

doi: 10.5191/jiaee.2018.25403

**The Future of Extension: A Network Emergence Perspective from the Case of the Global Forum for Rural Advisory Services**

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**Abstract**

Extension, as a socially-based institution, must constantly evolve with society. This case study on the Global Forum for Rural Advisory Services uses social network theory to add to the literature on network emergence in the context of extension. The researchers explored how an extension network evolved in response to global agricultural issues. The use of a qualitative content analysis of the eight themes of the annual meeting of the network showed how the Forum changed in response to current events and regional needs. The Forum first built and consolidated a network of global extension members and then moved to an outward focus in terms of relations within and outside of extension. Analysis revealed the network first focused on simple, basic themes of interest to the knowledge network, and slowly expanded to wider and more complex topics that involved a richer network of actors. This case implies that extension institutions, which are on the front line of trends stemming from societal shifts, are thus positioned to play a crucial role in technology transfer and sensitization of global agricultural issues.

Keywords: Extension network, social learning, network emergence

## Introduction

The future of global extension is unknowable; however, one might argue the extension ethos has always been to evolve consistent with the needs of the clientele that it is intended to serve, known or not. Therefore, to ensure ongoing relevance, extension must be nimble and proactive in addressing issues facing agriculture rather than reactive. One thing extension has always been good at is establishing networks and building strong relationships at the local and national level. However, the need to work across country and even continental borders has become even more important as the world shifts to one driven by global issues such as regulation of imports/exports, an agricultural workforce that is impacted by immigration policy, climate change, and the transfer of invasive species. Extension is logically connected to societal shifts (Davis & Sulaiman, 2014). While the future of extension is unknowable, what is readily observable in society are shifts that will inevitably affect the structure and delivery of extension programming in the future (Lamm, Lamm, Davis, & Swaroop, 2017) and the increased need for a global extension system that is connected through networks.

Retrospectively, predictions for the future are notoriously inaccurate. Drawing from chaos theory, there are simply too many variables to confidently prognosticate the specifics (Levy, 1994). Nevertheless, there are observable patterns of innovation and technology leading to societal shifts (Rogers, 2003). For example, humans have always had a need for transportation. First by foot, then by animal, then facilitated by the invention of the wheel, the improvement of animal conveyance apparatus (carts, etc.), and more recently automobiles, airplanes, and even craft capable of travelling to the depths of oceans and the far reaches of the solar system.

Communication systems followed a similar pattern. Starting with individual-to-individual verbal utterances or gesturing, pictorial representations, distance-mediated (signal fires, etc.), postal letters delivered by person, telegraphs conveyed over transmission wires through a series of dots and dashes, voice capable transmission over wire, and more recently data transmission in the form of text, audio, and video through either wired or wireless transmission. The trend across examples is the scale, speed, and density with which the innovation evolved and corresponding societal shifts (Rogers, 2003).

Technology has allowed society to become more connected and more integrated than ever before. An airplane flight that takes hours has replaced a journey that might have taken days by automobile or months on foot. Similarly, a telephone call can connect individuals that may be geographically located on opposite sides of the world in a fraction of a second. Humans have never had more opportunities to connect with each other than they do today and the speed with which the connections are made would be almost unimaginable a few decades ago (Economy, 2015).

This is the world in which extension finds itself: A world in which an increasingly-connected population is able to access more information through their mobile smart phones than would be possible in a lifetime of accumulation in the past. To remain relevant to society extension must evolve according to these trends (Davis & Sulaiman, 2014). In the past extension personnel may have been a single point of contact for knowledge and technology transfer for their clientele. Today extensionists represent only one of many potential sources of information for clientele (Lindner & Dolly, 2013). Information sources range from internet-based material in the form of Google searches and

YouTube videos to training provided by private industry. The proliferation and democratization of information has fundamentally altered the role of extension (Strong, Rowntree, Thurlow, & Raven, 2015).

