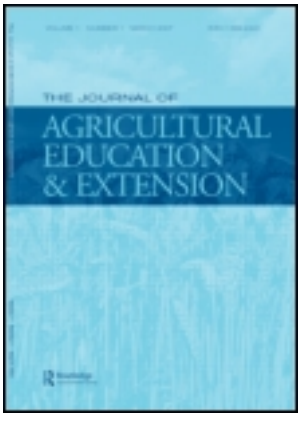

The Journal of Agricultural Education and Extension

Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/raee20

Disseminating Improved Practices: Are Volunteer Farmer Trainers Effective?

B. Lukuyu [a b], F. Place [b], S. Franzel [b] & E. Kiptot [c]

[a] International Livestock Research Institute, PO Box 30709, 00100, Nairobi, Kenya

[b] World Agroforestry Centre (ICRAF), PO Box 30677, 00100, Nairobi, Kenya

[c] Kenya Forestry Research Institute, 20412-00200, Nairobi, Kenya

Version of record first published: 18 Sep 2012.

To cite this article: B. Lukuyu, F. Place, S. Franzel & E. Kiptot (2012): Disseminating Improved Practices: Are Volunteer Farmer Trainers Effective?, The Journal of Agricultural Education and Extension, 18:5, 525-540

To link to this article: http://dx.doi.org/10.1080/1389224X.2012.707066

Journal of Agricultural Education and Extension
Vol. 18, No. 5, 525–540, October 2012

Disseminating Improved Practices: Are Volunteer Farmer Trainers Effective?

B. LUKUYU*,†, F. PLACE†, S. FRANZEL† and E. KIPTOT††
*International Livestock Research Institute, PO Box 30709, 00100 Nairobi, Kenya, †World Agroforestry Centre (ICRAF), PO Box 30677, 00100 Nairobi, Kenya, ††Kenya Forestry Research Institute, 20412-00200 Nairobi, Kenya

Abstract Purpose: *This paper assesses the effectiveness of volunteer farmer trainers in promoting adoption of agricultural technologies in western Kenya. Specifically, the purpose was to assess the type of information they disseminated, farmer trainers' characteristics desirable to farmer trainees, and how trainees evaluate farmer trainers.*
Design/methodology/approach: *Data were collected through focused group and open discussions, and interviews with 44 farmer trainers (32% women) and 91 trainees (63% women). Effectiveness of training was assessed based on level of learner satisfaction and attributes pertaining to knowledge, skill, attitude and application of the learning on farms. Other topics examined included selection of farmer trainers, organization of training, type, how and to whom information is disseminated, and farmer trainers' constraints and opportunities.*
Findings: *Farmer trainers played important roles such as mobilizing and training fellow farmers, hosting demonstration plots, bulking and distributing planting materials. They were, however, rated slightly lower in follow-ups and seed bulking. Farmer trainers disseminate on average two to four different types of technology. Crop-based technologies were disseminated more than livestock-based ones because of their simplicity. Technical backstopping from extension workers remains a challenge, which may compromise quality of information disseminated. The survey showed that the approach is sustainable, with farmer trainers continuing their work several years after project support had ended.*
Practical implications: *The results from this study are of use to development programmes keen on using low-cost, community-based dissemination approaches. Recommendations are also given on selecting farmer trainers, organizing training, types of technologies to disseminate incentives, and sustainability.*
Originality/value: *The added value lies in filling information gaps in the use and effectiveness of the farmer trainer approach in promoting technology dissemination.*

Key Words: Farmer trainers, Adoption, Dissemination, Crop and livestock technologies, Extension approaches

Correspondence address: B. Lukuyu, International Livestock Research Institute, PO Box 30709, Nairobi 00100, Kenya. Email: b.lukuyu@cgiar.org

1389-224X Print/1750-8622 Online/12/050525-16
http://dx.doi.org/10.1080/1389224X.2012.707066

Introduction

The main challenge facing agricultural extension in the 21st century is how to develop low-cost sustainable approaches for service provision that go beyond extending messages to playing a key role in promoting farmers as the principal agents of change in their communities. These approaches need to enhance farmers' learning and innovation and improve their capacities to organize themselves for more efficient production and marketing and to demand extension services (David, 2007; Davis et al., 2009; Leeuwis van den Ban, 2004). The task is especially complex, given the need for extension services to address the challenges of climate change, food insecurity, gender inequality, and globalization of agriculture (Christopolos, 2010; Haug et al., 2009; Scoones and Thompson, 2009). One such approach that has been operational in western Kenya for more than ten years is the volunteer farmer trainer approach, which was initially developed by a collaborative project to disseminate agroforestry technologies, spearheaded by the Kenya Forestry Research Institute (KEFRI), Kenya Agricultural Research Institute (KARI) and the World Agroforestry Centre (ICRAF). Since the project ended in 2005, the farmer trainers have taken up and disseminated many other agricultural technologies promoted by various institutions in western Kenya. Some of the technologies include the push-pull strategy to control striga weed, promoted by the International Centre of Insect Physiology and Ecology (ICIPE), the use of integrated soil fertility management options, promoted by the Tropical Soil Biology and Fertility Programme (TSBF-CIAT) and the promotion of fodder shrubs by ICRAF and partners to improve livestock productivity.

