to local farm financial benchmarks, farm management extension educators would not be able to contextualize farm production and marketing recommendations, damaging their credibility. This is another reason to act proactively in developing the long-term relationships with private farm management software developers. A potentially mutually beneficial agreement between farm management software developers and land grant universities is the exchange of anonymized farm level data for cutting-edge analyses of long-term trends, spatial analysis of financial information and agricultural productivity, and cost-benefit analysis for alternative farm management recommendations across similar groups of farms in such a way that the aggregated results could inform the general public and serve the public good.

Finally, the generalized adoption of integrated farm management platforms will reduce the need for stand-alone tools to help farmers make marginal management decisions (such as selecting the most cost-effective ration for hogs, an optimal seeding rate, a crop insurance policy, or a government program) and enhance the need for delivery of macro and sectoral analysis, to help farmers put the recommendations received from the online farm management platforms in context and help them evaluate and set long-term goals and keep track of their strategic decisions. Extension farm management educators will likely need to broaden the scope of their analyses and education programs to add sectoral, national, and international elements to the traditional farm-level approach.

A critical element for the effective delivery of extension services is championing engagement of the many different audiences, which is expected to become more challenging based on the weakening of the typical instructor-student paradigm and the increase in competition for attention from all kinds of media. One innovative program that could become a leading case to promote stakeholder engagement is the Testing Agriculture Performance Solutions (TAPS) program. This long-term program created and run by the University of Nebraska (UNL) allows UNL scientists and extension professionals, producers, industry people, agriculture students, government regulators, and agency personnel to interact in real-life farm management competitions and simulations to promote efficiency, profitability, and sustainability of agriculture production (https://taps.unl.edu/).

Concluding Comments

Land grant universities hold a trusted brand in the agriculture sector and have been a source of reliable and unbiased information for a long time. However, ongoing population, sociological, and technological trends are undermining the relevance of extension services as we know them. The future of farm management extension is tied to the future of technology in that producers and suppliers alike lack the ability to test, practice, and evaluate new technologies, systems, methods, or tools without a degree of bias and risk. Land grant universities by their very nature are ideal places to provide the environment and create an entrepreneurial space where this can happen. Land grant systems have been created to be sources of knowledge and information and have historically been the power to drive education and change. However, in the current information age they find themselves with increased competition that could threaten their survival if the necessary private–public collaborations fail to prosper.

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Impact of Emerging Technology on Farm Management

Michael Langemeier and Jordan Shockley
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Introduction

Cost economies and the reconfiguration of the value chain are accelerating farm consolidation and structural change in production agriculture. In addition, many economists have described scenarios in which key innovations and technologies could revolutionize business organization and productivity. How does an individual farm's management team cope with these changes?

This paper will have three main sections. The first section will briefly describe current and upcoming technological developments. The second section will discuss the importance of technological change to productivity and financial performance. The third section will describe the challenges faced by farm managers and extension economists when dealing with the technologies described in the first section of the paper.

Technological Developments

Several technologies are on the cusp of being rapidly adopted by businesses and farms. Brynjolfsson and McAfee (2014) refer to this new technology revolution that individuals and businesses are facing as the second machine age. Baily et al. (2013) discuss technological innovations that are going to transform manufacturing. These transformations will also have important ramifications for agriculture. On-going technologies include enhanced broadband access, precision farming technologies, robotics and automation, artificial intelligence, 3-D printing, and big data and the internet of things. Several of these technologies are further discussed below.

Precision farming technologies take advantage of information technology and allow farmers to collect and utilize precise data about their fields and animals (Lowenberg-DeBoer, 2015). Schimmelpfennig (2016) notes that precision agriculture and information technologies such as soil and yield maps, automated guidance systems, and variable rate input applications allow farmers to fine-tune their production practices. The author notes that precision agriculture technologies were used on 30 to 50 percent of corn and soybean farms in 2010-2012. Adoption was positively related to farm size. Soil and yield maps, automated guidance systems, and variable-rate input applications had small, but positive, impacts on net returns and operating profits. In addition to improving profits, precision agriculture technologies can promote stewardship or best management practices (Schimmelpfennig, 2018). However, adoption of precision agriculture technologies, in some cases, may raise operating costs. Thompson et al. (2019) evaluated farmers' perspectives of key precision agriculture technologies such as variable rate fertilizer and seed applications, yield monitors, automated guidance systems, precision soil sampling, drones, and satellite imagery. Eighty-eight percent of the farmers surveyed agreed that precision farming technologies and services are important contributors to their farm's current financial profitability.

In addition to contributing to financial profitability, precision farming technologies influence risk, and machinery and land management. Shockley et al. (2011) revealed how automated guidance systems allowed producers to plant more acres at the optimal time, therefore reducing production risk and income variability. Shockley et al. (2012) highlighted how automated guidance systems allow for the purchase of smaller machinery while increasing

net returns and lowering machinery costs. Furthermore, the authors discussed how automated guidance systems can be purchased in lieu of larger machinery to support land expansion.