Historically the flow of information was linear, traveling from researcher or technology creator to clientele, with extensionists serving as mediators between the two. The structure was hierarchical where interactions between actors were predictable. Lubell and Niles (2014) describe how the United States Cooperative Extension has evolved from a top-down approach to today's knowledge systems, with many actors and different learning pathways.

We go beyond Lubell and Niles' description of agricultural knowledge systems that consist of all the actors and their relationships in creating knowledge (2014) to the broader agricultural innovation systems approach (Spielman, 2002). Agricultural innovation system proponents also recognize many different sources of knowledge but emphasize the policies that influence interactions and the fact that innovation goes beyond technology to include process, institutional, and social innovations.

In this new paradigm there are no clear protocols for the dissemination of technology or information (e.g. Molnar & Jolly, 1988). Researchers can now publish results on the Internet and make them available to anyone, anywhere immediately. Clientele can interact with information directly and independently (Strong et al., 2015). However, despite the rise of available information and connectedness, there has been a corresponding rise in information overload and inaccurate and false information distribution. Clientele are becoming more overwhelmed by the volume of information they are exposed to and more

distrusting of what information they consume (Temming, 2018).

These are the countervailing trends upon which extension is best positioned to address. A known, trusted source of information provided in an accessible manner is what extensionists have been doing for decades (Davis & Sulaiman, 2014). The institutional knowledge associated with this role positions extension to continue to serve as a key actor in the technology-to-clientele transfer while adapting and evolving according to contemporary societal shifts (Davis & Sulaiman, 2014; Strong et al., 2015).

Consistent with technology trends and societal shifts, extension must adapt to remain relevant (Henning, Buchholz, Steele, & Ramaswamy, 2014). Although the mandate for evolution and adaptation is clear based on society, there is a limited literature base upon which to examine network emergence within an extension context. This work will address this gap by focusing on network emergence of the Global Forum for Rural Advisory Services (GFRAS). Using GFRAS as a case, the authors employ network emergence to examine how the organization first connected global extension actors and slowly began to expand its focus to relationships outside of extension.

### **Conceptual Framework**

The conceptual framework for this study was based on social network theory proposed by Borgatti, Mehra, Brass, and Labianca (2009) and in particular a focus on network emergence.

### **Social Network Theory**

Humans are social creatures (e.g. Deci & Ryan, 2000) and the interactions between self and others is a fundamental characteristic of the human experience (Bass, 2008). Social networks are a natural extension of this common and fundamental

experience; specifically, they have been described as “a way of thinking about social systems that focus our attention on the relationships among the entities that make up the system” (Borgatti, Everett, & Johnson, 2013, p. 1). From this perspective social network theory provides a framework within which to analyze social relationships, dynamics, and emergence (Borgatti et al., 2009).

Due to the inherent complexity of human nature and social interactions, social network theory has been applied under several conditions to elucidate the phenomenon of interest (Borgatti et al., 2009). Within the literature there are a variety of social network research examples including small group development (Johnson, Boster, & Lawrence, 2003), relationships among funding agencies in a sample of Biological Science educators (Lamm & Lamm, 2017), and the emergence and effectiveness of leadership networks in teams (Scott, Jiang, Wildman, & Griffith, 2017). Also important are social learning (Borgatti & Halgin, 2011) and the “strength of weak ties” (Granovetter, 1973), or the fact that boundary-spanning relationships are important to tap nonredundant sources of knowledge (Lubell & Niles, 2014).

The role of networks has also been examined from an internationalization perspective. Specifically, using a qualitative case study approach Francioni, Vissak, and Musso (2017) found “the relevance of personal network relationships as a factor stimulating and supporting international market development” (p. 18). The role of external actors beyond the individual were critical to expansion into new international markets.

