



Farmer-To-Farmer Extension (F2FE) approach for speedier dissemination of agricultural technologies: A review

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ABSTRACT

Enhanced efficiency of extension efforts targeted towards facilitating uptake of newer agricultural technologies by farmers is much sought after by extension systems all over the world. Experimentation with several methodologies has been done world over to achieve the said objective. Farmer-to-Farmer Extension (F2FE) approach is a farmer led approach that leverages the informal channels of technology penetration in form of existing social networks for diffusion of well proven agricultural technologies in the farming community. The approach emphasizes on experimentation with newer technology by progressive farmers, followed by sharing of learning gained with other members in the community. The basic strength of this model is the high credibility assigned by the farming community on local information source. The approach has well practiced in different forms in developing countries in Asia, Africa and Latin America. The article reflects on experiences gained from experimenting with F2FE approach in different forms and its institutionalization by extension systems across the globe.

Keywords: Farmer to Farmer Extension, Technology dissemination

Diffusion of agricultural technologies is though initiated by public extension services, it takes its own course once farmers realize its potential through local experimentation and adaptation. The farmer led informal and unstructured diffusion of proven agricultural technologies takes off and results in its spread among other farmers through social interactions and networks. Farmer-to-Farmer Extension (F2FE) is a complementary approach that leverages the potential of informal social networks for diffusion of agricultural technologies in the farming community. The approach involves farmers sharing knowledge on agricultural innovations within their communities (Lukuyu *et al.* 2012). The approach emphasizes the farmers' experimentation, sharing of knowledge and innovation and was found effective in addressing the limiting factors that inhibit peasants' food production (Kruger 1995). F2FE approach also attempts to harness the indigenous leadership existing in the farming community and their social networks for achieving the goal of agricultural development. Scarborough *et al.* (1997) described farmer-to-farmer extension as the provision of training by farmers to farmers, often through the creation

of a structure of farmer promoters and farmer trainers.

The basic strength of this model is the high credibility assigned by the farming community on local information source. The approach is well suited to smallholder farmers as they learn best from peers (Feder and Savastano 2006). F2FE models are inclusive, low-cost, effective, and offer a wide-reaching alternative in supporting agricultural innovation (Semakula and Mutimba 2011, Wellard *et al.* 2013) within a short period of time (Kiptot and Franzel 2014). The main benefits of F2FE approach are the ability to cover increasingly large areas, number of farmers, enhanced sustainability of extension efforts and increased adoption as farmers learn more effectively from other farmers who use new technologies, than from extension staff (Simpson *et al.* 2015). This review article presents various aspects of F2FE approach based on available research studies literature with focus on relevance of the approach in Indian context with framework for assessing its effectiveness.

Effectiveness of F2FE approach for technology dissemination

Empirical studies have found the informal farmer to farmer technology diffusion mechanism to be effective for dissemination of improved agricultural technologies in various geographies in the world. This informal dissemination method was found vital in technology transfer to farmers, especially for seed varieties and improved livestock (Cromwell 1990). This system not only makes the seeds available to the farmers but also provided them

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seeds at a relatively lesser cost. (Hassan *et al.* 2008). Farmer to farmer extension approach was found to be effective in area expansion under introduced quality seed of pulses in 1: 8.1 ratio against the initial area. Among the introduced quality seed of pulse crops, the highest seed diffusion ratio was observed with respect to quality seed of pigeon pea (26.3) followed by summer mungbean (12.7) (Sah 2017). Farmer-to-Farmer extension approach of seed dissemination was found to be effective in completing the formal seed diffusion mechanisms in addressing the issues of shortage of improved seeds as well as limitation of extension machinery to carry out transfer of seeds of improved pulse varieties to the farmers (Sah *et al.* 2018). Farmer led informal spread was considered as a viable method of technology dissemination by Sinja (2004) in Kenya. Farmer to farmer (F2F) seed exchange was found to be effective in diffusing new varieties to farmers especially among the small holders whom the formal seed systems were unable to cover (Ndjeunga *et al.* 2000, Hassan *et al.* 2008, Sah *et al.* 2013 and Sah *et al.* 2018). This approach also offers to reach the farming community spread across a vast expanse at a reasonable cost and time (Sah *et al.* 2017). The informal seed diffusion take place in terms of exchange or barter of seeds, gifts, payment of labor, sale as seed etc.

