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Focus:

Granting equal access to information: experimental evidence from Uganda

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Unequal access to information

Two-thirds of the world's poor reside in rural areas and rely on agriculture for their livelihoods. Sub-Saharan Africa has the lowest agricultural productivity, primarily due to the minimal adoption of agricultural technologies compared to other developing regions. One major market failure contributing to these low adoption rates is the lack of access to information (De Janvry & Sadoulet 2019; Jack 2013). Agricultural extension systems, designed to facilitate information diffusion, often face significant logistical and financial challenges.

In response, some countries have implemented a farmer-to-farmer system. This approach involves training a local farmer in specific techniques that they can then share with other farmers. Farmer trainers typically have similar backgrounds to their peers but possess qualities that make them effective communicators. This system offers several advantages over traditional extension services: lower financial costs, local support from the farmer trainer, and reduced farmer risk-aversion due to learning from a trusted peer.

Despite the widespread adoption of the "farmer trainer" (FT) system, the few existing impact evaluations (see Takahashi et al. 2020 for a review) show low impacts on technology adoption when FTs volunteer without incentives (Kondylis et al. 2017), whereas incentives based on social recognition appear to enhance FTs' training efforts (Shikuku et al. 2019), and pay-for-performance incentives make FTs outperform professional extension agents in increasing farmers' knowledge and technology adoption (BenYishay & Mobarak 2019). Nonetheless, the farmer trainer system has faced criticism for sometimes selecting prominent community members due to cronyism and elite and political capture (Anderson & Feder 2004; Ragasa 2020), possibly restricting information dissemination to a close group of peers.

In a recent paper (Bertelli & Fall 2024), we examine whether cost-effective modifications to the standard farmer trainer model grant access to information also for those farmers who are socially distant from the FT. In theory, FTs in homophilous networks might favor training homogeneous groups with similar needs and capacities to minimize training costs (Munshi 2004; Golub & Jackson 2012; BenYishay & Mobarak 2019). This

preference could indirectly increase the benefits of volunteering by strengthening social ties (Conley & Udry 2001; Munshi 2004; Fafchamps & Gubert 2007; Conley & Udry 2010). Indeed, research indicates that farmers who are socially close to the communicator are more likely to learn and adopt new technologies (Cole & Fernando 2021; Beaman et al. 2021).

Therefore, socially distant farmers may be excluded from these networks and precluded from accessing information.[1] These barriers to information diffusion can have negative social implications and lead to inefficiencies, especially if marginalized (poor) farmers undervalue information due to an inability to properly assess its value (Anderson & Feder 2007).[2]

Randomized intervention design

Our study was conducted in rural Eastern Uganda from 2015 to 2017, in an environment typical of semi-intensive pastoral systems found throughout much of Sub-Saharan Africa. The analysis relies on the random assignment of a farmer training program, alongside three variations on the standard FT model, across 627 villages. In each village, five farmers are surveyed: the FT, three farmers selected from the FT's agricultural network survey module and one farmer randomly selected from the other dairy farmers in the village.

The basic treatment consisted of training local voluntary farmer trainers in animal feed and dairy farming practices for diffusion to their fellow farmers. In addition, three design variations were randomly assigned to treatment FTs: (i) vouchers for professional extension agents (Linkage variation), (ii) a metal signpost serving as advertising and social signaling (Signpost variation), (iii) one additional day of training to teach FTs how to tailor their training content to farmers' needs (Needs Assessment variation).

A key innovation of our study is to use comprehensive monitoring data, which includes the full list of trainees at each training session conducted by treatment FTs over a two-year period. We combine these data with the list of dairy farmers in the baseline farmer trainers' agricultural network to investigate whether FTs assigned to the treatment variations reached out

[1]In Mali, Beaman et al. (2018) found that individuals who are less socially connected, such as women, face greater difficulty in accessing valuable information. Similarly, in India, differences in sub-castes and family networks significantly reduce the likelihood of technology adoption (Emerick et al. 2014).

[2]In this respect, Emerick et al. (2014) shows that technology adoption within social networks is significantly lower compared to door-to-door sales and that the inefficiency from lower adoption within social networks is only marginally offset by improved targeting of farmers with above-median expected returns.

to farmers who were originally more or less closely connected to them. Our analysis uniquely contributes to the existing literature by examining whether experimental variations on the standard FT model differentially affect the spread of information within and beyond the FTs' agricultural network.

