

Farmer mental models and fertilizer use decisions: Insights from five communes in Madagascar

Michel Kabirigi^{1*}, Mamy Hasinjato Mandimbiriantsoa^{1,2}, Hamy Raharinaivo^{1,2}, Kossi Hounkpati^{1,5}, Patrick Ranjatson², Stefan Sieber^{1,3}, and Katharina Löhr^{1,4}

¹Leibniz-Zentrum für Agrarlandschaftsforschung (ZALF) e. V. Müncheberg, Germany, ²University of Antananarivo, Madagascar, ³Humboldt Universität zu Berlin, 10099 Berlin, Germany, ⁴Eberswalde University for Sustainable Development (HNEE), Eberswalde, Germany, ⁵University of Lomé, 1515 Lomé, Togo

Introduction

- Optimizing fertilizer use is vital for improving crop productivity and resilience among smallholder farmers.
- Understanding farmers' perceptions and decisions about fertilizer use is crucial for designing effective interventions.
- Using a mental model approach makes it possible to uncover cognitive frameworks that guide farmers' innovation adoption decisions.

Research questions

This study seeks to respond to the following research questions:

- What factors shape farmers' perceptions and decision-making processes regarding fertilizer use?
- And how do these factors vary across different socio-economic groups? .

Methods

- Conceptual framework:** Applied the "Mental Models" approach to understand farmers' perceptions of fertilizer use.
- Data collection:** Administered structured questionnaires to 494 households across five communes in Madagascar.

