



Is Organic Agriculture a Viable Option for the Global South?

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Long-term Farming Systems Comparisons in the Tropics

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Organic vs conventional as
monoculture or agroforestry

Organic vs conventional at low and
high input level

Organic and biodynamic vs
conventional with/without
GMO



Productivity

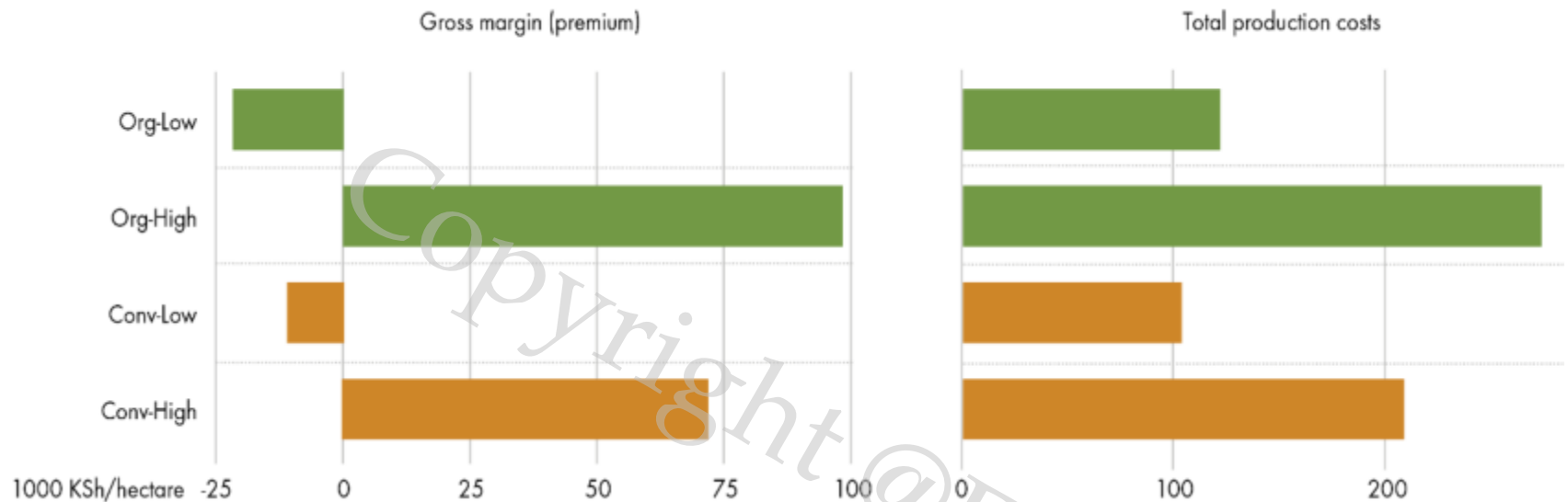
Average yields of annual crops in Kenya and India (2007-2019)



- Maize and soybeans achieved similar yields in all systems, because nutrient input was sufficient
- Lack of knowledge on appropriate pest & disease management in organic potato production
- With good management practices in organic, the yield gap is around $\pm 10-15\%$ (e.g. cotton)

Profitability

Average gross margin & production costs of annual crops in Kenya (2007-2019)



- Low input farming systems as currently practiced by a majority of smallholders in Africa are economically not sustainable—neither conventionally, nor organically.
- In organic arable farming systems, labour increases production costs, whereas in conventional systems, production costs relate mainly to external inputs.

Overall Conclusions I



Low input farming systems as currently implemented by most smallholders in Africa are not sustainable, regardless of whether managed with conventional or organic practices.