The farmer trainer approach involves farmer trainers, who share their knowledge and experience with others as well as conduct experiments (Braun and Hocde, 2000). Farmer trainers are not paid for their services; however, they receive free training from institutions promoting various agricultural technologies and receive seed and seedlings for setting up demonstration plots on their farms. This approach has the aim of reaching a large number of farmers in communities at low cost (Noordin et al., 2001) through multiplier effects that widen extension coverage in terms of number of farmers reached (Blauert and Quintanar, 1997). This approach also enables farmers to adapt or innovate, make better decisions, and provide feedback to researchers and policy makers (Kiptot et al., 2006). When farmers are used as trainers, they stand a chance of doing better than technicians because they know the audience and language better and use expressions that suit their environment (Mulanda et al., 1999). Farmer trainers are particularly effective if they are not of much greater social status than those they train (Feder and Savastano, 2006). They also instill some confidence in their fellow farmers as they demonstrate new practices (Mulanda et al., 1999). Although this approach has been operational in western Kenya for more than ten years, the effectiveness of farmer trainers has not been evaluated. The objective of the present study was to understand how the approach performed and to assess the effectiveness of farmer trainers in disseminating agricultural technologies in western Kenya. More specifically, we examined the following issues:

(1) How were farmer trainers selected?
(2) How do they organize training?
(3) What type of information is disseminated, how and to whom?
(4) What farmer trainer characteristics are desirable to farmer trainees?
(5) How do farmer trainees evaluate their farmer trainers? How effective are they?
(6) What constraints and opportunities exist in the use of this approach?

Methodology

Description of the research area

Surveys were conducted in Ebukhaya, Ebusiloli, and Ebusilatsi villages, Emuhaya Division, Vihiga District in western Kenya. Vihiga was chosen as a study area because an ICRAF–KEFRI–KARI project on scaling up of agroforestry-based soil fertility technologies was implemented there in the late 1990s and early 2000s using the farmer trainer approach (Noordin et al., 2003; Place et al., 2003). Vihiga District lies between 1300m and 1500m above sea level and is considered to have high agricultural potential (Jaetzold and Schmidt, 1983). Rainfall ranges from 1800m to 2000mm per year, with rains from March to June and from September to December. Temperatures range from 14 to 32°C. Population density is >800 persons/km^2 and land sizes are typically <1ha/household (CBS, 2003), increasing the competition between food, cash, and fodder crops (Waithaka et al., 2006, 2007). The main food crops are maize, beans, sorghum, groundnuts, bananas and vegetables (Waithaka et al., 2006). About 71% of the households own cattle, with cows producing an average of 2.7 liters of milk a day (Waithaka et al., 2002). The number of tropical livestock units per farm averages 1.8–2.1. Most farmers practice zero grazing and main forages include Napier grass (*Pennisetum purpureum*) and maize (*Zea mays*) and sorghum (*Sorghum vulgare*) residues. Vihiga District experiences a shortage of agricultural and extension service providers (Waithaka et al., 2002).

Evaluation framework

Several authors, such as Hellin and Dixon (2008) and Amudavi et al. (2009), have used various methods to assess the effectiveness of the farmer-to-farmer extension model in different countries. Effectiveness can be looked at from different perspectives. Hellin and Dixon (2008) measured the effectiveness of the farmer-to-farmer extension model in the Andes by looking at the livelihood impact of the approach. Amudavi et al. (2009) looked at farmers' knowledge of and skills about the push-and-pull technology, diffusion and uptake. The present study adapted the framework developed by Kaufman and Keller (1994), in which effectiveness of training is assessed from four dimensions.

(1) Participants' reaction to the training program. This criterion brings out issues pertinent to the level of learner satisfaction (Relevance).
(2) Attributes pertaining to knowledge, skill and attitude. These are attributes that can be related to the training (Participant learning).
(3) The application of the learning on farms (Transfer of learning).
(4) Increase in productivity and efficiency (Results).

In the present study, effectiveness was measured using dimensions (1), (2) and (3). The specific indicators for assessing the effectiveness of volunteer farmer trainers in disseminating technologies were technical characteristics, that is practical agricultural expertise, knowledge of subject, communication, availability and accessibility, and individual characteristics such as honesty, interest and willingness to work without expecting any reward. In addition, we assessed the sustainability of the

approach, that is whether farmer trainers were able to continue operating after the project supporting them ended.

Data collection and analysis

Since the study was conducted several years after projects that recruited the farmer trainers had ended, many of the data were based on the recall of respondents. But because some of the farmer trainers were still training other farmers, some of the data collected were current, that is about the farmer trainers' training activities at the time the survey was conducted.

With help of staff who participated in the agroforestry project, we compiled a list of six groups from which farmer trainers and trainees were randomly selected. Data were collected through the use of two focus group discussions (one with farmer trainers and trainees and one with farmer trainers alone) using a checklist, but allowing open discussion among participants. The checklist covered issues about farmer trainer selection criteria, roles, dissemination activities, performance, motivation, personal characteristics of farmer trainers from farmer trainees' perspectives and training frequency. Most interviews and discussions were conducted in Swahili and, when necessary, the local language was used. About one-third of farmer trainers interviewed and two-thirds of farmer trainees were women (Table 1). Farmer trainers are defined in the present study as farmers who have volunteered to train fellow farmers without being paid for their services.