Operationalizing the F2FE approach

At the base of F2FE approach are the progressive farmers who volunteer to learn and experiment with new production technologies or seed varieties and are willing to share the learning with fellow farmers through their social networks. Selener *et al.* (1997) defined these farmer trainers as individuals with little or no formal education who through a process of training, experimentation, learning and practice, increase their knowledge and become capable of sharing it with others, functioning as extension workers. The identified farmers may be either selected or appointed, paid or otherwise, facilitate the technology diffusion in a specified region. Wide varieties of terms are used by researchers across the world for these community leaders. They are called promoters in Nicaragua (Hawkinsworth and Perez 2003); lead farmers (Tsafack *et al.* 2015, Meena *et al.* 2016), key farmers (Sah *et al.* 2014), *kamayog* in Peru (Hellin and Dixon 2008), farmer promoters in Bangladesh (Islam *et al.* 2011), farmer teachers in western Kenya (Amudavi *et al.* 2009), community extension workers in Uganda (Ssemakula and Mutimba 2011) and volunteer farmer trainers in Malawi and Kenya (Kiptot *et al.* 2016). In Peru, the *kamayog* are paid by their fellow farmers for their services in cash, in kind, or in the pledge of future assistance through a native system known as *ayni* (Hellin and Dixon 2008). These farmers initially work in close interaction with the experts for technological options, develop capacities in technology and do experimentation and share the acquired knowledge with other farmers in their social networks. The entire approach works on empowering the farmers' leaders to be the change agents. Identification of this type of farmer to work with extension system to increase technology diffusion among

farmers (Sinja *et al.* 2004) is important. The approach has the potential to improve feedback from farmers to extension staff (Meena *et al.* 2016). The F2FE approach of leveraging the progressive farmers for technology diffusion could play complementary role to formal extension services in facilitating the dissemination of agricultural technologies and improving farmers' capacities (Singh *et al.* 2020).

F2F Extension approach in global perspective

F2FE approach has been practiced in different forms in developing countries in Asia, Africa and Latin America. This approach has its origin in Guatemala in 1970s, spreading to Nicaragua in 1980s, then Mexico and Honduras (Weinand 2002). Farmer to Farmer extension programmes have grown tremendously in Africa in recent years (Simpson *et al.* 2015). The model have been found widely utilized in developing countries like Peru (Hellin and Dixon 2008), Kenya (Kiptot and Franzel 2014) and (Lukuyu *et al.* 2012), Uganda (Semakula and Mutimba 2011), Malawi (Weinand 2002) and India (Sah 2014) as a cost-effective approach for reaching the farmers. The *Campesino a Campesino* movement in Nicaragua and *kamayog* in Peru (Hellin and Dixon 2008) are well known examples of the approach. Ministry of Agriculture, Malawi presently has institutionalized the approach and works with more than 12000 lead farmers (Simpson *et al.* 2015).

Relevance of F2F Extension approach in Indian context

Enhancement in agricultural productivity is directly linked to demand-driven and farmer-accountable; need specific, purpose-specific, and target-specific extension services. The extension system in India is decentralized, pluralistic and demand driven with structural arrangements for effective transfer of agricultural technologies to the farmers. However, the usage data of these services reflect a different perspective. Data collected by National Sample Survey organization (2003), revealed that as high as 60% of the farmers sampled had not accessed to any source of information on modern technology in the previous year. For the 40% who accessed the information sources, progressive farmers and input dealers were the primary information sources. Only 5.7% of those farmers received information from public extension agents. Further, only 4.8% of small farmers and 12.4% of large farmers accessed the public extension services. Wide extension personnel and farmer ratio 1:1500 (Agarwal 2011) with limited financial resources for operation and capacity development (Sulaiman *et al.* 2005, Swanson 2006), multiplicity of the assigned task to extension staff and alike factors explains the poor access percentage of extension services in India (Swanson 2006). The farmer to farmer extension model has the potential to reduce extension cost and workload of extension functionaries in a large country like India (Meena *et al.* 2016). The F2FE approach offers great relevance as it is farmer centric, low cost and sustainable approach that utilizes the innovative and progressive farmer for dissemination of agricultural technologies in the given farming communities.

In addition, the approach also holds importance as fellow farmers are preferred and trusted for their perception and information about the agricultural technology (Adhiguru *et al.* 2009).

Experimentation with Farmer field schools based on farmer to farmer extension for dissemination of agricultural technologies found to enhance participation, engagement, collaborations and mutual trust among farmers (Priyadarshini *et al.* 2019). To enable faster technology transfer, different models for promoting farmer facilitators at community level has been practiced in India with provision for their integration in formal structural arrangements. These include use of selected local practicing farmers as model farmers (*Adarshraytu*) for technology dissemination by Agriculture department in Andhra Pradesh state, *kisansahayaks* (farmer facilitators) in Uttar Pradesh state, Bihar, *kisanmitra* and *kisandidi* (farmer friend) farmers in Madhya Pradesh and so on. NGOs like Ramakrishna mission is also training young boys and girls from rural area in agricultural technologies and using them as local volunteers. The existing extension agency at district level has provision to promote one *kisanmitra* (farmer friend) for two villages for which he/she gets honorarium and incentives (Sadamate *et al.* 2019).