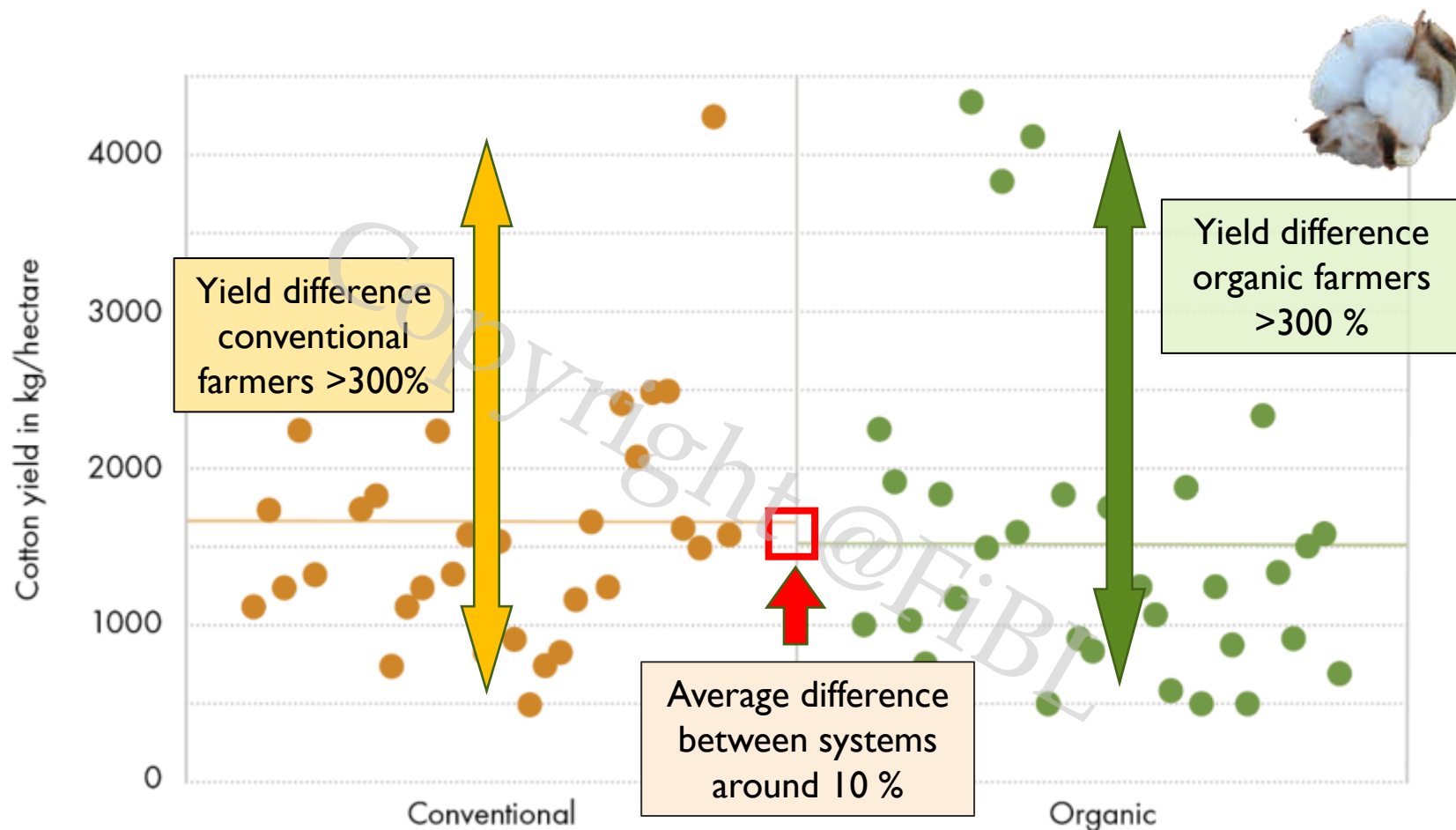
High input farming systems can achieve similar yields, but profitability depends on prices achieved.

Organic agriculture ...

- can match productivity and profitability of conventional agriculture.

Yield Difference between Farms

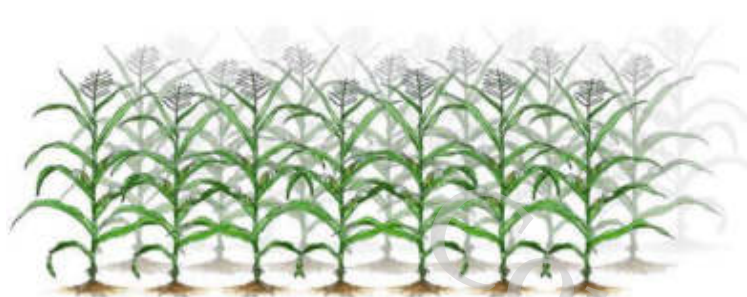
A survey on cotton yields among farmers in the Nimar Valley in India



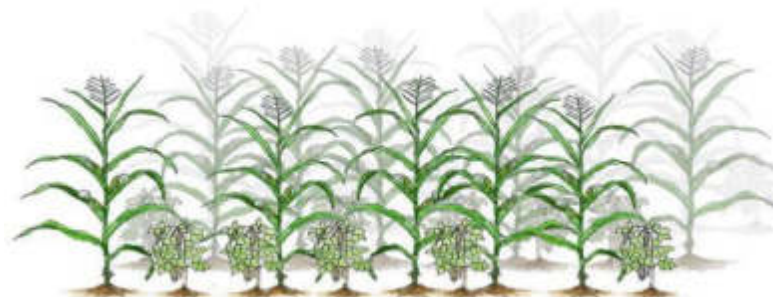
→ Good management / best practices are the most important success factors for production.

