

Embedding Research and Extension in Postgraduate Studies: A Novel Approach to Filling the Knowledge Exchange Competency Gap in Ireland

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Abstract

Set against the backdrop of an absence of agricultural extension in the curriculum of agriculture degree programs in Ireland between 1990 and 2010, this paper examines the knowledge exchange skills needed by the next generation of farm advisors and presents the case of a practice-based postgraduate program in Ireland that seeks to address the competency gap created. It reviews an Irish post graduate program that has been designed to equip graduates with the competencies to work effectively in advisory roles. It combines student, graduate, and manager survey results on their experience and assessment of professional development with this program.

The evolving role of front-line farm advisors to facilitators of knowledge exchange and innovation is recognised while a range of essential competencies are highlighted. The value of this postgraduate education for early career farm advisors is evidenced through building competencies in a range of areas and gaining a deeper understanding through applied research of the complexities of innovation adoption and the barriers to change for farmers and their families. The paper concludes that greater attention is needed to developing core competencies of farm advisors to build strong relationships of trust and influence with farmer clients.

Article History

Received: November 30, 2023

Accepted: November 30, 2023

Published: January 31, 2024

Keywords

advisory competencies; knowledge exchange; postgraduate; innovation

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Introduction

Agricultural extension and education had been largely absent from the curriculum of undergraduate and postgraduate agriculture degree programs in Ireland between 1990 and 2010. This was not a situation unique to Ireland as one-way technology transfer approaches to agriculture, which placed little attention to understanding farmer decision-making processes, reflected the dominant view of the time (Fielke et al., 2018). With an increasing recognition of the importance of a more two-way knowledge exchange approach to support farmer decision-making, a postgraduate program in agricultural innovation support was designed and developed to address the competency gap which had emerged amongst the cohort of frontline advisory staff in Ireland. The development of this program and its effectiveness in addressing this gap is the subject of this paper.

The depth and breadth of knowledge required to farm is considerable and growing more complex; consequently, more attention is being directed by advisory services to the process of innovation and “knowledge exchange” and understanding how to support farmers with knowledge more effectively (Department of Agriculture Food and the Marine [DAFM], 2020; EU SCAR, 2019). The challenges and opportunities facing the agriculture and food sectors globally have been well documented and include, *inter alia*, the rapidly growing global population, the diminishing base of natural resources, climate change, and animal welfare concerns (Charlton, 2016; Tomlinson, 2013; van der Ploeg et al., 2020).

Agricultural advisory services are expected to play an important role in the transformation process to address these challenges (Piñeiro et al., 2020) by performing a set of increasingly diverse functions that go beyond the mere promotion of increasing productivity (Blockeel et al., 2023). New functions, such as promoting agro-ecological practices, promoting collective actions, and facilitating innovation processes, are now considered the domain of both public and private agricultural advisory services (Blum et al., 2020).

Birner et al. (2009) highlighted the need for reform of advisory services to better meet the needs of farmers, and this includes building their capacity in an effort to better deliver their knowledge and innovation support requirements. Transition towards more sustainable agro-food systems and the emphasis on systemic, multi-actor, and transdisciplinary approaches to innovation has led to an increasing interest about actors being able to facilitate and support innovation processes (Proietti & Cristiano, 2023). Brunori et al. (2013) and EU SCAR (2012) recognised that a “business as usual” approach of technological and organisational solutions is no longer adequate, and there is a growing need for increased levels of innovation in the agricultural knowledge and innovation system (AKIS). In supporting decision-making for these changes, farm families who are well linked into networks of knowledge and information are much better able to deal with stresses and to exploit new opportunities (Fulton et al., 2003; Gorman, 2004). Ingram and Mills (2019) highlight the importance of the new facilitating role of advisors and the need to offer them training in initiating, fostering, and brokering farmer-centered networks and in facilitating group problem-solving.

This paper considers the gap which exists in developing the competencies of front-line farm advisors in supporting knowledge exchange process with clients. It examines the formation and professional development of farm advisors through the case of an Irish post graduate program in agricultural innovation support that has been designed to equip graduates with the competencies to work effectively in advisory roles.

