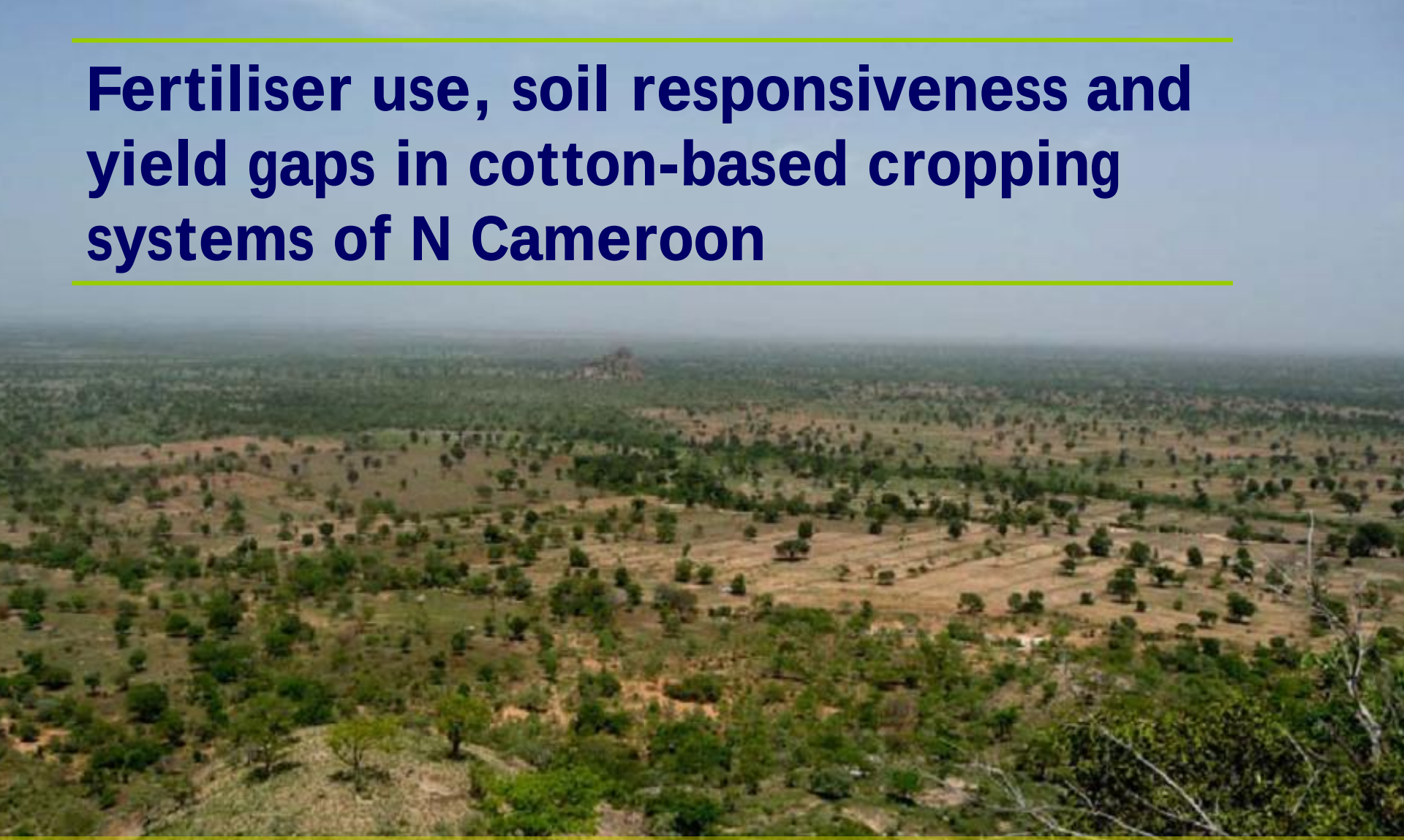
Fertiliser use, soil responsiveness and yield gaps in cotton-based cropping systems of N Cameroon



Michel Cretenet, Pablo Tittonell

CIRAD-Persyst

Yield Gap Symposium, AGRO 2010 Montpellier

Background

- Productivity decline in cotton-based cropping systems of West and Central Africa: impact on regional economies

- Price fluctuations lead to discontinuous/ insufficient fertiliser use in the long term: impact on soil productivity

