CBC – Centre for Biological Control

Diversified agricultural landscapes for resilient pest control

Mattias Jonsson

Resilient landscapes, SLU Global seminar,
Uppsala, 24 januari 2020

Pest control depends on both local management and surrounding landscape context

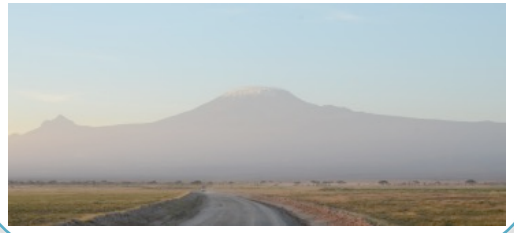
General management

Targeted management

X

Landscape

Altitude



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Enemies

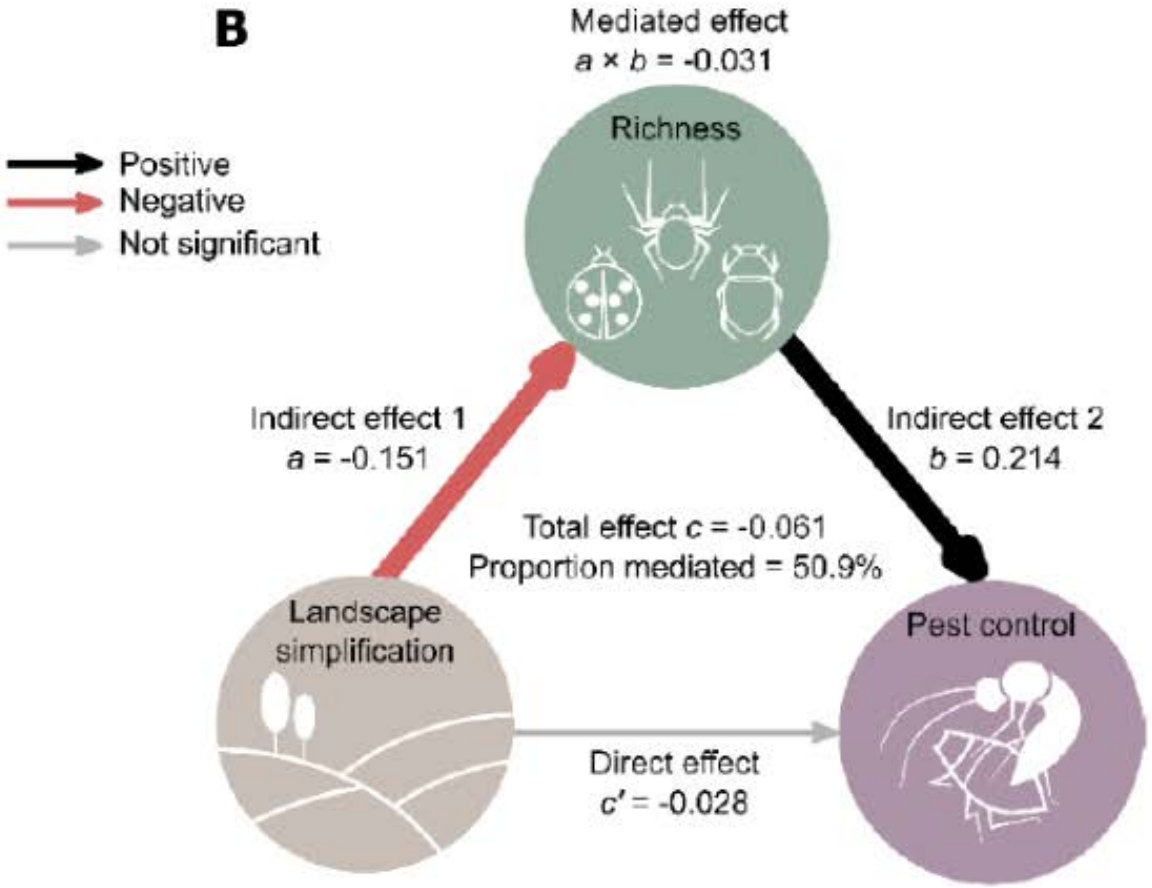
Photo: Lyle Buss, UF/IFAS

Pests

Yield

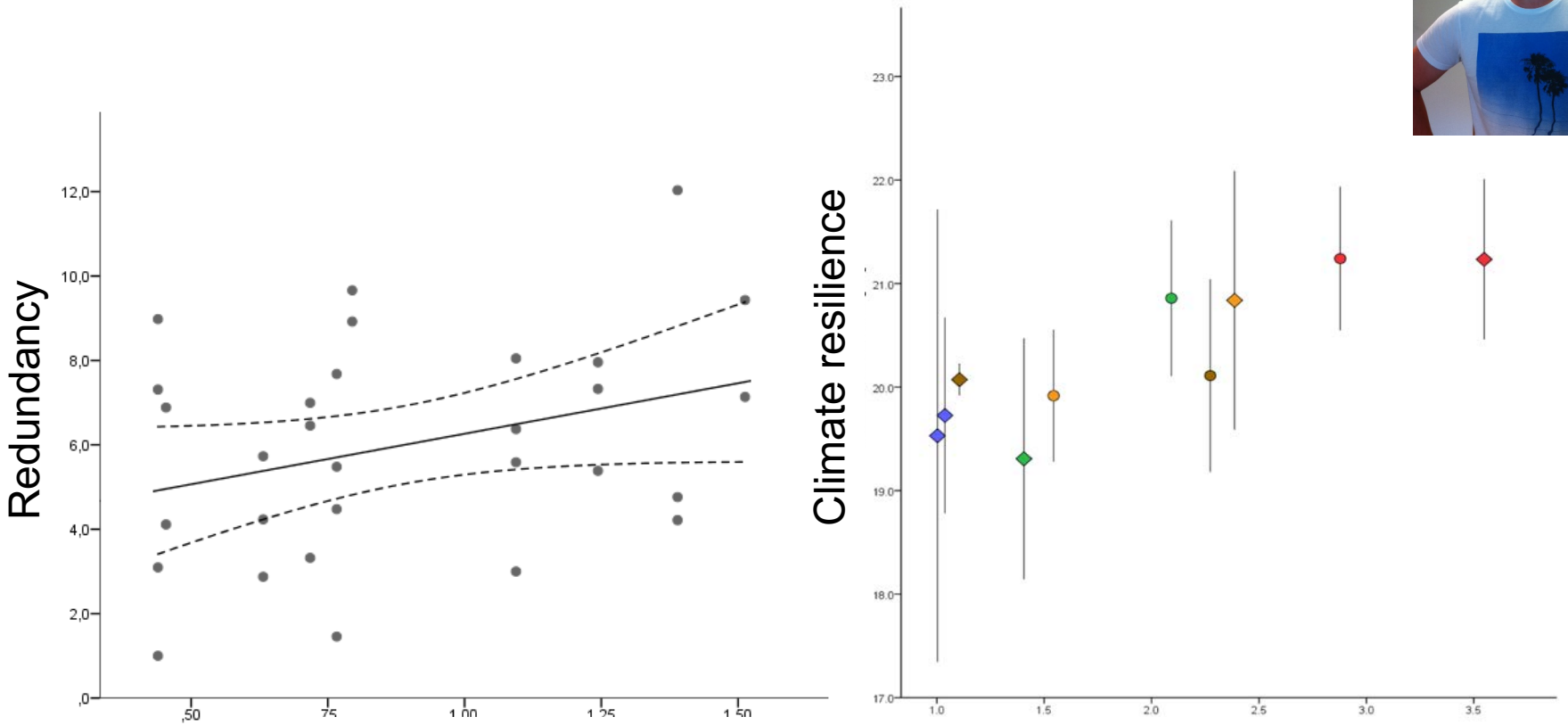
Research synthesis:

On average landscape diversity increases natural enemy richness and this improves pest control