For prioritizing issues, respondents used a ranking tool in which they listed issues and prioritized them in order of importance. Farmer trainees were asked to write down on a piece of paper their opinions about the farmer trainer who trained them. Descriptive statistics such as frequency counts and ranking were used to display the data.

Results

Selection of farmer trainers

Farmer trainers were selected through existing groups that the agroforestry project was working with. At the beginning of the project, farmers volunteered to become farmer trainers. Other group members volunteered at a later time to become farmer trainers. The latter group had less experience receiving and giving training.

Extension officers convened meetings with farmer groups via chief's *barazas* (public meetings) to create awareness about the project. At these meetings, farmer groups elected their group leaders, agreed on host farmers for various technologies

Table 1. Numbers of farmer trainers and trainees participating in the study at different sites.

		Farmer trainers			Farmer trainees		
Site	Name	Men	Women	Total	Men	Women	Total
I	Ebukhaya	4	5	9	17	27	44
II	Ebusiloli	4	2	6	17	30	47
III	Ebusilatsi	22	7	29	0	0	0
Total		30	14	44	34	57	91

and defined the selection criteria for farmer trainers. The first group to volunteer as farmer trainers and be endorsed by group members were those hosting demonstration plots for various technologies and at the same time committee members. Amongst these, only those farmers that were able successfully to set up demonstrations on their own farms in the first year were retained as farmer trainers. Additionally, they were required to be available for training when needed and ensure their farms were easily accessible to other farmers.

Most farmer trainers had training experience ranging from 8 to 13 years (Table 2). Many had served as farmer trainers in more than one project from 1997 to 2007, that is both before and after the agroforestry project. Some of them were still providing training even though project support for their training activities had ended three years before they were visited. Most farmer trainers (59%) covered distances of less than 3km, while 41% travelled distances of more than 3km (Table 2). Farmer trainers initially travelled long distances to reach farmers. However, travel distances reduced as they acquired experience because farmers nearby began to seek their services as their ability became apparent. Our findings agreed with those of Braun and Hocde (2000) and Hawkesworth et al. (2003), who reported that credibility and ability of farmer trainers needs to be tested and seen by farmers in order for them successfully to share their knowledge and experiences with others.

Organization of training

Farmer trainers conducted training either on farms with demonstration plots, at scheduled fortnightly meetings organized by groups or at impromptu meetings called by project staff. Additionally, either they visited other farms or farmer trainees visited them for individual training, travelling by foot, using their own transportation—mainly bicycles, or hired bicycles, motorcycles—or public transport. Occasionally they used project vehicles going for routine activities. Farmer trainers provided training either on their own fields, other farmers' fields or at organized meetings in public venues.

It emerged that farmer trainers played various other roles in their groups. They led in mobilizing farmers to attend group activities such as training or demonstration sessions, in hosting demonstration plots and trials, in following up on and backstopping adopters, and in linking farmers to seed sources for both food and fodder crops. They also bulked and distributed seed and planting materials to other group members.

Table 2. Length of service and distances covered by farmer trainers.

Period of service (years)	Number of farmer trainers (n = 29)	Distance (km)	Number of farmer trainers (n = 29)
< 1	6	< 2	12
2–5	0	2–3	6
6–7	7	4–5	3
8–9	8	6–7	4
10–13	8	> 7	3

Note: farmers who had served less than 3 years were recruited after projects ended.

Farmer trainers also served as committee members in their respective groups, but there were exceptions in cases in which they did not meet the criteria set by the group. They trained on a continuous basis whenever they were needed by farmers. Most farmer trainees reported that they had received training from farmer trainers at least ten times since 1997 and that they were accessible at most times since they resided within the community.

Farmer trainers consulted fellow farmers in assessing and determining the content of the topics to be taught. The topics were determined based on the following criteria.

(1) Nature of farmers' constraints; for example, those with poor crop yields due to low soil fertility demanded training on ways to improve soil fertility
(2) New technologies introduced by projects that farmers thought would be suitable for them
(3) Needs determined from farmers sharing success in adopting of technologies, hence triggering demand for training on those technologies
(4) Needs determined through visits to farms in other areas from where trainees identified new technologies that they needed training on

Technologies disseminated and information sources

Farmer trainers provided training on 30 technologies across the study sites. These included soil fertility, fodder and crop residues, food crops, vegetables, and livestock technologies (Table 3). The supporting projects promoted some of these technologies, such as soil fertility practices, fodder trees and shrubs, soya beans and disease-resistant beans. Farmer trainers began to promote other technologies owing to farmer demand. The most important means of disseminating new technologies was through farm visits. However, farmer trainers used various other dissemination channels such as field days, chief's meetings and community gatherings such as at funerals and churches. Other channels included routine group meetings organized at the demonstration plots and study tours to other villages where there had been successful adoption of technologies. Farmer trainers used various types of materials when undertaking their training activities. These included farm implements, seed and planting materials, and leaflets and brochures obtained from project or government

Table 3. Categories and types of technologies in which farmer trainers provided training.