Farm Innovation and Knowledge Exchange

European agriculture strives for sustainable intensification or the means of increasing productivity and profitability while coping with challenges such as climate change, environmental management and social concerns around food quality and animal welfare. Innovation is considered essential in this quest (Sayer & Cassman, 2013; Vermeulen et al., 2012) as reflected in the public and private sectors attention and resources focused on research and development for innovation in agriculture and the bio-economy (Dwyer, 2013; EU SCAR, 2019).

The role of science in relation to innovation is being reconfigured, and there is greater acknowledgement of the multi-player dimensions and the institutional settings that enable learning and innovation to emerge (Caraça et al., 2009; Leeuwis, 2004). Farm innovation is increasingly seen as emerging from the lively interactions of multiple stakeholders rather than the traditional flow of new ideas from research to farmers as end users, and Ingram and Mills (2019) conclude that best practice is reflected in scenarios in which advisor, scientist, and farmer knowledge are effectively integrated. In the EU several CAP instruments such as the EU EIP-AGRI network and the Farm Advisory System directly foster these knowledge exchange, advisory, and innovation activities (Beck et al., 2020). These activities are also prioritised in Ireland's agri-food strategy since 2020 (DAFM, 2020), which acknowledges that an effective innovation system and an engaged and responsive knowledge exchange environment are fundamental to achieving innovation in the sector.

The models for farmer engagement in the agricultural knowledge and innovation system are changing as the challenges of food security, climate change, and sustainable rural development cause us to question the dominant productivist paradigms (Gorman, 2019). The importance of knowledge exchange in supporting innovation in agriculture is emphasised by Rose et al. (2019) who conclude that for any concept designed to communicate new management practices to farmers, it would be prudent to consider how projects can be co-designed and make the most of trusted advisor and peer networks. Velardia et al. (2021) found that to achieve sustainable agricultural practices with long-term impacts, facilitative knowledge exchange based on equitable partnerships, mutual respect, shared expectations, and shared power were important. However, Ingram (2008) revealed that knowledge exchange processes can be challenging as many agronomist–farmer knowledge exchange encounters are characterized by an imbalance of power, distrust, and the divergence of knowledge.

Evolving Farm Advisory Services

There has been a gradual evolution in thinking on agricultural extension from linear models of technology transfer to more participatory models of knowledge exchange (Fielke et al., 2018; Jones & Garforth, 1997; Manning, 2013). The traditional role of the farm advisor was that of an instructor, expected to have the answers on how to improve farm profitability but over the years there has been a change in the role of farmers from one of passive learning to more active engagement and knowledge exchange, with the role of the farm advisor shifting to that of a facilitator who is able to support peer to peer learning among farmers and take on the role of knowledge brokerage as well (Cristóvão et al., 2012; Manning, 2013). The shift to participatory models of agricultural extension or advisory work has been gathering momentum over the past decades (Chambers, 1983; Knook et al., 2018; Leeuwis & Aarts, 2011; Pretty, 1999) with growing recognition that farmers are not passive recipients of knowledge from research but active agents of their own development. In tempering this shift of emphasis, Koutsouris (2012) has cautioned against “over-preoccupation” with participatory techniques and methods and draws attention to the emerging “intermediation” functions within the AKIS which still has to confront the knowledge gap between the expert and the farmer and recognise the power relationships that shape local knowledge and the articulation of needs. Leeuwis and Aarts (2011) see the role of the extension agent as the intermediary, not aiming for pre-defined change but facilitating the potential for change in complex, dynamic settings.

The Core Competencies in Agricultural Extension

The core role of farm advisors can be viewed as “the conscious use of communication of information to help people form sound opinions and make good decisions” (Van den Ban & Hawkins, 1996, p.9). While this core role of farm advisors is well accepted, Bengé et al. (2020) found that many extension professionals enter the field without having the appropriate functional competencies.