Treatment effects on farmers' participation at training sessions

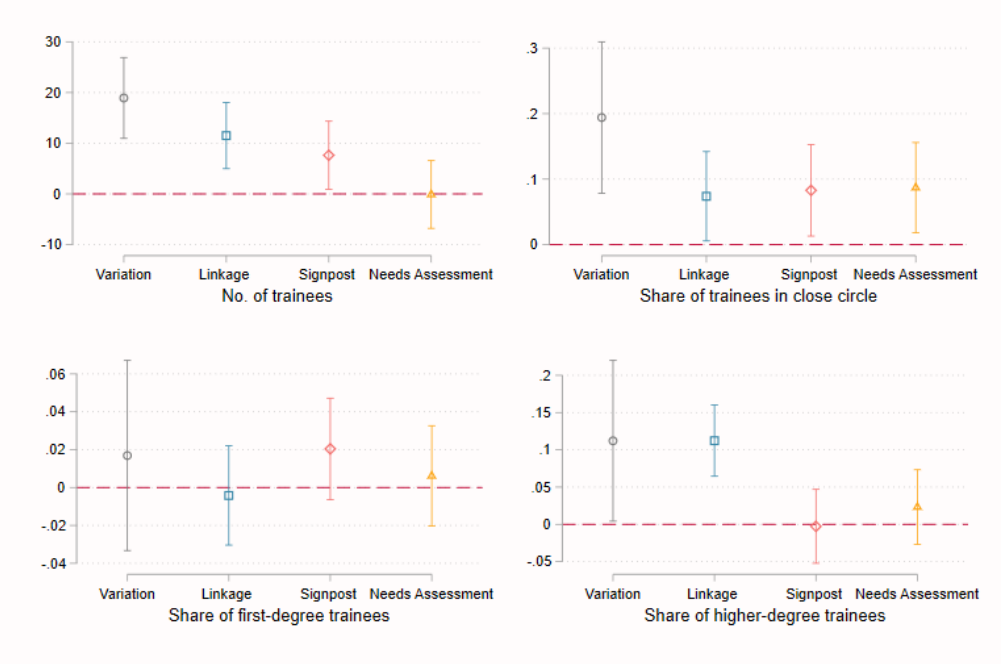
We highlight four main sets of results. First, we investigate the results of the training activity. Specifically, we aim to determine whether the different incentives affect whom the FTs train. To achieve this, we categorize the trainees into three groups based on data from the FT's agricultural network list:

(i) Close circle: farmers listed as close contacts;
(ii) First-degree: all farmers named by the FT in the network module;
(iii) Higher-degree: farmers not listed in the FT's network module.

Figure 1 shows that being assigned to one of the three treatment variations increases the number of farmers trained relative to the basic treatment group. FTs train on average 19 more farmers than in the standard farmer-to-farmer model, nearly doubling the number of trainees. These are mostly farmers closely linked to the FT – mainly through agricultural ties – (+19.4 ppts) and more socially distant farmers (+11 ppts). In turn, farmers sharing different relationships with the FT are less likely to be trained. The Linkage variation, in particular, is the one where the increase in the number of trainees is the largest. FTs in the Linkage variation train the most (+11.5), followed by the Signpost variation (+7.6), while the Needs Assessment variation shows no significant increase.

While in all the three design variations we observe a higher share of trainees closely connected to the FT, it is only in the Linkage variation that the share of higher-degree trainees (that is, socially distant) increases. These results show that the Linkage variation is effective in reaching out to a larger number of trainees, and to more socially distant ones. FTs in the Signpost variation also train more farmers, but the share of first-degree contacts is larger and there is no increase in the share of socially distant trainees. Lastly, the Needs Assessment variation is not effective in neither attracting more farmers, nor in reaching out to more socially distant farmers.

Figure 1: Effect of the treatment variations on the type of trainees



Farmer Trainers' prominent role in the community

We delve further into whether the effectiveness of design variations depends on the prominence of the Farmer Trainers (FTs) at the village level, as there is still a debate on whether peer farmers or lead farmers are more effective disseminators of information. The debate revolves around the efficacy of disseminating information through a peer farmer, who shares similarities with other farmers, versus a lead farmer, who may be more popular or successful.

We measure FT prominence at baseline by relying on the sampled farmers' perceptions of whether the FT is among the community three most accomplished farmers and/or among their three geographically closest farmers, following the approach outlined by Banerjee et al. (2019). We also consider whether one of the FT's household members holds a political role in the village, as reported by the FT.