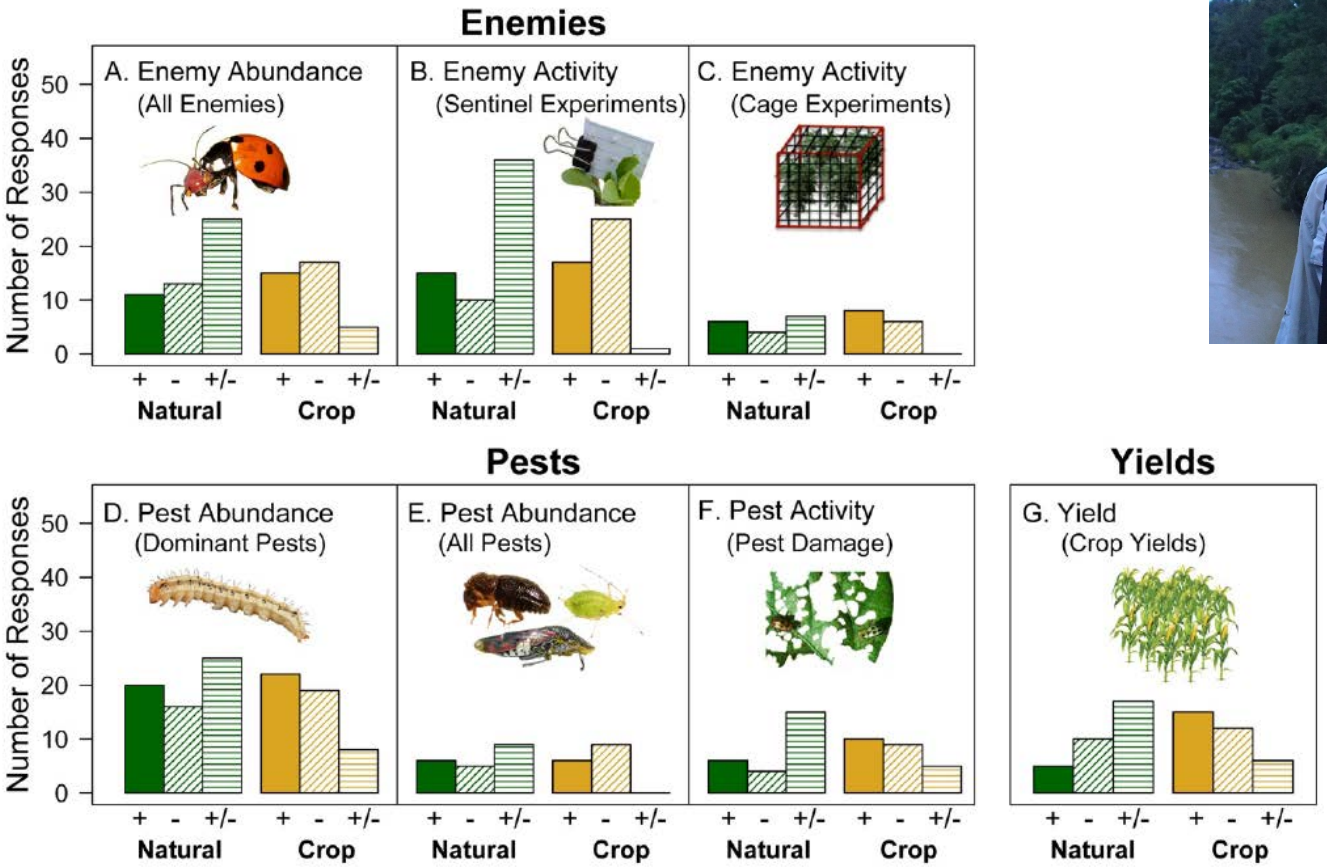
Dainese et al. 2019. Science Advances, Vol. 5, eaax0121

Pest control may also be more resilient in diverse landscapes



Feit et al. 2019. Ecol Lett 22: 1568-1577.