The core competencies required by early career farm advisors have been identified by Harder et al. (2010) in broad groupings around interpersonal communications skills and program management as well as technical expertise for production, farm business management, and environmental conservation. In supporting interactive innovation, Lybaert et al. (2021) group the competence requirements for advisors similarly around content competence, methodological competence, and organisational competence, and they also emphasize the importance of commitment to reflection, learning, and personal development. The need for stronger business management advisory support to farmers is argued by Phillipson et al. (2004). However, it is prudent to recognize that many extension professionals enter the field without the appropriate functional competencies (Bengé et al., 2020).

Millar and Curtis (1997) suggested that more emphasis is needed on the processes through which effective learning takes place compared to the content of information packages. The importance of recognising and responding to the dynamics of farm families that have such a bearing on the processes of farm decision-making is highlighted by Olsen et al. (2009). The need

for enhanced technical competence especially in relation to integrating environmental issues in advisory services is considered by Labarthe (2014) and Ingram and Morris (2007) who suggest that new policy challenges and opportunities associated with environmental management require a significant enhancement in the advice and support farmers require.

Leeuwis and Aarts (2011) argue that agricultural extension has to reinvent itself as a professional practice as many of the challenges transcend the individual farm household and require new forms of collaboration. Today's extension worker needs to be able to support and facilitate collective learning and decision making, build linkages between diverse stakeholders, and create a context for learning and innovation (Cristóvão et al., 2012; Klerkx et al., 2012). Gorman (2019) in a review of agricultural advisors' competencies suggests that if agricultural advisors are to be able to influence individuals and groups to engage in innovative responses to farming challenges, then it follows that their training should expand their professional identities in terms of facilitation and reflective listening and encourage a critical questioning of their underlying assumptions. Hansen et al (2018) found that the advisor's relational and professional competence is crucial to achieving satisfied farmer clients.

In summary, the competent farm advisor needs to stay up to date on the best technical and practical knowledge of farming, be competent in business and financial management, understand the wider context of agriculture, be able to guide individual farmers and their families towards sound decisions, facilitate peer to peer learning, and identify and build links between key stakeholders.

A Curriculum for Extension Education

Mulder (2012) argues that competence-based education programs have developed to counter the structural disconnect between the world of education and training and the world of work and society. Straw et al. (1996) outlined some of the benefits of postgraduate extension training as development of a more professional approach with a marked improvement in core competencies, mental stimulation, lateral thinking, and career enhancement. At the postgraduate level, the challenge in curriculum design is to ensure that students develop the facets of mastersness, i.e. working autonomously, independent research, in-depth analysis, abstraction, professionalism, and being able to work in complex and unpredictable environments (Bamber, 2015).

The value of experiential learning through work placements has been considered by Wilton (2012), including developing graduate employability and giving graduates a head start at the outset of their careers. Devitt et al. (2012) discuss how every profession has its concepts and practices, ways of thinking and acting and that these provide the pathway from novice to initiate within a profession. Smith (2012) outlined the key dimensions to be considered in work-integrated learning as authenticity; integrated learning supports; alignment of teaching, learning activities, and assessments with integrative learning outcomes; supervisor access; and induction/preparation processes.

Building Competencies: The Masters in Agricultural Innovation Support

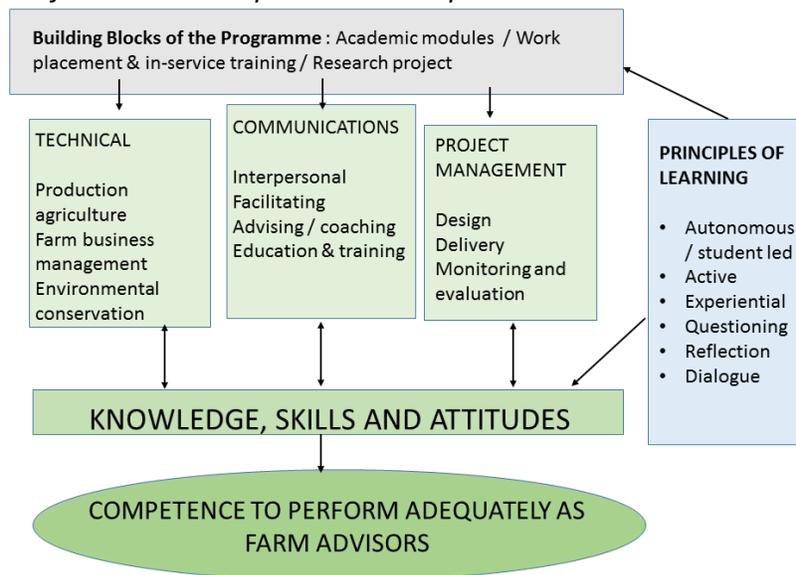
In 2010 in Ireland, University College Dublin (UCD) and Teagasc¹ (Ireland's Agriculture and Food Development Authority) started a master's level program in Agricultural Innovation Support (MAIS) with the stated aim to equip graduates with the skills and knowledge to be effective as front-line farm advisory and agricultural education officers. The program design combined theory with practical learning and action research, with students placed in a real advisory/education work setting.