Shifting from common to best practice in organic

→ Examples



Mono cropping system



Inter cropping system
(including push-pull)



Low-quality inputs
(often commercial)



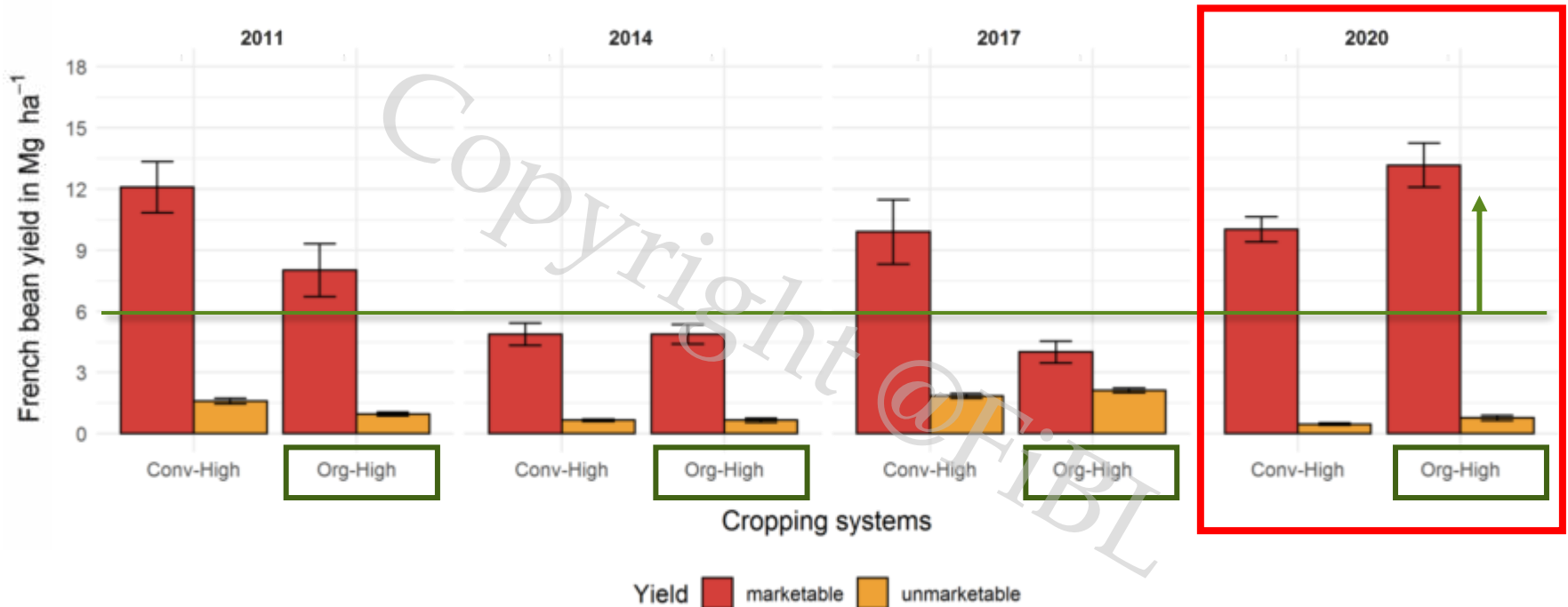
High-quality inputs
(made from local resources)

Change in productivity after changing to best practices

Example with 'active agroecological management' from Thika, Kenya



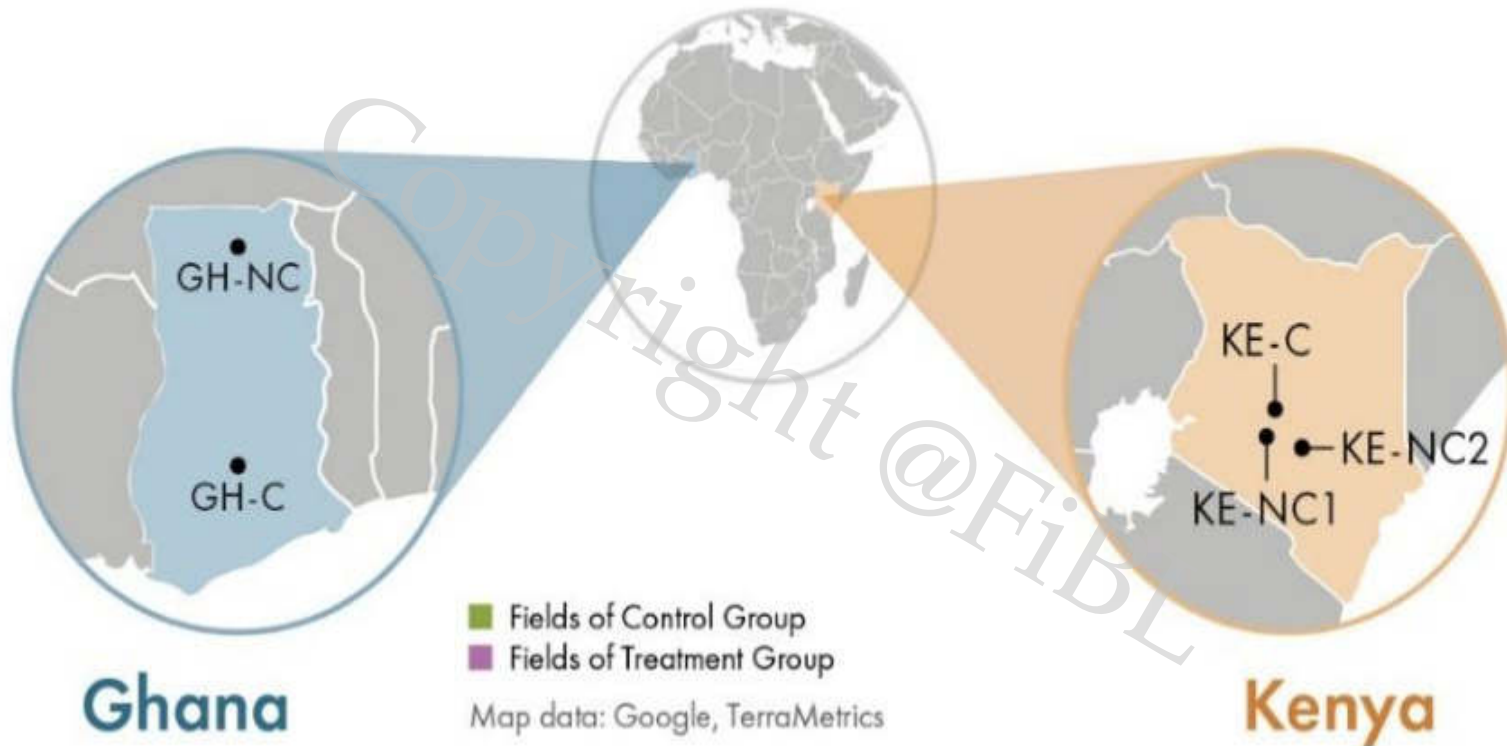
Marketable and unmarketable yield of French bean



