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Feed the Future Innovation Lab for Collaborative Research on Sustainable Intensification

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Demonstration plots, seed trial packs, bidirectional learning, and modern input sales: Evidence from a field experiment in Tanzania

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Introduction

Greater integration of legumes in cropping systems, increased use of modern inputs, and more tailoring of extension recommendations to local contexts are essential for sustainable agricultural intensification (SI). In addition, bidirectional learning (BDL) in which information providers and farmers iteratively refine extension recommendations is critical for improving the relevance of extension content (Snapp et al. 2015, p. iii). In the context of under-resourced government extension services that is prevalent in many countries in sub-Saharan Africa (SSA), including our focal country of Tanzania, extension services provided by non-governmental organizations (NGOs) may be able to play an important role in promoting improved agricultural technologies and providing information to support SI.

One such NGO is Farm Input Promotions Africa Ltd. (FIPS). FIPS aims to "assist farmers to gain access to advisory services and local access to the inputs and technologies they need to increase the productivity of their crops and livestock in a sustainable way," with an ultimate goal of helping farmers to become food secure (FIPS Africa 2020a). FIPS' extension model involves the use of Village-Based Agricultural Advisors (VBAAs) – local farmers that are selected by their community to receive training from FIPS on good agricultural practices, entrepreneurship and small business development, and subsequently share this knowledge with other farmers in their community. FIPS also provides VBAAs with technical support to become registered agro-dealers if they desire.

Two key activities lie at the heart of the FIPS approach: "mother demos" and "baby demos". Mother demos are demonstration plots set up by VBAAs (often with the assistance of other local farmers) that highlight improved crop varieties, inorganic fertilizers, crop protectants, and/or crop and soil management practices. VBAAs also distribute free small packs of select inputs highlighted in the mother demos to local farmers so that they can try out the inputs on their own land. FIPS refers to these free trial packs as "baby demos". In the past, most FIPS mother and baby demos in Tanzania were done for maize, and the mother and baby demos were always

Key Findings:

- This policy brief reports the main results from a randomized controlled trial conducted in the southern highlands of Tanzania that sought to determine if there is an appreciable difference in NGO lead farmer extension agents' improved bean input sales or bidirectional learning (BDL) with other farmers if they set up a bean demonstration plot only vs. if they establish a demonstration plot and distribute to other farmers free trial packs of the inputs highlighted on the demonstration plot (in this case, seed for improved varieties and a new chemical seed treatment product, Apron Star).
- While no statistically significant differences were found between the two groups, endline survey results suggest that there may be unmet demand from farmers for the inputs promoted through the interventions but that the lead farmer extension agents are constrained in their ability to meet that demand by inadequate supply of the inputs or lack of financing.
- The endline survey results also indicate that many – but far from all – of the lead farmer extension agents consider farmers' feedback when making bean recommendations or believe that they can learn things from other farmers that could help them improve their recommendations. Explicit training in the importance of and strategies for BDL are likely needed if meaningful BDL is to occur.

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done jointly in a given community. As a result, little is known about the value-added by the baby demos. FIPS' theory of change hinges on the belief that these demos raise local farmers' demand for the inputs, which VBAAs can then sell at market prices in future seasons – the goals being to improve local farmers' access to improved inputs as well as to provide an income-generating activity to VBAAs (i.e., operating as local agro-dealers) (FIPS Africa 2020b).[1] The baby demos allow recipients to supplement knowledge gained from the mother demo with experimenting with the new inputs on their own farms. We expect this additional, hands-on experience to increase farmer demand for the inputs and, in turn, VBAA sales of the inputs relative to those of VBAAs who conduct a mother demo (demonstration plot, DP) but do not distribute baby demo free input trial packs (TPs).