A novel aspect of the MAIS Program is the process through which topics for research are identified each year. The network of Teagasc agricultural advisors throughout Ireland (approx. 250 staff) are invited at the start of each year to put forward research proposals that they feel can best inform their day-to-day work with the core criterion being that it must be focused on knowledge exchange challenges that they encounter. The initial list of proposals is then assessed and shortlisted as the "hot topics" for MAIS research in that year.

Figure 1 illustrates how the program was structured to enable the student to develop their competence for agricultural advisory work and to balance academic work and action research as an integral part of the experiential work-based learning.

Figure 1

The building blocks of extension competence development



¹ Teagasc is the public agency with responsibility for agricultural research, advisory services and education in Ireland

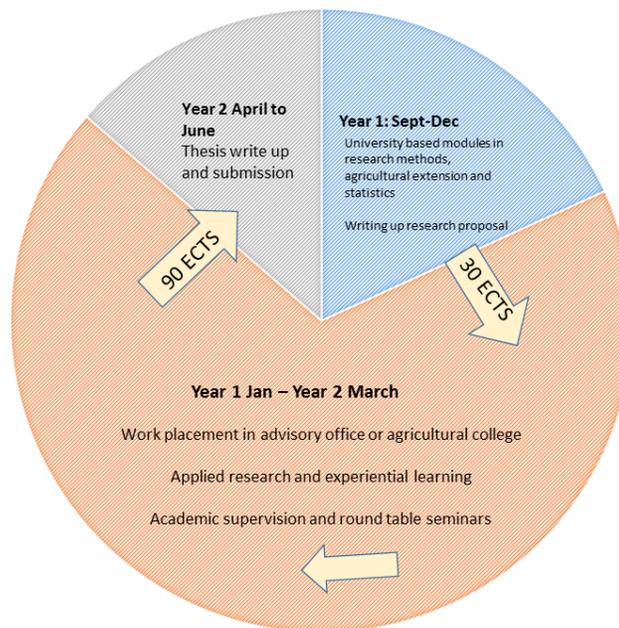
For the building blocks to result in the desired technical, communications, and project management learning outcomes for the students, certain principles were interwoven into the program. These include autonomy with students encouraged to take responsibility for their own learning and competency development (Biggs, 2012); active and experiential learning (Honey & Mumford, 1992; Kolb, 1984); as well as dialogue and reflection (Newman, 2014).

The Program Curriculum

The program design is illustrated in Figure 2. Students start the program with a semester in the university taking three core modules in 1) agricultural extension and innovation; 2) research methods; and 3) biostatistics. It is possible for students to take additional modules where they are deemed relevant to their particular area of study.

Figure 2

Stages in the Masters in Agricultural Innovation Support



On interview-based selection, students are matched to research projects that have been identified by Teagasc farm advisors reflecting real life issues and challenges in agricultural advisory and education contexts. A university supervisor is assigned to each research project with a Teagasc co-supervisor who guides the student to keep the research project focused on the real-life problem or challenge.