Using a quantitative social network analysis approach Chrobot-Mason, Gerbasi, and Cullen-Lester (2016) analyzed the role of organizational identity as a predictor of leadership identification. In particular they

found “individuals who identify strongly with their organization and team are more likely to see others as sources of direction, alignment, and commitment” (p. 307). The emergence of network identity, proxied by organization and team identification, was a significant predictor of network member behavior. These results are consistent with the observations of Kogut (2000):

Networks are more than just relationships that govern the diffusion of innovations and norms, or explain the variability of access to information across competing firms. Because they are the outcome of generative rules of coordination, networks constitute capabilities that augment the value of firms. (p. 423)

Consistent amongst much of the social network literature is the acknowledgment of one of the core tenets of social network theory, specifically a focus on the interactions between actors within the network, not on individual actors in isolation. The interactions are important to recognize as collectively they represent the network, and the network in turn has potential value and contribution above and beyond the individual level (Kogut, 2000).

### **Purpose and Objectives**

The purpose of this study was to use the Global Forum for Rural Advisory Services (GFRAS) as a case with which to examine network emergence and its perceived importance to the future of extension on a global scale. The objectives of the study were to (a) determine how GFRAS evolved to address global agricultural issues of concern, (b) determine how GFRAS interacted with and connected extension actors from around the world to address issues of global concern and (c) describe how GFRAS expanded its focus to relationships outside of extension to ensure its relevance and ability to remain nimble.

## Methods

A case study approach was used to reach the objectives of the study. A content analysis of the themes chosen and detailed notes of record from the annual GFRAS meetings was conducted to identify what issues were being addressed, the actors present and interested in the discussion, and the resulting outcomes related to building networks and communities of practice within extension and beyond. Qualitative methods were used to develop an in-depth description of the factors explaining the past and present state of GFRAS, its role connecting global extension actors, and the internal and external networks and partnerships that developed through the growth of the GFRAS organization (Merriam, 1998). It is important to recognize that while these methods provide an in-depth view of the phenomenon, they lack breadth of the entire environment the organization was working within, and therefore, should be used to gain insight into the specific situation rather than being generalized (Hatch, 2002).

Since its inception, GFRAS has been hosting an annual meeting at different locations around the world. The meeting typically hosts 150 individuals from 30-60 countries representing all continents, with the exception of Antarctica. Since 2010 there have been eight annual GFRAS meetings located in Chile, Kenya, the Philippines, Germany, Argentina, Kyrgyzstan, Cameroon, and Australia. A ninth meeting will take place in South Korea. During these meetings there are opportunities for networking, presentations of latest research and innovative extension programs, roundtable discussions, plenary sessions with keynote speakers, and celebrations of success and unity across the global extension system. Detailed notes are taken by the GFRAS organization and

volunteers throughout the exchange. The notes are aggregated at the conclusion of each meeting, including conclusions and recommendations made based on the discussions. The summaries are available on the GFRAS website: [www.g-fras.org](http://www.g-fras.org). The meeting reports from all eight GFRAS meetings served as the data analyzed for this study.

Two coders familiar with the GFRAS organization conducted a content analysis of the annual meeting themes and notes of record. Using predetermined items of analysis, content analysis divides data into groups *a priori* (Lincoln & Guba, 1985). The predetermined items of analysis included identifying: (a) what was addressed at the GFRAS meetings to determine how the organization was responding to and driving change within the agricultural sector around global issues (e.g. women in agriculture, role of youth in agriculture, climate-smart agriculture), (b) how individuals connected through formal and informal communities of practice to establish networks within extension, and (c) how individuals connected through formal and informal communities of practice to establish networks outside of extension. The two coders discussed the themes, patterns, and relationships identified amongst themselves using the results to tell the story of the GFRAS organization as it grew over time. The aggregated results were then discussed with two additional researchers to establish trustworthiness through peer review (Lincoln & Guba, 1985).