Chui et al. (2016) indicate that automation, which includes robotics, will not necessarily eliminate entire occupations over the next decade. However, automation is likely to affect portions of almost all jobs. The authors identify three groups of occupational activities: those that are highly susceptible to automation, less susceptible to automation, and least susceptible to automation. Highly susceptible technologies include data processing and predictable physical work. Least susceptible technologies include personnel management and decision-making, planning, and creative tasks. At least a portion of the activities in production agriculture fit into the data processing and predictable physical work categories. One example of automation that is widely spreading is robotic milkers (Salfer et al., 2017).

3-D printing also has important implications for production agriculture. 3-D printers will allow machinery dealers and producers to manufacture spare parts on-site. This technology will likely change how we think about manufacturing batch size and inventories, and will allow parts to be just-in-time, which could substantially reduce machine downtime.

Big data involves the use and analysis of massive volumes of data emanating from yield maps and similar technologies for decision making. The use of big data tools in production agriculture will likely influence the nature of competition and inter-firm relationships (Sonka, 2016). Value is expected to be created through the application of tools to measure and monitor activities; data analytics, which can integrate and analyze data from multiple sources; and the creation of data sources that can help mitigate detrimental environmental effects. Big data will likely reconfigure the value chain creating opportunities for farms to add value.

Technological Change as a Driver of Productivity and Financial Performance

Production agriculture has been substituting capital for labor for decades (Wang et al., 2018). From 1948 to 2015, output growth (1.48 percent per year) was almost entirely due to total factor productivity growth (1.38 percent per year). Over the 1948 to 2015 period, output tripled, but labor and land declined by 75 and 24 percent, respectively. By comparison, intermediate and capital inputs (excluding land) grew by 134 percent and 78 percent, respectively.

Another way to think about the large change in output growth (1.48 percent per year) in relation to the small change in input growth (0.10 percent per year) is that farms are obtaining increasingly higher aggregate output levels using a similar level of aggregate inputs. In other words, the production frontier is shifting upward. Mugera et al. (2016) illustrate the large shift in the production frontier for a sample of farms from 1993 to 2010. Due to their inability to keep up with farms on the production frontier, many of the sample farms saw their relative efficiency decline over the sample period. Despite adopting new technologies, these farms are falling further behind their counterparts. Yeager and Langemeier (2011) examined changes in productivity over a 30-year period (1979 to 2008) for a sample of farms, and determined whether there was convergence or divergence among the farms. Results indicated there was significant divergence in productivity among farms. Farms in the top one-third in terms of productivity had an annual productivity increase that was almost four percent higher than that for farms in the bottom one-third. Differences in productivity among the top one-third and bottom one-third groups was due to both efficiency change (i.e., ability to catch-up) and technical or technological change (i.e., shifts in the production frontier).

Yeager and Langemeier (2009) examined sustained competitive advantage for a sample of Kansas farms for a 20-year period (1988 to 2007). As with productivity, differences in economic efficiency and financial performance among farms is substantial. Economic efficiency was over 50 percent higher for farms with above average efficiency indices than it was for farms with below average efficiency indices. The average operating profit margin for the above average group was 0.212 compared to a ratio of -0.024 for the below average group. Snider and Langemeier (2009) examined the changing structure of Kansas farms. Convergence analysis was used to determine whether small farms were catching up to larger farms or whether the difference in financial performance between

groups of farms was widening. Results provided evidence of divergence in terms of farm size and financial performance between small and large farms. The larger farms were growing more rapidly than smaller farms. Moreover, their relative financial performance was improving over time.

MacDonald et al. (2018) examine the shift of agricultural production to larger farming operations. The authors note that consolidation has been persistent, widespread, and pronounced in crop production. Structural change has also been rapid for the dairy, laying hen, and swine industries. MacDonald et al. (2013) and MacDonald et al. (2018) indicate that technology has played a major role in crop and livestock consolidation. Technologies have often been labor saving and capital using. Moreover, technology has also allowed capable managers to expand and operate larger businesses.

Langemeier and Boehlje (2017) note that large farms may be better positioned to adopt new technologies. Large farms tend to have higher profit margins and retained earnings, increasing the speed with which they can adopt new technologies with benefits that exceed their costs. Larger farms also have the ability to assign one or more individuals specifically to the adoption of new technology.

The upward shift in the production frontier and the divergence in financial performance noted above will almost certainly continue. Indeed, as noted above, many individuals suggest that we are on the cusp of another technology revolution (Brynjolfsson and McAfee, 2014). Thus, it is imperative that technology adoption and its impact on financial performance be on the radar of a farm's management team. One of the ways to do this is to conduct an assessment of farm's management team skill set associated with the adoption of new technology. For example, does the farm use technology that provides the most efficient use of inputs? Do the operators improve their production skills through interactions with similar operations and by attending technology and production workshops? Does the farm identify, monitor, and benchmark key production efficiency measures? Are written equipment and facility replacement plans updated at least annually? Management skill assessment is more fully discussed below.

