



Strengthening the role of innovation brokers in the livestock advisory services system of Pakistan

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ABSTRACT

Context. This article assesses development and implementation of a non-traditional training ‘whole-family extension approach’ (WFEA) that contributes to the innovation-brokering capacity of farm advisors within the current livestock advisory services system of Pakistan. **Aims.** The primary objectives of the research were to explore how the WFEA training leads to improved capacity and knowledge of farm advisors and then examine these through the lens of innovation brokers and the difference they can make within the extension system, including (1) articulation of problems and possibilities, (2) network building and (3) supporting negotiation and learning in networks. **Methods.** A qualitative investigation was conducted during four facilitated discussions and three field follow-up visits following project interventions to build the capacity of 50 farm advisors from across a network of 22 organisations that are part of the Pakistani’s livestock extension system. Data were collected by using the following two qualitative approaches: (1) facilitated discussions, during each of the four separate training workshops; and (2) field follow-up visits, where farm advisors were interviewed following a set of semi-structured questions. The data were analysed to assess the changes observed across the different farm advisors during the training interventions and subsequent mentoring provided by the project team. **Key results.** Gaps in innovation-brokering capacity from WFEA were identified and include co-designing and more institutional support of various collaborating organisations, use of visioning tools, scenario analysis to predict possible future for the farm-advisor training and training of farm advisors on analytical skills to capture the household impacts; these should be incorporated in WFEA training. **Conclusions.** A holistic extension training intervention approach (the WFEA) can positively influence the innovation-brokering capacity of farm advisors within the current livestock advisory services system of Pakistan. **Implications.** This article has contributed to the literature on innovation-brokering roles in the livestock advisory systems by highlighting key additional functions of innovation-brokering in a developing-country context. Furthermore, examples from Pakistan can be used to show how farm advisors can develop skills in articulating problems and possibilities, network building and supporting negotiation and learning in networks.

Keywords: advisory services, agricultural extension, capacity building, extension approach, livelihoods, smallholders, training, whole family.

Introduction

A well-functioning agricultural innovation system (AIS) can lead to enhanced agricultural efficiency, productivity and reduce poverty in low-income countries. An AIS is a network of actors, including organisations and individuals, involved in generating, diffusing, adopting and using new agricultural technology together. To enhance the functioning of an AIS, there are several factors that need to be addressed. This includes a shared vision along with the concept of multi-stakeholder coalitions to drive desired institutional change through communication, enhanced cooperation and interactive learning processes (Klerkx *et al.* 2012).

In many AIS, there is a disconnect among organisations, which leads to coordination failures and inefficiencies in the system. Individuals, or innovation brokers, within an AIS can play a vital role in communication, trust building, supporting and enhancing interaction among various components within the AIS and helping build social capital for innovation (Rivera and Sulaiman 2009; Klerkx 2012). Furthermore, they facilitate information flows, connect partners, articulate demands, facilitate linkages among different actors and have other functions that support innovation processes (van Lente *et al.* 2003; Winch and Courtney 2007; Klerkx and Leeuwis 2009). So as to play these multiple roles, the AIS needs well-developed human capital and an enabling environment to support their continued development (Hall *et al.* 2004).

Strengthening AIS in low-income countries is particularly important, so as to support farmers in making decisions relating to their household livelihoods. An immature innovation system has been diagnosed in South Asian countries including Bangladesh and India (Rivera and Sulaiman 2009). This immature AIS tends to be inefficient because of underdeveloped linkages among actors within the system and a lack of capacities to emerge collaborative innovation. In Pakistan, farm advisory services are based on a linear, top-down model of technology transfer, where knowledge is developed and validated by researchers, communicated by extension agents and transferred to the farmers (Ashraf *et al.* 2018). This type of AIS is generally poorly connected, with limited communication between farmers and the institutions involved in the technology transfer. Furthermore as the AIS in Pakistan becomes more pluralistic, the organisations involved in the delivery of extension services (including government, non-government organisations (NGOs) and private sector) will become more diverse with different goals, exacerbating the challenges in this type of system (Davidson *et al.* 2001; Baig and Aldosari 2013).

Several studies across Latin America, Africa and Asia have recommended that improvements can be made to optimise the formation of linkages among scientific, extension and agricultural practice domains by strengthening the role of innovation brokers. Farm advisors who perform the role of innovation brokers need to acquire high levels of knowledge and capacities in several areas covering technical farming information, and social skills for building community learning opportunities. These skills include working with organisations and coordinating groups, conflict management, practical learning increasing the efficiency of advisor interventions capacity to impact changes on agricultural practices and rural development.

Building the capacity of farm advisors across this breadth of information and skills is not new, but it is challenging because of the dynamic nature and specificity to the current AIS within the country. The concept of training innovation brokers has shifted over recent years owing to the multiplicity of contexts and increase in the complexity of their roles. Acknowledging this complexity requires regularly rethinking

and updating both the contents and strategies for the training of farm advisors. Thus, for farm advisors to perform their role as innovation brokers they require a range of skills developed through participatory approach to training (Knickel *et al.* 2009). Supporting the development of human capital within an AIS can be difficult, particularly where formal training mechanisms do not exist at either the organisation or country level; this is a common challenge in many developing agricultural and livestock sector scenarios. There are limited studies that assess this type of capacity building in low-income countries, particularly when involving multiple stakeholder groups, which exacerbates the challenge because advisors have different educational backgrounds, mandates and goals.