Since “the researcher is the primary instrument for data collection and analysis in qualitative research” (Merriam & Tisdell, 2016, p. 16), we include subjectivity statements for the two coders. Coder One was involved in the establishment of GFRAS and was the chief executive officer of the GFRAS secretariat from 2010 to 2016. Coder One has no formal role in

GFRAS currently but still works in the international arena and collaborates closely with GFRAS. Coder One was educated in international extension and has researched extension for 14 years. Coder Two became involved with GFRAS in 2011, co-founded the GFRAS Consortium on Extension Education and Training, and currently serves as a Steering Committee member. Coder Two has worked as an extension educator and conducted research on the practice of extension for his entire career. This researcher has extensive experience in extension work at the frontline where there is interaction between farmers, other learners, and extension professionals in the developing country environment. Coder Two views GFRAS as the apex of providing extension and advisory services which, through a network mechanism, uniquely brings together extension public and private service providers in an effort to revitalize last-mile extension services (Khalid, 2018). One or both have attended each of the GFRAS annual meetings. While both researchers support GFRAS they believe that constructive criticism will help to improve the network.

**Results**

Analysis of the eight annual meetings tell a story of the evolution of a network in response to agricultural themes of the day and to its members. Table 1 shows the meeting themes, emerging topics and GFRAS response, and depicts how GFRAS matured from an inwardly-focused to an outwardly-focused network of extension to ensure its relevance and ability to remain nimble. While GFRAS uses the term *rural advisory services*, it is interchangeable with extension and we will use both terms.

We can see that over the first eight years (and into the ninth), the network focus evolved through the following steps:

1. Emancipating the network (2010)
2. Consolidating the network (2011)
3. Positioning the network (2012)
4. Broadening the network (2013)
5. Strengthening the network (2014, 2015)
6. Deepening the network (2016, 2017)
7. Partnering the network (2018)

Table 1  
*GFRAS Annual Meeting Themes, Key Topics, and Communities of Practice (Working Groups and Regional Networks)*

<b>Year</b>	<b>Theme of Annual Meeting, Emerging Topics and Networks</b>
2010	Networks and evaluation; Evaluation Working Group; new regional networks in Asia, Africa, and Latin America
2011	Good practices in regional networking and current issues in rural advisory services; working groups on advocacy and capacity strengthening; regional network in Central Asia
2012	Role of Rural Advisory Services in Agricultural Innovation Systems; Gender Working Group; new network in South Asia
2013	Role of Private Sector and Producer Organizations in Rural Advisory Services; new regional networks in Europe and the Caribbean
2014	RAS Policies – Evidence and Practice
2015	Global Good Practices in RAS; new sub-regional networks in Asia and Africa
2016	The Role of Rural Advisory Services for Inclusive Agripreneurship; new sub-regional network in Europe
2017	Rural Advisory Services and Empowered Youth for Balanced Transformation in Rural and Urban Communities; Youth Working Group; new sub-regional network in Asia
2018	Addressing Challenges and Seizing Opportunities: Developing Effective Partnerships in RAS

The network began with *emancipation* in 2010. The GFRAS network emerged out of the Neuchâtel Initiative, an informal group (initially composed mainly of donors) that met annually to discuss common frameworks for extension. GFRAS was formed as a more formal, inclusive, and proactive organization to support extension around the globe. The GFRAS founders felt extension was viewed globally as less important than research and was without its own identity, and thus there was initially focused on becoming an independent global institution to exchange knowledge and advocate for extension as a critical actor in agricultural development processes. Key topics at the first meeting and in subsequent activities included the importance of networks and evaluation of extension. Both regional and thematic communities of practice started to emerge. During the meeting, several new regional networks formed to represent Asia, Africa, and Latin America. The working groups served to facilitate GFRAS activities on a theme as well as to link actors and knowledge across regions; each working group was made up of members from different parts of the world. The most active during the first year was the Evaluation Working Group.