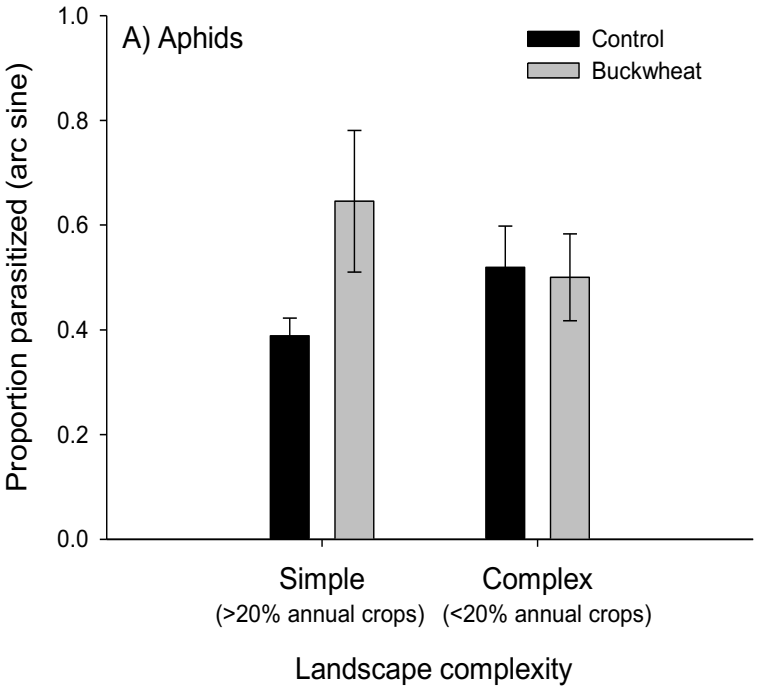
Another research synthesis:
Effect of surrounding landscape highly system specific



Karp et al. PNAS 115 (33) E7863-E7870.

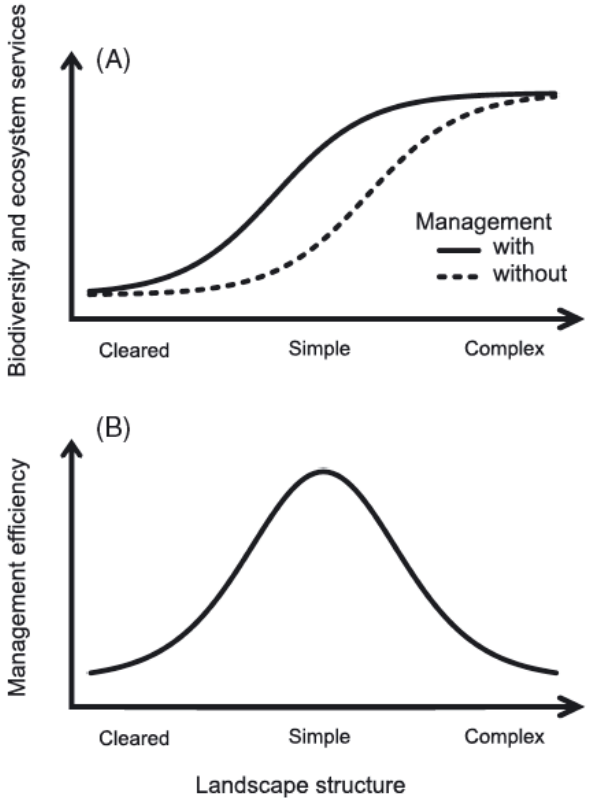
The effect of local management often depends on landscape structure