This research explores the ways in which capacity building of farm advisors, by using a new farmer engagement approach, can lead them to act as innovation brokers within the current livestock advisory services of Pakistan. It addresses the following question: how can a holistic training intervention (that is, the whole-family extension approach, WFEA) affect the innovation-brokering capacity of farm advisors? In addressing this question, we identify and discuss the strengths, as well as the gaps and weaknesses of this training intervention. This provides beneficial insights on innovation-brokering roles in agricultural advisory systems by highlighting key additional functions of innovation-brokering in a developing-country context, by using examples from Pakistan.

Background of the ‘whole-family extension approach’ intervention

There are a number of different farmer engagement approaches, which have been the basis of training interventions to support the role of farm advisors in the AIS of low-income countries. One of these is the Farmer Field School (FFS), which has been used to increase production and income of small-scale farmers in East Africa, with the approach being used to target women and producers with limited literacy. Similarly, the Family Team Approach (FTA) was developed in Papua New Guinea to enable farming families to explore issues of gender and culture within families, seeking to encourage more effective, sustainable and gender-equitable farming and business practices (Pamphilon *et al.* 2017). The Training and Visit (T&V) approach has also increased farmers’ knowledge and adoption of technology in Pakistan but did not capture information on the impacts on knowledge and capacity of farm advisors.

One program, recently developed in Pakistan, is the WFEA, which is a farmer-engagement program providing training to the men, women and children of the farming household about the whole dairy-farming system (Warriach *et al.* 2019). This approach is made up of multiple components, including extension material with farm-based recommendations, extension tools to support farmer engagement and technical information to support farm advisors. A flowchart depicting the different components of WFEA is shown in Fig. 1.

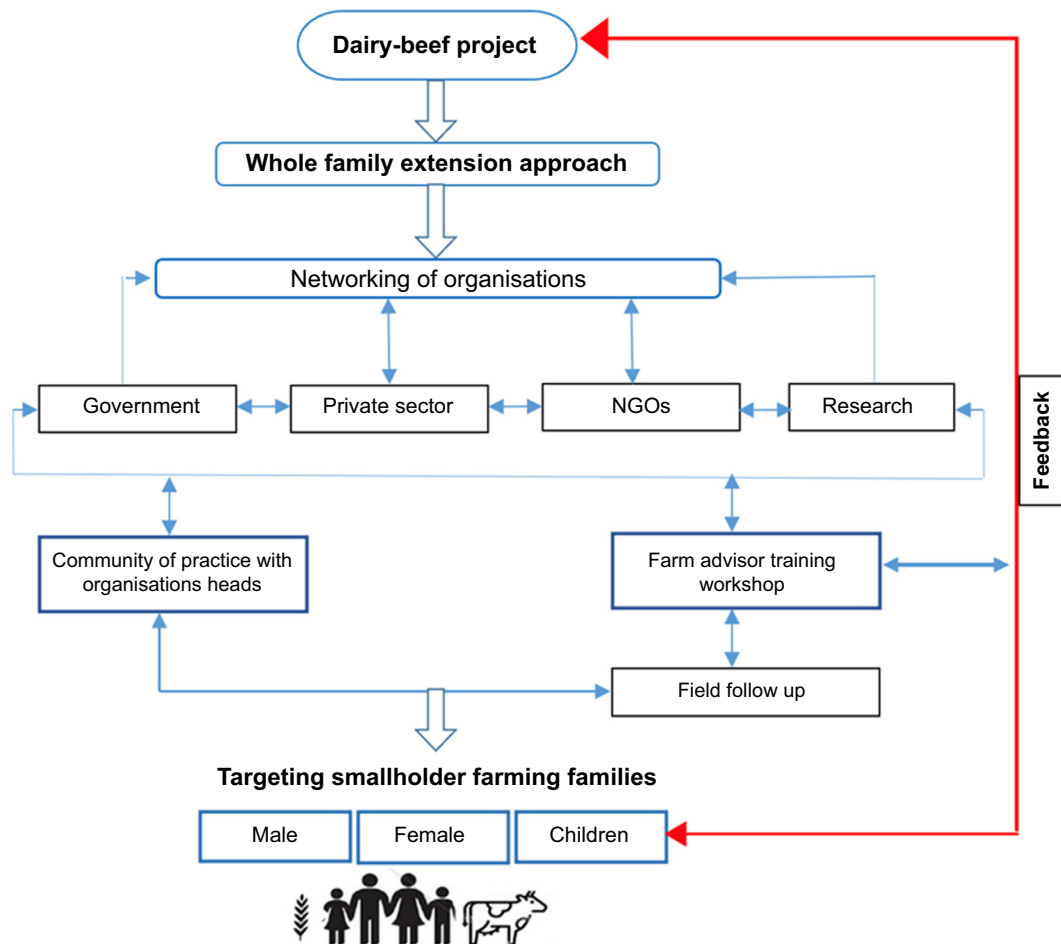


Fig. 1. WFEA extension model modified from Warriach *et al.* (2019).

