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Are there systematic gender differences in the adoption of sustainable agricultural intensification practices? Evidence from Kenya

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ABSTRACT

This paper uses sex-disaggregated survey data at the plot level to test whether there are systematic gender differences in the adoption of multiple sustainable intensification practices (SIPs) in Kenya. We analyze plot level adoption decisions of SIPs by male, female or joint plot managers within the household, controlling for household characteristics, asset wealth and land quality factors that condition investments in intensification options. Using a multivariate probit model, we find gender differences in the adoption pattern for some SIPs. Compared to male plot mangers, female managers are less likely to adopt minimum tillage and animal manure in crop production, indicating the existence of certain socioeconomic inequalities and barriers for female farmers. However, we find no gender differences in the adoption of soil and water conservation measures, improved seed varieties, chemical fertilizers, maize-legume intercropping, and maize-legume rotations.

Introduction

Gender and development issues in Africa and the developing world continue to generate interest among researchers and policy makers. The main proposition underlying this interest, particularly in Africa, is that African women play a key role in farm work where they are responsible for family food security and home production (Meinzen-Dick et al., 2010). Although the contribution of women to agricultural production and the specific gender division of labor in household, farm and non-farm activities varies across countries and cultures, women play a crucial role in enhancing food and nutritional security in Africa. Given this central role that women play in agriculture and family well-being, it is instructive to understand the gender-technology gaps and the potential factors that create barriers for women in raising productivity to increase food security at the household and national levels. These constraints are usually in the form of limited access to land, livestock and other assets, education, health care, markets, extension services, and other subtle forms of social and cultural inequality linked to social perceptions about the proper roles of women and about their perceived lack of suitability as farmers (Quisumbing, 1995; Doss and Morris, 2001; World Bank, 2001; Githinji et al., 2011; Odame et al., 2002; Meinzen-Dick et al., 2010; Quisumbing and Pandolfelli, 2010; Croppenstedt et al., 2013). Women face additional constraints such as weaker land tenure security, poorer quality of land, and little access to credit (Doss, 2001; Doss and Morris, 2001). This has implications for technology adoption on the plots they manage, market access, food security and income growth for poverty reduction in the households they belong to or head.

The gender specific constraints that affect technology adoption and sustainable intensification of production are, however, unequally covered in current research. Although a fair amount of attention has been paid to the determinants of technology adoption in the economic development literature (e.g., Adegbola and Gardebroek, 2007; Feder et al., 1985; Kassie et al., 2013; Teklewold et al., 2013a; Shiferaw et al., 2008), much less attention has been given to understanding how gender issues affect technology adoption within and across households, particularly related to multiple technology adoption that includes agronomic and resources management practices. Little consideration has been given to who exactly participates in the technology adoption decision. Recent reviews in existing gender-related studies (e.g. Doss, 2001; Peterman et al., 2010a; Quisumbing and Pandolfelli, 2010) have found that, with few exceptions, many studies typically look at the gender of the household head rather than the specific plot or farm manager within the household.

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As Udry (1996) argues, agricultural production in certain African cultures occurs on many plots controlled by different members of the household. Heterogeneous gender roles cannot be clearly determined as to who exactly makes specific agricultural investment and managerial decisions in non-unitary households without looking at the specific decision makers themselves (Peterman et al., 2010b). In Burkina Faso, Udry (1996) found that plots controlled by women are farmed much less intensively than similar plots within the household controlled by men. The assumption that the adoption and production decision making is joint within a household in some African farming systems may neglect the phenomenon of differential farming decisions taken by male and female individuals within the same household, whether independently or jointly, and hence potentially leads to wrong conclusions and policy choices. This is particularly important when rights to, and control of, resources differ significantly within the household depending on whether the man or the woman or both have managerial responsibilities on farmland and other household assets.

In this study, we examine gender and technology adoption issues by analyzing the adoption of several sustainable intensification practices (SIPs[1]) options across farm plots in Kenya by differentiating plots managed by men, women or both together. We test whether there are systematic gender differences in the adoption of SIPs in the Kenya context. The choice of multiple technology options allows us to study the differential patterns of adoption for different innovations and how gender specific issues matter in this process.

The paper mainly contributes to the limited literature on differential technology adoption patterns of male–female plot managers and provides new insights using detailed plot level data from diverse farming systems in Kenya. Unlike existing studies on the gender technology adoption gap that focus mainly on the adoption of external inputs (e.g. seed and fertilizer), we extend this analysis to the adoption of a range of SIPs (e.g., maize-legume intercropping, maize-legume rotation, manure application, and minimum tillage) required for sustainable intensification of production. These new dimensions provide deeper insights for better understanding gender-technology gaps and offer important economic and policy-relevant information for designing agricultural extension services for female and male farmers in African countries with comparable conditions.