Our findings indicate that prominent FTs in the basic treatment group are more likely to conduct at least one training session. However, prominence does not seem to enhance training activities when combined with any design variations. This means that the distribution of Extension Agent (EA) vouchers is not effective exclusively among prominent FTs, but also within the broader farmer-to-farmer system. This makes it a feasible and cost-effective scheme without the need for expensive FT targeting.

Do extension agents help to attract a broader spectrum of farmers?

We further explore one of the main mechanisms underlying the outcomes of the Linkage variation, that is the role played by EAs. As explained before, the Linkage variation consists of providing vouchers to farmer trainers for accessing professional extension services for checking on the cattle and for helping during training sessions by offering technical support and additional information. Extension agents might, hence, play a key role explaining the capacity of FTs in the Linkage variation to attract farmers beyond their close social network. The Linkage intervention effectively facilitated the connection between FTs and EA assistance. Relative to the basic treatment group, were 37 ppts more likely to have received an EA visit in the past year, marking a 108 percent increase, and they averaged 4.5 more visits. Furthermore, they were 18.5 ppts more likely to have an EA assisting with the training session, likely reducing the FT's training costs by sharing session management responsibilities with the EA. However, they conducted slightly more training sessions than the number of EA visits received.

Using a standard mechanism analysis and a causal mediation analysis (Imai et al. 2010), we examine whether the presence of an EA at a training session significantly influences the attraction of trainees. Our results show that the main effect of the treatment variations on the number and type of trainees changes little compared to the main results. While the presence of an extension agent at the training session positively correlates with the number of trainees, the effect of being assigned to the treatment variations – in particular the Linkage and Signpost ones – remains stable. Moreover, the mediation analysis reveals that the presence of an extension agent at the training sessions explains between 14% and 29% of the total effect of the Linkage variation on the set of outcomes.

Further results show that FTs and farmers in the Linkage variation particularly appreciate the presence of an EA at the training sessions. They report the double number of advantages than FTs in the basic treatment group. In particular, FTs consider the EAs to be useful in helping with training fellow farmers and increasing their knowledge, making them accountable and overseeing their work, while farmers are more likely to report that the main advantage is to make FTs accountable and monitor their work. Overall, two mechanisms seem to be at play behind the success of the Linkage variation. First, the physical presence of the EA attracts

more farmers. Second, FTs gain public recognition among farmers secured by the EA's oversight.

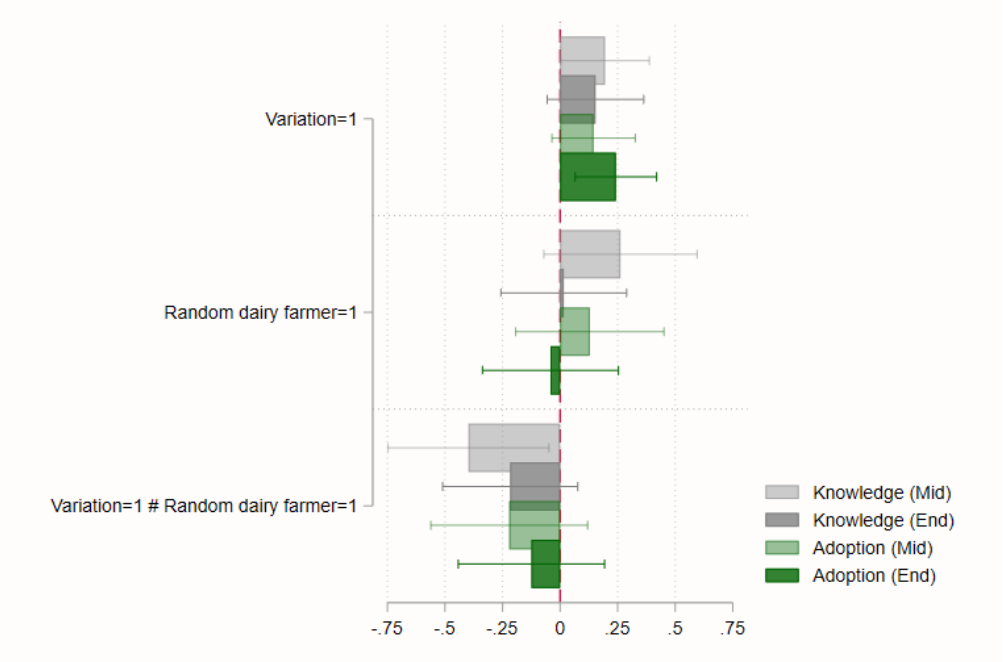
Do knowledge and adoption rates increase?