This approach was based on the rationale that family members are each responsible for particular aspects of the farm operations and, thus, would require different information. Women are most often responsible for milking, oestrus detection and calf rearing, men for agricultural farming operations, whereas children play a major role with calf rearing. Providing information to all family members stimulates informal discussion among family members over meals and during non-working hours. Research has shown that success can be achieved when implementing the WFEA, including on-farm practice change, leading to overall productivity increases of up to 25–30% on smallholder dairy farms (Warriach *et al.* 2019). This highlights the value and opportunity of this WFEA when working towards enhancing Pakistan's AIS.

Part of the process of implementing the WFEA is to train the farm advisors to connect with the farming communities. Farm advisors who were part of this initial program were from two provincial government livestock departments and were trained using participatory and interdisciplinary approaches (Warriach *et al.* 2019). The aim was to improve their technical knowledge and communication skills to support engagement

with farming communities and farm practice change by addressing their on-farm challenges; it was not designed to train farm advisors as 'innovation brokers'. Taking this work around the WFEA to scale would have to take into account the pluralistic nature of the livestock advisory system in Pakistan. The pluralistic nature of AIS around the globe is becoming more widely accepted. This acknowledges the variety of organisations that are involved in working with this pluralistic extension system and communicating with farmers, which allows for more collaboration and accepting of the breadth of organisations involved including government, NGO, private sector and research groups.

Materials and methods

Participants

The present study builds on the initial implementation of the WFEA (Warriach *et al.* 2019) and expands the training program to the wider livestock advisory services system of Pakistan. The project team from the University of Veterinary

and Animal Sciences (UVAS), Lahore, established collaborative partnerships with 22 organisations from Pakistan's livestock advisory system that have the common goal to improve the livelihood of smallholder farmers (Table 1). Selection of organisations was based on the following criteria: (1) providing farm advisory services or being linked with smallholder farmers, (2) having employed extension staff and (3) having the broad goal to improve the livelihoods of smallholder farmers. The project is supporting these collaborating organisations by establishing links among their management teams, farm advisors and providing farm advisors in each organisation capacity building on the implementing of the WFEA. Each organisation selected up to four farm advisors from their field teams to be involved in the project interventions. In total, 50 farm advisors were part

Table 1. List of the extension organisations engaged with the dairy–beef project of Pakistan.

Organisation	Type/mandate
University of Veterinary and Animal Sciences, Lahore	Research, teaching, extension
Sindh Agriculture University, Tandojam	Research, teaching, extension
University of Sargodha	Research, teaching, extension
Centre for Agriculture and Bioscience International	Research, development, extension
National Agricultural Research Centre	Research
Farm Dynamic Pakistan	Private sector, extension
Shakarganj Foods Products Limited	Private sector, extension
Fauji Foods Limited	Private sector, extension
Engro Foods	Private sector, extension
Haleeb Foods Limited	Private sector, extension
Matra Asia (Pvt) Ltd	Private sector, extension
Nestle Pakistan	Private sector, extension
Livestock and Dairy Development, Punjab	Government, extension, research
Livestock and Fisheries Department, Sindh	Government, extension, research
National Rural Support Program	NGO, development, extension
Lodhran Pilot Project	NGO, development, extension
Management and Development Foundation	NGO, development, extension
Rural Education and Economic Development Society	NGO, development, extension
World Wide Federation	NGO, development, extension
Potohar Organization for Development Advocacy	NGO, development, extension
Sindh Agricultural and Forestry Workers Coordinating	NGO, development, extension
Akhuwat Foundation	NGO, development, extension

of the project WFEA training program (as described below) and were each responsible for implementing the WFEA within their own organisations.

Conceptual framework

In the AIS, systemic intermediaries play a crucial role in ‘coordinating and brokering relations at several interfaces in complex multi-actor configurations’ (Devaux *et al.* 2009; Klerkx and Leeuwis 2009; Kilelu *et al.* 2013, p. 66). Kilelu *et al.* (2011) provided a collated range of functions that intermediaries in agricultural innovation can fulfil; we apply these to understand the role of innovation brokers, as described by Klerkx *et al.* (2009, 2012). These functions include the following:

- Demand articulation: articulating innovation needs and corresponding demands in terms of technology, knowledge, funding and policy.
- Network building: facilitation of linkages between relevant actors (scanning, scoping, filtering, and matchmaking of possible cooperation partners).
- Innovation process management: enhancing alignment and learning of the multi-actor network, which involves facilitating learning and cooperation in the innovation process.

In the present study, the functions of innovation brokers (listed above) presented by Klerkx *et al.* (2012) were used as a conceptual framework to assess the capacity-building interventions as part of this program. This research aims to understand how the WFEA training intervention, which does not include specific training on innovation-brokering, affects the capacity of farm advisors within the current livestock advisory services system of Pakistan to play the roles of innovation brokers.

Project interventions

The project has engaged in two major training activities to build the capacity of farm advisors so as to support the implementation of the WFEA within the current livestock advisory services of Pakistan. This training program included (1) engaging farm advisors from these collaborating partners in a set of WFEA training workshops and (2) supporting these farm advisors with one-on-one field follow-up visits. Further descriptions of these interventions are outlined below.

Farm-advisor training workshops

The 50 farm advisors from 22 partner organisations took part in a training program, which consisted of a 3-day community practice workshop every 6 months (from early 2018 until late 2019, details can be seen in Table 2). Organisations with both men and women as part of their farm advisory teams nominated at least one male and one female to participate in this collaboration and training program to align with the WFEA principles. However, organisations without

Table 2. Methods used, data collection, and participants involved in the research.

