Adoption Intensity of Climate Smart Agriculture Technologies in Uganda: A Semiparametric Analysis

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Selected poster prepared for presentation at the 2019 Agricultural & Applied Economics Association Annual Meeting, Atlanta, GA, July 21 – July 23, 2019

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Abstract

Soil erosion, soil nutrient depletion, deforestation, over-grazing, water depletion and fluctuating pattern of rainfall, and unavailability of appropriate modern agricultural technologies are the main problems of the Ugandan agricultural sector. Adoption of Climate Smart Agriculture technologies (CSA) can address the challenges for low agricultural production and productivity. There were 19 CSA technologies considered in our study. To identify the variables influencing the adoption intensity of CSA technologies, we conducted a face-to-face interview survey of randomly selected 400 farmers located within the Lake Kyoga watershed. We estimated parametric, nonparametric, and semiparametric models and tested for a better-specified model. The Hong and White model specification test showed that the nonparametric and semiparametric models are better specified than the PQL model. Our semiparametric model suggests that the parametric variable, arable land, is negatively associated with the number of technology adoption. As farm size increases, farmers are more likely to continue with traditional practices as they are better equipped to absorb the shock caused by weather extremes. Results help to identify critical variables to increase adoption of CSA technologies in Uganda. Policymakers can expand the extension service to educate farmers about CSA technologies adoption to increase food security in their country.

Introduction

Most of the people in Uganda rely on agriculture for their livelihood. As in the other Sub-Saharan countries, the main problem of the Ugandan agricultural sector is low agricultural production and productivity. This problem is mainly due to soil erosion, soil nutrient depletion, deforestation, over-grazing, water depletion and fluctuating pattern of rainfall, and unavailability of appropriate modern agricultural technologies (Jayne et al. 2014). Crop yield losses caused by land degradation are very high especially in marginal land which used to be productive land in the country not long ago. It is not possible to restore depleted nutrients in farmland if continuous cultivation without conservation practices becomes a norm. The Food and Agricultural Organization has been pushing for Climate Smart Agriculture technologies (CSA) in Uganda, and other developing countries as those can integrate the three dimensions of sustainable development (economic, social and environmental) by jointly addressing food security and climate challenges (Njeru et al. 2016).

Objective

- To find the influence of socio-economic and farm characteristics on the number of CSA technologies adopted by farmers using parametric, semiparametric and nonparametric methods.

Data

- A household face to face interview survey was conducted in the Lake Kyoga waters hed, Uganda in 2018
- 400 farm households from 15 communities were randomly selected for the interview
- Tested among two focused groups before developing the final survey.