We finally turn to the last part of our analysis, which concerns effective knowledge transmission and adoption of technologies. Attending training sessions may not necessarily lead to heightened levels of knowledge and technology adoption if there is friction in the diffusion of information. Conducting more sessions could boost the confidence of FTs, refining their training abilities and ultimately enhancing the overall quality of instruction. However, training a larger and more diverse group of farmers may introduce variability in needs and constraints, potentially impacting the efficacy of the training provided.

Using survey data collected at midline and endline, we find no significant effects of the treatment variations on farmers' knowledge at either the midline or endline stages compared to farmers in the basic treatment group. Only the adoption of dairy technologies displays a notable increase at the endline, equating to 21 percent of a standard deviation. However, results depicted in Figure 2 reveal that when we differentiate by the type of sampled farmer, we find significant increases in knowledge at midline and adoption at endline (respectively +19.5 and +24 percent of a standard deviation) only among farmers closely connected with the FT. Conversely, socially distant farmers do not seem to reap the benefits of knowledge transfer. It is striking to note that their knowledge levels lag behind those of other farmers at the midline, although the overall treatment effect for random farmers is not statistically significant.

These results point to persistent knowledge transmission along social network lines, in line with Emerick (2014), in favor of farmers who are already closely linked with the FT. Yet, this is not necessarily an efficient result, as farmers in close proximity to the FT do not exhibit significantly higher levels of productivity compared to randomly selected farmers - they do not possess more cattle or cows, nor do they yield more milk. Moreover, we tend to exclude a 'catching-up' phenomenon, as farmers closely connected to the FT do not report lower baseline levels of knowledge or adoption of dairy-related practices and feed. While these findings offer valuable insights, it is important to exercise caution in their interpretation, as other unobservable characteristics specific to dairy farmers near the FTs may contribute to their higher rates of technology adoption compared to socially distant farmers.

Figure 2: Effect on farmers' knowledge and adoption of dairy feed and techniques



Discussion

The farmer-to-farmer system has been widely implemented across many developing countries to improve access to information on agricultural practices and technologies. Farmer trainers, often volunteers, receive technical training and serve as communicators to disseminate information within their villages.

However, the effectiveness of information diffusion can be compromised. FTs may find it easier to limit knowledge sharing to farmers who are similar to them or whom they already know, or to provide information that is only relevant to farmers with similar needs and constraints as the FT. This can make it difficult for socially distant farmers to access information, while making it easier for those closer to the FT. Consequently, the diffusion of information may become unequal and potentially ineffective. Determining the best way to design a farmer-to-farmer system remains an open question.

Our findings underscore the essential role of continued support for farmer trainers from extension agents. This appears to be crucial in order to enhance farmer participation, particularly among those less connected to the FTs. This key takeaway is vital for practitioners and policymakers, highlighting the necessity of ongoing FT support while acknowledging the targeted impact of specific strategies. Our analysis also warrants about the

persistence of significant knowledge diffusion frictions and this despite increased participation of socially distant farmers in the training sessions.

Our work contributes to the literature on information diffusion patterns in agricultural settings and the mobilization of agents for community benefit. We demonstrate how alternative approaches to shaping trainers' activities can help engage trainees who are socially distant from the communicator. By using detailed monitoring data combined with social network data, we provide new evidence that relatively simple and cost-effective variations of the standard farmer-to-farmer model can effectively reach less socially connected farmers. Additionally, we offer suggestive evidence that these variations are effective regardless of the farmer trainer's social position within the village.

We also more broadly relate to research on effective strategies for motivating agents to voluntarily engage in collective activities. Agents can be effectively mobilized by supporting FTs with periodic visits from extension agents – a cost-effective strategy that can be easily implemented in resource-constrained settings.

As a concluding remark, this study highlights the importance of collecting comprehensive data that covers a diverse range of farmers. Adopting such an inclusive approach in the sampling design is essential for effectively analyzing diffusion patterns among farmers with varying degrees of social connection to the primary sources of information. A more extensive mapping of the FTs' social networks, combined with the inclusion of long-term survey data, could significantly enhance the depth and robustness of the analysis of FT systems.

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