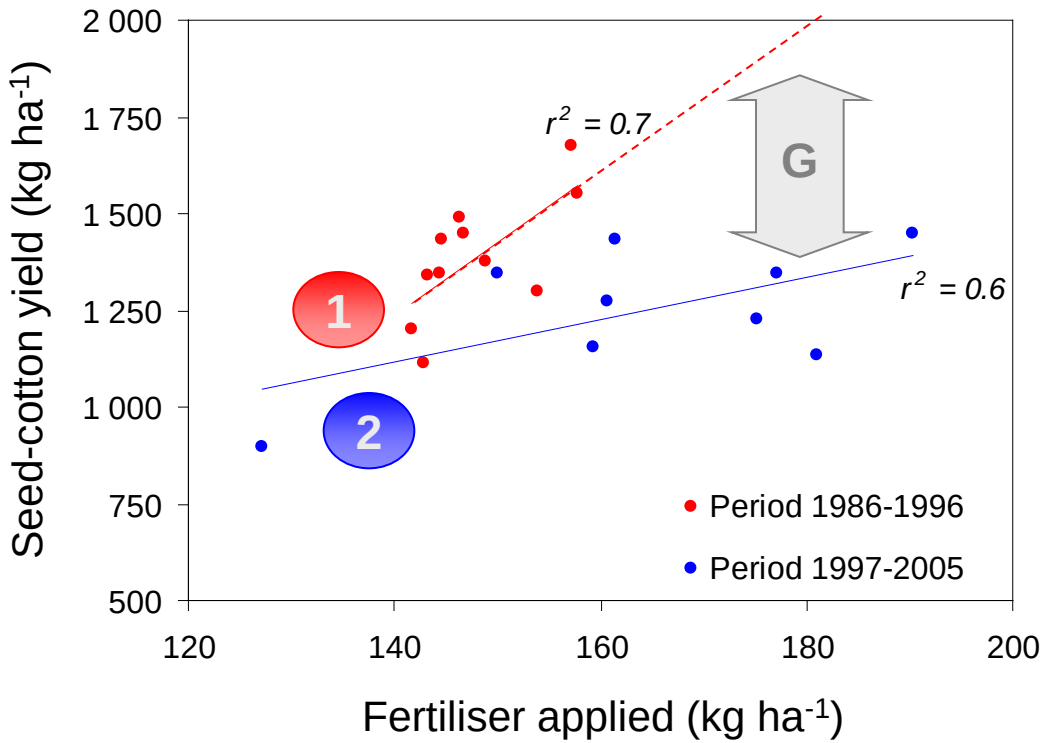
- Cameroon National debt funds (C2D) : soil fertility restoration project (SODECOTON, CIRAD)

- What determines current yield gaps, how wide are they, and how to close them?