Category of technology	Types of technologies
Fodder and crop residues	Napier grass, herbaceous species, fodder trees and shrubs, sweet potato vines, maize stover (green and dry), banana pseudo stems for dry season feeding, sugar canes tops for fodder
Food crops	Maize, disease resistance beans, sweet potatoes, cassava, arrow roots, soya beans, sorghum, pest and disease control
Vegetables	Tomatoes, spinach, kales, various indigenous vegetables, chillies, pest and disease control, soya beans, sorghum
Soil fertility	Compost manure, fertiliser rates, cereal legume rotation
Livestock	Artificial insemination, dairy production, brewers waste, use of molasses, mineral licks, diseases

extension staff. Farmer trainees often made copies of leaflets and brochures at their own cost.

Farmer trainers' most important source of information was from international organizations such as ICIPE, TSBF, ICRAF, the Government extension service and other government services (Table 4). Another important information source was dissemination materials, for example leaflets, brochures and manuals. They reported that exchange visits were not an important source because they were few and costly.

Desirable characteristics of farmer trainers

According to trainees, desirable farmer trainers were those who were keen, outgoing and early adopters. Important desirable characteristics for farmer trainers were that they be altruistic, hard working, that they keep to time and that they be good communicators and patient. Less important characteristics included their availability, knowledge, receptivity and trustworthiness (Figure 1).

Evaluation of farmer trainees

The majority of trainees perceived their farmer trainers as very effective in most of their roles (Figure 2). Trainees perceived them as very effective in hosting demonstration plots and organizing and mobilizing farmers to attend training. Farmer trainers scored lower on farm visits and seed multiplication. A total of 22% viewed the role of farmer training as attractive, 17% viewed it as unattractive, while others were not sure.

Trainees felt that most subjects were well taught, but more than 30% said that some were not, such as herbaceous forage legumes, and pest and disease control (Table 5). These topics were perceived to be complex and farmer trainers did not have enough information about them. Generally, farmer trainees perceived crop-based technologies to have been better taught than livestock-based technologies. Indeed, farmer trainers reported that it was generally easier to disseminate crop than livestock based technologies because livestock technologies, such as artificial insemination, were specialized and needed more training.

Table 4. Sources of information for farmer trainers and trainees ranked in order of importance.

Sources of information	Ranking		Site III (farmer trainers only)
	Site I	Site II	
Government extension service	2	3	1
International organisations	3	2	2
Local research organisations	3	4	4
Media (electronic and print)	5	√	–
Farmer-to-farmer (including farmer trainers)	1	1	–
Community gatherings	6	√	–
Booklets and brochures	–	√	3
Churches	–	√	–
Exchange visits	–	√	5

Note: √, used but was not ranked; –, not used.

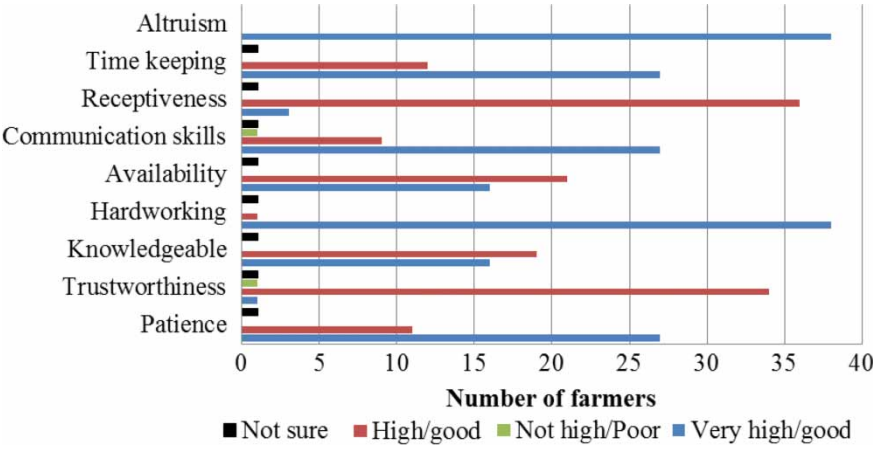

Figure 1. Desirable characteristics of farmer trainers, according to trainees.

Farmer trainers' performance was often so effective that trainees were able to train others. Thirty percent of the farmer trainees reported having trained other farmers within their community.

Out of a total of 19 farmer trainers interviewed, most had the capacity to disseminate knowledge on one to four different types of technologies. Most trained between two and five farmers a month, with an overall mean of 6 (range 2–25) farmers a month (Table 6).

Farmers listed and rated various attributes they used to determine the quality and importance of information received from farmer trainers (Table 7). Most farmers