→ By introducing agroecological measures using intercropping and botanicals, the yields have increased substantially, especially thanks to a lower pest and disease pressure.

Findings from the Field

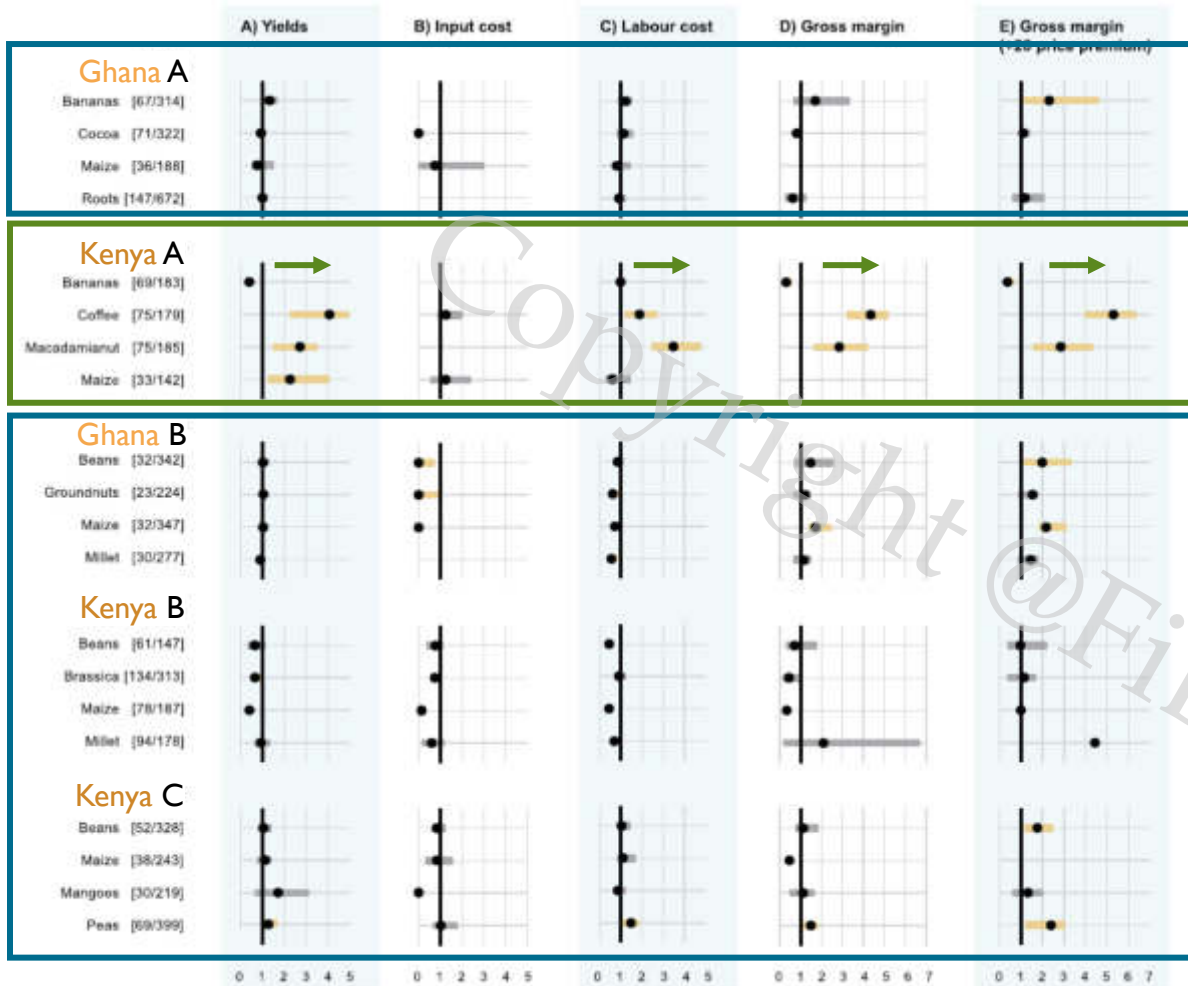
5 Case Studies with 1 600 Farmers in Kenya and Ghana



