









## Never change a running system? Balancing systems approach and comparability when adapting LTEs

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# Farming Systems Comparisons Trials in the Tropics (SysCom)

	Kenya	India	Bolivia
Site	Sub-Saharan <b>Africa</b> - Kenya Central Highlands	South <b>Asia</b> - India Madhya Pradesh, Nimar Valley	South <b>America</b> – Bolivia Sara Ana
	 	 	 
Crops	<b>Maize</b> -based systems, 3-year crop rotation with maize, <b>vegetables</b> and <b>potato</b>	<b>Cotton</b> -based systems, 2-years crop rotation with cotton, <b>wheat</b> and <b>soybean</b>	<b>Cacao</b> -based systems, cacao trees with <b>bananas</b> , <b>coffee</b> and <b>timber</b> and <b>fruit trees</b>
Systems	Organic vs conventional at <b>low</b> and <b>high input level</b>	Organic and <b>biodynamic</b> vs conventional <b>with/without GMO</b>	Organic vs conventional as <b>monoculture</b> or <b>agroforestry</b>

# Farming Systems Comparisons Trials in the Tropics (SysCom)

Thika, Kenya



Chuka, Kenya



Kasrawad, India



Sara Ana, Bolivia



## Methodological approach – Comparison trials



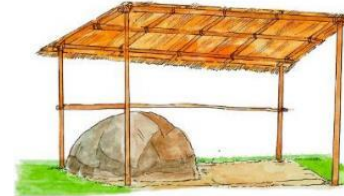
**Synthetic pesticides**



**Organic pesticides**



**Synthetic inputs**



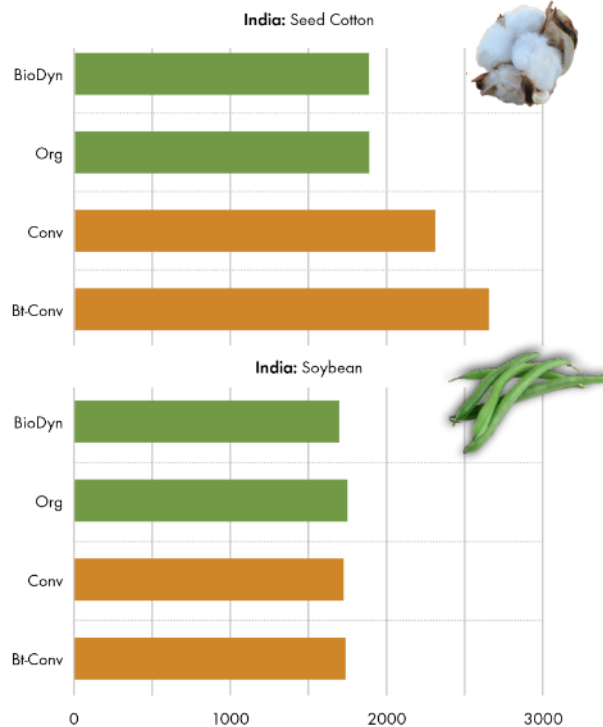
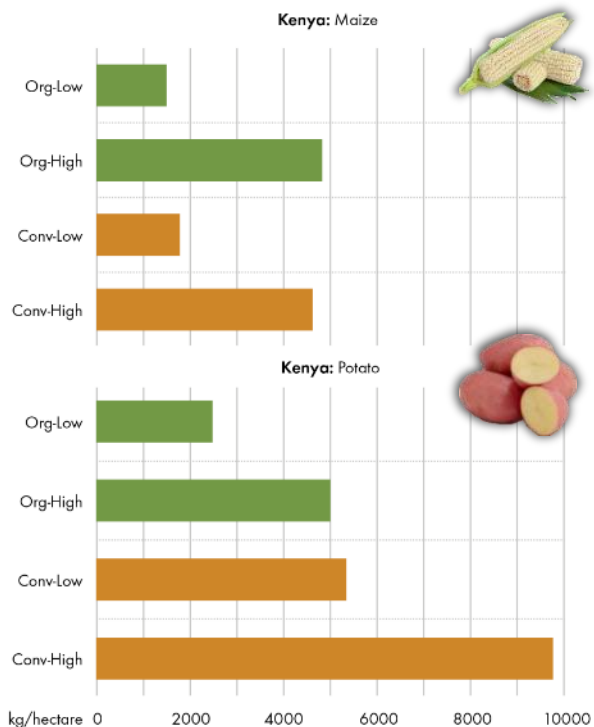
**Organic inputs**



**Same cropping pattern/crop rotation, same timing of nutrient application and pest control, same crop varieties, plant densities**