The program's three phases covered a 22-month period. The first phase is from September to December of Year 1 where the students are university-based and complete modules on agricultural extension, research methods, and statistics. On finishing the first phase they are expected to have successfully completed these modules and developed a research proposal and literature review on their assigned knowledge transfer topic. The second phase is for 15

months (January of Year 1 to end of March of Year 2), during which time the student is based at a Teagasc centre (advisory office or agricultural college) for this period, with at least half of their time allocated to research and the balance to extension and/or education support activities within that Teagasc centre such as preparing farm nutrient management plans, supporting farmer discussion groups, and delivering elements of agricultural education programs. Phase 3, from April to June of Year 2, is dedicated to final writing-up and submission of thesis. While based at the Teagasc centre in Phase 2 the students are managed and mentored in their day-to-day work by the relevant Regional Manager or Agricultural College Principal as is the case for all advisory or education staff. There are also roundtable seminars every 3-4 months where all students and supervisors are brought together to discuss and review progress on the research projects. Following completion of the program, students are given an opportunity to present their research publicly through presentations and posters at an annual “Knowledge Transfer” conference jointly hosted by UCD and Teagasc.

Experience of the Program to Date

Between 2010 and 2023 there has been an intake of 126 students into the MAIS program, an average of nine per year and ranging from 4 to 12. The numbers who have graduated with MSc degrees is 91 and with PhDs is four (with two more pending), while eight students withdrew from the program, eight failed to complete, and 13 are still in their 1st or 2nd year in the program. Of the 91 graduates of the program to date, 43% are female and 57% male.

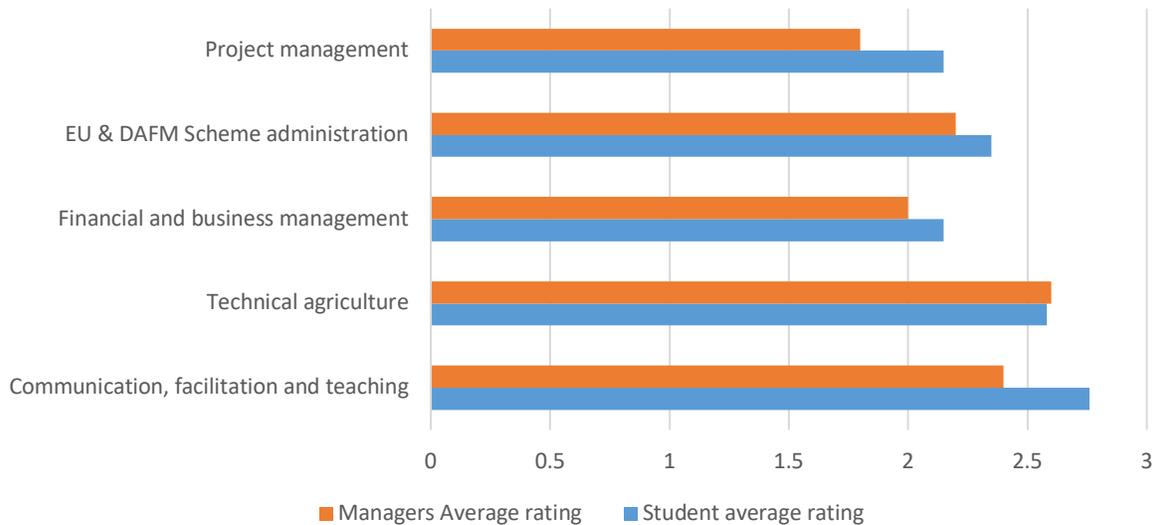
In order to assess whether this approach is an effective model for developing extension competencies, the program’s progress to date was reviewed using:

1. A survey of the program graduates. A list of 91 graduates was compiled and contact emails were available for 81 of them. The survey yielded a total of 34 responses (42% response rate). These included at least one graduate from every year of the program with five graduates from 2013, 2015, and 2016.
2. A survey of five senior regional managers (four male, one female) in the national farm advisory service who have hosted students on placement and have subsequently had graduates employed in their regions.

Students and Regional Managers were asked their views on the importance of different competencies for agricultural extension. These competencies were identified from the literature (Harder et al., 2010; Leeuwis & Aarts, 2011) and from the experience with the program to date. Figure 3 below presents and compares the average rating by both groups where a score of three indicates a critical competence for the role, a score of two indicates an important competence while one indicates useful, and zero is not important.