Source: Schader et al. 2021, *Global Environmental Change*

Economic impact of organic management

Focus on yields, costs and gross margins



4 case studies:
No significant differences in yields and gross margins between organic and conventional smallholders

1 case study:
Both yields and farm incomes were +127-308 % higher in organic

Source: Schader et al. 2021, Global Environmental Change

Overall Conclusions II



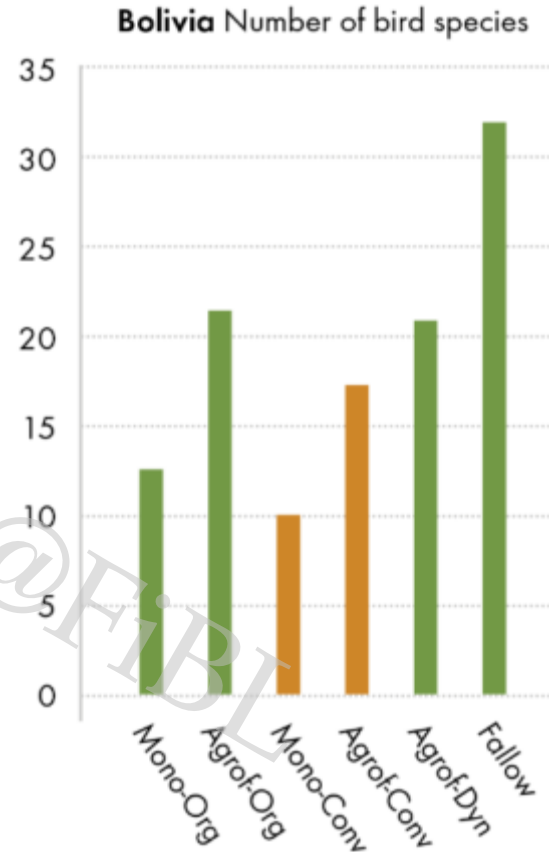
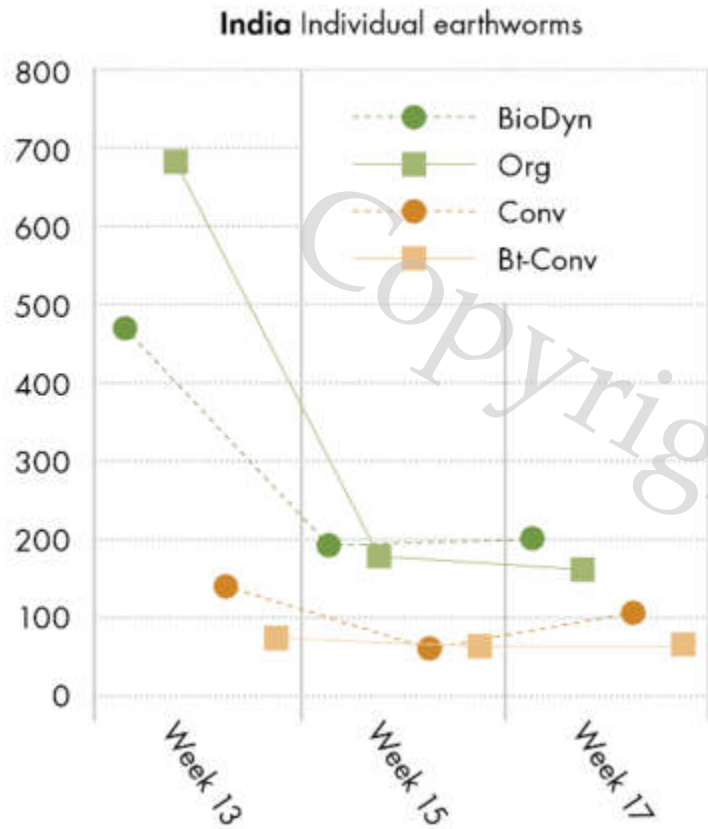
A passive farm management (only replacing conventional by organic inputs) is not sustainable ~ productivity & profitability

Organic agriculture...