The rest of the paper is organized as follows. Section 'Gender differences and technology adoption' discusses gender differences and technology adoption. Section 'Dependent and explanatory variables description and statistics' presents descriptive statistics and describes how the dependent and explanatory variables are defined in this paper. Section 'Conceptual and methodological framework' discusses the methodology and Section 'Empirical results' presents the main results. Finally, Section 'Conclusions' concludes, highlighting the main findings and policy implications.

Gender differences and technology adoption

Accelerating technology adoption is a fundamental prerequisite to increasing agricultural productivity for food security, inclusive growth and poverty reduction. One of the key challenges is the unequal access to, and use of, new technologies by men and women farmers in the field. Addressing the gender differences between women and men farmers in Africa and other developing regions, therefore, represents a significant development potential in the fight against hunger and poverty.

In Kenya, women contribute the bulk of the farm labor needed for intensive activities such as weeding (60%), and over half for the overall agricultural labor (see Fig. 1), but they have unequal opportunities and access to a range of productive resources, including land, education, information, and financial resources. Land in Kenya is either owned by individuals, by the government or collectively by groups or communities. Women lack equal access to and control over land resources since land registration and legislation from the colonial period favored male ownership of land (Mackenzie, 1998; Heyer, 2006). The use of important communal resources under the community/group ranches has frequently been gender-biased, both by discriminating against women when such resources are subdivided and privatized, and through customs and management practices that exclude women (Kameri-Mbote, 2006; Mwangi, 2007; Willy and Chiuri, 2010).

There are several ways to acquire individual land in Kenya: purchase, allocation by government and inheritance. Though it is the most important way of acquiring land in rural Kenya, inheritance practices have frequently entailed male heirs inheriting land and female heirs inheriting movable property; and even when the law was changed to allow for equal inheritance, social traditions frequently made female heirs reluctant to press for their rights for fear of being ostracized (Mackenzie, 1998; Mak, 2005; Kameri-Mbote, 2006). This has meant that ownership of land and/or access to it, as well as other resources linked to agriculture, has had a clear gender bias that leads to lower technology adoption on female-managed plots.

In recent extensive reviews of gender-related issues in technology adoption literature, Doss (2001), Peterman et al. (2010a) and Quisumbing and Pandolfelli (2010) have well documented the complex and heterogeneous gender roles in agricultural systems and have emphasized the need to collect data with several indicators of gender for a robust analysis and relevant policy implications. Here are the key points and gaps that emerge from these studies. First, with few exceptions, the majority of studies on gender and technology adoption find no differences between men and women, after controlling for complementary inputs/resources, especially access to land, credit, education and extension services. However, women farmers often have less access and application of fertilizer, lower levels of education, less access to credit, and have smaller plots with low quality soil compared to their male counterparts.

Secondly, with few exceptions, the majority of studies reviewed simply use the gender of the household head as the gender indicator by comparing female-headed households (FHHs) and male-headed households (MHHs) for their technology adoption behavior. But this provides only limited information about a small

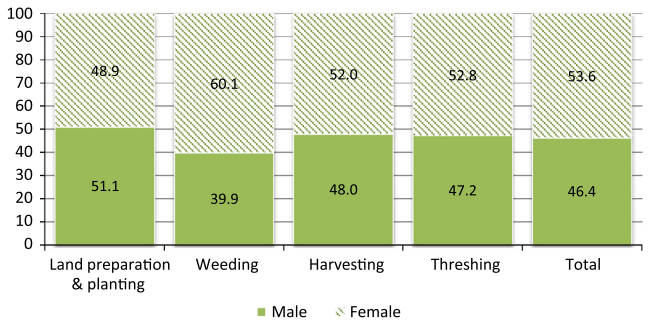

Fig. 1. Labor contribution by sex for different maize production activities (%). *Source:* Author compilation from own survey data.

[1] Sustainable intensification refers to producing more outputs with more efficient use of all inputs – on a durable basis – while reducing environmental damage and building resilience, natural capital and the flow of environmental services (Pretty, 2011; the Montpellier Panel, 2013). Accordingly, SIPs broadly defined include various inputs and practices such as organic fertilizers, soil and water conservation, conservation tillage, legume intercropping and rotations, new crop varieties, and prudent use of inorganic fertilizers (D'Souza et al., 1993; Lee 2005).