Figure 3

Average Rating of Importance of Different Competencies by Students (N = 34) and Managers (N = 5)



Both managers and students gave the highest level of importance to technical and communications skills while the managers placed more importance on the technical skills. They attached similar levels of importance to the administration of schemes as to farm financial and business management and the lowest levels of importance to project management competence. This finding affirms the literature with regard to the core role of extension being the ‘use of communications to bring about cognitive changes as triggers for other forms of change by farmers’ (Leeuwis, 2004, p.27)

There are indications that the program is effective in enabling the students to build these critical competencies. Of the 34 graduates who responded to the survey, 17 had started their career in education roles; 11 had started their careers in advisory positions while the others included research, policy, working with government, and agri-business. The earlier graduates gave information on their career moves and career development showing considerable mobility between education and advisory roles. Nine graduates who started in education roles have since moved onto advisory roles while three who started as advisors have since moved into education roles.

They were asked how important their master’s had been in securing their current roles, and 71% said it had been “very important,”; 21% said it was “important” while two respondents said it had not been important. The Regional Managers were asked to compare the MAIS graduate with other early career graduate advisors in terms of the important competencies, and their responses are shown in Table 1 below.

Table 1

Teagasc Regional Managers ratings of important advisory competencies between MAIS graduates and other early career graduate advisors (n = 5)

Competence Area	Stronger	The Same
Communication, facilitation, and teaching	4	1
Technical agriculture	4	1
Financial and business management	0	5
EU & DAFM Scheme administration	3	2
Project management	4	1

This suggests that the key competencies developed by students during the program were in communications, technical agriculture, project management, and scheme administration. One of the managers stated that:

It serves as an apprenticeship for advisors and, when successful, gives graduates the opportunity to develop themselves as advisors who can operate and think independently so that they can go straight into the advisor role with confidence and a high degree of autonomy.

How Effective is the Learning from the Different Components of the Program?

In terms of their own learning, students were asked to rate their learning from the different components and the three different stages of the program, and the average ratings are shown in Table 2 below where 1 = very poor and 5 = excellent.

Table 2

Student rating of their own learning from different phases and components of MAIS program (1 = very poor; 5 = excellent)

Phase 1	Agricultural Extension	Research Methods	Advanced Bio-Statistics	Electives	Preparing research proposal	Building relationships with classmates
Average Rating	3.90	3.62	2.70	3.37	3.39	4.09
Phase 2	Advisory Office	Agricultural College	Conducting Research	Supervision	Round Table seminars	
Average Rating	3.73	4.13	3.88	4.16	3.97	
Phase 3	Thesis write up	Thesis examination & feedback	Dissemination (KT conference)			
Average Rating	3.68	3.62	3.72			

In Phase 1 of the Program, the two most valued modules were Agricultural Extension and Research Methods, both providing a solid basis for their research and their entry to the extension profession. The value of the Agricultural Extension module was noted as “important due to been put into practice for phase 2 (Work placement)” and learning “how broad agricultural extension is and the complexities around adoption, innovation, and behavior change, while learning about the different methods available and the pros and cons of each was also useful.” The importance of research methods was critical to “adapting a research mindset with a strong focus on social science compared to the hard science background that we were used to in Undergrad.” While the subject Biostatistics was less valued, one graduate mentioned that “advanced biostatistics course has been the most useful over time, particularly as I've used varied analytical programs through the course of my employment.” While most of the responses about the first phase were positive, two respondents felt that there had been limited value to Phase 1 in UCD in terms of “proper preparation in undertaking a research masters.”

The highest average rating in the first phase of the Program was given to building relationships with classmates and one third of respondents specifically mentioned how valuable this was leading to support networks that have persisted into their professional lives – “The relationship with my classmates was the most important thing I would say. Even to this day we are still in touch.”