Date	Type of data collection	Research activity	Participants/Location
2 January 2018	Workshop intervention	Workshop on 'Basic principles of animal husbandry, social mobilisation and WFEA'. The first workshop (January and March 2018) was organised in two cohorts. It was the first cohort.	25 farm advisors/Lahore
5 March 2018	Workshop intervention	Workshop on 'Basic principles of animal husbandry, social mobilisation and WFEA'. It was the second cohort.	21 farm advisors/Lahore
26 March 2018	Field follow-up visit	Project team members provided one-on-one mentoring to the farm advisors, monitoring and evaluation of the implemented activities. Collected the data from the farmers and farm advisors.	14 farm advisors/Punjab 7 farm advisors/Sindh
17 July 2018	Workshop intervention	Workshop on 'Animal nutrition and social mobilisation'.	48 farm advisors/Lahore
17 October 2018	Field follow-up visit	Project team members provided one-on-one mentoring to the farm advisors, monitoring and evaluation of the implemented activities. Collected the data from the farmers and farm advisors.	7 farm advisors/Punjab 7 farm advisors/Sindh
17 December 2018	Workshop intervention	Workshop on 'Basic principles of calves management and nutrition, fodder production and social mobilisation'.	36 farm advisors/Lahore
25 June 2019	Workshop intervention	Workshop on 'Animal health, ration formulation and social mobilisation'.	42 farm advisors/Lahore
7 August 2019	Field follow-up visit	Project team members provided one-on-one mentoring to the farm advisors, monitoring and evaluation of the implemented activities. Collected the data from the farmers and farm advisors.	4 farm advisors/Punjab 7 farm advisors/Sindh
17 December 2019	Workshop intervention	Workshop on 'Animal reproduction, selection of dairy animals and role of gender in livestock'.	32 farm advisors/Lahore

this option designated the farm advisors available (either male or female) to attend these training workshops. Farm advisors who were part of this program came from diverse backgrounds depending on their role and the scope of their organisation. Therefore, technical knowledge ranged from individuals being trained as veterinarians and veterinary assistants to agriculture graduates, social mobilisers and various diploma holders.

Taking into account the diversity in the participants and the objective of the training intervention, the workshops included a broad range of technical livestock information covering the whole farming system (see Table 3). During each training workshop the project team covered two of the technical modules outlined in Table 3. In addition, to support the integration of the WFEA into the extension programs of the collaborating organisations, an array of community development and engagement principles were conveyed. Hence, the training workshops incorporated activities to help participants understand social mobilisation, gender mainstreaming, participatory communication skills and were given the opportunity to engage in a collaborative learning environment where individuals reflect on their own field experiences and the challenges they face.

Although this research is focused on understanding the role that farm advisors play as 'innovation brokers', the training was not specifically designed to build the innovation-brokering capacity of the participants. Instead it focused on supporting participants to understand the WFEA, and build capacity around engaging and communicating with smallholder livestock farmers. All training interventions were organised and facilitated by the project team (from UVAS), who were Pakistani

nationals with expertise in veterinary sciences, livestock farming systems and farmer extension.

Field follow-up visits

Field follow-up visits were conducted by the project team to further support and emphasise the information provided to collaborating farm advisors during the training workshops. The project team consisted of both males and females in both provinces, which was part of the project design to assist with the engagement of both men and women at the farm-advisor and farmer level. These field visits occurred every 6 months in-between the training workshops (see Table 2). During these follow-up visits, project team members provided one-on-one mentoring to the farm advisors, which included strategies to support effective farm advisory services and monitoring of implemented activities relating to the WFEA. During these visits, the project team conducted semi-structured interviews (see Supplementary Appendix S1) with collaborating farm advisors to better understand their progress, challenges and successes with their role and any changes to their extension program.

Data-collection strategy

Data were collected from 50 farm advisors (across the 22 collaborating organisations) by using the following two qualitative approaches at the same time as the two major training interventions:

1. Facilitated discussions; during each of the four separate training workshops (July 2018, December 2018, July

Table 3. List of the extension material used during the primary source of information during the implementation of training program on the WFEA.

Module (for farm advisors)	Fact sheet (for farmers)
Animal husbandry	Basic husbandry principles
Basics of animal nutrition	Basics of animal requirements Nutritional requirement according to age, weight and production Ration formulation
Calf rearing	Calf management Calf diseases Calf fattening
Animal reproduction	Principles of animal reproduction Reproductive disorders Importance of feed for reproduction
Dairy breeds and their selection	Different breeds of dairy animals Recommendations for the purchase of milking animal Selection of better productive animals
Ration formulation	Balanced feed for animals Total mixed ration (TMR) Urea molasses block (UMB) and mycotoxicosis
Improved fodder agronomy	Strategies to overcome fodder shortage Seed selection and preparation Summer and winter fodders Mixed cropping
Milk marketing and value chain	Cost of milk production Milk marketing options Milk value addition
Animal health	Deworming of animals Infectious diseases of animals and their prevention Mastitis prevention
Extension and mobilisation	Communication skills Relationship building Community mobilisation
Gender mainstreaming	Gender definitions Gender skills assessment Importance of gender mainstreaming in extension

The detail of extension material used during the implementation of training program on the WFEA can be found on the following link: <https://research.aciar.gov.au/aik-saath/links-extension-and-train-trainer-modules-developed-through-ten-year-aslp-dairy-project>.