We test the VBAA sales part of this hypothesis in the study, which draws on the results of a randomized-controlled trial (RCT) conducted in the southern highlands of Tanzania in 2017. (See Mason et al. 2020 for the full paper.) VBAAs were randomly assigned to the DP only control group or the demonstration plot plus free trial packs (DPTP) treatment group. These interventions highlighted improved varieties of common bean rather than maize to differentiate the demos from those previously conducted by most VBAAs. Common bean (henceforth, simply "beans") was also chosen because Tanzania accounts for almost a quarter of all beans produced in SSA, and because of the important role of legumes in SI. The study area, the southern highlands, is Tanzania's main bean-growing region. The DPs and TPs also showcased Apron Star – a new seed treatment produced and commercialized by Syngenta – by including improved bean varieties and a local variety with and without Apron Star applied to the seed before planting. One main objective of the RCT was to understand if and to what extent the addition of TPs to a DP affected VBAA commercial (unsubsidized) sales of Apron Star or seed for improved bean varieties. In addition to analyzing actual input sales, we explore the effects of including the TPs on "unfilled orders" - i.e., requests from farmers for inputs that VBAAs were unable to fulfill but that indicate latent demand from farmers for the inputs.

In addition to testing the hypothesis that the combination of a demonstration plot and free trial packs raises VBAA input sales/unfilled orders relative to a demonstration plot only, the second main objective of the RCT was to assess whether the addition of trials packs increases opportunities for BDL between VBAAs and farmers. BDL is critical for the development of extension recommendations adapted to local context. In Tanzania and numerous other SSA countries, the majority of agricultural production is undertaken by smallholder farmers under conditions that vary by location within the country. A noted shortcoming of early government extension programs was that they provided "one size fits all" recommendations that were not tailored to local circumstances. Through their interactions with farmers, VBAAs can leverage farmers' specific knowledge about their land and farmers' feedback on what has worked well (or not) to provide more tailored advice. BDL therefore has the potential to enhance the quality, content, and relevance of extension recommendations in Tanzania and further encourage adoption of inputs and management practices in support of SI. We hypothesize that, by enabling farmer experimentation with the inputs on their own land, the combination of a demonstration plot and free trial packs increases the exchange of information and opportunities for BDL between farmers and VBAAs relative to if only a demonstration plot were done.

Study area, interventions, and data

FIPS had active VBAAs in seven districts in the southern highlands at the time of the project: Iringa Rural, Wanging'ombe, Songea Rural, Mufindi, Njombe Rural, Mbeya Rural, and Mbozi. Each district had 30 active VBAAs as of 2015/16 per FIPS' records with the exception of Njombe Rural, which is larger and had 50. All 230 of these VBAAs were to be involved in the project and were randomly assigned to either the DP group or the DPTP group. Interventions were implemented in the 2016/17 main bean growing season in each district.

Each VBAA was to set up a DP that featured three improved bean varieties: Njano Uyole and Uyole 96 in all districts because these varieties are widely preferred and agro-ecologically adapted, and a

[1] The demos may also facilitate market penetration and a sustainable supply of inputs by large agro-input suppliers.

third improved variety that varied by district to reflect differences in preferences/demand and agro-ecological conditions across districts [2] (Kato et al. 2016). The preferred local variety in each VBAA's village was also included in the DP.

Each variety was planted with no inputs applied, with Apron Star applied to the seed prior to planting, with inorganic fertilizer applied, and with both Apron Star and inorganic fertilizer. Apron Star was brand new in the southern highlands and was not commercially available at the time of the interventions. It is a fungicide/insecticide seed treatment used to control early season pests and diseases (Syngenta n.d.), and a product that was viewed by the FIPS and CIAT-Tanzania staff involve ed in the project as a potential "game-changer" for bean productivity in the study region due to its ability to combat complex root rots and bean stem maggot, which are prevalent in the area. VBAAs were to invite community members to attend and participate in the DP planting, and to encourage them to visit the DP throughout the growing season.