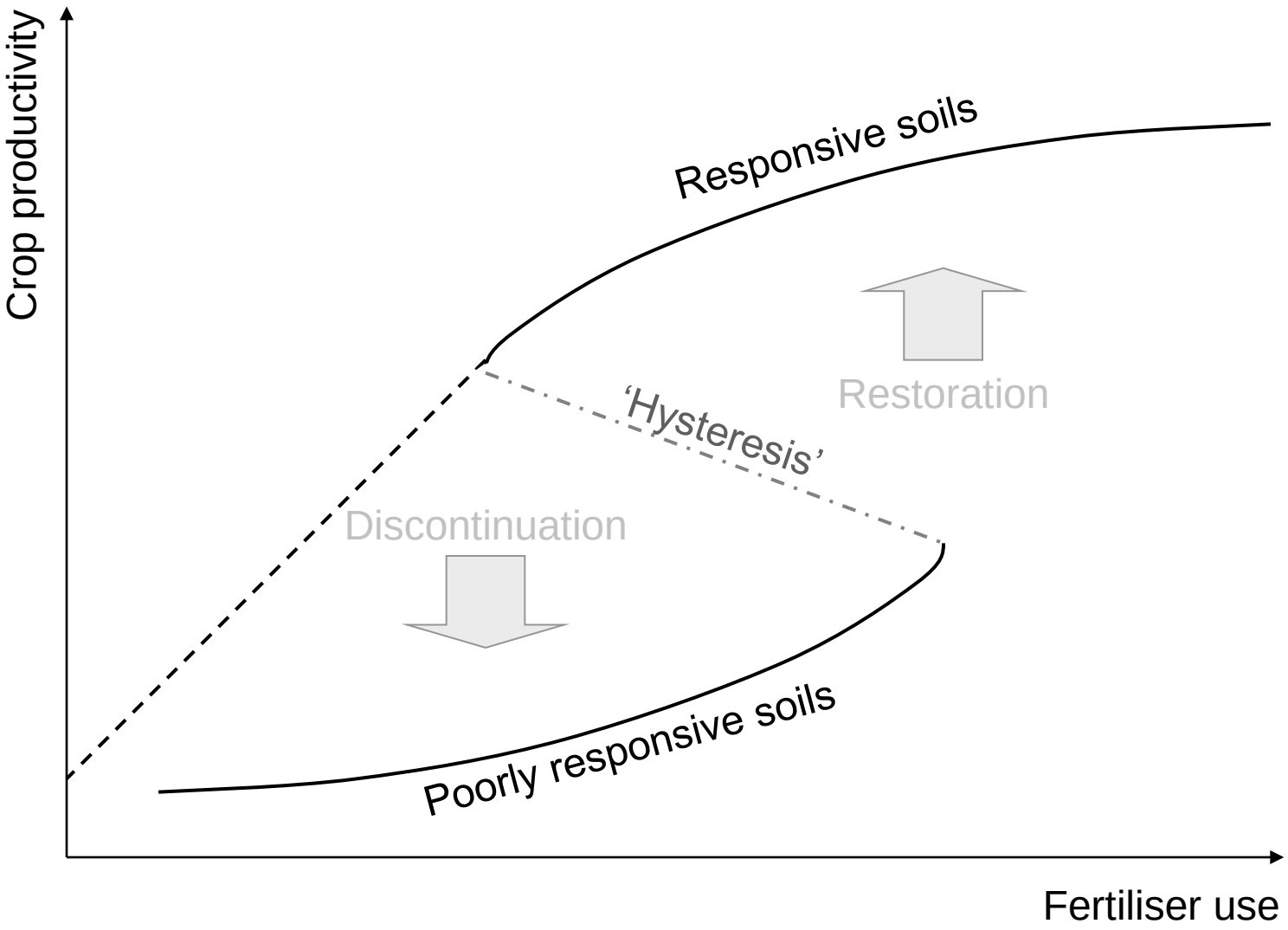
- Data mining: reanalysis of ‘old’ and long term trials

Decline in productivity

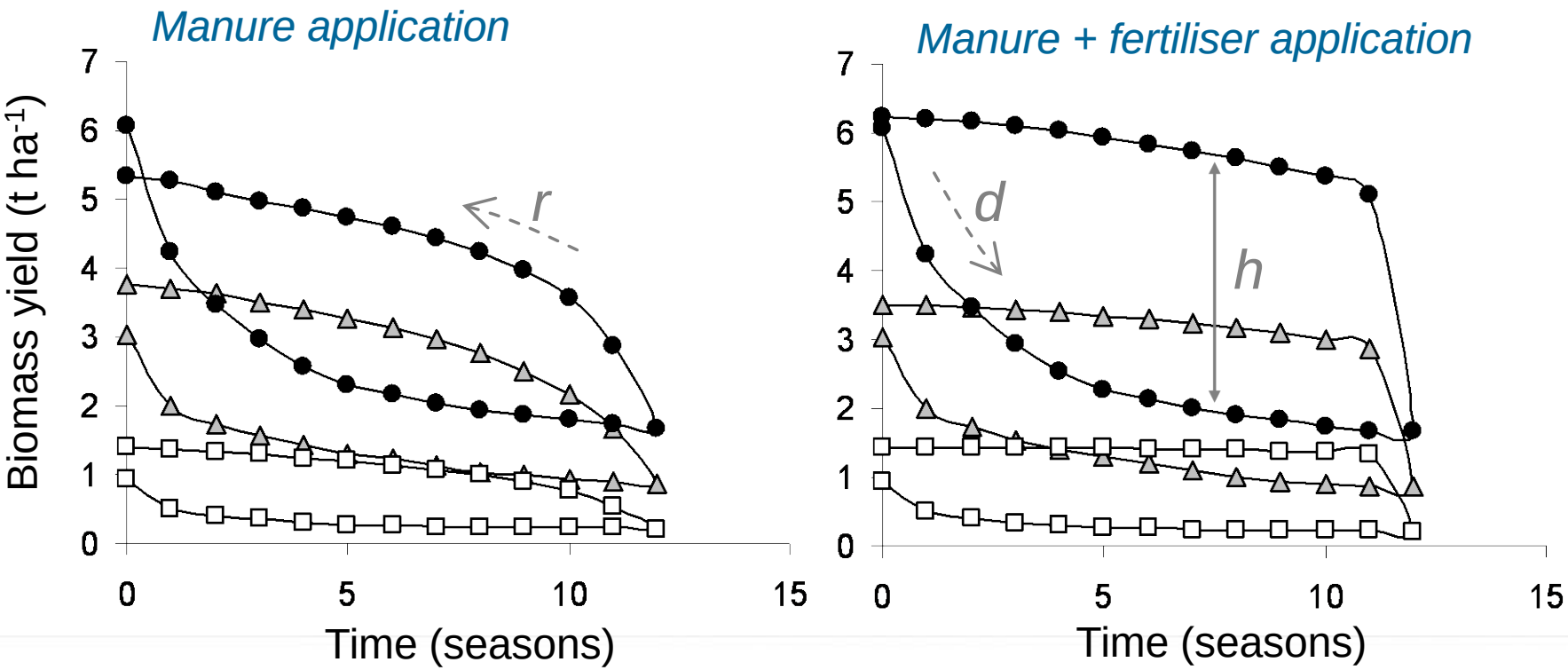
Global fertiliser productivity at Garoua, N Cameroon



