



Drivers of Push-Pull Pest Management Adoption and Continued Use among Smallholder Maize Farmers in East Africa: A Two-Step Heckman Approach

1. Background and Objective

Background

- Maize accounts for 40% of produce in SSA but still facing mounting constraints from rising pest infestation such as fall armyworm pests (Ndayisaba et al., 2020; Woolfork et al., 2025).
- Methods such as chemical control, biological methods and traditional practices have been used but others remain limited and are associated with human health-related (Misango et al., 2022).
- Icipe and its partners developed push-pull technology (PPT) to control cereal pests. Other secondary benefits are fodder provision, reduce soil erosion and increase soil fertility.
- Although, several pest control practices have been developed, their uptake remains low while the effectiveness of some of the practices are questionable

Objective

To evaluate and compare the factors influencing maize farmers' decisions to continue using PPT and identifies its determinants of continued use of PPT in Kenya and Uganda

2. Methods

Study area: Kenya and Uganda in East Africa

Sampling procedure: Three stage Cluster-sampling approach

Data sources: 740 Household interviews (Kenya (404) and Uganda (336))

Estimation strategy: Two-Step Heckman Approach



FAW infestation



PPT effective in control of maize pests

3. Results

Results from first hurdle of Heckman model showed that perceived technology benefits, its effectiveness, training, group membership, gender and livestock ownership play key role in farmers' decisions to continue using PPT in Kenya and Uganda.

Key role of icipe and KALRO: Training farmers and linkage between the government of Kenya and Uganda and other project developers

Bottlenecks: Low adoption, high PPT input prices, small land sizes, knowledge ga

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Table 1: Maximum likelihood estimates of the Two-Step Heckman Model

Variables	Uganda (336)	Kenya (404)	Pooled (740)	Uganda	Kenya	Pooled
	dy/dx (Robust Std) of first hurdle (Probit) of Heckman			Coef (Bootstrap Std Error) of second hurdle of Heckman		
Perceived PPT effectiveness	0.41 (0.09)** *	0.08 (0.03)**	0.13 (0.04)** *	0.77(0.20)* **	0.09(0.05) **	0.20(0.05)* **
Perceived benefits	0.27(0.06) ***	0.23(0.04) ***	0.29(0.03) ***	0.39(0.15) ***	0.05(0.09)	0.13(0.10) **
Group membership	0.11(0.05) ***	0.13(0.03) ***	0.15(0.03) ***	0.16(0.07) **	0.07(0.03) **	0.01(0.03)
Gender of the farmer	0.14(0.05) ***	- 0.11(0.03) ***	- 0.06(0.03) **	0.07(0.08)	-0.01(0.03)	0.01(0.03)
TLU	0.01(0.03) 3)	0.09(0.03) ***	0.04(0.02) 2) **	0.04(0.04)	0.04(0.03)	0.04(0.02) **
Training	0.20(0.05) ***	0.20(0.03) ***	0.20(0.03) ***	-	-	-
Inverse Mill's Ratio	-	-	-	0.42(0.19) **	0.02(0.08)	0.16(0.09) **
Constant	- 3.25(0.54) ***	- 1.37(0.56) ***	- 1.55(0.34) ***	-1.15(0.50) **	0.28(0.14) **	0.11(0.17)
Censored Wald Chi ² (10)	92.49	120.66	172.09	129 25.77	87 31.09	216 32.98
Prob > Chi ²	0.00	0.00	0.00	0.00	0.00	0.00

Note: ***p<0.01, **p<0.05, *p<0.1 significance level

- Results from second hurdle of Heckman model revealed that perceived technology effectiveness, group membership, distance to input stockiest and family size were crucial determinants of continued allocation of land to PPT.

4. Conclusion

- Perceived technology attributes, training and group membership play crucial role in farmers' decisions to continue using PPT in East Africa

5. Policy Recommendation and Take Away

- Investment in awareness creation especially by training farmers on technology attributes using group approaches
- Development initiatives should strengthen extension efforts utilizing group platforms disaggregated by male farmers differently from female farmers

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Selected references

- Misango, V. G., Nzuma, J. M., Irungu, P. and Kassie, M., (2022). Intensity of adoption of integrated pest management practices in Rwanda: A fractional logit approach. *Heliyon*, 8(1), e08735. <https://doi.org/10.1016/j.heliyon.2022.e08735>.
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