Year two (2011) began a process of *consolidation*; the meeting report stated that “Within one year, GFRAS has been consolidated and regional networks emerged. This has changed the institutional landscape of extension worldwide and shows that RAS has been emancipated by taking the future into their hands” (GFRAS, 2010, p. 9). GFRAS began to move from processes of institution building to focusing on issues of importance to extension at the time: policy advocacy, capacity strengthening, and a continued focus on evaluation. Working groups were started on capacity strengthening and policy. As a

network, GFRAS was still very inward-focused with an emphasis on initiating and strengthening regional networks, such as the new one that emerged in Central Asia.

The third annual meeting (2012) was focused on *positioning* the network, with a theme on the role of advisory services within an agricultural innovation system. This led to recognition of the capacities needed to play a facilitating and brokering roles within the innovation system, and thus the position paper “The New Extensionist” was developed (Davis & Sulaiman, 2014; Sulaiman & Davis, 2012). The New Extensionist inspired the Consortium on Extension Education and Training and initial work on the New Extensionist Learning Kit (modules on key global extension competencies) in 2013. At the same time, the Global Good Practices Initiative emerged to share systematized learning on theoretical and practical extension know-how (Davis, et al., 2018). These initiatives gave GFRAS rallying points and helped shape a sense of identity.

On the network side at the 2012 annual meeting, focus moved beyond just regional networks to the newest building block of GFRAS: the country forums. Country forums are national-level platforms of all extension actors that facilitate prioritization, capacity strengthening, and advocacy. On the governance side, two more regional network representatives from Asia and Africa were added to the steering committee. The network also sought greater global visibility that year through participation in high-level global agricultural events: the Global Conference on Agricultural Research for Development and the Rio+20 Conference.

In 2013 the network further evolved and began to *broaden* beyond the public-sector dominance, with a focus on producer organizations and the private sector and their role in extension. This was the largest

meeting to date, with 160 participants, and a number of topics were discussed: strengthening farmer organizations, public-private partnerships, diversity, and inclusiveness. Agribusiness and extension's role in supporting farming as a business also arose as a topic. Within the network, newly-emerging regional networks were struggling, and the topics of creating and sustaining an energetic network, network financing and sustainability were addressed. Two new networks emerged in Europe and the Caribbean.

The years 2014 and 2015 saw a focus on *strengthening* the network, mainly through work on policies, the Global Good Practices Initiative, and the Learning Kit. An online Policy Compendium was initiated under the guidance of the Policy Working Group in 2014. Sub-regional networks also began to emerge in Asia and Africa. In 2014 the national Argentine extension services, a member of the regional Latin American Rural Extension Network, co-funded the meeting. This began a trend of co-funding from the local and regional GFRAS partners. It continued in 2015 in Kyrgyzstan, when a local extension agency called RAS Chui Talas co-hosted the meeting. This happened again into 2016 when the Cameroonian government co-hosted the annual meeting.

In 2016 the GFRAS network began to further *deepen* as it started to focus on nontraditional topics (“agripreneurship”) and the inclusion of women, youth, and other marginalized groups in extension. This continued in 2017 with a continued focus on youth as well as on rural and urban communities. GFRAS reached out to the Australasia-Pacific Extension Network, a professional network of over 600 extension professionals, and held back-to-back meetings with some joint events. Another sub-regional network in Europe and one in

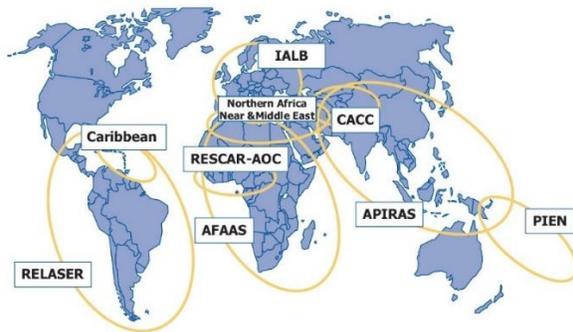
Asia formed. The GFRAS Youth Working Group emerged.