With the increased importance of technology adoption and business management, it is imperative that extension continues to update farm financial performance standards (Farm Financial Standards Task Force, 2017) and key financial performance benchmarks (FINBIN, University of Minnesota, 2018). These standards and performance metrics allow producers to analyze the impact of adopting specific technologies and management strategies. Spreadsheet tools involving partial budgets, enterprise budgets, financial analysis, and capital budgeting are regularly updated by extension economists and can be utilized in conjunction with educational efforts or as stand-alone tools for producers that are familiar with these concepts. Griffin et al. (2018) provide a resource for evaluating the economics of precision farming technologies, the appropriate methods to determine return on investment, and managing economic risk with precision farming technologies.

Farm Management in a Rapidly Changing Environment

Extension has a long history regarding technology transfer in production agriculture. The plethora of potential new technologies and the increasing role of business management as farm size increases augment the importance of lifetime learning. Extension continues to have an important role in transferring knowledge. The analysis of new technology adoption and the teaching of business management skills will require educational opportunities that are in-depth or involve multiple meetings, webinars, or distance education modules. It is important to note that more training is available from agribusinesses and trade associations than in the past. However, extension remains a trusted source of unbiased information. In many cases, agribusinesses and trade associations are interested in partnering with extension economists when delivering programs.

Educational needs pertaining to technology adoption are manifold. However, there are several management areas such as business planning, transition planning, personnel management, financial analysis, capital budgeting, and management skill assessment that will be essential. The components of a business plan include a strategic plan, an operations plan, a marketing plan, a personnel plan, and a financial plan. Strategic planning involves the articulation of goals and mission, and the determination on whether a farm is going to pursue a low cost or product differentiation strategy. Historically, pursuing a low cost strategy has been very common for farms. As

value added opportunities arise, it is also important to evaluate whether a product differentiation strategy would be more beneficial to a farm than the low cost strategy.

Extension farm management personnel have expanded educational efforts pertaining to transition planning in recent years. When transferring a farm business, it is important to analyze the feasibility and profitability of adding one or more family members, and to determine how management responsibilities will be shared (Kay et al., 2015).

In addition to business planning and transition planning, many farms have limited experience managing personnel, computing accrual net farm income and financial performance ratios, and with the use of capital budgeting tools. In the authors' experiences, evaluating investments using capital budgeting tools is one of the largest skill gaps in production agriculture. Given the importance of evaluating potential new technologies, and the fact that this topic is typically not addressed by others providing training to farmers (i.e., agribusinesses and trade associations), extension has a role in improving this skill set. Resources such as Griffin et al. (2018) can be utilized to aid in the educational efforts of evaluating potential new technologies.

As capital and technology become an increasingly important part of the resources utilized on farms, assessing management gaps becomes essential. One of the tools that can be used to assess management gaps is to use management assessment scorecards. Financial management skills such as computing and analyzing key performance measures, utilizing partial and enterprise budgets, using capital budgeting tools, analyzing competitive terms for loans, and setting policies for withdrawals of capital and the division of earnings need to be assessed. If any of these skills is relatively weak, the farm will either need to engage in professional development or obtain the skill from an outside party. Similarly, examining strategic positioning skills is important. These skills include identifying key resources and factors critical to success, capitalizing on new and emerging markets, assessing the farm's strengths and weaknesses, and utilizing action plans and equipment and facility replacement plans.

The challenges pertaining to management gaps are exasperated by current farm organization. Sole proprietors and partnerships are still very common. For many reasons, including problems associated with wearing numerous management hats, these farms tend to focus on tactical or day-to-day management issues. As farms continue to grow, particularly in an environment in which technology and market opportunities are rapidly changing, strategic management becomes just as important if not more important than tactical management.

Due to different learning styles and resource constraints, educational methods will need to be diverse. There is still demand for traditional extension meetings. However, many of the topics that will need to be addressed, due to the complexity of the topics and time needed to learn the concepts, are better suited to workshops spread over several weeks, webinars, and distance education. The nature of the topics place a premium on programs that extend beyond state boundaries, and the involvement of multiple economists with various specialty areas.

Concluding Comments

This paper discussed emerging technologies and their impact on farm management. The better utilization of current technologies and the adoption of new technologies will create opportunities for production agriculture to improve productivity and efficiency, while reducing economic risks. These changes will make it imperative that farms more fully utilize skills pertaining to business planning, transition planning, personnel management, financial analysis, capital budgeting, and management skill assessment.

What does the surge of potential technologies that may be used in production agriculture mean for extension programming? First, the demand for in-depth programs that discuss how to evaluate the adoption of new technologies will increase. Second, programs will need to address the differences in farm management educational backgrounds. Both basic and advanced programs will be needed. Third, given financial constraints, programs that effectively reach large audiences in a timely fashion such as webinars and distance education will be important. Fourth, given that a growing share of agribusiness personnel do not have a strong production agriculture background, this audience will also be seeking farm management educational opportunities.

The points pertaining to extension programming noted above are not necessarily new. Extension farm management has a rich history of discussing topics such as technology adoption and financial management with farms, ranches, and agribusinesses. However, there are far fewer farm management extension economists today than there was two or three decades ago. Productivity is not just important to farms and agribusinesses. Extension farm management economists will need to keep improving their productivity with regard to program delivery and impact to be effective.