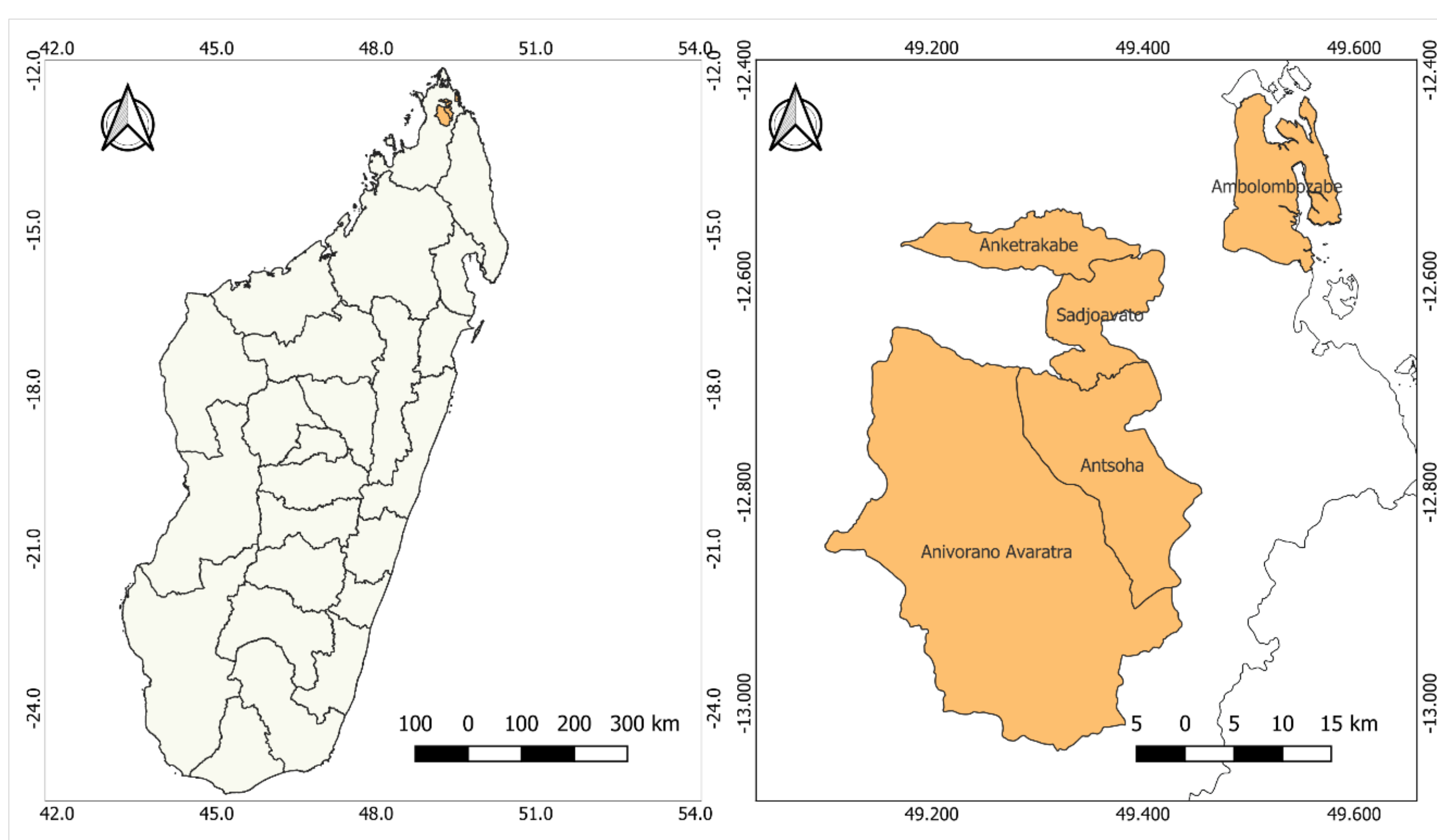


Figure 1: Geographical locations of study areas (source: authors)

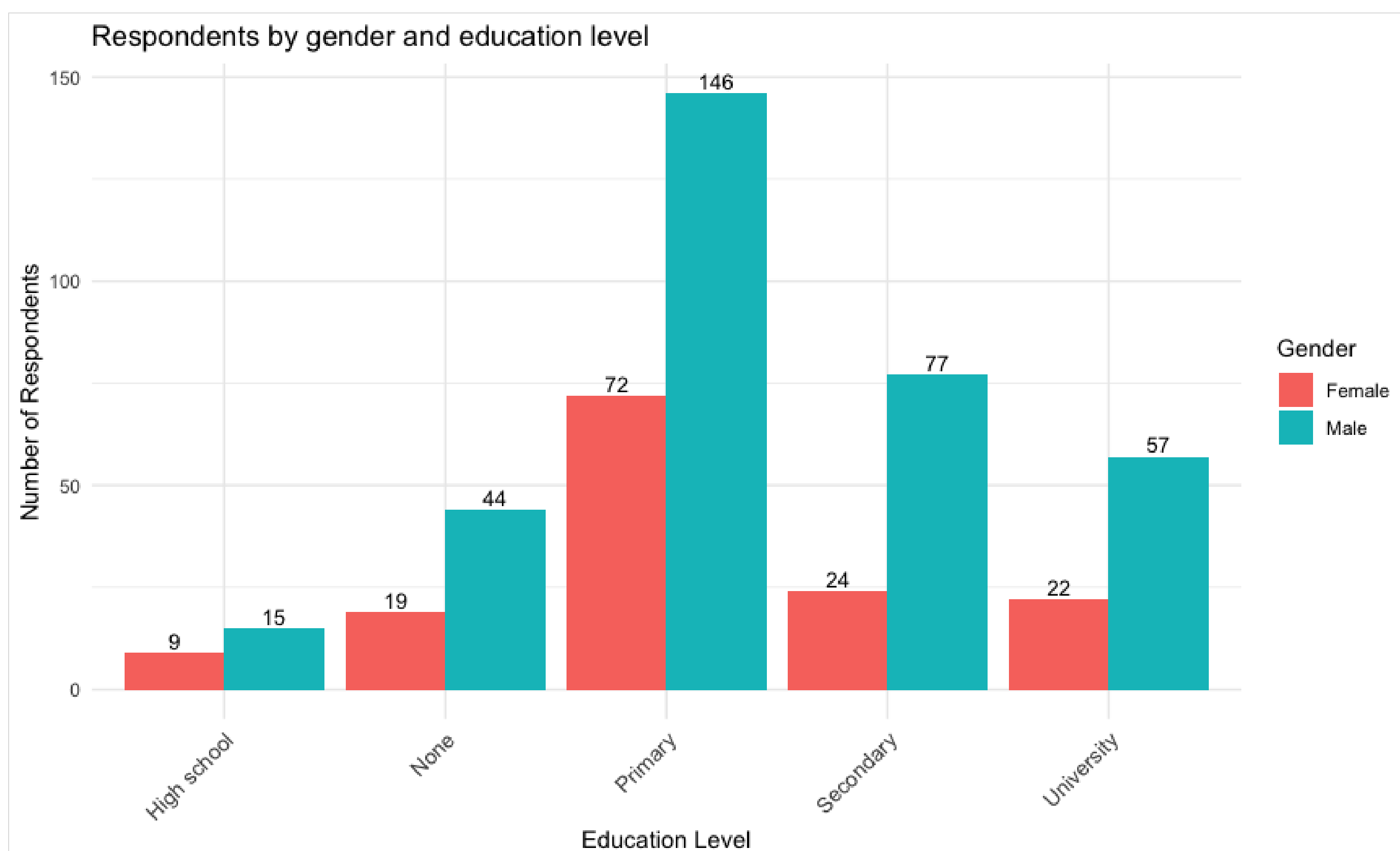


Figure 2: Characteristics of respondents: Gender and Education Level

Results

- Environmental health and food security stand out as the main enabling factors to fertilizer use whereas adverse climatic conditions are the most significant barrier to fertilizer use .