# Results – Productivity of annual crops

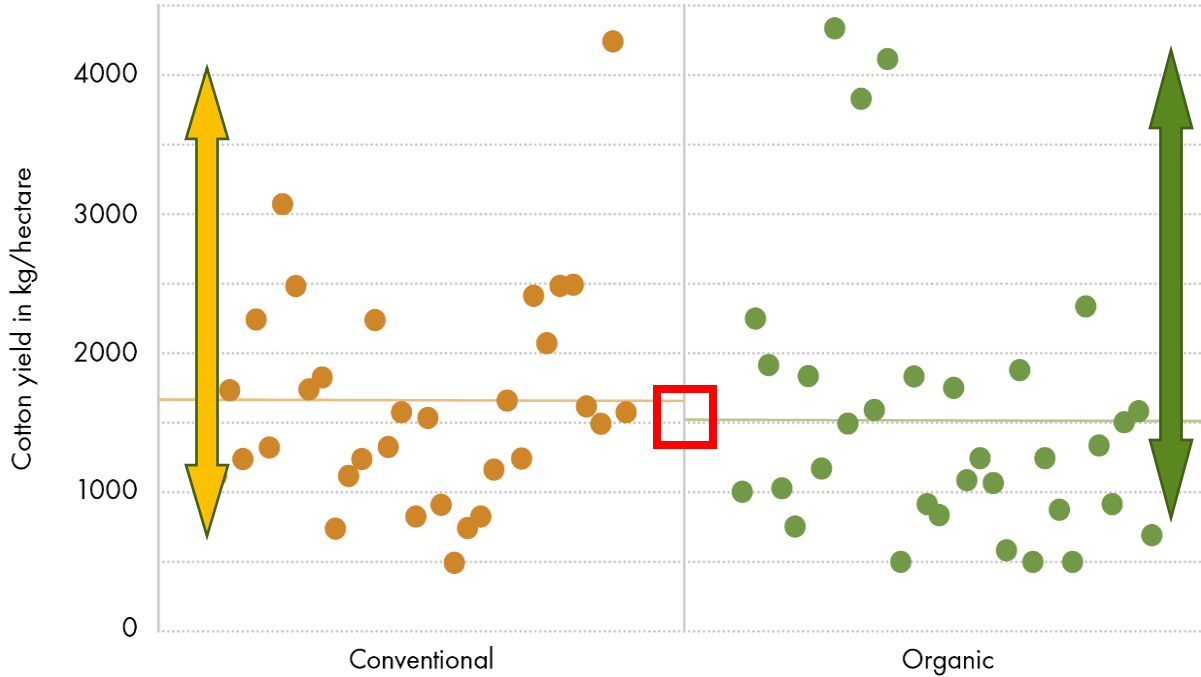
## Average yields of annual crops in Kenya and India (2007-2019)



Annual crop yields in organic systems are primarily limited by nutrient availability as well as pest and disease damage

# Yield Difference between Farms

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

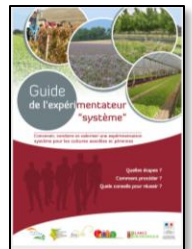
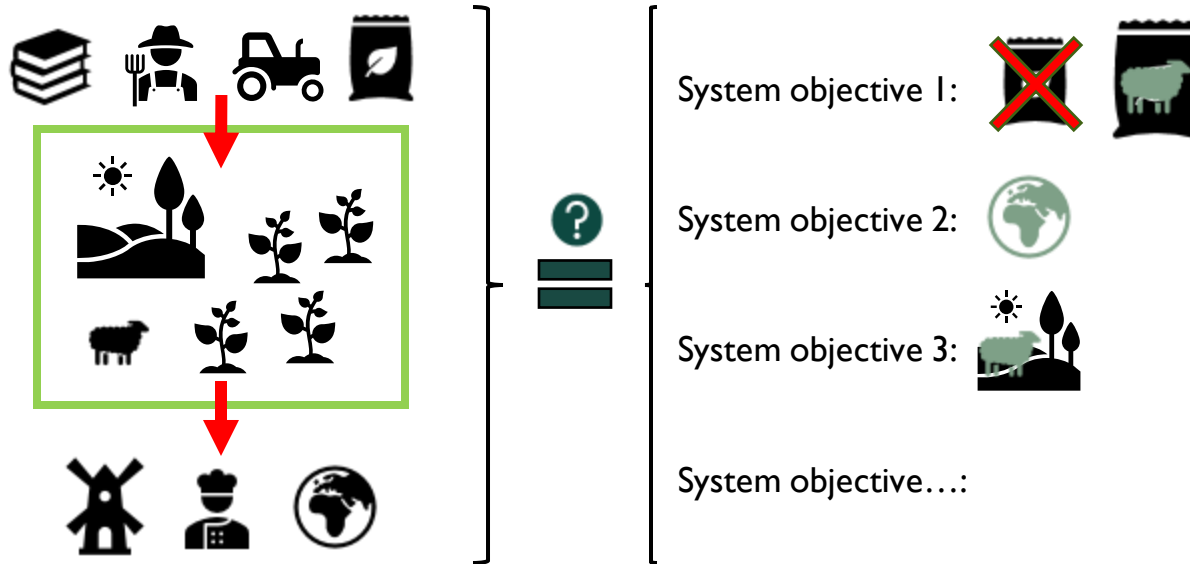


- Yield difference within system >300%
- Yield difference between systems ~10%

# System experiment

«System experiments make it possible to evaluate the ability of an agriculture system to meet its objectives (global strategy) assigned to it given its complexity.»