2019 and December 2019), participants were divided evenly into four groups (of 8–10 people), with each group having representation of each category of organisation (NGO, government, private and research). Within these groups, two team members facilitated a group discussion

(for 45–60 min) following a semi-structured questionnaire (see Appendix S2).

- Field follow-up visits; project team members travelled to the field sites of the farm advisors and observed a typical half-day of activities in the community. Following this, farm advisors were interviewed following a set of semi-structured questions (see Appendix S2). As part of the observational data, the project team members interacted with farmers who were part of the program with the farm advisor. This occurred on three separate occasions, namely, March 2018, October 2018 and August 2019 (Table 1).

During both data-collection approaches, the discussions between project team and farm advisors were conducted in Urdu and Punjabi (local languages). Key points were noted during those discussions and paraphrased into English language by the project team members. The final data translated into English from (1) the four facilitated discussions and (2) the three field follow-up visit reports from 50 farm advisors each time (total of 150 reports) were entered into NVivo software v 12.0 (The University of Melbourne, see <https://lumivero.com/products/nvivo/>). The data were first coded using an inductive approach into key roles and functions of the farm advisors and then, by using the adapted framework from Klerkx *et al.* (2012), the data were analysed to assess the changes observed across the different farm advisors during the training interventions and subsequent mentoring was provided by the project team.

Results

The data collected from this study demonstrated that the WFEA supports farm advisors in the Pakistani extension system to play numerous roles that are consistent with those identified in the innovation-broker literature. These are listed and explained, with evidence from this research, under the subheadings of the various roles that innovation brokers can take, as presented by Klerkx *et al.* (2012).

Articulation of problems and possibilities

Explore and exchange stakeholder perspectives (values, problems, aspiration and context etc.) through discussion, role playing, dramatisation, visits, filmed interviews, informality, humour, fun, etc.

The majority of farm advisors from NGOs (7/8), private sector (5/7), research organisations (3/5) and government organisations (2/2) shared ideas with each other at various facilitated discussions regarding how the WFEA project interventions helped improve their technical, social and communication skills, which subsequently helped achieve both their routine job targets and organisational goals. For example, one farm advisor from the private sector noted that smallholder farmers started implementing improved farm-practice changes, resulting in increased milk production,

after participating in farm-level extension activities delivered by this advisor who had been trained in the WFEA. This then contributed to the farm advisor reaching his routine milk-volume targets with greater ease, benefiting both the individual and the company (source: FD-17 December 2018).

Another common theme found was that participants in the training shared stories about how they had acquired and used their new skills within their own organisations in some teaching or training capacity. This included an NGO farm advisor reporting that their organisation had involved them in various other projects with farmer-engagement components (source: FD-17 December 2019) and one female farm advisor from a research organisation shared that she has started sharing the applied field knowledge she has gained with her students and farmers (source: FD-17 December 2018). One farm advisor from a government department explained that his role as ‘master trainer’ allowed him to use his new teaching skills in various on-going training programs within his organisation. Furthermore, he shared that the participants in the training are more engaged as a result of the participatory approach he is now using, making his routine job much more target oriented (source: FD-17 December 2018).

Similarly, with respect to organisational benefits, one farm advisor from the private sector noted that their core job is milk collection from smallholder farmers and their employer does not require any technical (veterinary/animal sciences) background of their staff. Hence, when they have previously been faced with farm-based problems, they have needed to pay technical experts to assist in addressing the issue. However, after becoming part of WFEA training, the farm advisor is feeling more confident, resourceful and technically sound to solve these challenges without any additional technical support and, in the process, providing value to his organisation by saving time and funds (source: FD-17 July 2018). Another private-sector advisor noted that the social mobilisation training helped him build trust with farmers by taking more time to provide support beyond his routine job (source: FD-17 December 2018). One farm advisor (NGO) shared the success of an on-farm practice-change competition he organised among farmers. This included making a documentary of the winner of the competition and screening it on a popular TV channel to share the information and motivate other farmers (source: FD-17 December 2019).

These examples, including saving funds for their organisation while improving job targets, and the different types of ‘capacity’ training and improvements within organisations illustrate how farm advisors in this program have shared ideas about success and addressing problems (such as a lack of technical knowledge). This highlights the role of the farm advisor as an innovation broker by facilitating information flows, articulating demands and facilitating linkages between/among different actors and supporting innovation processes.

Articulate knowledge and resource needs (e.g. funding, lobbying support) as well as where to get knowledge and resources

A large number of farm advisors from NGOs (5/8), private sector (5/7), and research (2/5) and government (1/2) organisations reported in various facilitated discussions that the project interventions helped improve their technical skills in on-farm practices, efficiency and resourcefulness, which subsequently helped meet the needs of the farming communities they work with. For example, one farm advisor from the private sector mentioned that the majority of his farmers were more interested in technical information related to increasing milk production (e.g. animal nutrition and husbandry practices). After becoming part of WFEA training, he provided the farming community with the desired technical information and used his connections within his organisation to launch a scheme to provide concentrate feed to the farmers on credit and at a subsidised rate to increase milk production. As a result of this success, this scheme has now been allocated additional resources and has been replicated in 23 villages (source: FD-17 December 2019). A farm advisor from the private sector reflected that previously their company had to hire technical experts to run farmer training to meet the needs of the farmers. Now that this advisor is part of the WFEA network, he is confidently running those training workshops and the company is saving funds because they do not need to hire more veterinary/animal technical experts (source: FD-17 December 2019). A farm advisor from the private sector explained that WFEA training delivered technical information through simple, evidence-based participatory approaches which they had never experienced before, helping build trust with their farmers (source: FD-17 December 2019). These examples show that the farm advisors are using their skills and knowledge to be more resourceful within their own networks to better support farming communities through maintaining engagement and impact, as well as reducing their organisation’s costs.