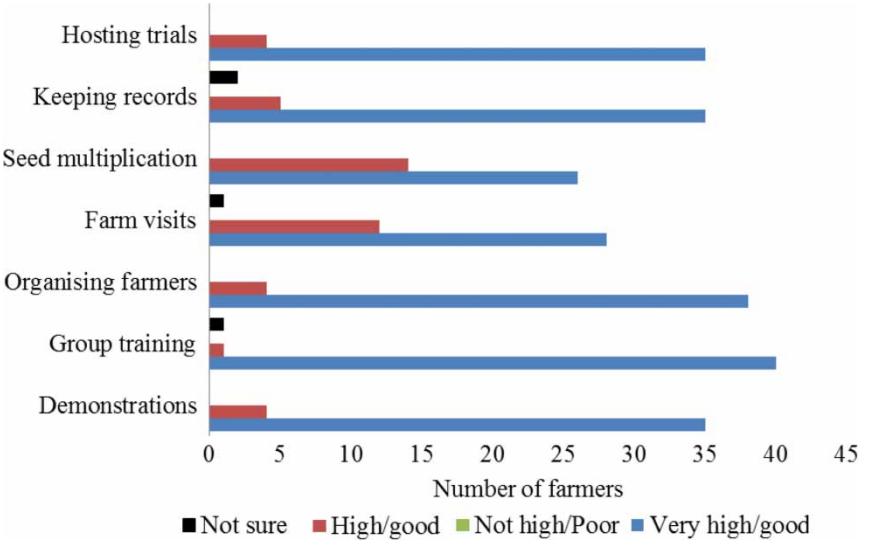

Figure 2. Trainees' views about effectiveness of farmer trainers in performing different roles, Ebusiloli and Ebukhaya villages.
Note: n = 46, but some farmers did not vote on some roles.

Table 5. Trainees' views on how well farmer trainers taught various topics, Ebusiloli and Ebukhaya villages.

	Site I (n = 53)			Site II (n = 50)		
Topics taught by farmer trainers	Yes	Somewhat	No	Yes	Somewhat	No
Napier grass	46	0	0	–	–	–
Herbaceous species	9	4	20	17	7	4
Fodder trees and shrubs	26	2	8	27	3	0
Composting manure	43	0	0	26	2	2
Pest and disease control	8	8	14	–	–	–
Mineral licks	41	6	0	–	–	–
Maize stover (green/dry)	46	0	0	–	–	–
Banana pseudo stems feeding	46	0	0	–	–	–
Use of molasses	17	11	0	–	–	–
Sweet potato vines for fodder	46	0	0	–	–	–
Sugar canes tops for fodder	46	0	0	–	–	–
Artificial insemination	26	2	6	–	–	–
Brewers waste	26	1	1	–	–	–
Vegetables	–	–	–	27	4	1
Soya beans	–	–	–	26	4	4
Dairy production	–	–	–	0	20	14
Resistance beans	–	–	–	15	15	2
Sorghum	–	–	–	7	15	10
Fertiliser rates	–	–	–	21	3	2
Cereal legume rotation	–	–	–	19	8	4
Food crops	–	–	–	35	2	0

Note: Blanks indicate that farmers at the site did not mention those particular topics specifically.

rated relevance, depth of content and ease of use highly in importance. Ease in understanding and accuracy were rated slightly lower.

Farmer trainers' perceived opportunities and constraints

Farmer trainers cited limited technical backstopping from extension workers as well as time to commit to training as the main constraints to promoting technologies. None of the farmer trainers interviewed had received formal agricultural training. However, most of them had attended workshops and seminars lasting up to two weeks, mostly organized and funded by projects. Other limitations were the high cost

Table 6. The number of farmers trained and different types of technologies taught by farmer trainers per month.

Frequency of different type of technologies	Number of farmers	Frequency of farmers taught (no.)	No of farmers taught per month
1–2	7	1–5	11
3–4	8	5–10	4
5–7	3	10–30	2
>7	1	>30	2
Mean	4	Mean	6
n	19	n	19

Table 7. Farmer trainees' evaluation of the information received from farmer trainers, Ebusiloli village.

Attribute	High	Moderate	Low	Don't know
Depth of content	29	7	0	0
Relevance	34	5	0	6
Easy to understand	18	11	2	10
Ease of use	29	3	0	4
Accuracy	22	12	0	3

Note: The total number indicates farmers who voted for the attribute. The higher the number, the higher the importance. The numbers of responses differ for different variables as some farmers did not vote for certain attributes—either because they were undecided, did not know, or thought the attribute was unimportant.

of transport and poor road infrastructure, which caused inadequate follow-up on dissemination activities, and inadequate training materials that resulted in less effective training sessions. Other constraints were social conflicts and rivalry within groups.

Farmer trainers perceived their training role and exposure to new technologies as a potential avenue of improving their social standing and income. They felt that accreditation by sponsoring projects would help improve farmers' attitudes towards them and improve their performance. The main factors that motivated them to become farmer trainers were the benefits accrued from accessing new technology, farmers' demand for new technology, and improved social status. Other important motivating factors were early acquisition of new information and technology and altruism (Table 8).

Challenges and external relations of farmer trainers

Newly recruited farmer trainers won farmers' confidence by arriving at appointments on time, by being flexible in the time of appointments, and by establishing seed multiplication plots in order to supply seed and planting materials to farmers to

Table 8. Importance of factors motivating farmer trainers.

Motivation factors/incentives	Ranking in order of importance*,†
Farmers demand for technology	1
Benefits accrued from the technology	1
Acquiring new technology	3
Pioneer of information and technology	2
Improved social status	1
First to test new innovation	2
Altruism	2
Potential platform for networking	3
Desire for increased production	1
Disseminating knowledge to the new generation	3

Note: 1, very important; 2, important; 3, less important.
*These factors were ranked based on group consensus after discussion and were reported as presented.
†Rankings were similar for men, women and young adults.

maintain interest in their training. However, farmer trainers complained about inadequate seed for use in seed multiplication.