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Training the Next Generation of Extension Economists

Mykel Taylor and Wendong Zhang

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Since its inception in the Smith–Lever Act of 1914, Extension has been a hallmark of the tripartite mission of U.S. land grant universities. In fact, arguably, Extension is a globally unique feature of the U.S. public universities that provide practical higher education opportunities to the public (Rasmussen, 1989; Gould, Steele, and Woodrum, 2014). Through the Cooperative Extension System, a unique partnership among federal, state, and county governments allows "useful and practical" researched-based knowledge to be disseminated beyond the campuses of various land grant universities to farmers, ranchers, and consumers. However, this century-old cooperative system is at a critical inflection point, facing both challenges and opportunities.

The first challenge involves hiring and replacing Extension economists under dwindling Extension funding and declining rural populations. By law, 80% of the Smith–Lever funds are allocated in proportion to the state's relative share of rural and farm population (Thomson, 1984). As a result, on an annual basis, the Smith–Lever Act provides more funds to states with a higher percentage of rural and farm population. While turnover in the workplace, due to retirements, is a common challenge faced by many universities, the replacement of Extension economists poses a unique challenge to agricultural and applied economics departments, which must consider both internal needs and those of the external constituent base. In particular, many Extension economist positions require extensive knowledge and firsthand experience in agricultural production and/or agribusiness. With farm and ranch numbers declining, so too are the numbers of people coming from the farm or rural America into academia. This poses numerous questions: Does this decrease in the number of people with experience in the agricultural sector mean that universities will have trouble serving their Extension constituents with qualified persons? Can universities look to other sources to fill these Extension positions? How can universities train people to fill those needs?

The second challenge is related to responding to increasing competition from private outlets and growing demand for new, responsive Extension programs from producers, policy makers, agribusiness, and consumers. Extension faces unprecedented competition in the information marketplace (King, 2018). The increasing competition comes not only from companies in the broader agriculture and food industry but also from information titans such as Google, Apple, Facebook, and Amazon. With competing information more readily available, what is the best strategy for Extension to compete and thrive in this new information age? At the same time, demand for Extension programming continues to expand in all areas, including many consumer-driven topics such as food safety and nutrition, the environmental impacts of agriculture, agricultural trade, and animal welfare. There is also great demand for Extension economists to provide well-reasoned but often rapid responses to proposed legislation, regulation, or policies. This calls for new expertise in the Extension workforce to cover these topics of growing interest.

This perspective piece analyzes the challenges and opportunities surrounding the recruitment, training, and evaluation of future Extension economists. We argue that a more modern, inclusive, and diversified workforce, responsive to the needs of producers, industry, and consumers, is key for the success of Extension for the next century. In particular, we advocate for the recruitment and hiring of more women, underrepresented groups, and international Extension economists, more creative training of graduate students for Extension positions, and better

integration of Extension economists within agricultural economics departments, colleges of agriculture, and county-based Extension systems.

Recruiting for the Future: A More Modern, Inclusive, and Diversified Workforce

Women landowners play significant and increasing roles in U.S. agriculture—almost half of the land across the United States is owned by women. The 2014 USDA Tenure, Ownership and Transition of Agricultural Land (TOTAL) survey shows that over 76% of land with a female nonoperator landowner is controlled by someone older than 65 (Bigelow, Borchers, and Hubbs, 2016). However, despite an increasing number of women in agriculture programs across the land grant universities, women producers, especially senior women landowners, represent a significantly overlooked group in federal and state data collection as well as in Extension programming. This is historically at odds with the original intent of the Smith–Lever Act, which included family and consumer sciences and had been referred to as the first piece of federal legislation with direct benefits for women.

A key obstacle is lack of representation of women Extension economists. According to the American Economic Association's Committee on the Status of Women in the Economics Profession, only one in five tenure-track economics professors is a woman (Tankersley and Scheiber, 2018). Arguably, the lack of women Extension economists for both tenure-track faculty and field specialists is even more pronounced. This disconnect will be increasingly significant in the future. For example, Iowa data show that 14% of all land in Iowa is currently owned by a woman landowner who is at least 80 years old. Of these landowners, 82% currently do not farm, and 12% live out of state (Zhang, Plastina, and Sawadgo 2018), highlighting the urgent and growing need to serve women producers and women landowners. A particularly effective strategy would be more women Extension economists.

The 2012 Census of Agriculture shows that 95% and 86% of U.S. farms are currently operated by a white or male principal producer, respectively (USDA, 2014), suggesting that U.S. agriculture is still a white- and male-dominated industry. In spite of this, the recent U.S.–China trade war serves as a perfect reminder of the importance of international markets for U.S. agriculture (Balistreri et al., 2018). USDA Foreign Agriculture Service data show that more than 20% of U.S. agricultural products are sold to foreign countries (USDA FAS, 2017). The Brookings Institution also forecasted an unprecedented expansion of the global middle class, with Asians representing 88% of the next billion entrants into the middle class (Kharas, 2017). In sum, U.S. agriculture will continue to rely heavily on international demand, which suggests greater demand for Extension programming to help producers and consumers better understand these international markets.

