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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.

For More Information

Allen, D.W., and D. Lueck. 2002. T*he Nature of the Farm: Contracts, Risk, and Organization in Agriculture*. Cambridge, MA: MIT Press.

Arbuckle, J.G. Jr. 2017. *Iowa Farm and Rural Life Poll: 2016 Summary Report*. Ames, IA: Iowa State University Extension Report SOC3081.

MacDonald, J.M. 2014. *Technology, Organization, and Financial Performance in U.S. Broiler Production*. Washington, DC: U.S. Department of Agriculture, Economic Research Service, Economic Information Bulletin EIB-126, June.

MacDonald, J.M., R.A. Hoppe, and D. Newton. 2018. *Three Decades of Consolidation in U.S. Agriculture*. Washington, DC: U.S. Department of Agriculture, Economic Research Service, Economic Information Bulletin EIB-189, March.

MacDonald, J.M., P. Korb, and R. Hoppe. 2013. *Farm Size and the Organization of U.S. Crop Farming*. Washington, DC: U.S. Department of Agriculture, Economic Research Service, Economic Research Report ERR-154, August.

McBride, W.D., and N. Key. 2013. *U.S. Hog Production from 1992 to 2009: Technology, Restructuring, and Productivity Growth*. Washington, DC: U.S. Department of Agriculture, Economic Research Service, Economic Research Report ERR-158, October.

Schimmelpfennig, D.S. 2016. *Farm Profits and the Adoption of Precision Agriculture*. Washington, DC: U.S. Department of Agriculture, Economic Research Service, Economic Research Report ERR-217, October.

Sumner, D.A. 2014. "American Farms Keep Growing: Size, Productivity, and Policy." *Journal of Economic Perspectives* 28(1):147–166.

U.S. Department of Agriculture. 2017a. *America's Diverse Family Farms. 2017 Edition*. Washington, DC: United States Department of Agriculture, Economic Research Service. Available online: https://www.ers.usda.gov/webdocs/publications/86198/eib-185.pdf?v=43083

U.S. Department of Agriculture. 2017b. *State Agriculture Overview*. Washington, DC: United States Department of Agriculture, National Agricultural Statistics Service. Available online: https://www.nass.usda.gov/Statistics_by_State

U.S. Department of Agriculture. 2019. *2017 Census of Agriculture. Volume 1, Geographic Area Series. Part 51, United States Summary and State Data*. Washington, DC: United States Department of Agriculture, National Agricultural Statistics Service. Available online: https://www.nass.usda.gov/Publications/AgCensus/2017/Full_Report/Volume_1,_Chapter_1_US

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