A large number of farm advisors from NGOs (4/8), private sector (6/7), and research (2/5) and government (2/2) organisations noted that a common challenge they face is the non-availability of female extension staff within their organisations. Hence, a majority of the villages restrict the participation of female farmers to engage in various field activities such as discussion groups, practical demonstrations and field follow-up visits with male farm advisors. One farm advisor from the private sector mentioned that it is very challenging to improve on-farm practice change and production without the active participation of female farmers in extension activities. Furthermore, the farm advisor reported that their organisation does not have female extension staff to implement the WFEA field activities (source: FD-17 July 2018). This illustrates a common resource need across the breadth of organisations, pinpointing a challenge to be addressed when trying to engage women in farming communities.

Network building

Build on existing initiatives for change and the networks around these

The majority of farm advisors from NGOs (7/8), and government (2/2) and private sector (6/7) organisations have facilitated change or streamlined existing livestock farm advisory services within their organisation as a result of their participation in the WFEA training. These farm advisors reported on different ways in which they negotiated with management within their organisation to start various initiatives, including adopting the WFEA within specific projects, establishing school programs for educating children regarding improved farm practices, providing loan opportunities for farmers, lodged feedback mechanism with their management and involving female staff within their farm advisory services teams. For example, one female farm advisor from an NGO noted that the WFEA has now been adopted across all on-going projects (four major longterm projects of more than 3 years) within their organisation (source: FD-17 December 2019), which includes projects in health, education, agriculture and livestock. Another farm advisor from a government department mentioned that previously the focus of his organisation was always on the treatment of animals. Now, they have initiated regular extension activities near their work place by implementing WFEA to educate farming communities regarding the best farming practices (source: FD-17 December 2019). Both these examples illustrate that the WFEA training is enhancing the scope of the mandatory work and functions within their organisations.

The majority of the farm advisors from NGOs, private sector, and research and government departments are sharing what they have learnt after each WFEA training workshop, with their managers, colleagues and junior staff. Utilising the knowledge and skills from the WFEA training, the majority of farm advisors from the NGOs (6/8) and private sector organisations (5/7) have initiated or strengthened their organisational training programs for their field staff. For example, one farm advisor from the private sector shared that his organisation has started a training program for farm advisors, sales officers and farmers on the basis of elements of the WFEA training program. He is running these training programs with great confidence (source: FD-17 December 2018). The research organisations have a broader scope of networking with various stakeholders owing to the nature of their roles and permanent positions they hold. One female farm advisor from a research organisation reported that her organisation initiated farm advisory services and she is sharing her applied knowledge and key lessons learnt after each WFEA training workshop with many networks within her organisation including students, field staff and farmers (source: FD-17 December 2018). The breadth of the examples from farm advisors here demonstrates the different ways in which they facilitate information flows within their organisations, as well as adding new ways to share these

lessons with broader networks beyond the normal scope of their roles.

Work towards ‘coalitions of the willing’ and excluding actors who do not feel interdependent

Since the commencement of the WFEA training program, male farm advisors from four organisations (two from NGOs, two from the private sector) started working in coalition with female field staff from other organisations to support the implementation of the WFEA. One male farm advisor from a private organisation reported that there is no female farm advisors within their organisation and therefore he had begun to collaborate with a female farm advisor from another local NGO to achieve common field extension goals and insure both women and men from the farming community were involved in their WFEA intervention (source: FD-17 December 2018).

Female farm advisors from NGOs (2/8) and private sector organisations (2/7) reported that they have established a network to work together across different organisational goals. For example, one female farm advisor from an NGO mentioned that she has networked with a private organisation within WFEA training to deliver training on fodder agronomy and to help her farmers source high-quality fodder seed (source: FD-25 June 2019). This underlines a role of the innovation broker in facilitating linkages among relevant actors who are willing to work together within the extension system.

There is one example of a private organisation who did not feel that this training program met their needs, and chose to leave the WFEA training program. The organisation joined in the beginning of the program in 2017 and their farm advisors participated in training activities until late 2018. However, due to changes in their organisational policy and a mandate shift to focus more on medium to large corporate dairy farmers, they no longer sent their farm advisors to participate in WFEA training workshops.

