Do Female Instructors Reduce Gender Bias in Diffusion of Sustainable Land Management Techniques? Experimental Evidence From Mozambique

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Summary. — Agricultural innovation is essential to meet the food requirements of Africa's growing population. One pathway to increasing yields may be to enhance female farmer productivity. In many settings, married women cultivate plots separated from those of other family members. They face different challenges to productivity, such as deficiencies in inputs, weak property rights, and time constraints. It has long been argued that traditionally male-dominated extension services may also contribute to a gender bias in adoption of new agricultural techniques. If this is true, placing women in extension positions may help other women overcome barriers to adoption posed by inequitable access to agricultural extension services or exposure to inapt information. To better understand the role of gender in the dissemination of sustainable land management (SLM) techniques, this study uses a randomized policy experiment conducted in 200 communities in Mozambique. We examine the impact of training female messengers of SLM techniques on the awareness, knowledge, and adoption of SLM practices by other female farmers. Communities were randomly selected in 2010 to have a female messenger trained in SLM who was encouraged to teach other women the techniques. Using data from panel surveys collected in the experimental areas, we find women's awareness of pit planting farming techniques increased by 9 percentage points in 2012 and adoption of the technology by 5 percentage points in 2013 in communities with female messengers.
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Key words — gender, extension, sustainable land management, experiment, Africa

1. INTRODUCTION

Agricultural innovation is essential to meet the food requirements of Africa's growing population (Byerlee, de Janvry, & Sadoulet, 2009). One pathway to increasing yields may be to enhance female farmer productivity. In many settings, married women cultivate plots separated from those of other family members. They face different challenges to productivity, such as deficiencies in inputs (Croppenstedt, Goldstein, & Rosas, 2013; Udry, 1996; Udry, Hoddinott, Alderman, & Haddad, 1995), weak property rights (Goldstein & Udry, 2008), and time constraints (Doss, 2001). It has long been argued that traditionally male-dominated extension services may also contribute to a gender bias in adoption of new agricultural techniques (Bowen, 1989; Saito et al., 1994; Doss, 2001; Due, Magayane, & Temu, 1997; Quisumbing & Pandolfelli, 2010). If this is true, placing women in extension positions may help other women overcome barriers to adoption posed by inequitable access to agricultural extension services or exposure to inapt information. This study uses a randomized policy experiment in Mozambique to examine the impact of training female messengers of Sustainable Land Management (SLM) techniques on the awareness, knowledge, and adoption of SLM practices by other female farmers.[1] To our knowledge, this study is the first to explicitly test the impact of training female messengers on the diffusion of agricultural techniques to other women in a randomized experimental setting.

Although agricultural intensification has been the standard approach to increase yields, there has been a recent push to emphasize SLM (Spielman, 2014). SLM can offer higher yields, more efficient water use, and enhanced soil fertility (Stevenson, Serraj, & Cassman, 2014; Thierfelder, Matemba-Mutasa, & Rusinamhodzi, 2015). There are, however, few examples of SLM practices being widely adopted by target populations or persisting over time (Giller, Witter, Corbeels, & Tittonell, 2009; Stevenson et al., 2014).

The Government of Mozambique (GoM) conducted a randomized agricultural extension intervention in 200 Zambezi Valley communities. In all communities, male messengers served as points-of-contact between extension agents and community members prior to the intervention.[2] In 2010 and 2012, the intervention, Treatment T_M, randomly selected male messengers from 150 communities to receive a three-day central-

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ized training in SLM practices. All trained and untrained messengers were encouraged to maintain demonstration plots to make it easier for community members to learn from their own experiences.

As part of their Poverty Reduction Strategy, the GoM is trying to develop agricultural policies that are inclusive to women, "the principal farmers in Mozambique" (Gallina & Chidiamassamba, 2010). In our study, women are responsible for 72% of the plots (as head of households) and 31% of the plots (in households headed by men). Despite their prominent role in agriculture, there are several reasons why women may not benefit from the information distributed by male messengers. In rural areas in Mozambique, for example, it is not culturally acceptable for females to interact with males external to the family (Gallina & Chidiamassamba, 2010). Studies have identified obstacles in other countries such as men and women specializing in different practices, or men not timing visits to accommodate female obligations such as childcare or outside income generating activities (Quisumbing & Pandolfelli, 2010). There is some evidence that hiring female extension agents was able to increase access to female farmers in Tanzania (Doss, 2001), presumably by overcoming these types of barriers.