The GFRAS network is now turning outward beyond the extension community and discussing *partnering* at its ninth annual meeting. Although the importance of partnership was discussed in the 2014 meeting, it became the major topic of the 2018 meeting. Thus as the network evolved, it evolved with regard to its membership and relational ties, and in response to topics of the day through communities of practice. When GFRAS first started in 2010, it was very inward-focused and had few members, especially the key membership institutions: the regional networks. In 2011 there were four main regional networks with a few subnetworks that were not even all formally named (nine in total) (Figure 1). A certain number of networks existed before GFRAS began (e.g. IALB and PIEN).

By 2018 the network had included more of the developed-country networks in North America and Australasia as well as many more subnetworks (17 in total) (Figure 2). The network also changed from being driven and represented mainly by a few secretariat members to having greater visibility and roles within and among regional networks and through working group representatives. However, as the network continues to grow, it will face issues of how to include and balance the many different regional, institutional, and thematic interest groups in governance and activities of the network.

The GFRAS steering committee started out initially with Neuchâtel-associated members but slowly expanded to include more regional and thematic representatives. In 2010 and 2012 four additional members from Asia and Africa were brought on, and in 2015 an education representative was brought on. The network never managed to acquire representatives from the private sector or from farmers'

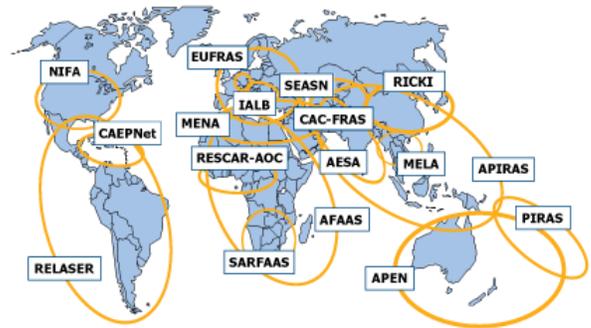
organizations, despite seats for these sectors on the steering committee and discussions on the topic each year.



**Figure 1.** GFRAS regional networks in 2011  
 Note. AFAAS = African Forum for Agricultural Advisory Services, APIRAS = Asia-Pacific Islands Rural Advisory Services, CACC = Central Asia and the Caucasus Forum for Rural Advisory Services, IALB = International Academy for Agriculture and Home Economics Advisors, PIEN = Pacific Islands Extension Network, RELASER = Latin American Network for Rural Extension Services, RESCAR-AOC = West and Central Africa Network for Rural Advisory Services  
 Source: GFRAS, 2011

The GFRAS annual meeting themes addressing issues of global agricultural concern have also become more elaborate and sophisticated. They started with some basic issues: evaluation, policy advocacy, and capacity strengthening and have gone wider and deeper to include issues of agripreneurship, youth, and inclusion. As we can see from the annual meeting topics, however, the issue of “keeping networks hot” (annual meeting 2013) and finding working group members who will contribute time and energy without payment remains a pervasive one. Several topics never really worked very well: the topic of climate change never managed to take off with GFRAS, and the gender working group was dissolved in 2016 because there were no champions or resources to take it forward.

Since its beginning, GFRAS also wrestled with the issue of limited resources and was initially criticized for starting up



**Figure 2.** GFRAS regional networks in 2018  
 Note. AESA = Agricultural Extension in South Asia, CAEPNet = Caribbean Agricultural Extension Providers Network, EUFRAS = European Forum for Farm and Advisory Services, MELA = Mekong Extension Learning Alliance, MENA = Middle East and North Africa, NIFA = National Institute for Food and Agriculture, PIRAS = Pacific Islands Rural Advisory Services (name change from PIEN), RICKI = Rural Innovation Centre for Knowledge and Investment; SARFAAS = Southern Africa Forum for Agricultural Advisory Services SEASN = South Eastern Europe Advisory Service Network; all others noted under Figure 1.  
 Source: GFRAS website (<http://www.g-fras.org/en/community/members.html>)

new institutions at the global, regional, and national level, which possibly duplicated the work of other forums within agriculture. GFRAS is entirely donor-dependent and is only now working on a sustainability strategy and business plan. It is also reviewing its governance (Khalid, 2018).