Flower strips improved pest control only in simple landscapes



Jonsson et al. 2015. J. Appl Ecol. 52: 1274-1282

Intermediate landscape complexity



Tscharntke et al. 2012. Biological Reviews

A couple of examples from East Africa

Agroforestry

Push-pull

X

Landscape

Altitude

Enemies

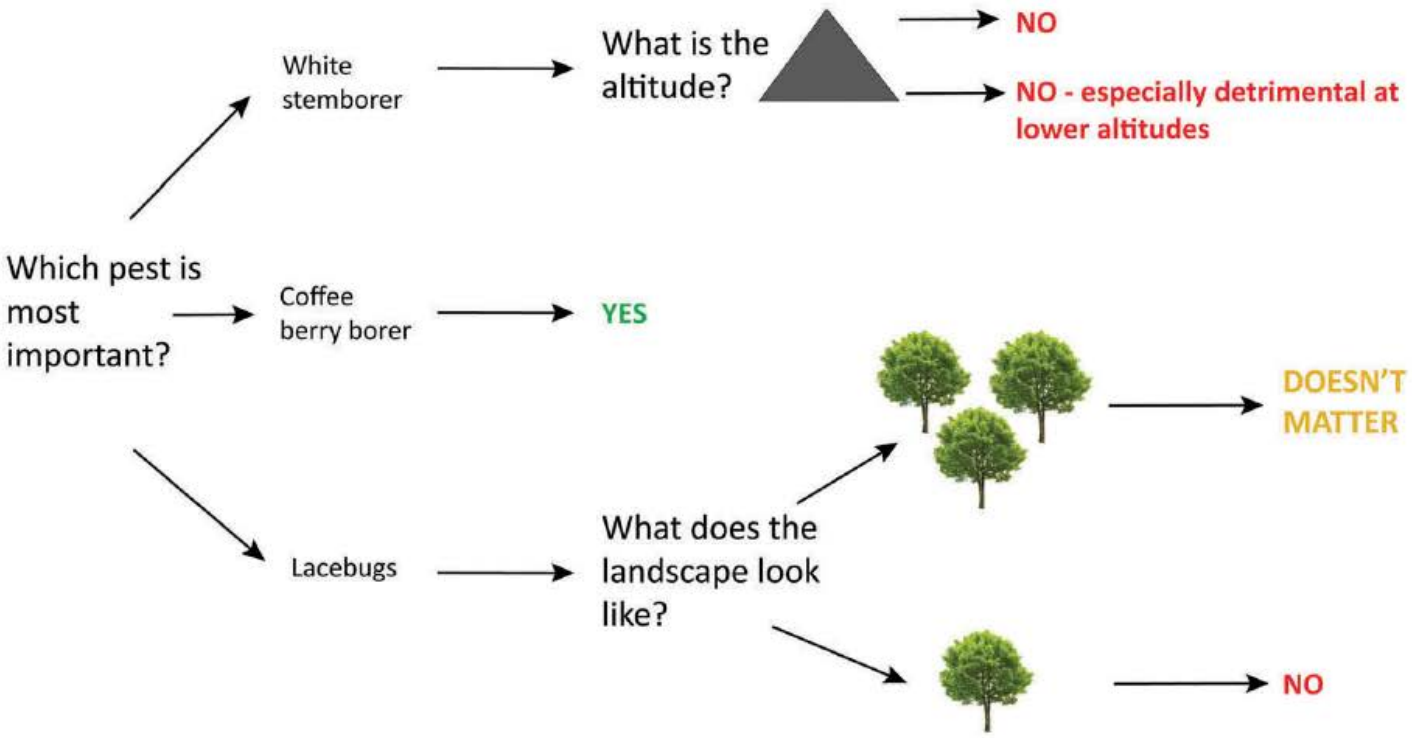
Photo: Lyle Buss, UF/IFAS

Pests

Yield

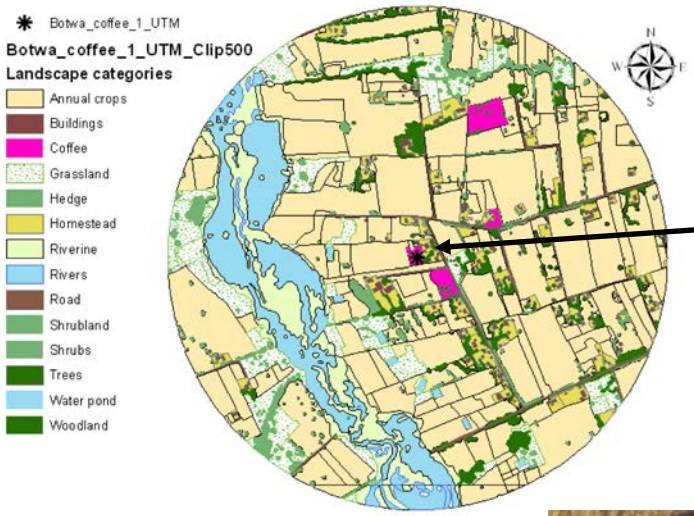
The effect of agroforestry on pest control is highly dependent on species, landscape and altitude

Does shade trees reduce pest abundances?



Barrios et al. 2018. *Int. J. Biodiv. Sci. Ecosyst Service Manage*, 14(1): 1-16.