Each VBAA in the DPTP treatment group was to receive trial packs for 150 farmers. Each trial pack consisted of four 100 g packets of seed: the preferred local variety with and without Apron Star applied, and one of the three improved varieties included in the DP with and without Apron Star applied (such that 50 trial pack recipients got Uyole 96, 50 got Njano Uyole, and 50 got the third, district-specific improved variety). VBAAs were encouraged to distribute the TPs to farmers that attended the DP planting, with any remaining TPs distributed to other bean-growing households in the community in a manner consistent with the VBAA's usual practice for maize TPs.

A baseline survey followed by a training for all VBAAs in participatory extension were conducted in January-February 2017 before the DPs and TPs were set up, and an endline survey was conducted two years later (in February 2019).[3] We measure the effects of adding TPs to a DP on several outcomes: inputs sales, unfilled farmer orders for inputs, and proxies for bidirectional learning (summarized in Table 1). Due to implementation challenges (see Mason et al. 2020 for details), the analysis focuses on the 179 VBAAs who were interviewed on both the baseline and endline surveys and whose DP/TP inputs received could be verified, as well as the subset of 120 VBAAs who received the correct DP/TP inputs based on their random assignment. The results are similar regardless of which of these two sets of VBAAs is used in the analysis. See Mason et al. (2020) for further details on the impact evaluation data analysis.

TABLE 1. Proxies for bidirectional learning

How much do you consider feedback from farmers when you make recommendations on bean inputs or crop management practices? (1=not at all, 2=very little, 3=somewhat, 4=quite a bit, and 5=a great deal)	
You often get together with other farmers to discuss farming practices or inputs.	1=strongly disagree 2=disagree 3=neutral 4=agree 5=strongly agree
You like to experiment with new farming practices or inputs.	
You encourage others to experiment with new farming practices or inputs.	
You are frequently taught new things by other farmers about farming practices or inputs.	
You often consider changing your own farming practices or the inputs you use because of things you have learned from other farmers.	
You often consider changing the recommendations you make to others on farming practices or inputs because of things you have learned from other farmers.	
You feel empowered to alter the recommendations you make to other farmers on farming practices or inputs based on things you learn from other farmers.	
You try to tailor the recommendations you make to other farmers on farming practices or inputs based on the needs of each farmer.	

[2] The third improved variety was Calima Uyole in Wanging'ombe, Songea Rural, and Njombe Rural, because its appearance is similar to a local variety (Rosekoko) that is popular in those districts; Uyole 03 in Mbeya Rural and Mbozi due to high demand there from an exporter; and Wanja in Iringa Rural and Mufindi due to market demand and its being well-suited to the drier, shorter rainfall seasons in those districts.

[3] All VBAAs were also trained in bean agronomy, the use of Apron Star, and how to set up the DP, distribute the TPs, and the recommended setup for the "baby demos" that TP recipients would be encouraged to set up on their own farms. This training took place in late February 2017 for Mbeya Rural and Mbozi VBAAs, and in December 2016 for all other VBAAs based on the different timing of the main bean season in these two sets of districts.

Findings and policy implications

The main finding across all the input sales/unfilled orders and BDL-related outcomes is that we find no statistically significant differences between VBAAs in the DP vs. DPTP treatment groups in the intervention year or up to two years thereafter. Eight potential reasons for this are discussed in the full paper (Mason et al. 2020).

In addition to this main result, there are three other key findings. First, non-negligible shares of VBAAs received requests/orders for bean seed (22-30%) or seed treatments/pesticides (16-18%) but were unable to fill these orders, largely due to a lack of financing or the inputs not being available for them to purchase for onward sale to other farmers. This may signal an unmet demand for these inputs by farmers, and that improving access to credit for VBAAs (e.g., through providing the inputs to the VBAAs on credit or through greater availability of cash loans) or increasing the supply of these inputs (either at the district center or more locally) may enable VBAAs to more effectively function as local agro-dealers in their communities. To the extent that other local agro-dealers also operate in VBAAs' communities, these findings may also point to business opportunities for them.