Parameters for assessing the effectiveness of F2FE approach

Effectiveness of Farmer to farmer extension approach has been assessed from different perspectives across the globe. Performance of F2FE approach was measured in the Andean region by looking at the livelihood impact of the approach (Hellin and Dixon 2008). Farmers' knowledge and skills about the push-and-pull technology, diffusion and uptake of technology were taken as parameters of effectiveness of F2FE model by Amudavi *et al.* (2009). In Uganda, effectiveness of F2FE model was measured in terms of increased technology uptake, production, food availability, multiplier effect in information-sharing and increased sales of commodities (Semakula and Mutimba 2011) while effectiveness of F2FE approach with respect to extent of diffusion of quality seeds, coverage of farmers and area under improved seeds (Sah *et al.* 2017). Safack *et al.* (2015) in Kenya assessed effectiveness on training conducted by farmer-trainers on extent of farmers trained. They reported that each trainer trained on an average of 201 farmers (median: 37) while Franzel *et al.* (2015) using the same effectiveness parameter reported that in Cameroon, the average number of farmers was 58 and in Malawi the number was 61. Kiptot *et al.* (2013) on the other hand reported that in Kenya, effectiveness of farmer-trainers was assessed on knowledge of farmers about the innovations on which they had received training (Table 1).

Strengths of F2FE approach

F2FE approach is appropriate for a wide range of target groups, including women, youth, and the poor. It is particularly useful for increasing the proportion of women extension providers and women's access to extension services

(Franzel *et al.* 2015). Sah and Singh (2020) highlighted that in F2F extension approach to be cost effective and efficient mechanism for dissemination of improved seed among the farming community. The change inducing farmers being from the same socio-cultural settings comprehended farmers concerns, situations and perceptions. In addition, these farmers are considered as credible information source in their farming community. All this translated into better information flow. Farmers' involvement in technology dissemination gave them an ownership of process, which helped to speed up the technology uptake among the farming community. In F2FE approach, accessibility to credible information sources in form of key farmers is improved, this is particularly of great importance in situations where extension machinery is constrained by limited manpower. The approach thus provides to supplement the extension efforts for enhanced penetration of improved seeds among farming community. Meena *et al.* (2016) stressed on low-cost, often sustainable, wider reach among farming community and improved accountability to community, promote uptake of new practices as major strengths of the approach. Further, they emphasized that F2FE programmes promote feedback on new practices to research and extension and help strengthen the capacity of communities to access information. Simpson *et al.* (2015) reported that organizations using F2FE approach, perceived the ability to cover increasingly large areas and numbers of farmers, enhanced sustainability of extension efforts, increased technology adoption as farmers learn more effectively from other farmers than from extension staff as the main benefits of using the approach. From a survey of 80 organizations using F2FE in Cameroon, Kenya, and Malawi, Franzel *et al.* (2015) concluded that organizations valued the approach as it was low-cost, helped extension services expand their reach, and improved accountability to the community. The approach is often sustainable with government extension staff or farmer organizations taking over the backstopping of farmer-trainers after a project ends.

Challenges for operationalizing the approach

Technical backstopping of change inducing farmers, conflict between farmer-trainers and extension staff, lack of sustainability due to failure in getting support from local institution were identified as the challenges in the farmer to farmer approach of technology dissemination (Franzel *et al.* 2015). Meena *et al.* (2016) highlighted that farmer to farmer approach may simply be an arm of a top-down technology transfer model where communication is one-way as a major challenge in implementation of the approach. Sustainability also experienced to be a principal challenge in using F2FE approach (Simpson *et al.* 2015, Meena *et al.* 2016). Sah and Singh (2020) identified scouting of motivated key farmers to experiment with the new agricultural technology, sustaining their commitment for the cause and their personal biases may hinder information sharing to all in social networks as the major challenges that may hinder F2FE from effectively facilitating spread