Discontinuous fertiliser use



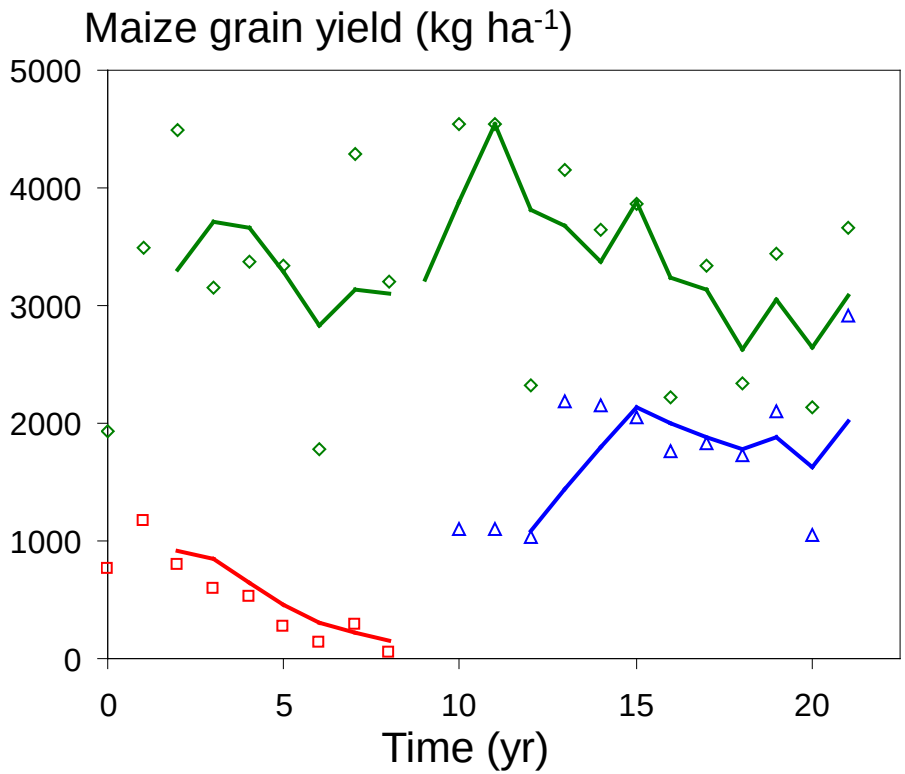
“Hysteresis” of land rehabilitation - Kenya