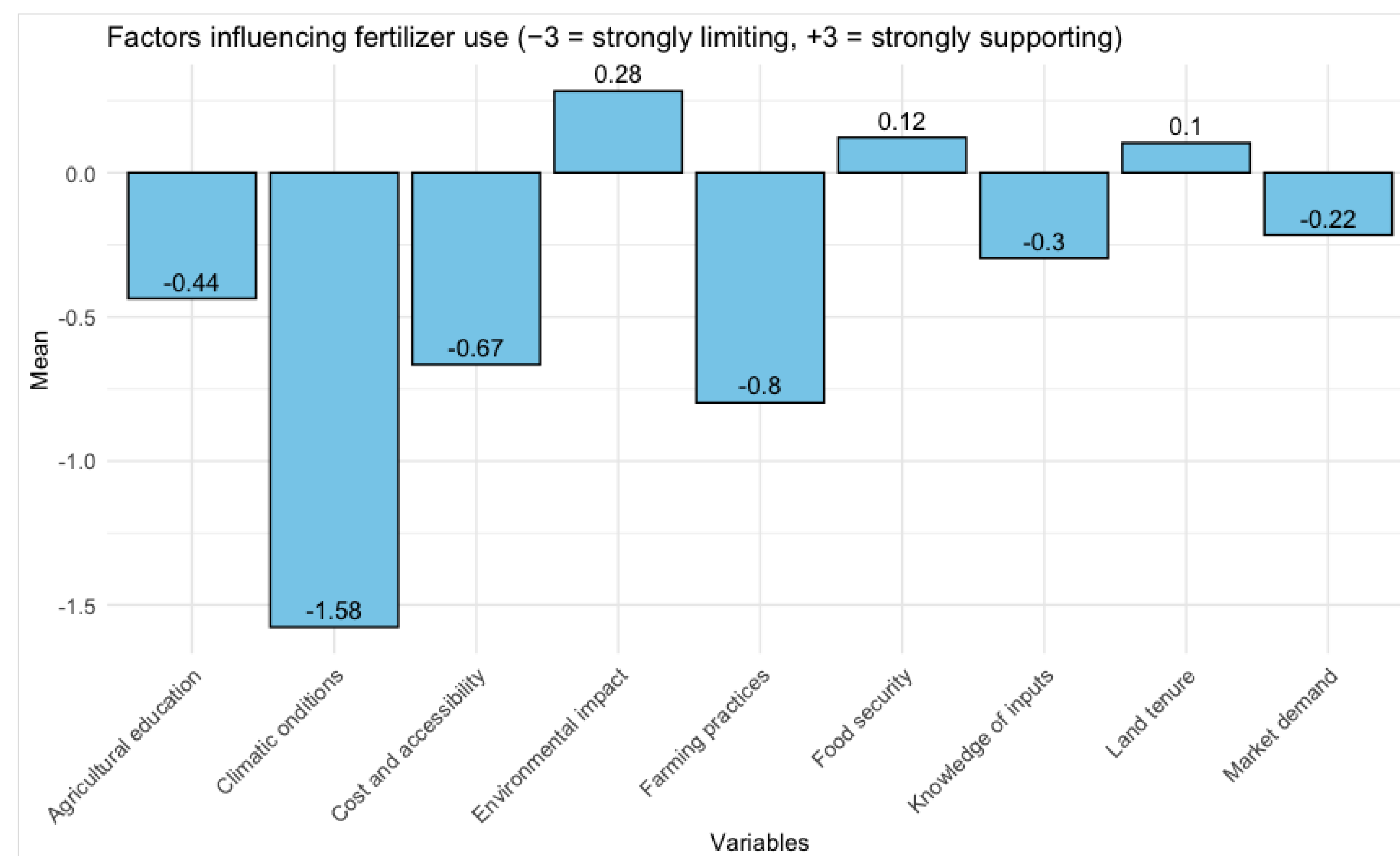


Figure 3: Farmers' perceptions of factors influencing fertilizer use in five communes of Madagascar (Scale: -3 = strongly limiting, +3 = strongly supporting)

- Regression results show that farmers in charcoal production and handicrafts consistently perceive farming practices as barriers, whereas those in agriculture link fertilizer use to food security.
- Men are slightly more likely to see education as a barrier and market demand as a supporting factor.