Supporting negotiation and learning in networks: dealing with dynamics of power and conflict

Work towards process agreements, including dealing with media and mandates

A large number of farm advisors from the NGOs (5/8), and private sector (5/7), research (2/5) and government (1/2) organisations explored ideas and shared potential solutions to various field challenges with other farm advisors at various facilitated discussions in the WFEA training workshops. One farm advisor from the private sector shared a potential solution regarding the lack of female extension staff. He utilised his knowledge and skills gained during the WFEA training to establish stronger relationships with farmers by using social and communication skills. These stronger relationships have helped build trust, and as a result, the farm advisor is not facing any issue to run male and female training in field,

which is quite uncommon owing to the social norms in that area, which would usually require a local female extension officer to help facilitate (source: FD-17 December 2018). Another farm advisor from an NGO mentioned that his core job is to improve the livelihood of smallholder livestock farmers through improved on-farm practice change. He noted that the majority of farmers he worked with were unable to make animal sheds at their farms to implement improved husbandry practices because of financial constraints. Therefore, he advocated for those farmers and negotiated with his organisation to provide access to funding to support these changes. His organisation launched a scheme to provide interest-free loans to farmers of Rs. 50,000–200,000 to build animal sheds. This scheme has now been successfully running since 2019 (source: FD-17 December 2018) and illustrates an important role this farm advisor has played as an intermediary between the organisation and the farming communities he works with.

Organise regular reflection on process dynamics and satisfaction with outcomes

The majority of farm advisors from NGOs (6/8), and private sector (5/7), research (2/5) and government (1/2) organisations shared ideas with each other during facilitated discussions at the WFEA training workshops on how regular self-reflection and feedback from their management staff helped achieve both their routine job targets and organisational goals. For example, one farm advisor from an NGO reported that after becoming part of the WFEA network, he realised that majority of the technical messages he delivered to the farmers were wrong. Since participating in the WFEA training program, he is feeling much more confident and technically capable to solve the farm-level challenges of the farmers who are working with him (source: FD-25 June 2019).

A farm advisor from the private sector disclosed that he lacked technical expertise and had limited knowledge about livestock to share with farmers. When farmers queried him about their livestock, he often deferred responses, promising to provide answers later or consult technical team members within his organisation. This behaviour led to a decline in respect from farming communities. However, following participation in the WFEA training, his organisation appointed him as a master trainer to conduct training sessions for other extension staff. This recognition within his organisation boosted his confidence (source: FD-25 June 2019). Another male farm advisor from a private organisation shared that during their annual conference, he initially expressed reluctance to attend the WFEA training. However, on his manager's encouragement, he decided to seize the opportunity. Prior to the WFEA training, there was no established feedback mechanism within their organisation (source: FD-25 June 2019). The majority of the farm advisors involved in the WFEA training program reported that their management staff found that their technical, social and communications skills have improved after being the part of WFEA network.

As a result of this, the farm advisors have found that their relationships between (1) their organisation and farming communities and (2) their immediate supervisors have significantly improved. For example, one farm advisor from a private organisation shared that previously he had never updated his management staff regarding field activities or problems that he was facing. After becoming a part of the WFEA network, he started providing them with regular feedback. He reflected that he felt great honour when his line manager shared his pictures of field activities with other management staff and that it helped improve relationships and his status within his organisation (source: FD-17 December 2018).

A small number of farm advisors have reported on effecting changes in organisational policies after being the part of WFEA network. For example, one farm advisor from an NGO shared that all the technical lessons became the standard operating procedure within his organisation, including having farm-level targets, along with monitoring and evaluation plans to assess these. The aim is that all the field staff within their organisation have to achieve those targets at their registered farmers doorstep. For example, calf mortality should not be more than 5% and animal herd fertility should be more than 60%. The NGO is also providing the loan facility, quality of veterinary and artificial-insemination services to his target farming-community members to achieve those targets. The farm advisor learnt these technical lessons from the WFEA training and shared them with his higher management (source: FD-17 December 2019) and this helped them make the decision to include these as targets for their field staff. This demonstrates an essential role of the innovation broker in extension system facilitation, which is providing regular feedback and communication between farm advisors and their organisations, which can lead to process or systemic changes.

The present study aimed to understand how a holistic training intervention affects the innovation-brokering capacity of farm advisors in the livestock advisory services system of Pakistan. In this section, we discuss (1) capacity-building of farm advisors in the role of innovation brokers, (2) lessons from the intervention design and (3) key additional functions of innovation-brokering in a developing-country context.

Capacity-building of farm advisors in the roles of innovation brokers

Over the course of the WFEA intervention, farm advisors were found to build their capacity in several of the roles of innovation brokers identified by Klerkx *et al.* (2012). The WFEA interventions including network building, farm-advisor training workshops and field follow-up visits enabled farm advisors to perform innovation-brokering roles including (1) articulation of problems, (2) network building and (3) facilitating the innovation process.

The results presented have demonstrated that building a network of farm advisors from a wide range of organisations in the Pakistani system helped build the capacity of farm advisors to perform innovation-brokering roles including facilitating information flows, enhanced cooperation and supporting interaction among various components involved in the process. These roles helped achieve both their routine job targets, organisational goals and strengthen the functioning of this network. It has been recognised in several studies that to enhance the functioning of an AIS, it is necessary to engage multi-stakeholder coalitions to drive desired institutional change through communication, enhanced cooperation and interactive-learning processes (Klerkx *et al.* 2012). The network evaluated within this research was helpful working in coalition with other organisations and promoted learning of potential solutions to various field challenges. This network building helped improve relationship among various actors involved in the system and facilitated the process for innovation implementation. However, there is need to place more emphasis on the development of individual and collective capabilities of farm advisors to access, imitate, and adapt existing information, knowledge that has not been shared during WFEA training, which leads to more functional network.