Proceeds accruing from seed sales were deposited into group accounts. However, farmer trainers retained cash and other material rewards accruing from their services for their personal use. They sold produce from demonstration plots to finance their training activities. Group members obtained loans at agreed interest rates against their deposits for their personal use, while farmer trainers obtained interest-free loans to support their training activities.

Farmer trainers tended to be involved in many other community activities such as becoming village elders or office bearers in local groups, such as dairy farmer groups. They were also active in local administration, churches, political groups, school committees, and health education committees. The farmer trainers reported that these roles helped them mobilize groups for dissemination activities. The roles also helped them gain the support of local leaders in mobilization and publicizing their dissemination activities.

Dissemination activities of farmer trainers are hampered by transport in terms of lack of means and poor road infrastructure, which they cited as the main reason of inadequate training and follow-up. Any effort to promote farmer trainer programs should focus on innovative ways of supporting farmer trainers in their initial phase of training including farmer trainees assuming more responsibility as observed by Antholt (1994).

Farmer trainers mainly disseminated technologies through public awareness creation (such as making announcements to meetings and groups), training and follow-up with farmers, and distributing seeds and seedlings. It was evident that they lacked practical-oriented training packages that are crucial in spreading the impacts of action training (Kogi et al., 2005).

Results showed that most dissemination activities were conducted through groups at village level involving youth, men and women. Some of the key roles that farmer trainers played within groups were training fellow farmers, hosting demonstration plots and trials, and organizing farmers. Groups bonded farmers together, enabling them to implement their activities and identify training needs. The group approach proved very successful in disseminating technologies, since information easily passed from farmer to farmer across all social classes in a participatory manner around demonstration plots within their locations, as observed by Niang et al. (1999) and Noordin et al. (2001). The approach also seemed to influence farmers' attitudes especially towards farming (Noordin et al., 2001) and helped ensure that women-led and poor households were effectively reached and benefited from group activities (Davis et al., 2004; Nyasimi et al., 2000).

Conclusions

This study has demonstrated that the farmer trainer approach has the potential to disseminate technologies to farmers in a cost-effective way that is sustainable beyond project lifetimes. The approach should be promoted by extension service providers such as governments, NGOs and the private sector. The approach is particularly relevant given the increased amount and complexity of information that farmers require on such subjects as climate change and marketing. The results of this study

provide guidance on several aspects of farmer trainer programs, including farmer trainer selection, technologies and training, incentives and sustainability. The guidance we provide, however, should not be considered as best practices that are likely to work under any circumstances. Rather, they are 'best fit' approaches that suit the frame conditions existing in western Kenya (Birner et al., 2009).

Farmer trainer selection

Selecting farmer trainers through existing farmer groups proved to be an excellent way to choose them. Much training was either within groups or between groups and, besides, working with groups proved to be an effective way to mobilize farmers. The success of group activities observed in the present study reinforces earlier findings by Mungala and Chavangi (1996), Davis et al. (2004) and Kiptot et al. (2006) that groups are effective entry points to extension in communities.

Trainers were selected on the basis of both their farming skills (their ability to set up demonstration plots) and their training skills, as perceived by group members who elected them. Those skilled in a particular subject are not necessarily effective trainers in that subject, hence the importance of using both criteria for choosing trainers (Gladwell, 2002).

Technologies and training

Our experience confirms that farmer trainers are best suited to disseminate fairly simple technologies, such as new crop varieties and tree species as compared to more complex ones with high risks, such as certain crop-protection measures, artificial insemination and animal health. Technologies from which farmer trainers can earn cash from producing seed, such as for new feed crops or tree species, are particularly suited to farmer trainers as the ability to earn cash or social benefits from distributing or selling seed provides a built-in incentive for farmers to share knowledge and technology.

There was wide variation in the number of technologies that farmer trainers disseminated as well as the number of farmers they trained. Most farmer trainers disseminated one to four different technologies; however, there was a wide variation in their abilities. Variation in number of technologies disseminated by farmer trainers could be due to varying interest and keenness amongst them, as observed by Hoffman (2005). He found that categories of farmer trainers included those who were trained but were not interested (poor farmer trainers), those who were trained and showed interest (normal farmer trainer) and those who were trained and had genuine interest in integrating what they were trained on their farms as well (good farmer trainer). This highlights the desirability to categorize farmer trainers in terms of performance to motivate them and track their performance.

Although trainees rated farmer trainers highly on knowledge, it was clear they need technical backstopping in training and dissemination materials. This is evidenced by the fact that the topics that were perceived to be poorly taught are those in which farmers did not have enough information. Indeed, farmer trainers cited limited technical backstopping from extension workers as a constraint to their effectiveness, especially because they were disseminating many distinct technologies.

In addition to training in technologies, they also need training in communication and capacity-building skills.

Farmer trainers should not be viewed as alternatives to salaried extension staff; rather they complement them, help them reach greater numbers of farmers, provide them with feedback on the performance of technologies and promote sharing of innovations among farmers. Integrating farmer trainers into extension services is needed both to backstop them as well as to increase the reach of the extension services.