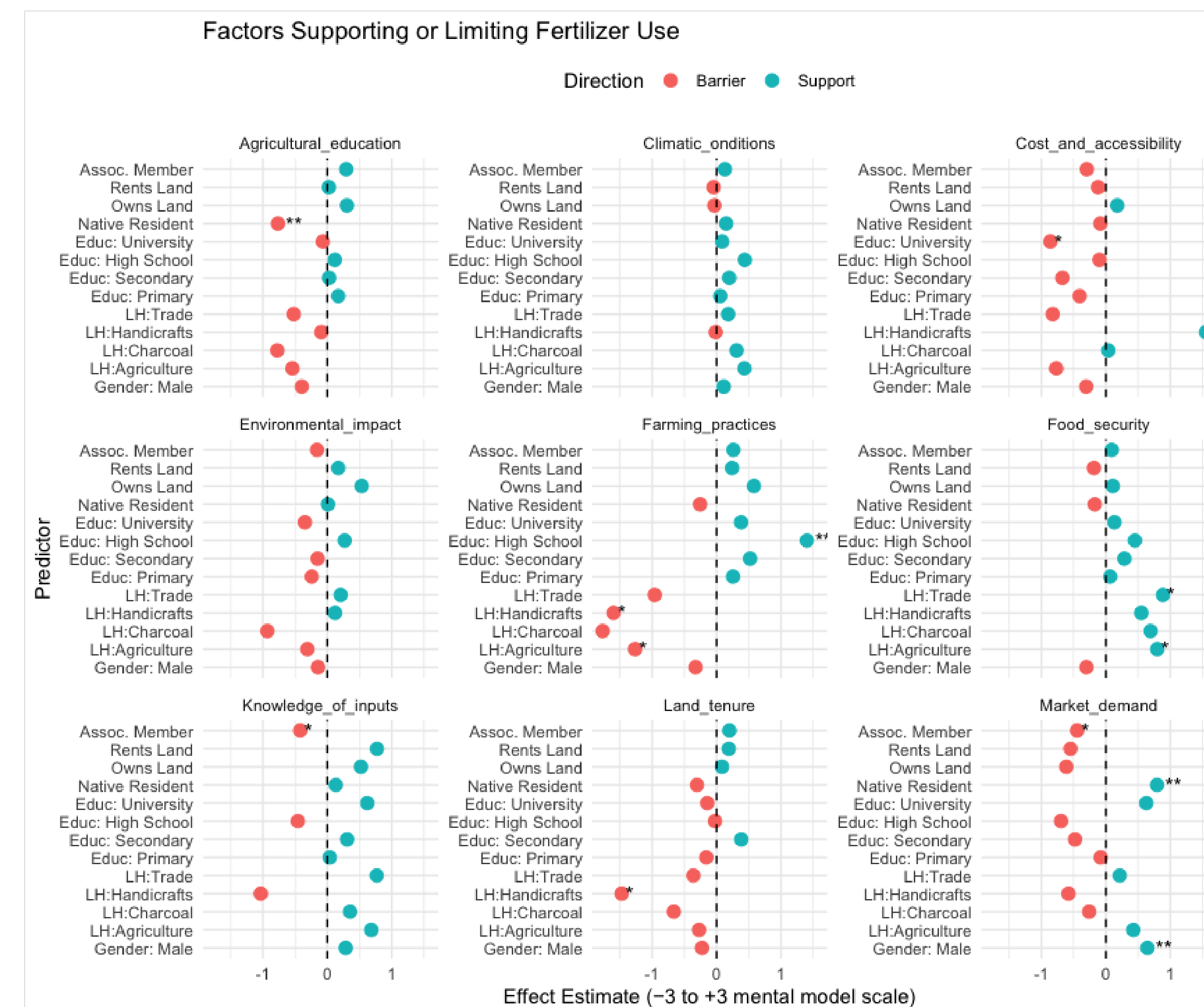


Figure 4: Regression results showing variation in perceived drivers and barriers to fertilizer use by farmer category (dependent variable: mental model score on each factor; scale: -3 to +3)

Conclusion

- Livelihood differences shape how farmers perceive barriers and enabling factors in fertilizer use.
- Education is associated with more favorable attitudes, with higher educational supporting positive perceptions of fertilizers.
- Gender differences persist, indicating that men and women may experience or interpret barriers and incentives differently.