- can match productivity and profitability of conventional agriculture.
- requires a system-oriented farm management with agroecological practices (e.g., intercropping, alley cropping, enriched fertilizer, etc.).

Impact on Biodiversity

Abundance of earthworms, diversity of birds and termites

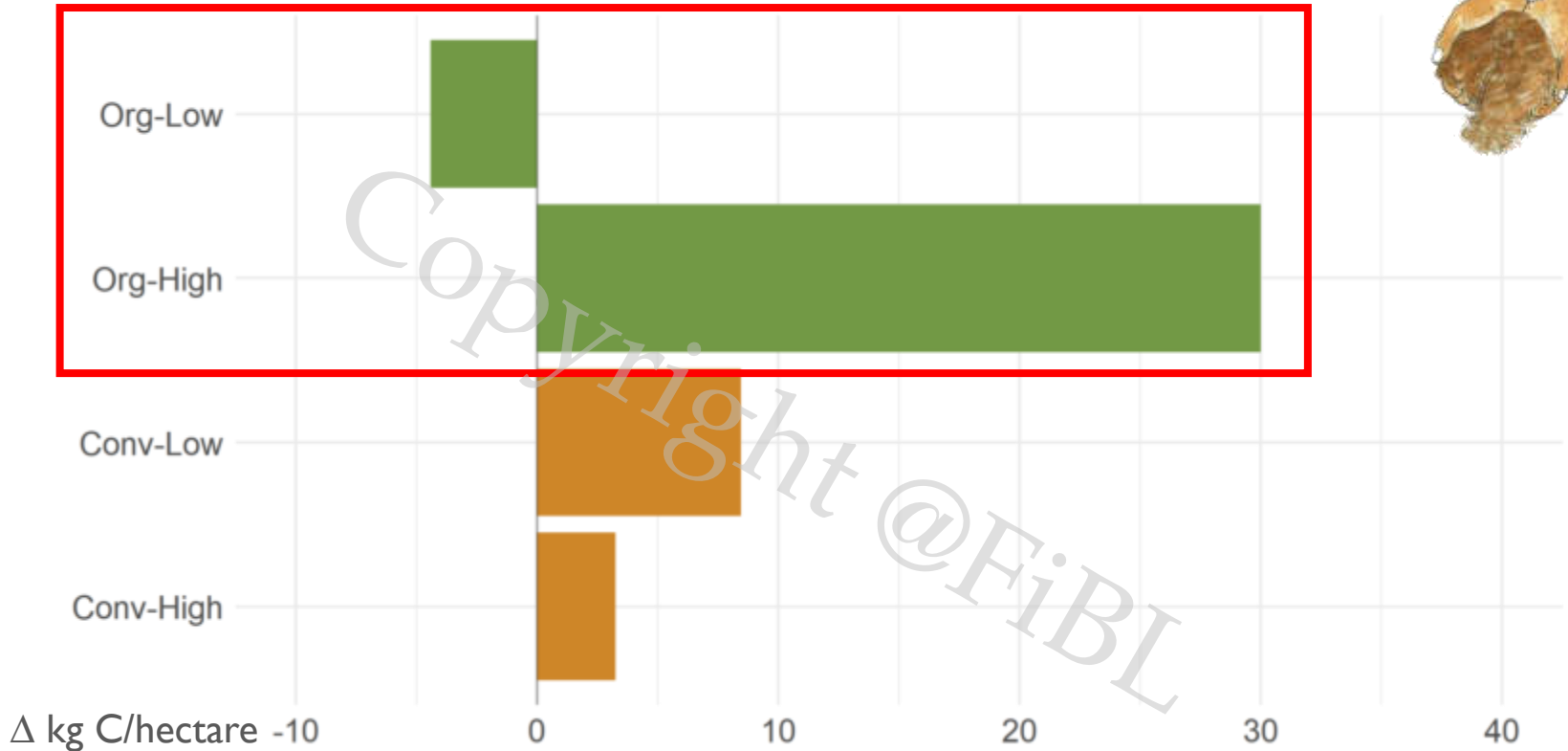


→ Organic and agroforestry systems offer relevant benefits with regards to biodiversity.

Source: Naoki, K., Gómez, M. I., Schneider, M. (2017).