The diversified workforce also calls for more representation of other underrepresented groups, including people with disabilities, African Americans, Hispanics, American Indians, and socially and economically disadvantaged groups such as beginning farmers and ranchers. For example, in many states, a growing share of agricultural laborers, producers, Master Gardeners, and consumers are Hispanics, but they remain underrepresented in science and economics education and the Extension workforce. According to the latest Census Bureau projections, minorities will account for 56% of the U.S. population by 2060. The largest growth is projected in the numbers of Hispanics, Asians, and persons of multiple races. The Extension workforce for the future needs to be responsive to these long-term trends.

Furthermore, many economics and agricultural economics graduate programs are populated by a majority of international students. As these graduates look for employment opportunities upon completion of their graduate work, they are finding many Extension positions open but have little understanding of or training in how to compete for these jobs. Encouraging international students to consider Extension positions is key to increasing their interest and willingness to be trained. International students also bring unique skills to the table that may enhance their effectiveness as Extension economists. As trade grows in importance in agriculture, their understanding of foreign markets is useful. In addition, despite their limited knowledge of U.S. production agriculture, many international students have expertise in topics of growing interest, including environmental impacts of agricultural production, animal welfare, food safety and nutrition, and adoption of new technologies. Of course, the largest challenge to international students when it comes to Extension is the language barrier. Good

communication skills, both written and oral, are key to a successful Extension program. International students with these skills will be especially competitive in other job markets.

University departments have been diversifying for decades. As we look around, we see colleagues of both genders coming from many different backgrounds, both domestic and international. However, the Extension portion of our faculty is only just beginning to diversify. Within the last 10 years, diverse applicants have been hired into the traditional Extension fields of farm management, policy, and marketing. Continuing this trend, through recruitment and training, is vital to the continued success of Extension economists throughout the country.

Currently, when a new Extension economist is hired, the priority is often to find a person whose area of expertise resembles that of individual retiring. While this can help smooth the transition, a rigid hiring strategy focused on the past could miss opportunities to shape the Extension workforce for the future, which arguably requires greater representation of women, underrepresented groups, and international Extension economists. In other words, if the previous and current image of Extension looks like producers, the future Extension workforce increasingly resembles consumers.

Can Extension Still Make a Difference amid Growing Private Competition?

Extension faces unprecedented competition in the information marketplace. Although this is not a new concern, today's Extension competitors are no longer an abstract potential. The competition is at least twofold: First, private agricultural companies increasingly leverage big data and artificial intelligence to provide competing resources and information for producers. Second, new players such as Google, Apple, Amazon, and Facebook provide a more readily available and disruptive platform for information that exerts growing influence on Extension's current and underserved clients. With the development of better remote sensing technology, artificial intelligence, robotics, drone technology, and sensors, many nonagricultural firms are expanding their footprint in agricultural sectors. Arguably, some of the information featured on these newer platforms is produced by Extension systems, but producers and consumers are increasingly less aware of this linkage. Too often, Extension faculty and leadership myopically focus on specific information technologies themselves rather than the impact those technologies might have (King, 2018). In particular, many focus on the time and monetary constraint in adopting new technologies as opposed to the potential learning gains for clients and the opportunity to reach underserved clients. The public's growing concerns about food quality issues such as GMO technology as well as the water quality impacts of agricultural production are two examples that require innovative approaches in Extension programming.

A key strength of Extension is the strong connection with research in land grant universities and unbiased, research-based information. Producers and consumers now often see multiple sources of sometimes conflicting information on the same topic and struggle to discern and distill information. A way forward for Extension economists is to serve as the "screener" or "gatekeeper" of information and news without commercial or political bias. Sticking to the research-based, unbiased nature of Extension programming will also help producers and consumers make informed decisions by advancing the applications of research. The mission of Extension to serve the entire public rather than a select few has significant implications right now, when more resourceful producers and multinational agricultural firms can invest in newer technologies, creating greater challenges for beginning farmers and underprivileged producers in competing with their peers. However, this requires Extension leadership, faculty, and specialists to be more agile in adapting to newer technologies, systems, and paradigms.

Effective Extension education is built on trust and relationships. Even in the social media age, reputation and trust are important to followers. It takes time and sound, research-based analysis to build trust and earn respect from the clientele. As competition from the private sector or NGOs grows, a role for Extension is still research-based education. How can Extension make our clients better consumers of the information that we and others provide? Extension is often producers' primary source of a second opinion.

Another key is to encourage and incentivize Extension faculty and area specialists to work across state lines and share information and programming. This is already occurring within certain multistate research and Extension

projects, but Extension economists are in a good position to foster more multistate collaborations with other Extension colleagues. Applied research and Extension—particularly in agriculture and rural development—is often place-based. Although region-specific factors such as weather, soil, and culture need to be recognized, they arguably play a greater role in state-specific experiments or trials for agronomy or range management. Instead, market outlook, risk management, and farm management economists could and do work across state lines. If the delivery method is limited to in-person presentation, then sharing is limited. If industry specialization and effective educator skills are paramount, then sharing makes more sense. The more widespread use of online delivery techniques such as webinars, web-portals, and online tools should enable cross-state sharing and collaborations within Extension.