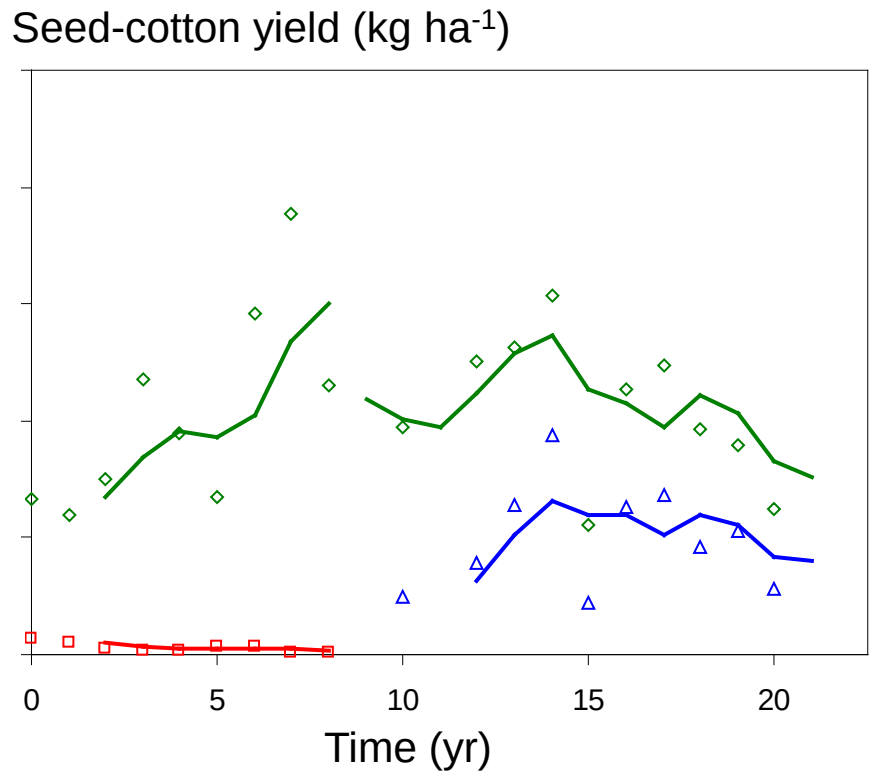


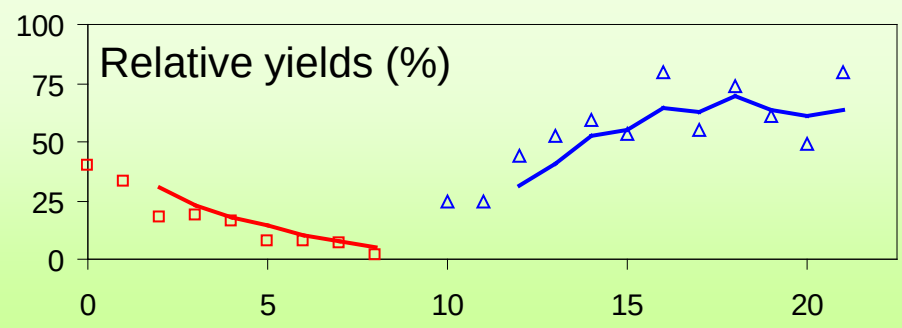
Tittonell et al., 2008, Agronomy Journal 100

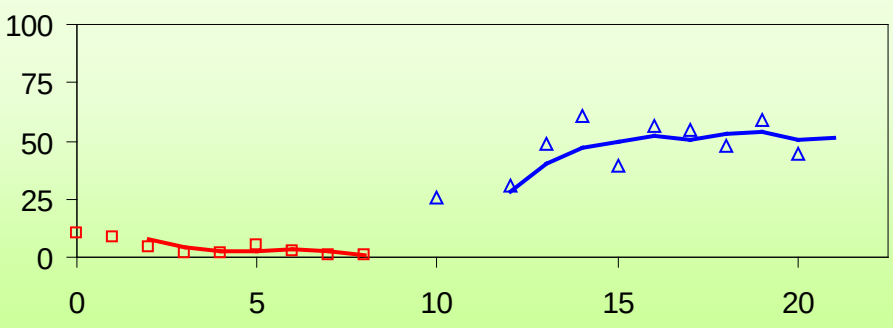
La mémoire du sol…

Phases of depletion and restoration (Benin)