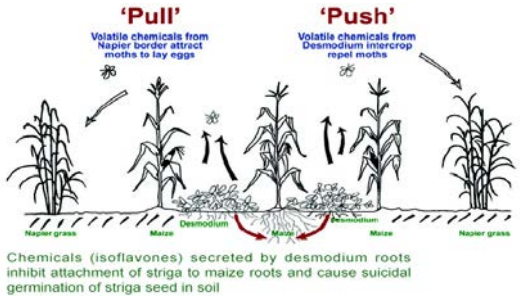
Push-pull and maize monoculture in landscapes with different cover of grasslands



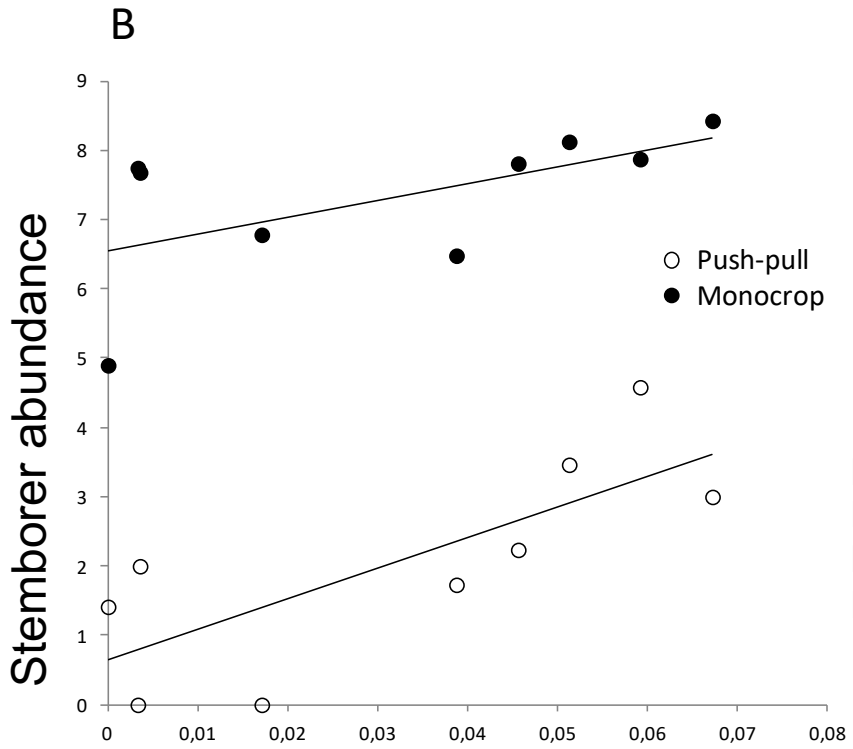
Maize monoculture

Maize with push-pull

Dr. Charles Midega



Push-pull reduced pest abundance in all landscapes, and grassland cover increased it



Local management: ***
Prop grassland cover: *
Local manage. X prop grass cover : NS

Midega et al 2014. AGEE, 188, 289-293

Project on push-pull started 2019:
Towards sustainable maize production in East Africa: Cropping system resilience under climate change

'Push pull' management, can reduce pests, weeds and enhance soil fertility

- Where is push-pull effective, does effectiveness change over time? *Analysis of large dataset.*

- Are pest-predator food webs in push-pull systems more resilient to landuse and climate change? *New field work.*

- How does crop variety and grass land quality in the surrounding landscape affect pest control in push-pull systems

- Synthesize where push-pull will contribute to closing yield gaps now and in the longer term. *Modelling.*

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H2020 – Sustainable Intensification Africa
Ongoing negotiation for start 2020:

UPSCALE

UPSCALING THE BENEFITS OF PUSH-PULL TECHNOLOGY FOR SUSTAINABLE AGRICULTURAL INTENSIFICATION IN EAST AFRICA

Summary

- We study how local management and the surrounding landscape affects pest control services
- Both local and landscape level diversity improves pest control on average – but effects highly system specific
- Emerging empirical evidence that diverse landscapes have more resilient pest control
- Effects of local management often depends on surrounding landscape context

Acknowledgements

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Sida

Vetenskapsrådet

SESYNC

SLU