Second, while the majority (55%+) of VBAAs consider farmers' feedback quite a bit or a great deal when making recommendations on bean inputs or management practices, about 20% consider such feedback only a little bit, if at all (with the remaining roughly 25% somewhat considering such feedback) (Figure 1). There is growing evidence of the value of enhanced communication between agricultural advisors and farmers regarding local practices and priorities, which is consistent with the need to facilitate bidirectional learning (Nord and Snapp, 2020). Information-intensive knowledge systems are particularly important for sustainable intensification, which suggests the need for explicit training of VBAAs and other agricultural advisors in bidirectional learning. That is, provide educational opportunities to explore how VBAAs can consider farmers' feedback and how to incorporate it into agricultural recommendations. New information and communications technologies (ICTs) such as LandPKS are now available that support bidirectional learning; these tools are being tried out in Tanzania and deserve broader consideration (Nord and Snapp, 2020).

And third, although the vast majority (83-93%) of VBAAs discuss farming with other farmers, try to tailor their recommendations based on each farmer's needs, and experiment or encourage others to experiment with new inputs or management practices, far fewer (55-65%) agreed that they could learn about inputs or management practices from other farmers, or would consider changing their own behavior or the recommendations they make in response to learnings from other farmers (Figure 2). This, too, may signal that additional training in the importance of and strategies for eliciting farmer feedback and incorporating it into extension recommendations may be needed to effectively support bidirectional learning between information providers like VBAAs and other farmers.