Funding and Training Undergraduate and Graduate Students for Extension Positions

Many of our best applied economists do not have an agricultural background. However, with sufficient training and personal motivation, they can be successful Extension economists. Graduate programs in agricultural and applied economics are very good at training students to do research and, to a lesser extent, teach in traditional classrooms. Many universities are not, however, effective at training people for Extension careers. As such, many of the most successful Extension economists have relied on their agricultural backgrounds and understanding of farmers' needs to jump-start their outreach programs. This strategy may not work if we recruit people without agricultural backgrounds into Extension positions.

Extension used to have a steady pool of people entering and moving up the system. Many people with agricultural background first engage with Extension via 4-H programs and then become county agents. Others obtained master's degrees in agriculture-related areas and continued on as area specialists. However, many key agricultural states have recently seen significant reorganization of the Extension system involving a reduction or even elimination of area specialists. This creates unique and urgent challenges for us to replenish and expand the pool for future Extension economists.

Recruitment, training, and mentoring of the future Extension workforce needs to start early, at the undergraduate level. Often many of the best and brightest undergraduates in land grant universities and agricultural colleges are attracted to the private sector without considering the rewarding lifestyle of Extension or even academics. Administrators, economics departments, and Extension faculty need to work more closely and early on to identify students of all walks of life who feel a calling for public service and steer them toward Extension. One way is to engage first-year freshman students to consider academia or work within the land grant universities as Extension professionals as career options to get at least some on a graduate school track.

How do we best prepare undergraduate and graduate students to be Extension economists? What are the key skills that are needed in the profession? We begin by recognizing that Extension programs are essentially teaching programs in a different setting. We teach nontraditional students and usually do not have the luxury of the repeated contact with students that we would over the course of a semester-long class. As such, highly effective communication skills are needed for both oral presentations and written products posted online. Personal communication is also needed since many Extension programs are based on strong networks of producers, county Extension staff, and others in the sector. Finally, potential Extension economists need to understand their audiences and be willing to ask questions of them as much as they are expected to have answers to producers' questions.

One possible way to train students in these skills is start an Extension working group of graduate students. A working group may consist of a monthly seminar with guest speakers from industry who can communicate to students the needs of external audiences. The seminars could also consist of Extension faculty in the economics departments sharing their philosophy of Extension and tips for communicating information to Extension audiences. Finally, the seminar format could allow students to work on materials to support an Extension program (i.e., bulletins, presentation slides, tools, webinars) and present these materials during the seminar for practice. Events like this could also potentially give exposure to interested international graduate students to understand and appreciate Extension as future career opportunities.

This is not the only way to train students, but it would give them a better understanding of what preparing for Extension meetings and generating online content requires. Finally, students could shadow Extension faculty to meetings across the state and, when ready, give their own presentations to an external audience.

These ideas for training require the engagement of Extension faculty and a willingness on their part to invest in the future of Extension economists. This willingness is likely there as many of our best Extension economists are nearing the end of their careers and would like to see their work continued. In another form of engagement, the AAEA Extension Section could actively collaborate with the Graduate Student and Undergraduate Student sections to bring more faculty and graduate students to judge and participate in graduate student competitions.

We have research and teaching assistantships, but an Extension assistantship is unheard of in our field. This could be changed with the realignment of priorities for external funding. Grants continue to be our best source of external funds, and many grants today have a diversified output requirement. That is, there is often both a research and outreach component to the deliverables required for the grant. Can this trend toward Extension and outreach deliverables be leveraged to fund activities by students to learn how to bring applied research full circle to the audience(s) most interested in their work? It seems that, if properly motivated, our faculty could create plans of work for students on grants that would include producing Extension materials in the form of bulletins, decision tools, or presentations.

Targeted funding sources such as National Needs Fellowships and commodity board funding could also provide students with resources to work on outreach activities. Many industry and government employers have noticed the dearth of students trained in both applied research and the delivery of that research to external audiences. As such, proposals to these groups for funding to train students have been and will likely continue to be well-received.

Evaluating Extension Economists within the Economics Profession

Extension connects the research done at land grant universities with the public. In this age of social media, public engagement does not just fall upon the Extension faculty with majority Extension appointments. Rather, many applied economists are actively engaging in public outreach via blog posts, webcasts, tweets, media interviews, and popular press articles. As a result, public outreach and engagement should not be treated as Extension silos but as shared responsibilities increasingly demanded of all applied economists.

At the same time, today's agricultural Extension economists often have research or teaching appointments and, sometimes, teaching and research appointments. University-based Extension faculty and field specialists must interact with research scientists and relay scientific learning and other knowledge to farmers and other users. They also serve as the university's link to the county Extension agents and the USDA's Extension Service (NRC, 1995). This is consistent with USDA's focus on funding integrated projects that explicitly incorporate Extension and research activities as well as interdisciplinary projects focusing on the linkages with related fields such as veterinary medicine, animal science, food science, agronomy, environmental science and engineering, and agricultural engineering. As a result, incentives need to be well established and communicated to encourage Extension economists, especially tenure-track faculty with Extension appointments, to conduct policy-relevant research and pursue interdisciplinary collaboration opportunities.

