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World Development Vol. 64, pp. 843–859, 2014
0305-750X/

http://dx.doi.org/10.1016/j.worlddev.2014.07.003

Beyond the Field: The Impact of Farmer Field Schools on Food Security and Poverty Alleviation

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Summary. — We estimate the impact of a Farmer Field School intervention among small-scale farmers in northern Tanzania on two main development objectives: food security and poverty. We employ a series of evaluation methodologies, including a Quasi-Difference-in-Difference setup, to account for potential selection into the project, despite lack of baseline data. We find strong positive effects on food security, but no effect on poverty. Investigating possible mechanisms for this result shows that reallocation of labor resources toward own agricultural production and improved production smoothing may have led to improved food security while poverty remained unaffected.

Key words — impact assessment, Farmer Field Schools, food security, poverty, Tanzania, Africa

1. INTRODUCTION

The majority of poor households in developing countries rely on subsistence agriculture for their own food production and as a source of income. Over the past few decades, various initiatives have been taken aimed at increasing food production by closing the technology gap faced by subsistence farmers. Such initiatives have worked either directly, through the supply of new technologies such as fertilizer, seeds of improved plant varieties, or new animal breeds, or more indirectly, through agricultural extension and advisory services, or both (Anderson & Feder, 2007; Lunduka, Ricker-Gilbert, & Fisher, 2013; Rawlins, Pimkina, Barrett, Pedersen, & Wydick, 2014).

Agricultural extension has long been seen as a key element in improving agricultural development. However, the effectiveness of two dominant approaches to agricultural extension services in particular—Training and Visit (T&V) [1] and Farmer Field Schools (FFS) [2]—has been widely debated. The T&V approach relies on the "top-down" extension of technical information, with specialists and field staff transferring knowledge to "contact farmers" in villages, who in turn are responsible for diffusing knowledge into the local community. As a response to this top-down approach, FFS were developed as a "bottom-up" approach to extension with a focus on participatory, experiential, and reflective learning to improve the problem-solving capacity of farmers through highly trained facilitators working with farmer groups (Anderson & Feder, 2007). In this paper, we assess the impact on food security and poverty of an intervention which seeks to combine both the top-down and bottom-up approaches and which has been implemented among smallholders in northern Tanzania. The intervention, locally known as RIPAT (Rural Initiatives for Participatory Agricultural Transformation), is designed as a modified FFS approach taking its starting point in farmer groups and experiential learning, but with a strong element of traditional technology transfer through the introduction of a "basket" of new technology options. We find that RIPAT has had a large impact on food security, but no detectable impact on poverty.

FFS have been implemented and adopted worldwide (Braun, Jiggins, Röling, Van den Berg, & Snijders, 2006). Nonetheless, the ability of the approach to ensure both sustained technology adoption and increased productivity is still subject to an ongoing debate about appropriate evaluation methodologies, when to evaluate, and choice of outcome measures (Braun & Duveskog, 2011; Feder, Murgai, & Quizon, 2008; Feder, Anderson, Birner, & Deininger, 2010; Davis & Nkonya, 2008; Mancini & Jiggins, 2008; van den Berg & Jiggins, 2008). More recently, a thorough survey of FFS impact studies was provided by Davis, Nkonya, Kato, Mekonnen, Odendo, and Miiro (2012, Table 1), highlighting the fact that the outcomes selected for examination are very mixed, as are the findings. While some papers find positive impacts on adoption, agricultural yields, productivity, and agricultural income, others do not. Most papers studying the impact on various aspects of empowerment find that empowerment increases, which has led to an argument being advanced that FFS is more a model of adult learning than of agricultural extension (Friis-Hansen & Duveskog, 2012; van den Berg & Jiggins, 2007).

The debate in the FFS evaluation literature was initially sparked by Feder, Murgai, and Quizon (2004) criticizing earlier FFS evaluation methodologies for not taking the potential positive bias of non-random program placement and selection of participants into account in their assessments of impact. This led to discussions of evaluation timing and problems of spillover effects. Measuring outcomes using a relatively long time horizon, as Feder *et al.* (2004) do, allows for an assessment of impact sustainability—unless the estimated impact is

* All the views expressed in this paper are those of the authors and do not necessarily reflect the views of the Rockwool Foundation. The Rockwool Foundation funded the RIPAT implementation and the data collection for the evaluation. We are grateful for comments and advice from RECODA, Jens Vesterager, Mette Ejrnæs, Torben Tranæs, Cathrine Søgaard Hansen, Maria Fibæk, as well as from participants in the CAM Christmas workshop 2011. All remaining errors are of course our own. Final revision accepted: July 9, 2014.

confounded by spillovers from FFS graduates to control farmers living nearby, as suggested by van den Berg and Jiggins (2007, 2008) but proven by Yamazaki and Resosudarmo (2008) not to be the case using the same data as Feder *et al.* (2004).

