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Does gender matter in adoption of sustainable agricultural technologies? A case of push–pull technology in Kenya

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INTRODUCTION

In sub-Saharan Africa (SSA), agriculture contributes to 33% of GDP and employs 65% of the labour force, most of them women. Women, however, have less access to and use of productive resources, including new technologies. Increased focus on gender equality in production systems can transform agricultural livelihoods and improve development outcomes[1,2]. Cereal stemborer pests and the parasitic *Striga* weed threaten sustainable maize production in SSA[3]. Push–pull technology (PPT) developed by *icipe* and partners controls the two constraints simultaneously http://push-pull.net/. Our research seeks to identify the gender gaps and their causes, for designing sustainable agricultural policies.

OBJECTIVES

The objective of this study is to assess the gender differences in the adoption of push–pull technology and other sustainable agricultural practices (SAPs).

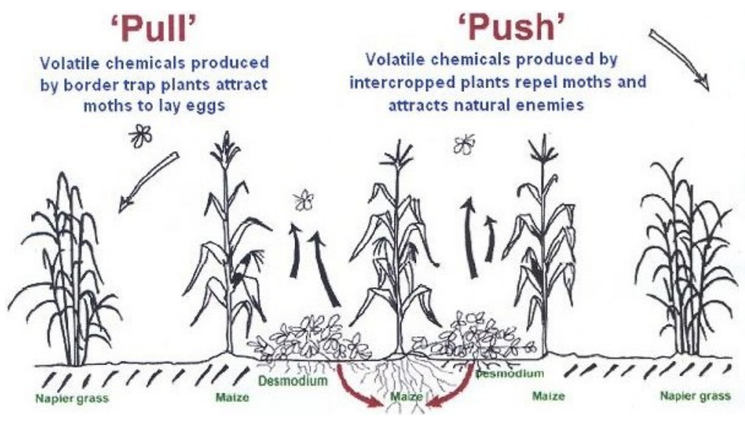

Figure 1. Schematic of the Push–pull technology

DATA AND METHODS

Data:

- The study uses **household and plot-level data** from 711 randomly selected maize-growing farm households operating on 4863 plots over nine counties of Western Kenya.
- The data used include information on plot manager, farm and farmer characteristics, household resource endowment, access to services, along with data on the access, use and benefits of push–pull technology and other SAPs.

Methods:

- A **multivariate probit** model was used to examine the association between gender dimensions and the adoption patterns of multiple sustainable agricultural practices adopted on plots managed by males, females and jointly-managed by males and females in western Kenya.

SUMMARY AND CONCLUSIONS

- Complementarities and trade-offs between SAPs imply:
  - Policy changes that promote PPT adoption can have positive spillover effects on adoption rates of organic and inorganic nutrient sources, as well as high yielding seeds.
  - Promoting these technologies together can have positive effects on productivity, food security, and livelihoods.
- Gender neutrality of push–pull technology supports its inclusive promotion and dissemination to increase the food security status of women and their households.
- Further research should explore the gender differences in adoption of PPT utilising panel data sets and focus on different cultures where the technology is being promoted.

RESULTS AND DISCUSSION

Gender differences in the adoption of PPT and other sustainable agricultural practices (SAPs):

- More male managed plots practice maize–grain legume intercropping, use fertiliser, and improved maize seeds in comparison to female-managed plots (Figure 2).
- More female managers practice crop rotation and soil and water conservation and use manure.

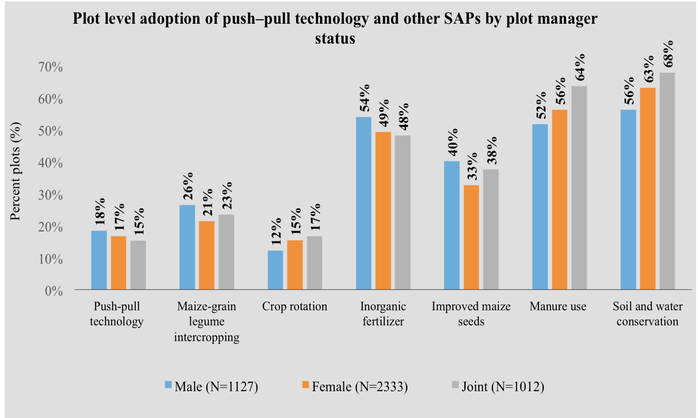

Figure 2. Adoption of push–pull technology and other SAPs

Complementarities and tradeoffs among SAPs:

- Maize–grain legume intercropping and crop rotation are substitutes of PPT, while the rest are complementary practices (Table 1).

Table 1: Complementarities and tradeoffs among SAPs - Correlation coefficient of error

	Push–pull technology	Maize–grain legume intercropping	Crop rotation	Fertiliser	Manure	Improved maize seeds	Soil and water conservation
Push–pull technology	1						
Maize–grain legume intercropping	-0.155***	1					
	(0.027)						
Crop rotation	-0.093***	-0.151***	1				
	(0.031)	(0.031)					
Fertiliser	0.507***	0.319***	-0.100***	1			
	(0.025)	(0.026)	(0.027)				
Manure	0.297***	0.180***	-0.030	0.359***	1		
	(0.026)	(0.025)	(0.026)	(0.021)			
Improved maize seeds	0.624***	0.324***	-0.213***	0.761***	0.404***	1	
	(0.023)	(0.025)	(0.028)	(0.013)	(0.022)		
Soil and water conservation	0.053*	0.035	-0.012	0.026	0.086***	0.064***	
	(0.027)	(0.026)	(0.027)	(0.024)	(0.024)	(0.024)	1

- Negative correlation between PPT and maize–grain legume suggest immediate food security and cash needs may surpass production of livestock feed.

Determinants of SAPs adoption—MVP model results:

- There is no gender difference in the adoption of PPT (Table 2), implying the technology is gender neutral, probably because it does not demand high cash outlay once it is established.
- There is no difference between male- and female-managed plots in adoption of other SAPs.
- Jointly managed plots are more likely to adopt manure and soil and water conservation, suggesting the importance of joint effort in undertaking labour-intensive farming activities.

Table 2: Factors affecting adoption of PPT and other SAPs - Multivariate probit (MVP) model results

Plot managers	Push–pull technology	Maize–grain legume intercropping	Crop Rotation	Fertiliser	Manure	Improved maize seeds	Soil and water conservation
Female-managed plots	-0.015	-0.065	0.095	0.079	0.071	0.017	-0.073
	-0.068	(0.064)	(0.069)	(0.057)	(0.055)	(0.056)	(0.056)
Jointly managed plots	-0.022	-0.036	0.160**	-0.001	0.238***	0.100	0.139**
	(0.079)	(0.071)	(0.078)	(0.064)	(0.064)	(0.065)	(0.065)

Note: (1) Male-managed plots the reference category (2) MVP results comprise of plots attributes, household characteristics, resource endowment, access to services, and social capital variables not presented here

Intensity of adoption:

Results of ordered probit model to test if there are gender differences in number of technologies adopted show that jointly-managed plots adopted more technologies in comparison with individually-managed plots. This supports joint efforts to enhance the intensity of adoption, especially where combined resources such as labour are required.

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