Table 1 Research and use domain of F2FE approach: Global and national scenario

Dimensions of F2FE approach	Year	Geographies	Reference
<i>Crop variety dissemination</i>			
Management of of <i>Striga</i> weed and stem borers	2009	Western Kenya	Amudavi D M, Z R Khan, J M Wanyama, C A. O Midega, J Pittcher I, M Nyangau, A Hassanali, and J A Pickett
Farmer to farmer extension of fodder legume technology	2004	Central Kenya	Sinja
Farmer-to-Farmer to farmer transfer of new bean varieties	1994	Uganda	Grisley W
Farmer-to-farmer seed distribution in diffusion of new barley varieties	2008	Syria	Hassan A, Mazid A and Salahieh H
Farmer-to-farmer transfer of an improved cowpea variety	2004	Nigeria	Kormawa P M, Ezedinma C I and Singh B B
Farmer to farmer diffusion of cowpea seeds	1997	Northern Nigeria	Singh B B, Ajeigbe H, Mohammed S G and van Gastel A J G
Improving peasants' livelihoods via dissemination of land-protective measure	2003	Nicaragua	Hawkesworth S and Garcia Perez J D
Leveraging farmer to farmer extension for dissemination of improved seeds of pulse crops	2017	Bundelkhand, Uttar Pradesh, India	Sah U, S K Singh, N Kumar, Sujayanad G K, Sabale P R and S Sharma
<i>Conceptual validation of F2FE</i>			
Developing sustainable farmer-led extension groups	2011	Bangladesh	Md. Mofakkarul Islam , David Gray, Janet Reid and Peter Kemp
Farmer-to-farmer extension model	2016	India	Meena M S, R B Kale, S K. Singh and Shobhana Gupta
Farmer-led extension approaches	2010	Nigeria	O M Akinagbe and A R Ajayi
Farmer-to-farmer Extension Program	2014	Kenya	Franzel S and Simpson B
Validation of farmer to farmer extension model for dissemination of quality seeds of pulse crops	2018	Bundelkhand, Uttar Pradesh, India	Sah U, Narendra Kumar, Saxena H, Dubey S K, Iquebal M A, Bhat S and Singh S K
Volunteer farmer-trainer motivations	2016	East Africa	Kiptot Evelyne, Monica Karuhanga, Steven Franzel and Paul Benjamin Nzigamasabo
Farmer-to-farmer extension: opportunities for enhancing performance of volunteer farmer trainers	2015	Kenya	Kiptot and Franzel
<i>Lead and volunteer farmers</i>			
Farmer-to-farmer extension: a survey of lead farmers	2015	Cameroon	Tsafack S A M, Degrande A, Franzel S, Simpson B
Tobit analysis of farmer to farmer diffusion of improved pulse seeds	2014	Bundelkhand, Uttar Pradesh, India	Sah U, Hem Saxena, Narendra Kumar, S K Singh and Shripad Bhat
<i>Empirical framework of F2FE approach</i>			
Farmer-to-farmer extension: lessons from the field	1997	Cameroon, Kenya and Malawi	Selener D, Chenier J and Zelaya R
Effectiveness of the farmer-to-farmer extension model in increasing technology uptake	2011	Masaka and tororo district of Uganda	Ssemakula E and J K Mutimba
<i>Issues and challenges related to F2FE approach</i>			
Farmer to Farmers: A story of innovation and solidarity	1995	Natal, South Africa	Kruger E
Farmer-to-farmer extension: Issues in planning and implementation	2015	Malawi	Simpson B M, Steven Franzel, Ann Degrande, Godfrey Kundhlande and Sygnola T safack
Farmer-to-farmer extension. opportunities and constraints of reaching poor farmers	2002	Sothorn malawi	Weinand J
Farmer-to-farmer extension mode	2016	India	Meena M S, R B Kale, S K Singh and Shobhana Gupta
Institutionalizing farmer to farmer extension model	2020	India	Sah U and Singh S K
Farmer-led extension approaches	2010		Akinagbe and Ajayi,
Farmer to farmers: opportunities for enhancing performance of volunteer farmer trainers	2015	Kenya	Kiptot and Franzel

of improved technologies. Fiscal sustainability was identified as one of the major challenges to farmer-led extension approaches (Akinagbe and Ajayi 2010). On the other hand, farmer trainers experienced high expectations from the community, lack of relevant training materials, limited technical knowledge, inadequate incentives and resistance to change by farmers were the major challenges experienced in implementing F2FE approach at field level (Kiptot and Franzel 2015). In contrast, Simpson *et al.* (2015) reported that high expectations of lead farmers in terms of financial and non-financial rewards and lack of access to new information or technologies as the major challenges in operationalizing the approach.