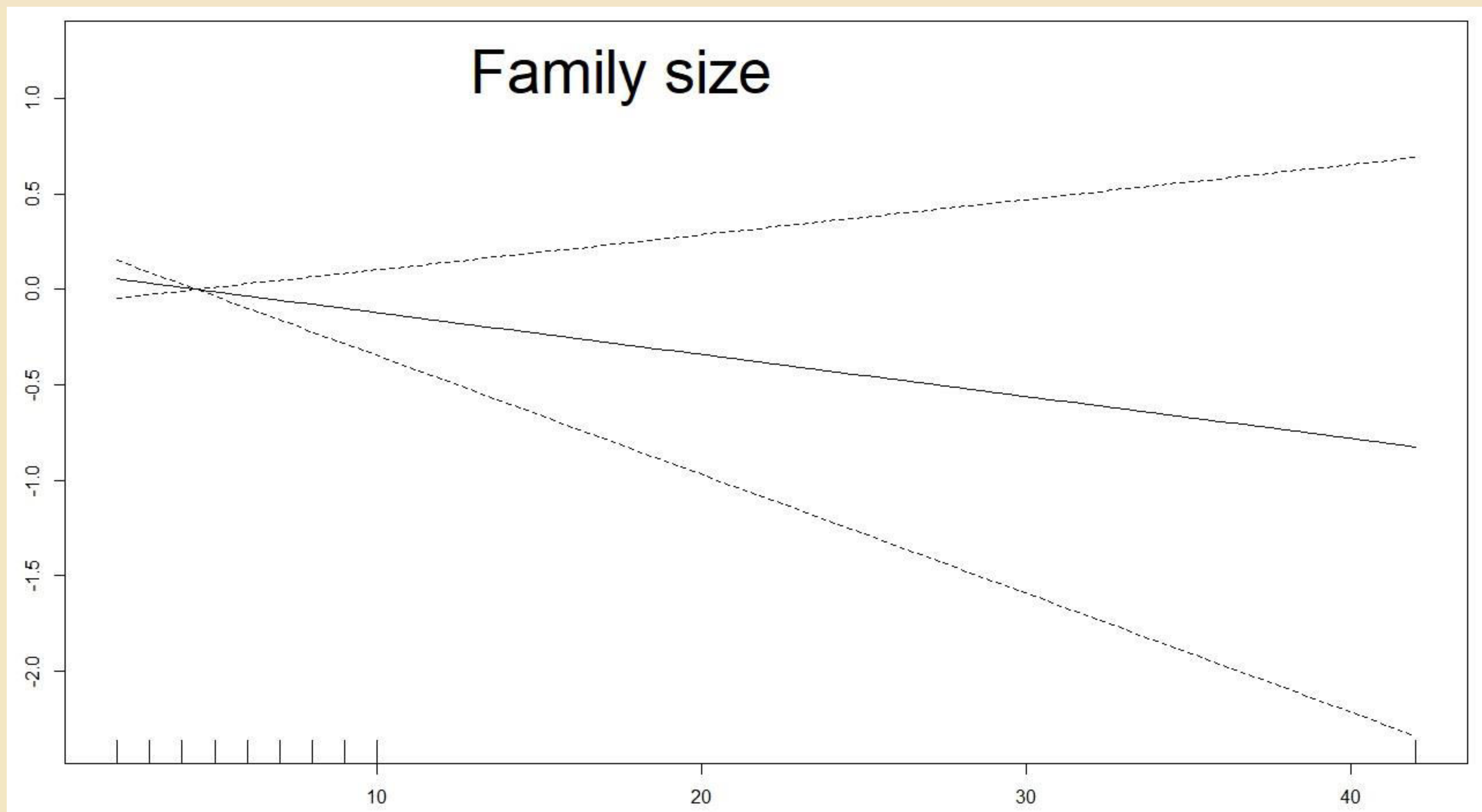
Methods

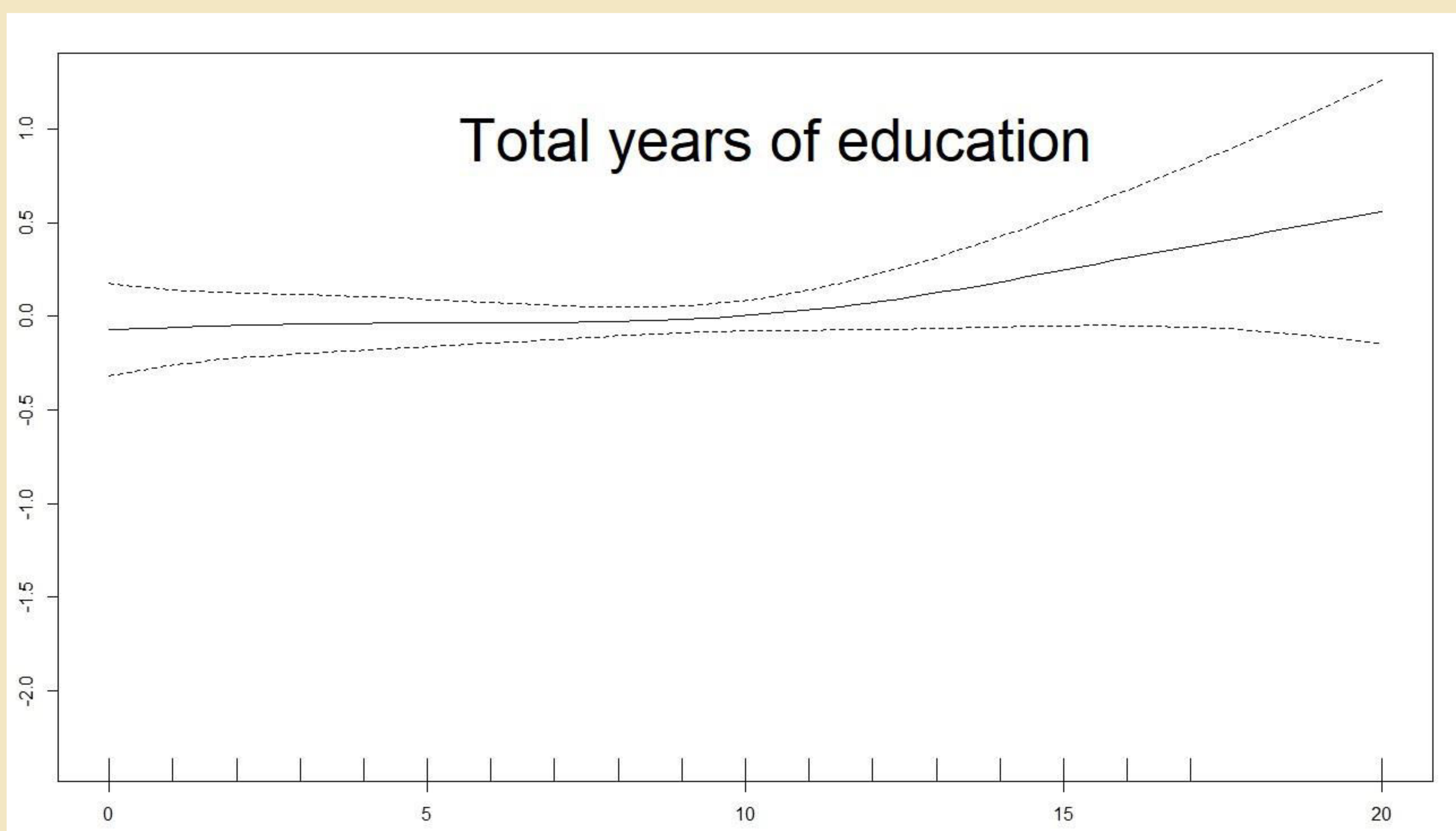
- Count data model are generally used to measure the intensity of adoption.
  - Parametric: Poisson, Negative Binomial (NB), Zero-Inflated Negative Binomial (ZINB) and Poisson Quasi-Maximum Likelihood (PQL)
  - Nonparametric
  - Semiparametric

  $y_i = X_i'\beta + g(Z_i) + u_i \; i = 1, \dots n.$ Where the explanatory variable X enters in parametric fashion and another variable Z enters in nonparametric fashion. β and g are the parameters related to X and Z respectively.
- J_n test developed by Hsaio et al. (2007) is used to compare the parametric vs. semi parametric models.

Results

- J_n test showed that semiparametric model was a better fit.
- Semiparametric model was defined on the basis of partial correlation plot of nonparametric model..