We argue for more clarity in the expectations for both research and Extension to help Extension faculty and specialists succeed in the current land grant university environment, with its heavier focus on research. Clearer expectations for promotion and tenure of Extension-driven faculty are particularly necessary, both in terms of departmental understanding on how to value and weigh Extension efforts and the balance and trade-off between Extension and research outputs. Extension faculty should also not be treated separately from other applied and theoretical economists. Debunking the erroneous disconnect between research and Extension will also help restore and strengthen the image of Extension faculty for graduate students, non-Extension faculty, and departmental and college leadership.

As discussed previously, another trend has been the reduction in area specialists in the Extension workforce. This also coincides with the changing emphasis in county Extension programming from production agriculture to programs such as 4-H and Master Gardener. It also remains an unanswered challenge regarding how to recruit, train, and improve area specialists so that they have the necessary education, experience, and financial support to grow in the Extension and land grant university system. Often the knowledge and local connections of these area specialists remain untapped and undervalued resources for agricultural economics departments. More effort is needed to ensure that the voices and inputs from the area specialists are heard and incorporated into the long-term planning process of agricultural economics departments, which will help identify key issues with policy and industry relevance.

Conclusion

It is in the best interest of land grant universities to invest in Extension faculty to continue the tradition of educational outreach to constituents. It guarantees the provision of resources from federal and state sources and maintains a connection with people in their state who look to the University for unbiased, research-based information. We offer some strategies on recruiting, training, and evaluating Extension economists to guide agricultural economics departments facing the challenges of hiring people to fill Extension roles. Looking to traditionally underrepresented groups of people, including international students, to serve as Extension economists will bring both opportunities and challenges, but the profession must be up to the task if the Extension portion of the land grant mission is to be fulfilled.

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The Future for Extension Farm Management Economists: The Director's Cut

John Lawrence, Gregg Hadley, and Jason Henderson
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Keywords: Administration, Extension, Farm management

And now for a different perspective. We are three North—Central Region extension directors, all agricultural economists, who worked in extension and outreach roles early in our careers—Hadley and Lawrence were state specialists and Henderson worked for the Kansas City Federal Reserve Bank. We conducted and published applied research, collaborated within the profession and with colleagues in other disciplines, and developed and delivered educational publications, decision tools, and presentations to adult learners. We drove thousands of miles, gave hundreds of interviews, and ate countless buffet dinners. Now we want to share our perspectives on a changing agriculture, academia, extension, and the future for extension farm management economists.

Like all good economists, we will start with our assumptions:

- Agriculture will trend along two paths: (i) commodity production driven by efficiency, lowering costs, and consolidation and, (ii) differentiated product supply chains defined by actual or credence attributes that must contain cost but can influence prices received.
- State and federal support for higher education and extension will continue to decline in real dollars, and faculty salaries will continue to increase in a competitive labor market for economists. Extension will face increasing demands to provide evidence of a return on public investment, a role that agricultural economists with skills in cost-benefit analysis can provide.
- Private sector competition to provide farmers with data management and decision support tools and services will continue to grow.

What Will Extension Farm Management Economists of the Future Do?

Many of the traditional farm management questions about land values, leasing practices, machinery investment, and enterprise analysis are still likely to be asked in the future. However, the complexity of the decisions—as well as how farmers get information and how extension is organized—will change how farm management economists address these questions.

- In addition to educating and informing farmers and private sector service providers, extension farm management economists have a long history as policy advisors. Providing objective, well-reasoned, but often rapid responses to proposed legislation or regulations is a vital role for economists. Objective analysis, identifying unintended consequences, and evaluating resource allocation decisions is what we do well.
- Effective extension education is built on trust and relationships. Individual farmers and agribusinesses, NGOs representing agriculture, natural resources and environmental interests, and governmental agencies are more likely to call upon individuals they know and trust. Even in the social media age, reputation and trust are currency to followers. It takes time and visibility, sincere interest, and sound

objective analysis to build trust with stakeholders. While not every extension economist can be an expert on all issues, those who have established trust can serve as a bridge between stakeholders and their research colleagues that have the necessary expertise but are unknown to the relevant parties on the issue.