Experiences of institutionalizing F2FE approach

Kiptot and Franzel (2015) experienced that F2FE approach often faces the challenge with reference to scalability and sustainability. Institutionalization of community-based extension approaches like F2FE approach in the context of local institutions such Producer Organizations (POs) was proposed as a way of achieving sustainability by Kiptot and Franzel (2019). It included awareness creation, joint learning at the individual, group and organization level, SWOT analysis of POs and identifying opportunities for harnessing resources for support functions. In addition they mentioned that the important supporting social and institutional processes including acceptance and support from key stakeholders, developing a shared understanding, stakeholder ownership of the process, commitment from top leadership of POs and institutional structures to support the process were crucial. Developing appropriate linkages of lead farmers to government extension

services, farmer organizations or private companies can contribute towards continued support and access to new information, thus making extension systems more effective and F2F extension systems more sustainable (Simpson *et al.* 2015). In similar lines, based on the experiences of four dairy producer organizations (POs), Kiptot and Franzel (2019b) identified local institutional support, social capital, technical backstopping and motivation of farmer trainers to work voluntarily as the four drivers of sustainability of F2FE approach.

Countries like Malawi and Zambia have incorporated F2FE approach into the national extension strategy while some cases farmer organizations that have successfully entered into profitable commercial activities have shown themselves willing and capable to engage their own farmer-extensionist to serve member needs (Simpson 2012). In similar line Sah and Singh (2020) reported that with successful experiences with F2FE model paved the way for mobilizing farmers into 8 farmer led institutions in the form of registered seed societies to address the issue of constrained availability of quality seed of improved pulse varieties. The member farmers of these societies were capacitated with regard to seed production technologies of pulse crops in the project and were encouraged for entrepreneurship development in pulse seed production. These societies besides producing a large quantity of pulse seeds for formal seed system of pulse crops (751.87 q) also contributed towards horizontal spread of improved seeds (550 q) through farmer to farmers' social networks among the pulse growers in adjoining villages and districts, thus contributed towards strengthening the informal seed system of pulses in the targeted geographies. The steps in harnessing F2F extension approach involved identification

SWOT analysis of F2FE approach

Strengths

Cost effective in expanding the reach of extension system among farmers.

The approach has the potential to supplement the extension efforts in organizations facing manpower crunch.

Lead farmers share a better rapport with the farming community owing to same cultural as well lingual background that facilitates better technology uptake.

Better comprehension of farmers' concerns related to the agricultural technologies and the feedback.

Improves the access of farming communities to credible information source on improved agricultural technologies.

Improve technical capacity and self confidence in the lead farmers that helps in smooth implementation of task as per the expectations.

Opportunities

The approach offer wide scope for taking the nonagricultural technologies under its ambit for their wide dissemination and popularization.

The approach could be leveraged for wide range of target groups, including women, youth, and the poor.

Improves the collaboration between farmers, extension and research systems.

Lead to benefitting farming community in effective manner.

Weaknesses

Success of F2FE approach rest to a large extent on the motivational level of lead farmers related to diffusion of improved agricultural technologies in the social networks.

The initial investment on lead farmer is high without any binding on part of lead farmer for his continuation in the process in future.

At times members of farming community fail to be convinced by the lead farmers on technologies involving high technical knowhow.

The lead farmers need to be continuously updated on agricultural technologies for them to be effective.

High expectations of lead farmers from the approach in terms of financial and non-financial rewards.

High expectations of members of farming community and other stakeholders from the lead farmers.

Threats

Engagement of lead farmer in other remunerative employment opportunities may lead to him losing interest.

Conflict between extension personnel and lead farmers, for their role in persuading farming community for uptake of improved technologies.

Influence of private profit oriented agencies on lead farmers.

Cessation of technical and financing support from the related agencies.

of need of agri-production situation, identification of key farmers, capacity enhancement, introducing seeds through key farmers and impact assessment.

Conclusion

F2F extension approach has been widely experimented and institutionalized in many developing countries. The approach has the potential to supplement the public extension services in dissemination of information related to improved agricultural technologies including improved seeds, and improving farmers' capacities for taking informed decisions. This low cost F2F extension approach is effective in achieving wider reach among the farming community by using selected farmers from the same community as drivers of change. The approach has also been effective in improving the uptake of improved production technologies by farmers across the countries. However, the said approach often faces the challenge with reference to scalability and sustainability. Strong technological backstopping and policy support is a prerequisite for the approach to be effective. Identification of the motivated volunteer farmers to initiate the process as well as sustaining their commitment for the cause are also crucial for the approach to deliver tangible results. F2FE approach offers immense scope for effectively meeting the extension delivery needs of farmers and expanding the geographic coverage of extension system. The approach can be harnessed in public sector extension systems facing limitations of human and financial resources. However, a thorough understanding of sources of motivation for leading farmers' is important and appropriately responding to them remains the crux of the sustainability of the approach.

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