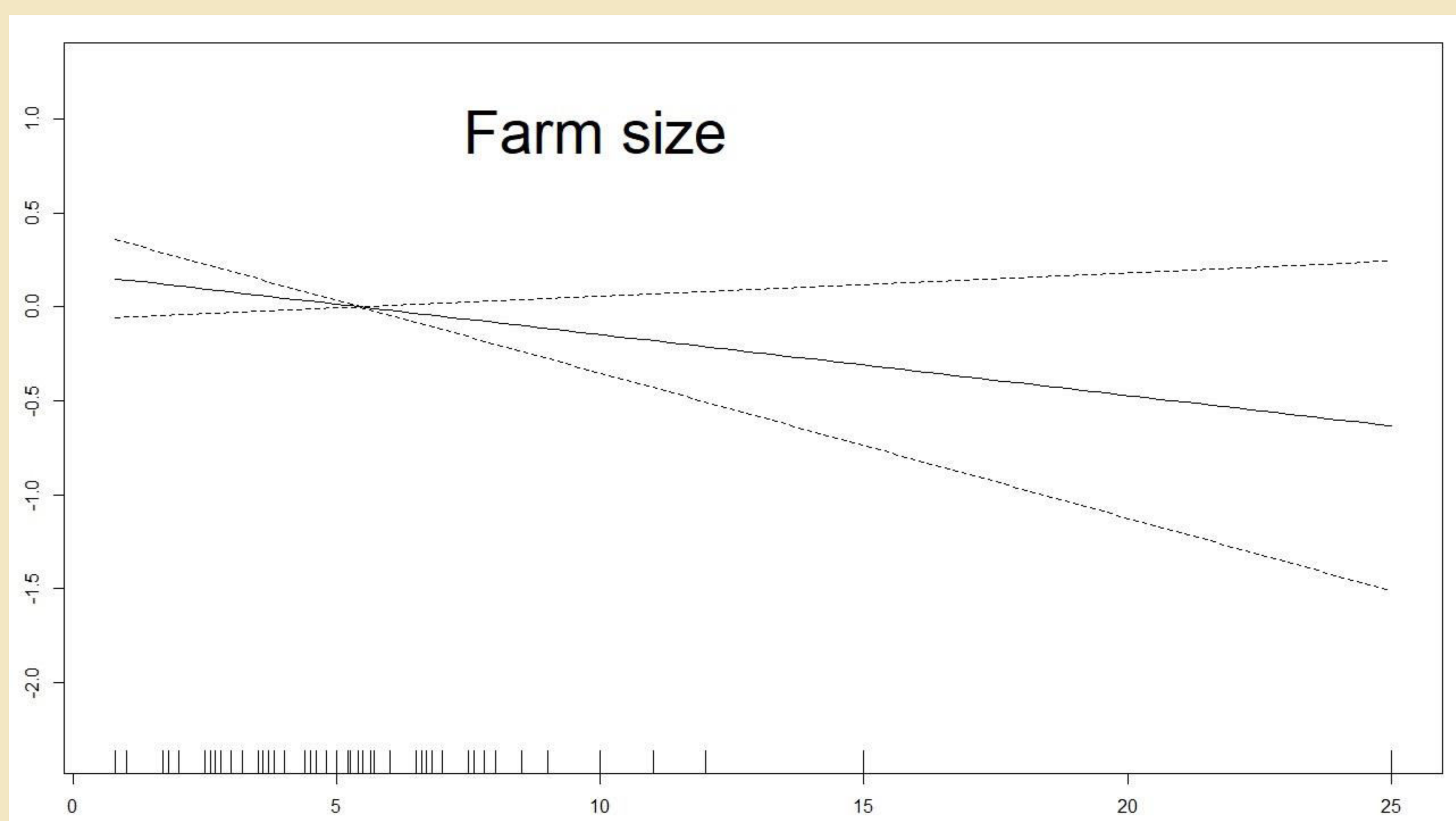


Table 1. Semiparametric results

Parametric Variables	Estimate
Intercept	2.335971 (3.925902)
Sub-county	
Buyende	-0.287001 (0.137696)
Kamuli	-3.202952*** (0.575043)
Kitayunjwa	-2.513785*** (0.185663)
Mbulamuti	-3.010399*** (0.790629)
Namwendwa	-2.182843*** (0.26539)
Nawanyago	-2.796275*** (0.535233)
Nkondo	0.032258 (0.139842)
Land_arable1	-0.3425* (0.177056)

Conclusion and Discussion

- The Parametric model is not consistent and the semiparametric model is a better model to determine the effects of socio-economic and farm characteristics on the number of CSA technologies adopted by farmers.
- Educated farmers adopt more CSA technologies.
- To increase the food security, policymakers should prioritize giving extension training to farmers related to the benefits of adopting conservation practices.

References

- Hsiao, C., Li, Q., & Racine, J. S. (2007). A consistent model specification test with mixed discrete and continuou s data. *Journal of Econometrics*, *140*(2), 802-826.
- Jayne, T. S., Chamberlin, J., & Headey, D. D. (2014). Land pressures, the evolution of farming systems, and dev elopment strategies in Africa: A synthesis. *Food Policy*, *48*, 1-17.
- Njeru, E., Grey, S., & Kilawe, E. (2016). Eastern Africa climate-smart agriculture scoping study: Ethiopia, Kenya and Uganda. *Food and Agriculture Organization of the United Nations (FAO), Addis Ababa.*