Factors unrelated to social or cultural practices may also be at play. For example, Bowen (1989) observed that the predominantly male extension agents in Mozambique preferred to work with male farmers because their education and organization skills made them better equipped to take advantage of extension services. If male farmers are in fact more receptive, then it may be the case that female messengers may also prefer to work with them. Similarly, extension outreach in countries such as Zambia and Malawi may have been biased against poor farmers (Doss, 2001; Hirschmann & Vaughan, 1983). If an observed gender bias in dissemination of techniques is due to the fact that most women farmers are poor, then using female messengers may do little to remedy the bias.

Regardless of evidence from other countries, however, rural African households are quite diverse, highlighting the importance of investigating the effectiveness of a particular policy in a local context (Doss, 2001). In this vein, the GoM was interested in evaluating, within the broader experiment, whether introducing female messengers would improve information dissemination to female farmers. As initially designed, the training intervention equipped male messengers to teach new techniques to their fellow farmers. However, even if it improves information dissemination, the information may not reach female farmers. To better understand whether this is the case, a second intervention, Treatment T_{MF}, randomly selected 75 communities within treatment M to have a second, female messenger, trained with a specific mandate to teach

women SLM. We test whether adding a female messenger further improves dissemination and if so whether this effect accrues to female farmers.

Results suggest that adding a female messenger addresses a gender bias in dissemination of SLM techniques in Mozambique. Understanding the channels in which female instruction improves female adoption was not integrated into the original experimental design. However, we are able to use available survey data to examine five potential mechanisms underlying the observed effects: (1) increases in access to female farmers come from increases in the supply of extension services; (2) complementarities exist between the female and incumbent male messenger improving outreach to female farmers, (3) adding female instruction encourages women to seek advice, (4) female messengers help provide more relevant information to female farming practices, and (5) in male-headed households female messengers reinforce practices learned by female farmers from their husbands. Our results are consistent with the first two channels. Efforts of the second messenger appear to complement those of the first, leading the incumbent to increase effort and, therefore, outreach to women.

2. MATERIALS AND METHODS

In 2007, the GoM, with financial support from the World Bank, invested heavily in the agricultural extension network in five districts in the Zambezi Valley, an area with high agricultural potential (World Bank, 2007). The government increased the number of extension agents per district and provided them with housing and training. In 2010 and 2012, agents received technical training on eight SLM practices (mulching, crop rotation, strip tillage, pit planting, contour farming, row planting, improved fallowing, and intercropping). Training lasted 3 days, split evenly between in-class lectures and field demonstrations.

In collaboration with the government, our research team designed an experiment that similarly trained a random subset of existing male contact farmers, or messengers, from communities in the five districts. In 2010, the messenger baseline survey collected a census of all messenger characteristics in over 300 communities. The baseline survey was used to randomize the selection of communities into treatment groups, stratified by district to ensure sufficient geographic representation. Figure 1 depicts the multi-arm treatment design of the experiment. All communities had incumbent male messengers of whom 150 were randomly selected into Treatment T_M and 50 into the control (no training). Of the 150 Treatment T_M communities, 75 were randomly selected into Treatment
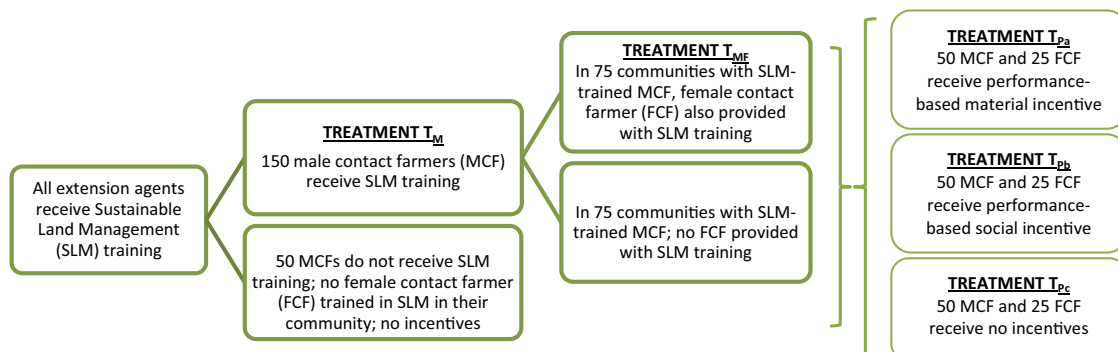

Figure 1. *Experimental design.*