**Conclusions**

The objectives of the study were to (a) determine how GFRAS evolved to address global agricultural issues of concern, (b) determine how GFRAS interacted with and connected extension actors from around the world to address issues of global concern, and (c) describe how GFRAS expanded its focus to relationships outside of extension to ensure its relevance and ability to remain nimble. Content analysis of the eight network annual meetings revealed how GFRAS evolved to address global issues of concern and to first build and

connect its community before reaching out to the broader agricultural development community. To do so GFRAS moved from emancipation to consolidation, positioning, broadening, strengthening, deepening, and finally, partnering outside of the network.

GFRAS used its regional networks, country forums, and working groups to connect actors from around the world to address issues of global concern for extension. Through regional-level conferences and products of the working groups, issues such as youth in extension, gender, and the role of producer organizations in extension were addressed. GFRAS started out as a very inward-focused organization, apparently trying to prove itself in the world of agricultural development often dominated by research. After its own consolidation, GFRAS reached out to a wider range of stakeholders within and beyond extension.

While GFRAS has succeeded in many ways in addressing global issues of concern through building the network and connecting extension and non-extension actors, it has also faced challenges. These include the difficulty of attracting stakeholder groups such as farmer organizations and the private sector and the stiff competition for limited donor resources. The case of GFRAS shows that although there is potential for extension to serve as a mediator in the technology-to-clientele transfer, it is also necessary for extension to adapt to the conditions in which it exists. Specifically, hierarchical information flows are no longer the norm, having been replaced with an integrated network of actors and information. Accordingly, extension must adapt to such societal shifts and become less hierarchical and more networked and integrated.

This shift will require a more pluralistic approach, whereby the best technology and information is shared and

proliferated amongst extensionists in acknowledgement of our shared global biome. There are no boundaries when it comes to resources such as water, soil, and air. The choices made at point A inevitably have an effect at point B. Extensionists are on the front line of these trends and are positioned to play a crucial role in technology transfer and sensitization of issues in global agriculture.

### References

- Bass, B. M. (2008). *The Bass handbook of leadership*. New York, NY: Free Press.
- Borgatti, S. P., & D. S. Halgin. (2011). On network theory. *Organization Science*, 22(5):1168–1181.
- Borgatti, S. P., Mehra, A., Brass, D. J., & Labianca, G. (2009). Network analysis in the social sciences. *Science*, 323, 892-895. doi:10.1126/science.1165821
- Chrobot-Mason, D., Gerbasi, A., & Cullen-Lester, K. L. (2016). Predicting leadership relationships: the importance of collective identity. *The Leadership Quarterly*, 27, 298–311.
- Davis, K., Bohn, A., Franzel, S., Blum, M., Rieckmann, U., Raj, S., Hussein, K. & Ernst, N. (2018). *What works in rural advisory services? Global good practice notes*. Lausanne, Switzerland: GFRAS.
- Davis, K., & Sulaiman, R. V. (2014). The new extensionist: roles and capacities to strengthen extension and advisory services. *Journal of Agricultural Education and Extension*, 21(3), 6-18. doi:10.5191/jiaee.2014.21301
- Deci, E. L., & Ryan, R. M. (2000). The "what" and "why" of goal pursuits: human needs and the self-determination of behavior, *Psychological Inquiry*, 11(4), 227-268. DOI: 10.1207/S15327965PLI1104\_01