- As competition to serve farmers from the private sectors and NGOs grows, there is still an important role for extension economists as analysts and educators. Farmers may receive information from a supplier, consultant, or organization, but extension is often the farmer's first second opinion, as unbiased research-based analysis is valued. In many cases, extension specialists were the original source of the information dispensed by others. Also, as educators, extension economists can make our clients better consumers of the information that we and others provide. Extension can provide farmers and land owners the tools and skills to evaluate data and make their own informed decisions.
- Applied research and agriculture related extension education are often location based. Weather, soil, infrastructure, and culture impact risk and optimal decisions. Farm management economists must understand and factor these local variables into their analysis and often help integrate colleagues on interdisciplinary teams toward optimal solutions. However, unlike agronomists, foresters, or range managers, farm management economists can and do work across state and ecosystem lines. If the delivery method is limited to in-person presentations, then sharing is limited. If industry knowledge and effective educator skills are paramount, then specializing and trading makes more sense to the extension system and the end users, particularly given digital delivery. Administrators have a role in lowering barriers to collaboration or providing an incentive structure that encourages multistate collaboration that benefits extension economist as well as constituents.
- Farm management economists could more easily "advise from the podium" about cost minimization and managing risk when educating farmers who grow relatively homogeneous crops and livestock in commodity agriculture systems and face similar management decisions. As farmers have increasingly more data from multiple layers of GIS technology, decisions are more individualized, and the educational focus must return to how to make decisions rather than providing answers. Successful managers of the future will have these skills, but the complexity of the data and questions will require refinement of decision support tools for economic analysis.
- How will extension farm management information and education reach end users? Much of the focus is on the future of PhD agricultural economists who will continue to write, present, and tweet to followers. Traditionally state specialists have trained the trainers, the county agents or educators who educate local farmers. As agriculture has become more consolidated and sophisticated, fewer farmers go to their county office for farm management information. Farm management economists may have their own followers, but they will need to collaborate with county staff to build the capacity needed to deliver sound farm management decision to a broader farm base. These collaborations will allow faculty to conduct the next round of applied research to underpin the next wave of educational programs.
- As mentioned above, extension is increasingly asked to show a return on investment of public funding. Farm management economists will have to better report their impact but are also well positioned to help agricultural extension more broadly identify the value provided to stakeholders and society from extension programming.

Balancing the Farm Management Portfolio

It's been said that farmers have problems and universities have departments. As administrators look at the needs of farmers, landowners, and agribusinesses in our states and the resources within our extension system available to them, we may take a broader view to balance our farm management portfolio. If agricultural economics graduate programs focus solely on accepting and producing quantitative researchers, how will extension farm management needs be met as extension seeks to provide relevant programming to stakeholders? One approach is that the skills needed may be broader than one degree or one profession. Another approach is that the profession and departments continue to produce PhDs for the extension market.

- As operations expand in scale and scope, human resources and organizational structure become increasingly important farm management issues. As few ag economists are trained in these fields, should extension be hiring into farm management positions from business or law schools?

- Farmers in differentiated supply chains face different management decisions. Cost minimization and risk management are still important, but so are contract analysis, quality management systems, food safety regulations, documentation of production or product specifications, investment in further processing, brand development, and logistics. While microeconomic decisions are at the core, business school tools and thinking may also come into play.
- Extension has always played a translational role between research and application and farm management economists with split extension appointments do both the research and translation. In addition, the development and translation of new research, highly valued extension publications, such as budgets, cash rent and custom rate surveys, marketing strategies, crop insurance analysis and other analyses that are updated annually are still needed. Master's-trained agricultural economists who support this work are efficient complements to research/extension faculty in the extension farm management team.

From Where Will Future Extension Economists Come?

When it comes to recruiting people into extension, one challenge that economists have that other disciplines do not is that we teach opportunity cost and net present value to our students. Thus, our best and brightest understand their value and are often attracted to the private sector without considering the rewarding career and lifestyle of extension and academics. We provide them great analytic and problem-solving skills that are in demand by employers, then struggle as universities to compete on salary alone.

In addition to tenure-track PhD faculty positions, extension also needs economists trained at the master's or PhD level to do applied research, create decision tools, educate stakeholders, work with media, and serve as regional farm management specialists. Departments and extension systems will continue to balance their portfolio between tenure-track and staff positions and between cutting edge research and timely and relevant applied analysis. The challenge remains: Who will produce extension economists? Successful extension programs are built on strong research. If future extension economists are highly valued coproducts of exceptional research programs, then departments should be intentional about producing these applied economists. As such, they will have comprehensive admission criteria, provide necessary communication skills and experiences, and have current extension faculty to advise and fund graduate students.

Once we hire economists to do extension work, mentoring is essential. Unlike research faculty, who may be granted a lighter teaching load to get papers into the journal mill, extension economists need to build their network, recognition, and trust among collaborators and stakeholders as well as start their research programs. Finding that balance between published research and public recognition among stakeholders is essential.

Regardless of the position or the years of training needed to be an extension farm management economist, we must get extension on students' radar early if we hope to attract them to extension. Why not identify students of all walks of life that have a calling for public service and steer them toward extension rather than engaging the grad students as they are entering the job market to think about an extension opening? Instructors in Principles of Economics want "real life" examples of economics in action for their class. Look no further than extension economists to showcase real world economics that impacts private decisions and public policy. We must start earlier to have students consider academia as a career option so they get on a grad school track.

Faculty play a big role in students' career choices. Reach out to students with the interest and skills for extension and have the talk about academia as a career. Direct them to the extension faculty in your department who will hire them to assist with routine analysis and cultivate their interest in extension economics and academics more generally. If the extension faculty say they don't have the resources to hire a future extension specialist, tell them to call their extension director. Most are investing in the pipeline of future extension professionals and may be willing to support undergraduate and graduate extension assistants.

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