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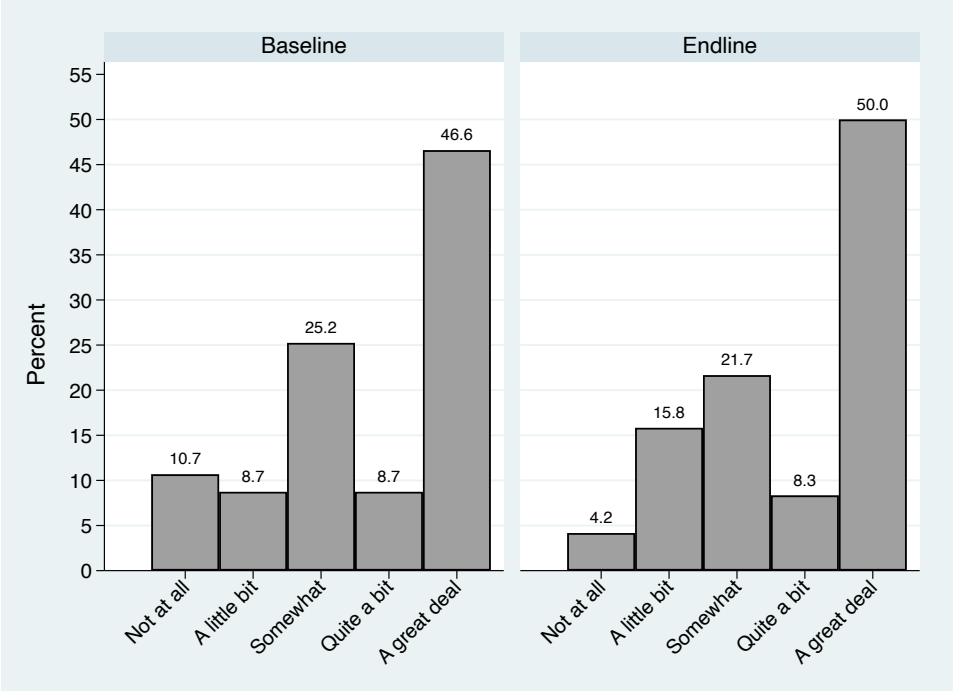
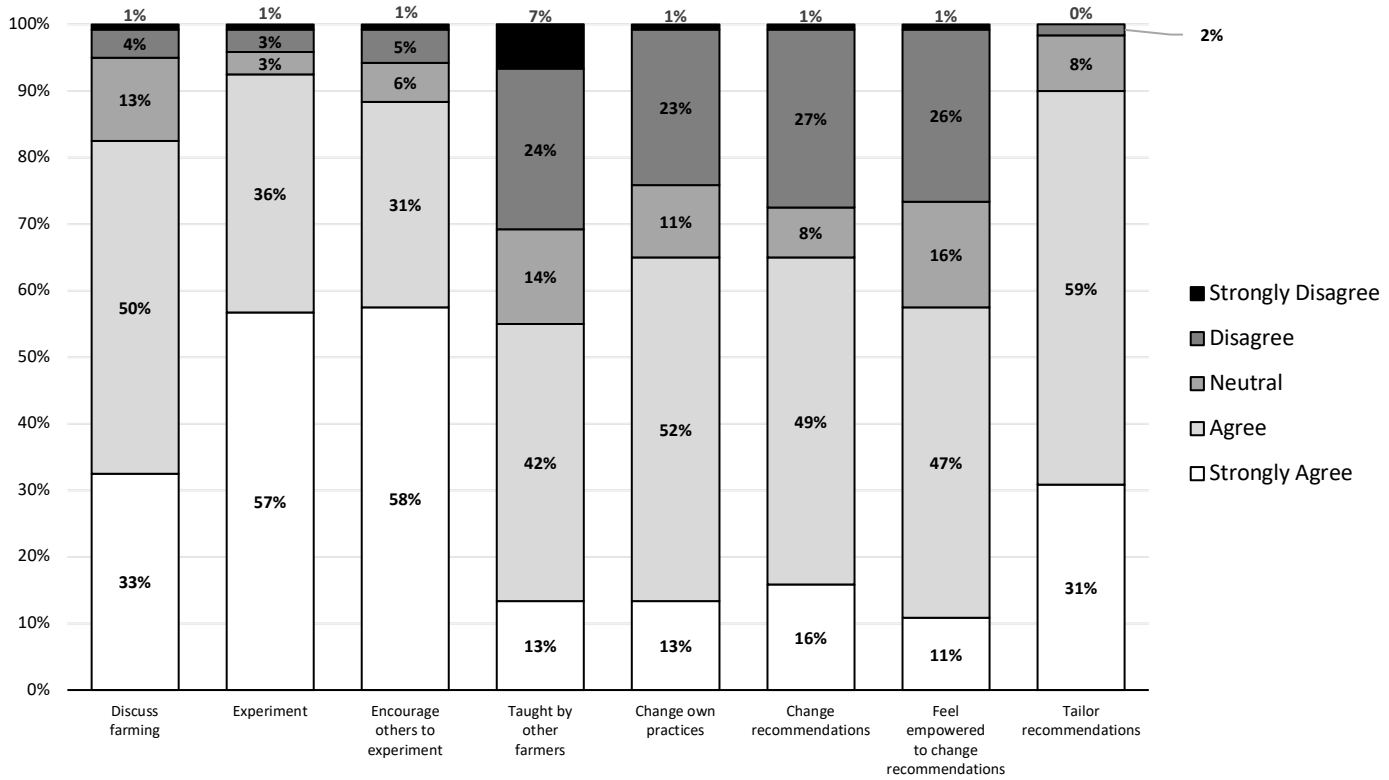
Figure 1. Histograms of responses to "How much do you consider feedback from farmers when you make recommendations on bean inputs or crop management practices?"



Note: N=120 VBAAs interviewed on both surveys and whose treatment status based on inputs received could be confirmed and is consistent with the random assignment. (Results are similar for the N=179 set of VBAAs.)

Figure 2. Summary of responses to VBAA-farmer learning interactions and attitudes statements listed in the bottom portion of Table 1



Note: N=120 VBAAs interviewed on both surveys and whose treatment status based on inputs received could be confirmed and is consistent with the random assignment. (Results are similar for the N=179 set of VBAAs.) Based on the 2019 endline survey data.

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