Incentives and sustainability

This study confirms that farmer trainers do not require financial rewards to be effective trainers; non-financial and indirect financial rewards suffice. Non-financial rewards include improved social status and opportunities to network, create new social linkages and attain leadership positions in one's group and community. Indirect financial rewards include earning money from selling materials and services associated with training activities, such as selling seed. Farmer trainers also reported that the training they received helped them increase productivity on their own farms. The social and income-generating activities associated with dissemination of information and technology were amongst the most important factors ensuring sustainability of the farmer trainer approach three years after the end of the projects that recruited them.

However, for the approach to be more effective and sustainable, farmer trainers need to remain motivated and up to date with the current knowledge. Various incentives such as initial support to set up demonstration plots, which can double as seed bulking plots, and the possibility of farmer trainers offering certain services at fee need to be explored. Another important option, not undertaken in this case study, is helping farmer trainers to organize themselves into an association and provide formal accreditation to members. This will help raise the quality of information they provide and will help raise their profile among farmers, policy makers and the development community. This will in turn improve their confidence, performance and also help them to access services that will enable them to offer greater assistance to farmers.

It should be noted that, while transportation was viewed as a constraint, facilitators did not provide farmer trainers with means of transportation, for example bicycles or allowances for using public transportation. This may have been because the area was one of high population density and farmer trainers could access many farmers fairly easily. Assisting farmer trainers with means of transportation may be more important in areas of low population density.

Future studies should examine the adoption and productivity impacts of the farmer trainer approach and its suitability for addressing the needs of women and other marginalized groups. Also important are surveys of randomly selected farmers in the area and assessing the relative importance of different sources of information they use in adopting new practices. More information is also needed on the experience and impact of farmer trainer programs across a wide range of frame conditions, such as varying population density, different crops and management practices, and varying degrees of prevalence of farmer groups.

Acknowledgements

This study was funded by the East African Dairy Development Project (EADD). The authors thank Patrick Mudavadi and Sylvia Nanjekho for assisting in data collection, the farmer groups in Emuhaya that participated in the interviews and ICRAF Kisumu for helping to organize meetings with the farmers groups.

References

Amudavi, D.M., Khan, Z.R., Wanyama, J.M., Midega, C.A., Pittchar, J. & Nyangau, I.M. (2009) Assessment of Technical Efficiency of Farmer Teachers in the Uptake and Dissemination of Push-Pull Technology in Western Kenya. *Crop Protection*, 28(11), pp. 987–996.

Antholt, C. (1994) Getting Ready for the Twenty-First Century: Technical Change and Institutional Modernisation in Agriculture. World Bank Technical Paper No. 217, World Bank, Washington, DC.

Birner, R., Davis, K., Pender, J., Nkonya, E., Anandajayasekeram, P. & Ekboir, J. (2009) From Best Practice to Best Fit: A Framework for Designing and Analyzing Pluralistic Agricultural Advisory Services Worldwide. *Journal of Agricultural Education and Extension*, 15(4), pp. 341–355.

Blauert, J. & Quintanar, E. (1997) Seeking Local Indicators: Participatory Stakeholder Evaluation of Farmer-to-Farmer Projects. Proceedings of World Wide Fund (WWF) workshop on Appraisal, Monitoring and Evaluation Methodologies for ICDP, Oaxaca, Mexico.

Braun, A.R. & Hocde, H. (2000) Farmer Participatory Research in Latin America: Four Cases. CIRAD, CIAT Cali Columbia.

Central Bureau of Statistics (CBS) (2003) Geographic Dimensions of Well-being in Kenya. Where are the Poor? From Districts to Locations, vol. 1. CBS, Ministry of Planning and National Development, Nairobi, Kenya.

Christoplos, I. (2010) Mobilizing the Potential of Rural and Agricultural Extension. Office of Knowledge Exchange, Research and Extension, Food and Agricultural Organization of the United Nations and Global Forum for Rural Advisory Services, Rome.

David, S. (2007) Learning to Think for Ourselves: Knowledge Improvement and Social Benefits among Farmer Field School Participants in Cameroon. *Journal of International Agricultural and Extension Education*, 14(2), pp. 35–49.

Davis, K., Franzel, S., Hildebrand, P. & Place, N. (2004) Extending Technologies among Small-scale Farmers in Meru: Ingredients for Success in Farmer Groups. *Journal of Agricultural Extension and Education*, 10(2), pp. 53–62.

Davis, K., Faure, G., Nahdy, S.M. & Chipeta, S. (2009) Institutional Changes and Challenges for Agricultural Advisory Services in Africa. In: Pafarini, C. and Santucci, F.M. (Eds), *Theory and Practice of Advisory Work in a Time of Turbulences*. Proceedings of the 19th Seminar on Extension Education. 15–19 September 2009, Domus Pacis, Santa Maria degli Angeli-Assisi (Perugia), Italy.

Feder, G. & Savastano, S. (2006) The Role of Opinion Leaders in the Diffusion of New Knowledge: The Case of Integrated Pest Management. World Bank Policy Research Working Paper 3916, World Bank, Washington DC.

Gladwell, M. (2002) *The Tipping Point, How Little Things Can Make a Big Difference*. Boston, MA: Back Bay Books.

Haug, R., Worku, T., Lemma, T., Berg, T., Phiri, A.R., Banda, J.W., Kaunda, E.E., Hella, J., Kamile, I. & Schulz, C.E. (2009) High Global Food Prices—Crisis or Opportunity for Smallholder Farmers in Ethiopia, Malawi and Tanzania. Noragric report no 50, Norwegian University of Life Sciences, Elanders Novum, Norway.