Impact on Soil Fertility

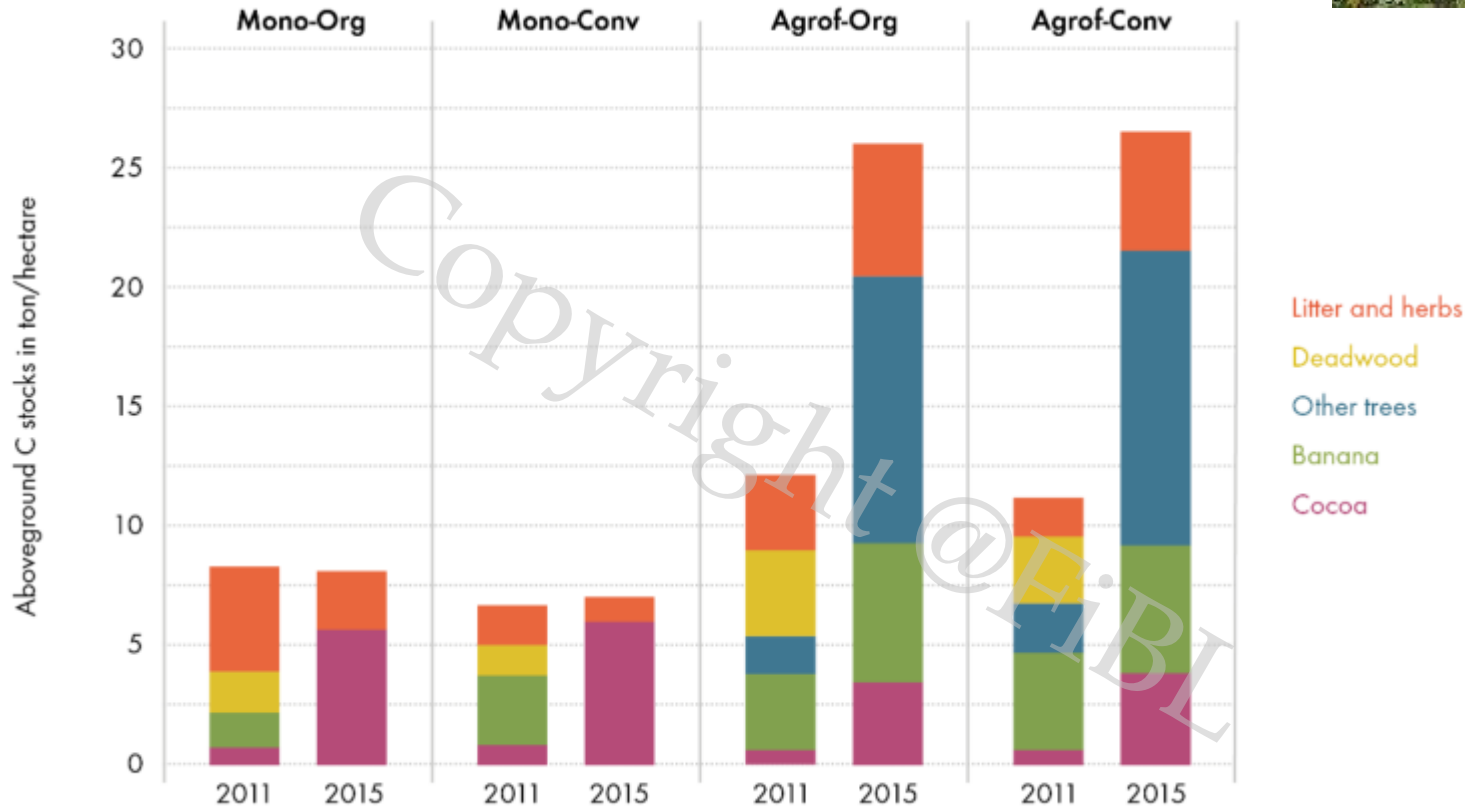
Soil organic carbon stock change in 0-20 cm depth after 12 years in Kenya (2019)



→ High-input organic farming can improve soil fertility, whereas low organic systems can even deplete it.