- Economy, P. (2015, November). 3 Ways Technology Helps Us Connect More Deeply. Inc. Retrieved from <http://inc.com>
- El Harizi, K. (2018, September). *Renewing GFRAS business model and governance*. Unpublished position paper, Lausanne, Switzerland.
- Francioni, B., Vissak, T., & Musso, F. (2017). Small Italian wine producers' internationalization: the role of network relationships in the emergence of late starters. *International Business Review*, 26(1), 12-22.
- GFRAS. (2011). *2nd GFRAS annual meeting*, November 11-13, Nairobi: Minutes. Lindau, Switzerland: GFRAS.
- Granovetter, M. (1973). The strength of weak ties. *American Journal of Sociology*, 78, 1360-1380.
- Hatch, J. A. (2002). *Doing qualitative research in education settings*. Albany, NY: State University of New York Press.
- Henning, J., Buchholz, D., Steele, D., & Ramaswamy, S. (2014). Milestones and the future for Cooperative Extension. *Journal of Extension*, 52(6).
- Johnson, J. C., Boster, J. S., & Palinkas, L. A. (2003). Social roles and the evolution of networks in extreme and isolated environments. *Journal of Mathematical Sociology*, 27(2-3), 89-121. doi:10.1080/00222500305890
- Khalid, E. H. (2018, August). *Renewing GFRAS business model and governance*. Unpublished draft position paper, Lausanne, Switzerland.
- Kogut, B. (2000). The network as knowledge: generative rules and the emergence of structure. *Strategic Management Journal*, 21, 405-25.
- Lamm, A. J., & Lamm, K. W. (2017). Mapping the money: a social network analysis of funding relationships amongst higher education biology opinion leaders. *Natural Sciences Education*, 46(1), 1-10, doi:10.4195/nse2017.03.0006
- Lamm, K. W., Lamm, A. J., Davis, K., & Swaroop, B. J. (2017). Identifying knowledge management capacity needs of rural advisory service networks. *Journal of International Agricultural and Extension Education*, 24(2), 93-106, doi: 10.5191/jiaee.2017.24207
- Levy, D. (1994). Chaos theory and strategy: theory, application, and managerial implications. *Strategic Management Journal*, 15(2), 167-178.
- Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. Newbury Park, CA: Sage Publication Inc.
- Lindner, J. R., & Dolly, D. (2013). Extension and outreach: not a question of if, but how. *Journal of International Agricultural and Extension Education*, 19(3), 1-9, doi: 10.5191/jiaee.2012.19301
- Lubell, M. & Niles, M. (2014). Extension 3.0: Managing agricultural knowledge systems in the network age. *Society and Natural Resources*, 27, 1089–1103, doi: 10.1080/08941920.2014.933496
- Merriam, S. B. (1998). *Qualitative research and case study applications in education*. San Francisco, CA: Jossey-Bass.
- Merriam, S. B., & Tisdell, E. J. (2016). *Qualitative research: A guide to design and implementation* (4th ed). San Francisco, CA: Jossey-Bass.
- Molnar, J., & Jolly, C. (1988). Technology transfer: institutions, models, and impacts on agriculture and rural life in the developing world. *Agriculture and Human Values*, 5(1-2), 16-23.
- Rogers, E. M. (2003). *Diffusion of innovations* (5th ed.). New York, NY: Free Press.
- Scott, C. P., Jiang, H., Wildman, J. L., & Griffith, R. (2017). The impact of

implicit collective leadership theories on the emergence and effectiveness of leadership networks in teams. *Human Resource Management Review*. doi:10.1016/j.hrmr.2017.03.005

- Spielman, D. J. (2002). *Innovation systems perspectives on developing-country agriculture: a critical review*. ISNAR Discussion Paper 2. Washington, DC: International Service for National Agricultural Research (ISNAR) Division of the International Food Policy Research Institute.
- Strong, E., Rowntree, J., Thurlow, K., & Raven, M. R. (2015). The case for a paradigm shift in extension from information-centric to community-centric programming. *Journal of Extension*, 53(4).
- Sulaiman, R. & Davis, K. (2012). *The “new extensionist”: roles, strategies, and capacities to strengthen extension and advisory services*. GFRAS Position Paper. Lindau: GFRAS.
- Temming, M. (2018). People are bad at spotting fake news. Can computer programs do better? There’s just too much misinformation online for human fact-checkers to catch it all. *ScienceNews*, 193(4), 22.