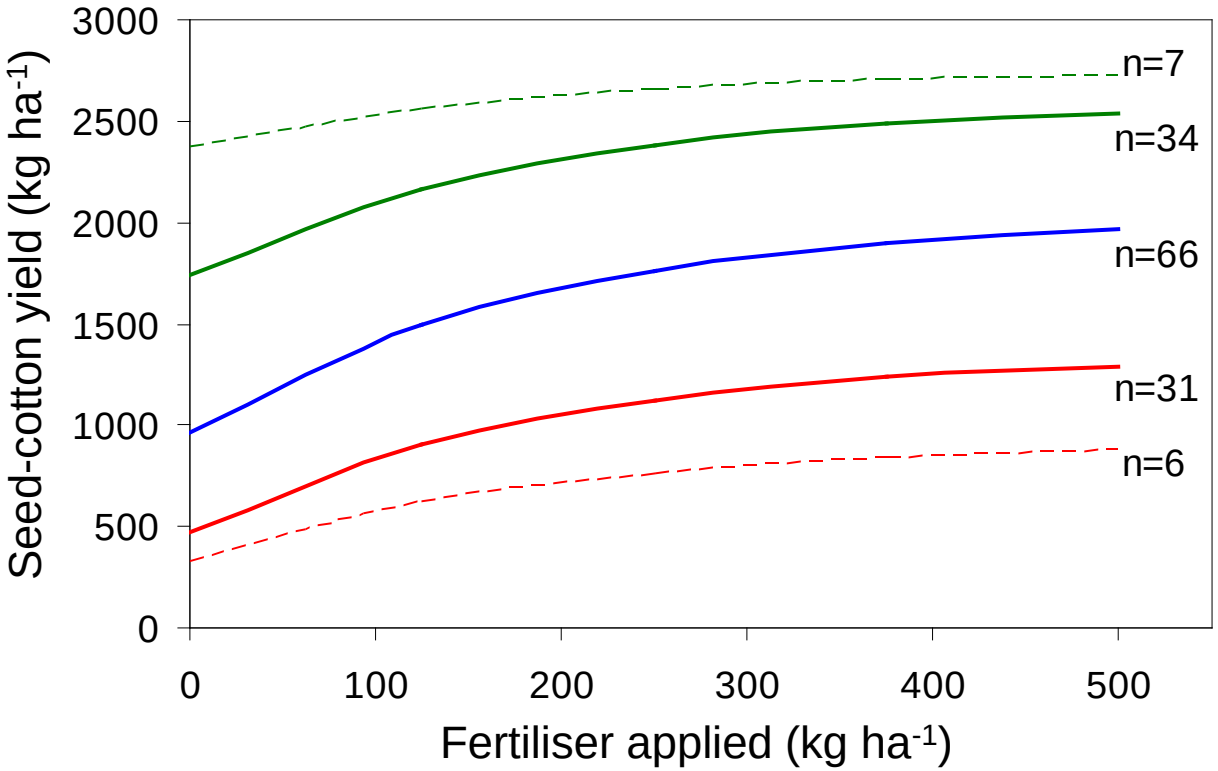


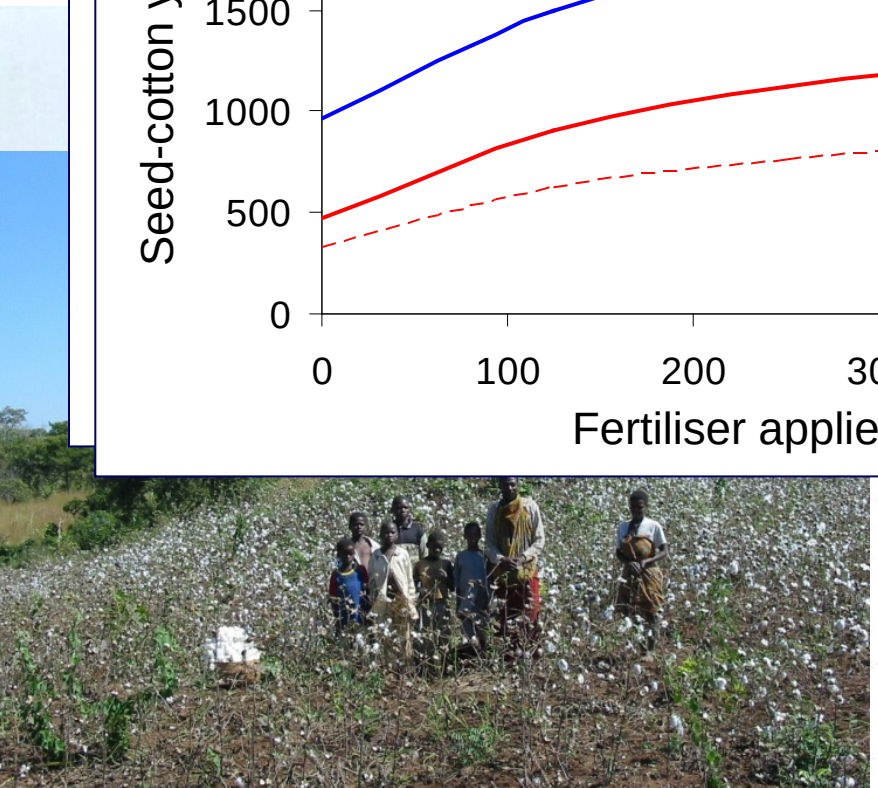