Phase 2 of the program was highly rated in terms of learning by the respondents. Most reported an “excellent” experience in their advisory office or agricultural college while a small number (two respondents) were dissatisfied. Typical comments about the advisory placements include “placement in agricultural advisory office is very beneficial as you learn the day-to-day tasks of an advisor’s role and also education role. It helps you gain experience in different areas.” For those in education placements “being immersed in the agricultural college so I fully understood the life of an agricultural teacher which was extremely important to my research.” Comments from those on advisory and college placements included praise for the overall support they received from the wider staff cohort and appreciation for the range of activities they gained experience with. The process of conducting their research and the supervision and support given were valued for learning, and one respondent commented that Phase 2 of the program had provided “so many learnings - phase 2 pulled everything together for me. Time management, putting learnings from phase 1 into action, working with experienced advisors, research work, working to deadlines, meeting with supervisors.” Others spoke of growing independence and autonomy in this period leading to personal and professional growth from “trusting own ability and making decisions.” Two respondents were not happy with their supervision but did comment that they had learned from this experience.

Respondents felt they learned a lot in Phase 3 (Thesis write-up), and that “it was great to see the fruits of our labour come together at this stage.” Many commented on how challenging it was especially in terms of underestimating the time required to complete the writing up, and one commented that “I learned a lot about writing and editing. It made me appreciate just how much work goes into producing a written piece, whether large or small.” For some their key

learning was about making sense of their research and thinking about its relevance with one saying that this phase “challenged me to really think of what the research actually meant beyond simply presenting the stats.” Many of them emphasised how important their regular communication with supervisors and receiving feedback was during this period. Almost all the students had also presented their research findings at the annual UCD/Teagasc annual Knowledge Transfer Conference, and this was a valued experience for most respondents in terms of “developing my presentation skills and being able to communicate my research to academic and non-academic audiences” while another commented that “presenting at the KT conference built up confidence and promoted my research and my profile.”

Discussion

Farmers’ engagement with the AKIS is changing as global issues of food security, climate change and sustainable development challenge the existing productivist paradigms (Gorman, 2019), and there is a shift in understanding as to what constitutes “good” extension and education practice to support agricultural innovation —from one-way models to exchange models and increasingly towards models of co-creation and interactive innovation (Fielke et al., 2018).

There is also increasing recognition that many extension professionals are entering the field without appropriate functional competencies (Benge et al., 2020). Lybaert et al. (2021) suggest that alongside the basic disposition and attitude required in an advisor, they also require content competence, methodological competence, organisational competence, and a commitment to reflection, learning and personal development. However, as we consider the challenge of building these competencies, Lybaert et al (2021) asks whether we need to focus on the competence development of individuals or should more people be involved in the innovation process as a team. We argue that both are necessary, and that individual competence complements team competence through the building of strong relationships within the AKIS.

Different models and approaches are needed to support the development of extension competence within the overall AKIS, within extension teams, and at the individual level. The model that has been tested with the MAIS program is designed for new entrants to extension and education services and is grounded in the reality of the Irish AKIS, with the research topics arising from the challenges that advisors face. By engaging the AKIS actors centrally in supervision and mentoring of students, it creates an environment in which cross-generational knowledge exchange can happen, and young advisors get the opportunity to develop and shape their own professional identity and build a sense of belonging within the community of advisors. The process of research in MAIS allows students to develop a disciplined and reflective approach to the design of advisory programs. Building a cohort of critical, reflective thinkers within extension services has been increasingly emphasised in relation to addressing sustainability issues with farmers (Howlett et. al, 2016), and the MAIS approach is helping early career advisors to think deeply about the implications of their research and their advisory work.

Collectively, academia and the public and private sectors' advisory services need to strengthen their research and knowledge on the factors influencing on-farm innovation and to share learning on how to better engage farmers as seekers of knowledge and in processes of learning. The opportunities and options for postgraduate training and continuous professional development on knowledge transfer and exchange need to be extended at the national and EU levels, particularly utilizing the potential of digital and blended learning.

Acknowledgements

The authors are grateful to the graduates and advisory services' managers who provided information for this paper. They also acknowledge the central role of Teagasc in the development and delivery of the MAIS postgraduate program.

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