The best way to obtain an unbiased estimate of impact would be to conduct a randomized controlled trial, but to our knowledge, this has not been done for FFS yet. Given non-random program placement, a few papers, including Godtland *et al.* (2004), Rejesus, Mutuc, Yasar, Lapitan, Palis, and Chi (2012), Davis *et al.* (2012), and Todo and Takahashi (2013), do attempt to take this selection factor into account in a careful manner. However, all four of these studies suffer from having relatively small sample sizes (ranging from 142 to 486 within each country), which may have resulted in no significant impact being found simply due to lack of statistical power, and from operating with a very short time horizon (one to two years since project start). They therefore have to assess the impact on outcomes that are very closely related to project activities, such as knowledge transfer, technology adoption, yields, or agricultural income.[3] Again findings are mixed, though with some indications of improved technology, knowledge transfer, and adoption leading to higher yields and thus to increased agricultural income.

While it is of value to assess the impact of FFS on farmers' knowledge, technology transfer, take-up, and agricultural production, it should be kept in mind that households may simply divert resources away from other activities toward the new project-related activities. It is therefore also important to analyze the impact on broader welfare indicators for the participating households. Although it has become popular to assess empowerment, it is not in itself a welfare measure; rather, it can be a channel through which people may obtain improved welfare. We have not found any studies within the conventional peer-reviewed literature that analyze the impact of FFS on broader welfare factors such as food security or poverty.

This paper is intended to contribute to filling this gap in the literature by presenting a rigorous impact evaluation of RIPAT FFS to examine whether the program improved food security and reduced poverty among participating households. In our evaluation, we have sought to address the main points raised in the FFS evaluation debate summarized above.

We let the original project documentation guide us in the choice of outcome measures. It was explicitly stated that the overall development objectives of the intervention were to increase food security and alleviate poverty among participating households. Any effect on these outcome measures can only be expected to be observable in the medium or long term, as participating households have to first adopt and then implement the new technologies throughout a full agricultural cycle before impacts on food security and poverty can occur. By developing our evaluation strategy and the associated survey instrument accordingly, we have effectively tied the analysis—and our hands—to these outcome measures, and thereby reduced the possibilities of "cherry-picking" convenient results. However, we did not have a full pre-analysis plan laid out, as suggested by Casey, Glennerster, and Miguel (2012).

In explaining our choice of impact assessment methodologies, we discuss the extent to which we can overcome the potential endogeneity issues noted by Feder *et al.* (2004) and Godtland, Sadoulet, Janvry, Murgai, and Ortiz (2004) that stem from non-random program placement and self-selection of participants. To address these issues we collected household data from two different areas: Arumeru district, where RIPAT I was implemented, and Karatu district, where RIPAT II was started two years later. In both areas we collected data from virtually all RIPAT households and from a sample of control households in nearby villages. In addition, we also collected data from non-RIPAT households in RIPAT I villages. We employ four different methodologies to assess the impact of RIPAT I: a simple cross-sectional comparison of RIPAT I and control households in a multivariate setting to control for observable characteristics; an intention-to-treat estimation, in which we include non-RIPAT households within RIPAT I villages, to circumvent the problem of self-selection at the household level; a matching estimation to increase comparability of observable characteristics between RIPAT I and control households and villages[4]; and finally a Quasi Difference-in-Difference estimation exploiting data from the later RIPAT II households and their controls to account for selection. Under the assumption that the household- and village-level selection mechanisms in the two districts were the same, the Quasi Difference-in-Difference takes selection on both observable and unobservable characteristics into account, i.e., we circumvent the endogeneity problems of non-random program placement and self-selection of participants. To the extent that there was already some initial impact among RIPAT II farmers on food security and poverty indicators at the time of the data collection in 2011, which was more than one year after RIPAT I completion and half way through the RIPAT II project period, our impact assessment will be a conservative estimate of the true impact. We thereby avoid the problem of positive selection bias. Throughout the paper, the impact assessment is an assessment of RIPAT I only, unless explicitly stated otherwise.

To address the potential problem of timing and spillover to control farmers diluting the impact of the intervention, as described by van den Berg and Jiggins (2008), we use control farmers living at a sufficient distance from the RIPAT intervention villages. Although there had been spillover within RIPAT I villages at the time of data collection, qualitative findings confirm that we do not have to worry about any potential spillover in food security and poverty from RIPAT I to control villages at the distances used.[5] In addition, by assessing the impact of RIPAT I almost five years after project start and more than one year after completion, we are also able to address issues of sustainability, at least in the medium term.

Our analyses are based on interviews with 2,041 farming households using a highly structured closed-form questionnaire administered in 36 villages, of which 16 were intervention villages. We thus have a large sample size compared to previous FFS impact evaluations.[6]

The vast majority of participants in RIPAT Farmer Field Schools were involved in the project throughout the full project period. We see that half-way through the project period in RIPAT II and one year after project completion in RIPAT I the participating households were more likely to have adopted virtually all the key technologies promoted through the basket of options than farmers in the control villages. This indicates both immediate and sustained adoption of the new technologies. We find that the participating households were more likely to be cultivating improved varieties of banana, to have a larger degree of crop diversification, to be keeping improved breeds of livestock, and to be members of savings groups.

Most importantly, we find that these high levels technology take-up resulted in considerable improvements in food security levels, suggesting an increase in overall household welfare. In the medium term, i.e., five years after project start,