Hawkesworth, S. & Garcia Perez, J.D. (2003) Potentials and Constraints of the Farmer to Farmer Programme for Environmental Protection in Nicaragua. *Land Degradation & Development*, 14(2), pp. 175–188.

Hellin, J. & Dixon, J. (2008) Operationalising Participatory Research and Farmer-to-Farmer Extension: The Kamayoq in Peru. *Development in Practice*, 18(4), pp. 627–632.

Hoffmann, M. (2005) Farmer Trainer Extension Approach: An Assessment of Its Impact in Selected Areas of Kenya. MSc Thesis, University of Geisenheim, Germany.

Jaetzold, R. & Schmidt, H. (1983) *Farm Management Handbook of Kenya,* Volume IIB: *Rift Valley and Central Provinces*. Nairobi: Ministry of Agriculture.

Kaufman, R. & Keller, J.M. (1994) Levels of Evaluation: Beyond Kirkpatrick. *Human Resources Development Quarterly*, 5(4), pp. 371–380.

Kiptot, E., Franzel, S., Hebinck, P. & Richards, P. (2006) Sharing Seed and Knowledge: Farmer to Farmer Dissemination of Agroforestry Technologies in Western Kenya. *Agroforest Syst*, 68, 167–179.

Kogi, K., Kawakami, T., Ujita, Y. & Khai, T.T. (2005) Roles of Farmer Trainers for Participatory Ergonomics in Agriculture. In: Thatcher, A., James, J. and Todd, A. (Eds), *Proceedings of CybErg 2005. The Fourth International Cyberspace Conference on Ergonomics*. Johannesburg: International Ergonomics Association Press.

Leeuwis, C. & van den Ban, A.W. (2004) *Communication for Rural Innovation. Rethinking Agricultural Extension*, 3rd ed. Oxford: Blackwell Publishing.

Mulanda, J., Mwenya, E. & Namalambo, E. (1999) Draught Animal Power: Experiences of Farmer Training in the Northern Communal Areas of Namibia. Proceedings of an ATNESA Workshop, September 1999, South Africa.

Mungala, P. & Chavangi, N. (1996) An Overview of Agroforestry Extension in Kenya. In: Mugo, J.O. (Ed.), *People and Institutional Participation in Agroforestry for Sustainable Development*, First Kenya Agroforestry Conference, Kenya Forestry Research Institute, 25–29 March 1996, Nairobi: Kenya Agricultural Research Institute, pp. 242–249.

Niang, A., De Wolf, J., Nyasimi, M., Hansen, T., Rommelse, R. & Mwendwa, K. (1999) Soil Fertility Recaptalization Project in Western Kenya, Progress Report. Report No. 9, Regional Agroforestry Research Centre, Maseno, Kenya, Nairobi ICRAF.

Noordin, Q., Niang, A., Jama, B. & Nyasimi, M. (2001) Scaling Up Adoption and Impact of Agroforestry Technologies: Experiences from Western Kenya. *Development in Practice*, 11, pp. 509–523.

Noordin, Q., Place, F., Franzel, S. & De Wolf, J. (2003) Participatory Research on Agroforestry in Western Kenya. In: Van Mele, P. (Ed.), *Way Out of the Woods: Learning How to Manage Trees and Forests*. Newbury, UK: CPL Press, pp. 53–67.

Nyasimi, M., Noordin, Q., Jama, B. & Ruigu, S. (2000) Dissemination and Extension Methodologies for Integrated Soil Fertility Management Practices in Western Kenya. Proceedings of a workshop held at ICRAF, Kisumu, 24–26 January 2000.

Place, F., Adato, M., Hebink, P., Lwayo, M., Omosa, M., Nyasimi, M., O'Leary, C., Ongadi, W., Ontita, E. & Opiyo, P. (2003) The Impact of Agroforestry Based Soil Fertility Replenishment Practices on the Poor in Western Kenya. Final Report of the Standing Panel on Impact Assessment (SPIA)/IFPFRI Project on the Impact of Agricultural Research on Poverty, ICRAF, Nairobi, Kenya.

Scoones, I. & Thompson, J. (2009) *Farmer First Revisited: Innovation for Agricultural Research and Development*. Sussex, UK: Institute for Development Studies.

Waithaka, M.M., Nyangaga, J.N., Staal, S.J., Wokabi, A.W., Njubi, D., Muriuki, K.G., Njoroge, L.N. & Wanjohi, P.N. (2002) Characterization of Dairy Systems in the Western Kenya Region. Smallholder Dairy Project Report of Dairy and Crop Characterisation Activities in Western Kenya, ILRI, Nairobi.

Waithaka, M.M., Thornton, P.K., Herrero, M. & Shepherd, K.D. (2006) Bio-economic Evaluation of Farmers' Perceptions of Viable Farms in Western Kenya. *Agricultural Systems*, 90(1–3), pp. 243–271.

Waithaka, M. M., Thornton, P. K., Shepherd, K. D. & Ndiwa, N. N. (2007) Factors Affecting the Use of Fertilizers and Manure by Smallholders: The Case of Vihiga, Western Kenya. *Nutrient Cycling in Agroecosystems*, 78(3), pp. 211–224.