(compare objective with system structure and behaviour)

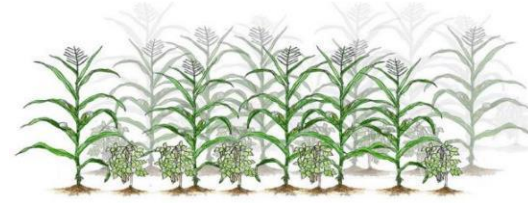


# Systems Approach and changes in the long-term experiment

## Examples



Mono cropping system



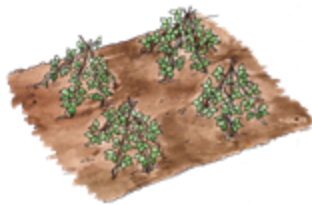
Inter cropping system (including push-pull)



Low-quality inputs (often commercial)



High-quality inputs (made from local resources)



No mulching (including deep tillage)

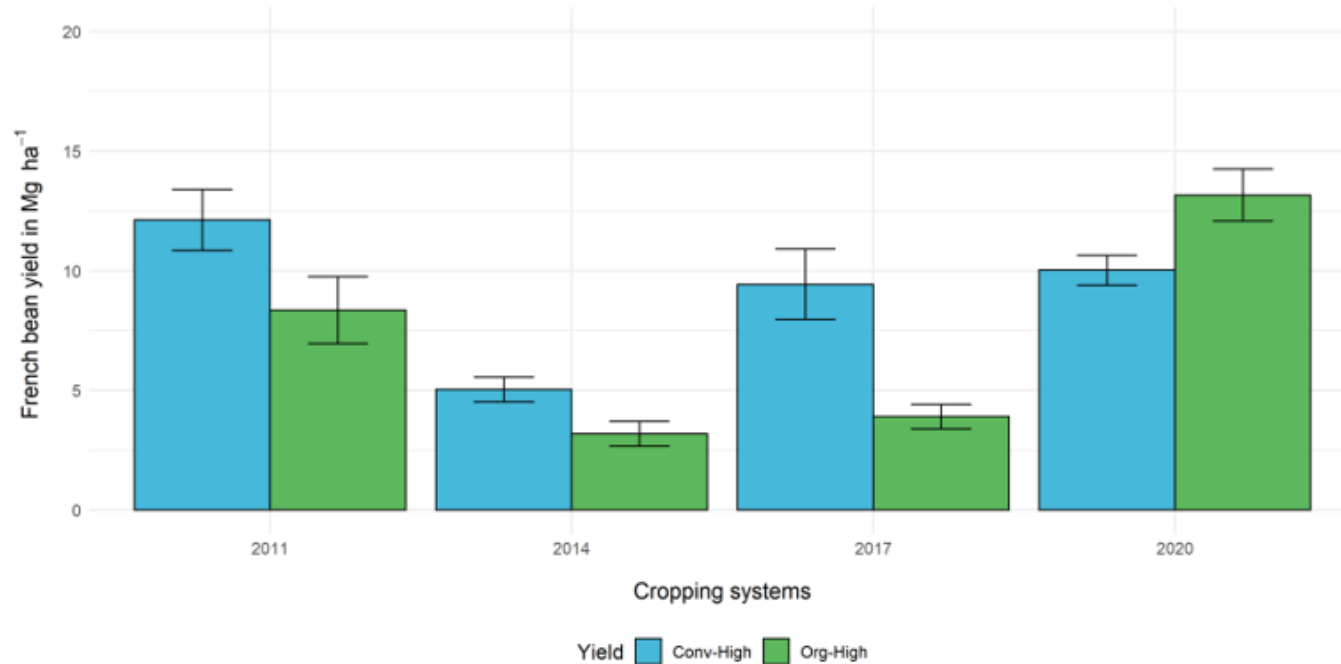


Mulching (including minimum tillage)



# Results after changing to a system approach in organic system

## Example from Kenya



# Results after changing to a system approach in organic system

## Example from India



## Open questions and challenges

- Farming systems reacting differently to changes depending on site, crop, season, etc.
  - Adaption is a continuous process
- Long decision making process as every change can have multiple effects
- Limited toolset – not every change is possible (agroforestry, integrated livestock)
- Difficulty to publish – more proof of concept than basic science
- Comparability through meta values (energy consumption, etc.)
- Needs long-term funding – no final answer on system performance

# Many thanks to our partners and donors!



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... and our  
colleagues!