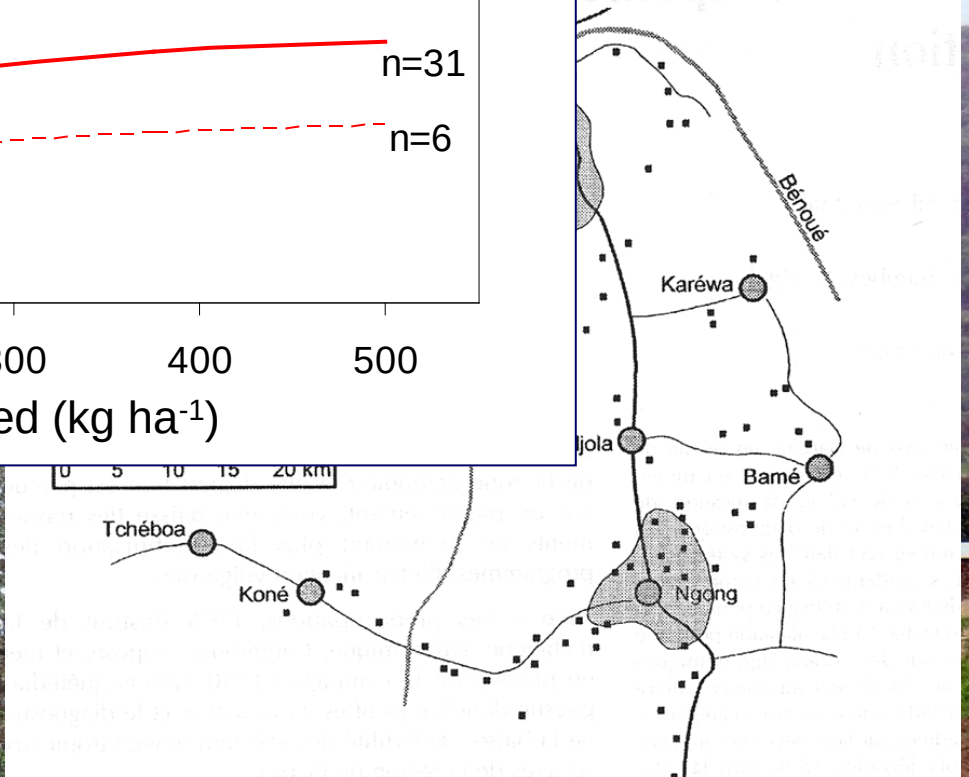


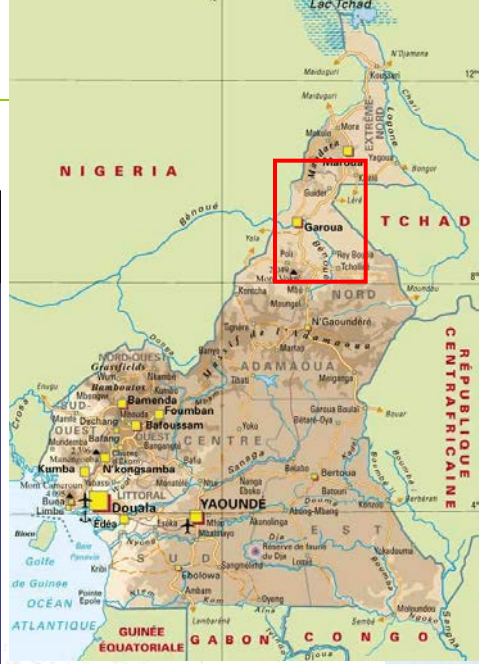
Closing yield gaps through fertiliser use

