World Development 103 (2018) 216–225

Contents lists available at ScienceDirect

World Development

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

Competition or cooperation? Using team and tournament incentives for learning among female farmers in rural Uganda ☆

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ARTICLE INFO

Article history:
Accepted 11 October 2017
Available online 26 November 2017

JEL classification:
C92
C93
O13
O33
O55

Keywords:
Team
Tournaments
Competition
Learning
Agricultural training
Uganda

ABSTRACT

This study explores the behavioral learning characteristics of smallholder female farmers in Uganda by quantifying the amount of information learned under different incentive schemes. The paper shows how competitive versus team incentives compare in motivating Ugandan farmers to learn and share information relevant to adopting a new agricultural technology. We find that tournament-based incentives provide greater outcomes in terms of total information learned than threshold-based team incentives. Furthermore the order of the incentive – whether the tournament precedes or follows the team incentive scheme – does not affect the volume of information learned. New information introduced between rounds was learned by more individuals under team incentives than under tournament incentives. The study provides direct practical policy recommendations for improving learning in the context of agriculture in Uganda.

1. Introduction

There are competing reasons for low levels of technology adoption in Sub-Saharan Africa, especially in agriculture, including: small land holdings and degrading soil quality, poor access to input and output markets, lack of available technolgies and training, and climate uncertainty (Yamano & Otsuka, 2011). In contrast, there is wide acknowledgment of the importance of agriculture in Sub-Saharan Africa especially as a vehicle to alleviate poverty and improve general well-being. Estimates indicate that about 91% of the rural extreme poor participate in agriculture, with about 75% of extreme poor living in rural areas (Kilic, Palacios-Lopez, & Goldstein, 2013). The potential culprits for low technology adoption range from low information access, inadequate input delivery systems, behavioral biases of farmers as well as risk aversion (Duflo, Kremer, & Robinson, 2006; Shiferaw, Kebede, & You, 2008). Much attention has been directed to technology diffusion and extension workers. Questions raised include how information spreads across villages, if at all, and whether extension agents are able to activate learning. Central to this discussion is whether learning can be encouraged. Further, if one views farmers as embedded in a social network, can certain incentives take advantage of this feature to improve the spread of information?

To understand the role of group dynamics in learning, we conducted lab experiments in the field using female farmers who can decide on whether or not to adopt a new cash crop, cotton, in Northern and Eastern Uganda. It was implemented as a means of training farmers in growing a relatively new crash crop, cotton, and at the same time testing which incentives would expedite learning in a group environment. We specifically examined two

☆ This work was part of a larger randomized control trial entitled "Gender Dimension of Cotton Productivity in Uganda" led by Laoura Maratou (University of Maryland) and John Baffes (World Bank Prospects Group) and funded by the World Bank's Gender Action Plan Trust Fund (TF 093760). The experiment was conducted in compliance with World Bank human subjects protocols. We give thanks to Markus Goldstein at the World Bank and the Africa Gender Innovation Lab of the World Bank, who funded the research presented here, and participants at the Yale Development Seminar, Experimental Economics Association, Kenneth Leonard, Andreas Lange, Erkut Ozbay, and Andrew Stocking who provided useful comments and suggestions. The views expressed herein are those of the authors and do not necessarily reflect the views of the World Bank.

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https://doi.org/10.1016/j.worlddev.2017.10.023
0305-750X/

incentive schemes, which would take advantage of group dynamics, feasibility of implementation, and reasonably mimic reality within the context of Uganda.[1] The first scheme we implemented was a team-based threshold incentive scheme where individuals were encouraged to share information in a session, and the full session of participants were rewarded if all participants demonstrated learning a minimum threshold of information. This was contrasted to the second scheme, a tournament-based scheme, in which all participants were still encouraged to share information, but only the best performing participant was rewarded. Details of the schemes are presented later in the paper.

The incentive schemes are motivated by two strands of literature. The first strand involves the importance of peer learning in technology adoption, and thus both incentive schemes require that farmers exchange information with one another. The second literature, firmly rooted in experimental and behavioral economics, involves the exertion of effort and outcomes under tournament versus team-based incentive schemes. The question of whether team incentives would be more effective than tournament incentives at increasing worker effort is part of a long literature in the context of public good contributions (Dechenaux, Kovenock, & Sheremeta, 2014; Groves, 2014; Hamilton, Nickerson, & Owan, 2003; Orrison, Schotter, & Weigelt, 2004). Experiments have compared the effectiveness of different variations of team and tournament incentive schemes in the lab (Barham, Chavas, Fitz, Ŕos, & Schechter, 2014; Nalbantian & Schotter, 1997). This literature is also relevant to the context of information sharing, as information can be seen as a public good that is non-excludable and non-rival (Romer, 1990). Team incentives generally take the form of a communally generated prize that is distributed among the team. Team members are awarded a fixed fraction of the team's collective product, or a portion contingent on their level of effort or contribution. In a team goal scenario, free riding is a natural concern, where reducing effort is beneficial to one's own utility, and compromises the team outcome. Tournament-based incentives take the form of a competition between individuals. The individual who exerts the most effort and obtains the highest outcome is rewarded, or rewarded the most. As a result, tournament-based incentives typically encourage greater competition and less cooperation. Therefore, even in a public good scenario where collective action is needed, tournament incentives have been shown to be a more effective mechanism than team-based incentives in inducing effort to contribute to the public good (Irlenbusch & Ruchala, 2008; Sutter, 2006).

