J. Japanese Int. Economies 33 (2014) 43–74

Contents lists available at ScienceDirect

Journal of The Japanese and International Economies

journal homepage: www.elsevier.com/locate/jjie

Disseminating new farming practices among small scale farmers: An experimental intervention in Uganda

Tomoya Matsumoto

National Graduate Institute for Policy Studies, 7-22-1 Roppongi, Minato-ku, Tokyo 106-8677, Japan

ARTICLE INFO

Article history:
Available online 28 November 2013

Keywords:
Technology adoption
Agricultural development
Field experiment
Africa

ABSTRACT

Matsumoto, Tomoya—Disseminating new farming practices among small scale farmers: An experimental intervention in Uganda

We used a randomized control trial to measure how the free distribution of hybrid seeds and chemical fertilizers for maize production affected their adoption by small-scale farmers in the subsequent seasons. Information on their demand for the same inputs for two years after the initial trial revealed that the demand of the free-input recipients was significantly higher than that of non-recipients; that of the neighbors of the recipients fell in-between. The initial treatment assignment has a persistent influence on the farmers' demand whereas the difference between the free-input recipients and their neighbors has been reduced over time. The reduction of their gap in the demand for fertilizers is partly driven by social learning through information networks. However, there was no clear evidence on learning effects from peers on the demand for the hybrid seeds. *J. Japanese Int. Economies* **33** (2014) 43–74. National Graduate Institute for Policy Studies, 7-22-1 Roppongi, Minato-ku, Tokyo 106-8677, Japan.

1. Introduction

Technology adoption is the key to realizing dramatic improvement in agricultural productivity as proved in Asia's Green Revolution which occurred since the late 1960s and which was nothing but the development of new technologies (or new seed varieties) invented through scientific research

E-mail address: tmatsumo@grips.ac.jp

0889-1583/$ - see front matter © 2013 Published by Elsevier Inc.
http://dx.doi.org/10.1016/j.jjie.2013.10.007

and their dissemination (Hayami and Ruttan, 1985). Given the current low application of technologies, there seems to be ample room for small-scale farmers in Sub-Saharan Africa to highly enhance their productivity by the adoption and adaptation of technologies which have been used in the other parts of world. However, many of the productivity enhancing technologies have not been widely adopted in this area.

There has been a growing body of empirical literature on technology adoption in agriculture in Africa. Many studies confirm the high average return of agricultural inputs or methods, for example, fertilizers for maize production in Kenya (Duflo et al., 2008) and hybrid seeds in Kenya (Suri, 2011), fertilizers for cocoa production in Ghana (Zeitlin et al., 2010), and NERICA rice variety in Uganda (Kijima et al., 2008). Nonetheless, such technologies tend to diffuse slowly and incompletely. Recent studies on technology adoption in agriculture among small scale farmers have focused on social learning since it is considered to be a key determinant of the speed of the diffusion of new technologies and hence productivity growth (Foster and Rosenzweig, 1995;Munshi, 2004; Bandiera and Rasul, 2006;Duflo et al., 2011; Conley and Udry, 2010). The evidence on social learning varies substantially depending on the nature of technology and the phase of dissemination. If a technology is new and easy to learn, social learning appears to have a large impact on its adoption and adaptation.[1]

This study is also an attempt to contribute to the literature on social learning. The use of modern inputs in maize production such as hybrid seeds and chemical fertilizers is new to many of the small-scale farmers in Uganda. Because various conditions affect social learning in different manners, I believe that it is worth investigating the mechanism of the dynamic adoption process with social learning in the context of maize production in Uganda, where the dissemination of technologies relating to intensive farming methods is in its nascent stage. Moreover, we use a superior approach to address the issue by combining a randomized control trial of the free distribution of new inputs to small-scale farmers, sales meetings eliciting the input demand information from each of the farmers in subsequent cropping seasons, household-survey panel data tracking household characteristics and maize production over years, and detailed social network information among the target farmers.

This approach has two major advantages in measuring the social learning effect. Firstly, the initial randomized control trial can create exogenous variation in the distribution of who are exposed to the new technology among the experiment participants, which is often endogenous.[2] Secondly, the detailed information of the social networks among the sample farmers enables us to distinguish peers living in geographic proximity and peers with whom information on farming practices is exchanged. As pointed out by Manski (1993), the proper definition of a reference group is crucial to identifying the social learning effect. Nonetheless, only few studies have collected and used the social interaction information to construct a proper reference group in the technology adoption literature.[3] Using this unique and rich information, we analyze the dissemination process of the modern inputs for maize production over two years.

Our previous study (Matsumoto et al., 2013) presents the first episode of a series of interventions and examines the outcomes of the first sales meeting held in 2009 just after the cropping season in which the free agricultural inputs were applied by the recipients.[4] This paper presents the second episode of the experimental interventions on maize production targeting small-scale farmers in Uganda conducted since 2009 in order to examine the technology adoption of productivity-enhancing inputs and their dissemination process. For this purpose, we implemented a series of interventions. The series started

[1] For instance, Conley and Udry (2010) showed evidence on the social learning of the fertilizer application among small-scale pineapple producers through information networks in Ghana, while Duflo et al. (2008) found that farmers in Kenya learned not from others but from own experience to find the optimal application level of fertilizer on maize production. These contrasting findings are not a puzzle once we understand that the farming practice is not new to Kenyan farmers, but it is to Ghanian farmers as pointed out by Foster and Rosenzweig (2010).

[2] Recent studies on technology adoption often use field experiments to measure the social-learning effects (Kremer and Miguel, 2007;Duflo et al., 2011; Dupas, 2010).

[3] Notable exceptions are studies by Conley and Udry (2010) and Duflo et al. (2008).

[4] Matsumoto et al. (2013) observed the farmers' purchasing behaviors on the same inputs and found that the free input recipients purchased significantly more of the same inputs in the subsequent season and that the input demand of their neighbors (who live in the treatment villages but were not given free inputs) fell in between the free input recipients and the control households (who live in the control villages where no free inputs were given). The neighbors of the free input recipients purchased more inputs if their "information peers" (whom they communicate with) have a higher yield with the use of the inputs compared to the local maize yield.