Lessons from the intervention design

Interactive learning is a critical component adopted during these training workshops and field follow-up visits. A participatory approach was used to generate and enhance horizontal learning processes through social interaction, instead of a knowledge-transfer approach. It has been recognised in several studies, that to achieve more sustainable agricultural practice there is a need to engage all the stakeholders, including farm advisors, farmers and researchers, in a process of joint experiential learning in the creation of knowledge and practices. The WFEA training workshops adopted participatory approach with farm advisors by supporting exchanges and joint construction of knowledge, addressing the problems that arose within the workshops. This shared creation of practice has been shown to create sustained change (Cristóvão *et al.* 2012) as opposed to the transfer of knowledge from experts to farm advisors.

A reflective learning process was another component embedded during these training interventions, where farm advisors articulate knowledge and resources needed for innovation with other advisors. The development of reflective capacities and critical analysis of their own conceptions and practices played a significant role in establishing the relationship with their peers.

There are a number of lessons from this training intervention that are specific to countries with an immature AIS. Regular farm-advisor training workshops and field follow-up visits helped build the capacity of farm advisors. It is in agreement with a previous study where system-level farm

advisory services were evaluated and 87% of organisations found that regular training of farm advisors is an important component of a successful advisory service (Prager *et al.* 2017). Furthermore, there was a lack of female extension staff, which was a major limiting factor to implement this training intervention in field. It has been clearly recognised that women play a key role in agri-food systems and that extension services have to address gender equity so as to generate sustainable impacts. Technical training on whole farming system, social mobilisation, gender mainstreaming, communication skills and the opportunity to engage in a collaborative learning environment where individuals reflect on their own field experiences and the challenges they face, helped implement this training intervention in field. Farm advisors who perform the role of innovation brokers need to acquire high levels of knowledge and capacities in several areas covering technical farming information, and social skills for building community learning opportunities.

Key additional functions of innovation-brokering in a developing-country context

Immature AIS are characterised by a lack of farm-advisor capacity-building opportunities and services with limited scope provided by organisations within the system. On the basis of the literature, and research in this study, Pakistan's AIS would be considered immature (or developing), and this would be similar to other countries in the same region such as Bangladesh and India (Rivera and Sulaiman 2009). AIS of this nature tend to be inefficient because of underdeveloped linkages among actors within the system and a lack of capacities to emerge collaborative innovation. Within Pakistan's AIS, the present study demonstrated that one of the most important function of farm advisors is the development of linkages and enhancing interaction among different actors involved in the process. This is supported by examples of coalitions formed (generally between NGOs and private organisations) to support the common goal of improving the livelihood of farmers and their organisational goals. The lack of connection with the AIS makes establishing linkages and enhancing interaction among different actors a low-hanging fruit to help support and strengthen the livestock advisory services system in low-income countries.

The evidence collected from this study demonstrated that farm advisors in the livestock advisory services in Pakistan were found to build their capacity in several of the innovation-broker roles identified by Klerkx *et al.* (2012). In addition to this, three additional functions from the results illustrated that farm advisors in Pakistan's AIS had to overcome extra challenges so as to be an effective innovation broker within this system. These additional innovation-broker functions include (1) cross-disciplinary skill development, (2) performing a role beyond their job's mandate and (3) the ability to function and thrive under hierarchical system of their organisations. As mentioned, organisations that are

part of an immature AIS tend to have few capacity-building opportunities and job roles with limited scopes of work. Hence, numerous stories from farm advisors in this study highlighted the fact that they worked outside their normal job roles such as milk-procurement individuals running additional extension activities, including establishing school programs for educating children regarding improved farm practices, and providing loan opportunities for farmers. As part of this, these advisors are driven to develop and implement skills that are not what they were primarily employed for. Although this occurs for farm advisors in more mature AIS as well, there is also more expectation that this is the 'norm' given that there are often the capacity-building programs and support to enable them to occur.

Several authors indicate that innovation brokers should look for complementarity with existing actors and weaknesses in the innovation system (Klerkx and Leeuwis 2009). A number of the farm advisors who participated in this research were from large hierarchical organisations which, in any AIS, can reflect some of the system weaknesses both in terms of communication among management layers and internal capacity building. Evidence from farm advisors in this study have contributed to resolving certain system flaws by working within these hierarchies and affecting change by engaging with their managers beyond the standard practice. This then helped farm advisors show value of new training programs and approaches, and helped managers be part of decisions with their farm advisors that lead to the implementation of new programs either across different segments (e.g. education/health) or throughout the whole agricultural program.

Data from this study show that the WFEA training workshops helped farm advisors improve their technical, social and communication skills. The training program (see Supplementary material) aimed to have a broad scope, which started with technical farm-production information and included areas that literature has pointed out as critical for individuals in innovation-broker roles, such as management, entrepreneurship, marketing, and program development. Despite this, other literature has highlighted some opportunities to further develop the WFEA training program. These include (1) co-designing and more institutional support of various collaborating organisations, (2) the use of visioning tools and scenario analysis to predict possible future for the farm-advisor training and (3) incorporating training of farm advisors on analytical skills to capture the household impacts in WFEA training.

Conclusion

The results of this study conclude that the holistic extension training intervention (the WFEA) can affect the innovation-brokering capacity of farm advisors within the current livestock advisory services system of Pakistan.

Supplementary material

Supplementary material is available [online](#).

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Data availability. The data utilised in this paper were obtained from survey questionnaires and can be made available upon request.

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