While experiments may provide a wide range of general implications for encouraging learning in a group context, specific practical policy implications are needed for agricultural extension work. In the developing world, new information is not readily available and thus the burden of information dissemination falls on extension agents or trainers. Such trainers and extension agents typically provide information and knowledge about new technologies in person.

Due to the poor performance of traditional agricultural extension services in Uganda, the National Agricultural Advisory Services (NAADS) program was introduced in the Act of 2001. The program had a mandate to target poor farmers, especially women and farmers with disabilities. Despite NAADs' mandate, the national delivery services showed that only about 10% of Ugandan farmers received extension services from 2001–2010 (Mutimba, 2014). Indeed, using LSMS data from Uganda, only 7% of agricultural households received any agricultural extension information in 2009, the year in which the study was conducted. Furthermore, comparing households who did and did not receive extension training, those who did had larger land holdings.[2] Moreover, information based on 22 interviews with respondents ranging from District Agricultural Officers, farmer associations, NGO agricultural extension workers, NAADS coordinators and rural service providers regarding agricultural extension reforms in Uganda show that few farmers were reached due to inadequate staffing (Afranaakwapong & Nkonya, 2015). The NAADs approach of using selected host farmers to carry out demonstrations resulted in a large number of farmers being omitted. Non-cooperation from farmers was also observed.

Given the high cost and time involved in training remotely situated smallholder farmers, extension agents can often train only a handful of farmers at one time, often the most productive or most visible, with the expectation that newly trained farmers will then share their expertise. There are two concerns with this. First, traditional extension training is costly.[3] This is important as most extension officers have a limited supply of resources, and thus choose the perceived most productive farmer, and provide advice or improved seeds to them. Second, trained farmers will not necessarily adopt the technology nor spread the information (Evenson & Mwabu, 2001). Thus, agricultural extension workers in developing country settings often see low adoption rates of new agricultural technologies despite their efforts, especially with female farmers.

The findings of this study can aid extension workers, who remain primary agents in spreading information. Activating social ties to share knowledge around a new technology may be one way to introduce technologies into the lives of remote and poor households in a cost effective manner. Improving the effectiveness of extension agents is important due to limited budgets and mixed findings (Anderson & Feder, 2007; Davis et al., 2012). The literature has explored avenues of increasing the effectiveness of extension workers. Kondylis, Mueller, and Zhu (2014) specifically explore technology diffusion and find that Training & Visits (T&V) models, where extension agents offer ad hoc training to contact farmers in a village, with the hopes that they then transfer knowledge across the village, are inferior to centrally training contact farmers. Their recommendation is that running small-scale, low-cost training of designated communicators may be one way to improve overall learning. Yishay and Mobarak (2017) also study the use of more central contact farmers, and find that they are effective at spreading information, but only when provided with individual incentives. Campenhout, Vandevelde, Walukano, and Asten (2017) test whether farmers can learn and abstract agricultural information provided via Android tablets. Conversely, very few studies have explored increasing effectiveness of extension work using group incentives. Social ties and networks have been extensively studied in how they facilitate the spread of information (Bandiera & Rasul, 2006; Yishay & Mobarak, 2017; Duflo et al., 2006; Conley & Udry, 2010). An overarching evaluation established that local social networks were found to be complementary to extension work and a cost effective means of improving outcomes for female farmers in rural Uganda (Vasilaky, 2013; Vasilaky & Leonard, 2017). In addition, game theoretic work in networks shows that chatting can increase the fraction of stable outcomes regarding two-way communication (Ding & Schotter, 2017). However, less work has been done in studying the degree to which group versus individual

[1] For example, a piece rate incentive scheme would be costly to implement in reality in terms of monitoring output as well as administering payouts to farmers. This is true, even more so for farming, where we only observe the aggregate output as in Holmstrom (1982).

[2] The difference in area land holdings between those who received and did not received agricultural extension training is 3.4 hectares versus 2 hectares, and the difference is statistically different with a t-statistic of 1.8.

[3] The vehicle and fuel costs to reach remote areas in Uganda alone can be prohibitive, averaging 30 USD per day to visit, for example, 3 villages at most. These costs are based on our budgeting and hiring of staff for the project, and is a low estimate.