Impact on Carbon Sequestration

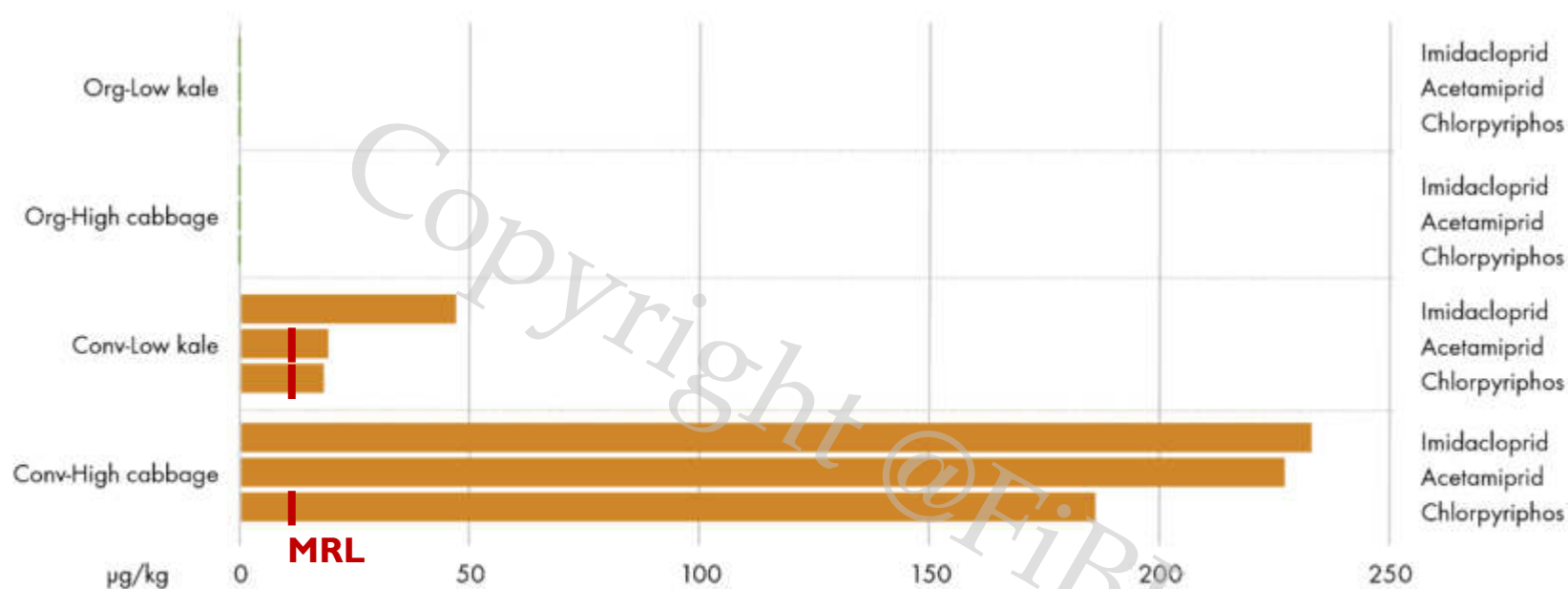
Aboveground carbon sequestration in cocoa production in Bolivia



→ Agroforestry systems offer relevant benefits with regards to climate change mitigation.

Pesticide Residues !

Residues of synthetic pesticides in leafy vegetables in Kenya (2016)



→ Pesticide residues in vegetables, soil and run-off are very high in conventional production.

MRL: Maximum Residue Limit (EU)

Overall Conclusions III



Organic agriculture...

- can match productivity and profitability of conventional agriculture.
- requires a system-oriented farm management.
- provides environmental benefits (soil fertility, resource use, biodiversity, etc.).



How to exploit the huge potential of organic agriculture?

➔ Create market opportunities for diversified production

- Facilitate market and product innovations that help reduce farmers' dependency on main cash crops (often export-oriented).
- Support a conducive policy environment providing production system-oriented pricing and/or compensation schemes.
- Engage in awareness creation campaign to promote a more diverse healthy diet based on local (organic) food.



➔ Invest in (agroecological) systems research

- Ensure holistic systems design: diversified, interlinked, complex to optimize soil management, pest and disease management, carbon storage, water conservation.
- Endorse participatory research approaches: provide a setting to involve stakeholders and sufficient time (needed for systems research).



➔ Foster innovation & capacity building

- Interlinked knowledge along the whole value chain is key to successfully drive organic farming.
- Facilitate practice-related creation of knowledge on systems-oriented farm management.



Overall Conclusions IV



Organic agriculture...

- can match productivity and profitability of conventional agriculture.
- requires a system-oriented farm management approach.
- generates environmental benefits → soil fertility, resource use, biodiversity, etc.
- requires knowledge → knowledge which will drive innovation for a resilient production system and enable farmers to successfully adapt to a changing environment.



Thank you very much
for your attention!

More information
available at



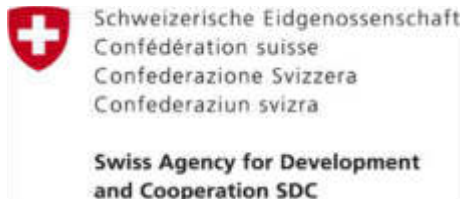
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systems-comparison.fibl.org



Many Thanks to Our Partners!



This project is supported by the
Coop Sustainability Fund.



... and our colleagues!



Farming system in the Kenyan Long-term Experiment

Treatment	Input use details	Input N	Farm type
Conv-Low	Synthetic & organic fertilizers/pesticides, rainfed	60 kg ha ⁻¹	Small-scale, home consumption and local market
Org-Low	Organic fertilizer/pesticides, rainfed	60 kg ha ⁻¹	
Conv-High	Synthetic & organic fertilizers/pesticides, irrigation	225 kg ha ⁻¹	Commercial, domestic and export market
Org-High	Organic fertilizer/pesticides, irrigation	225 kg ha ⁻¹	

- **Low input** based on a survey done around the experimental sites (practice of 35 farmers at Chuka and 25 farmers at Thika).
- **High input** is based on the recommendation of the Kenyan Ministry of Agriculture and export agencies (most recommendations are for conventional!).