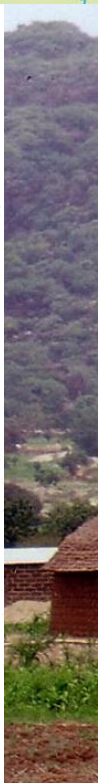
Response to fertiliser by cotton per quintile





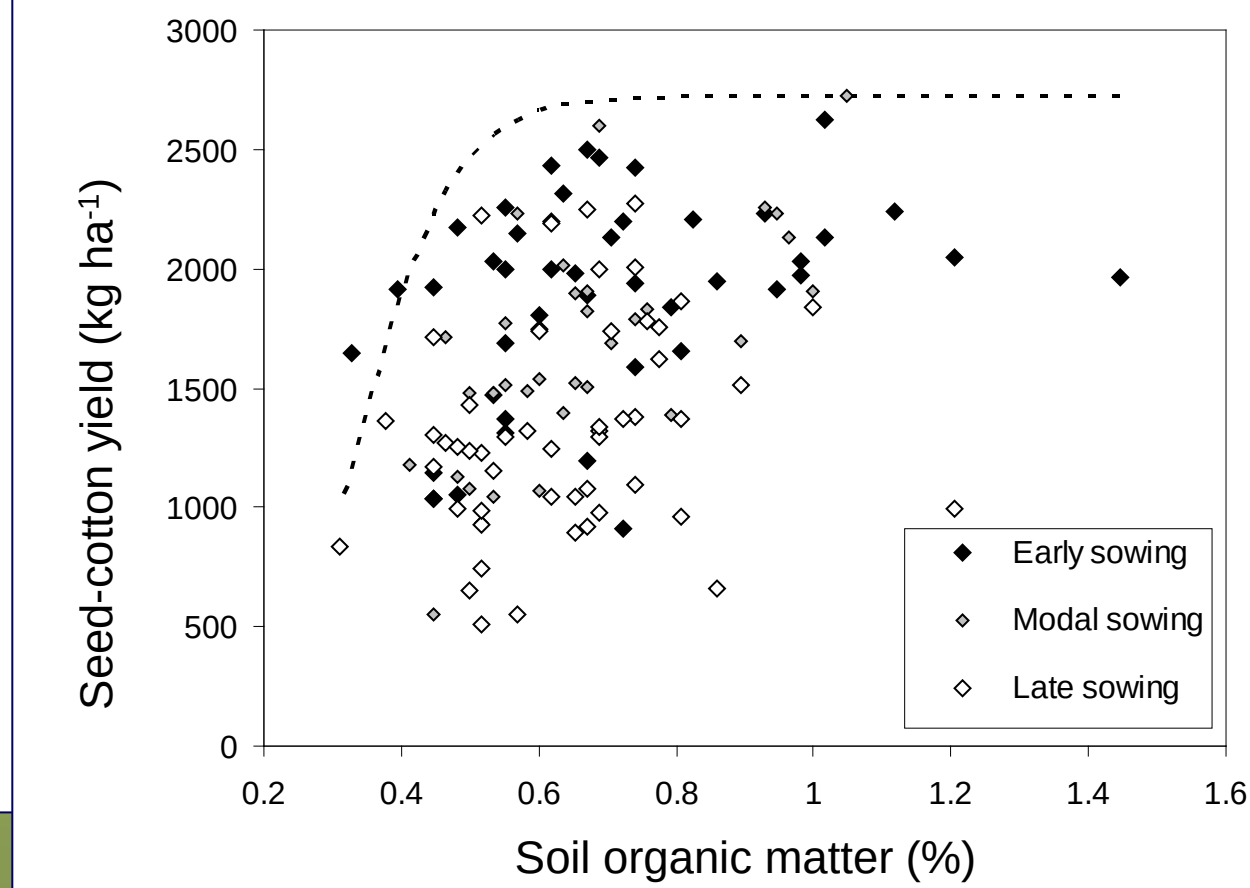






Closing yield gaps through fertiliser use

Management practices affect attainable yields

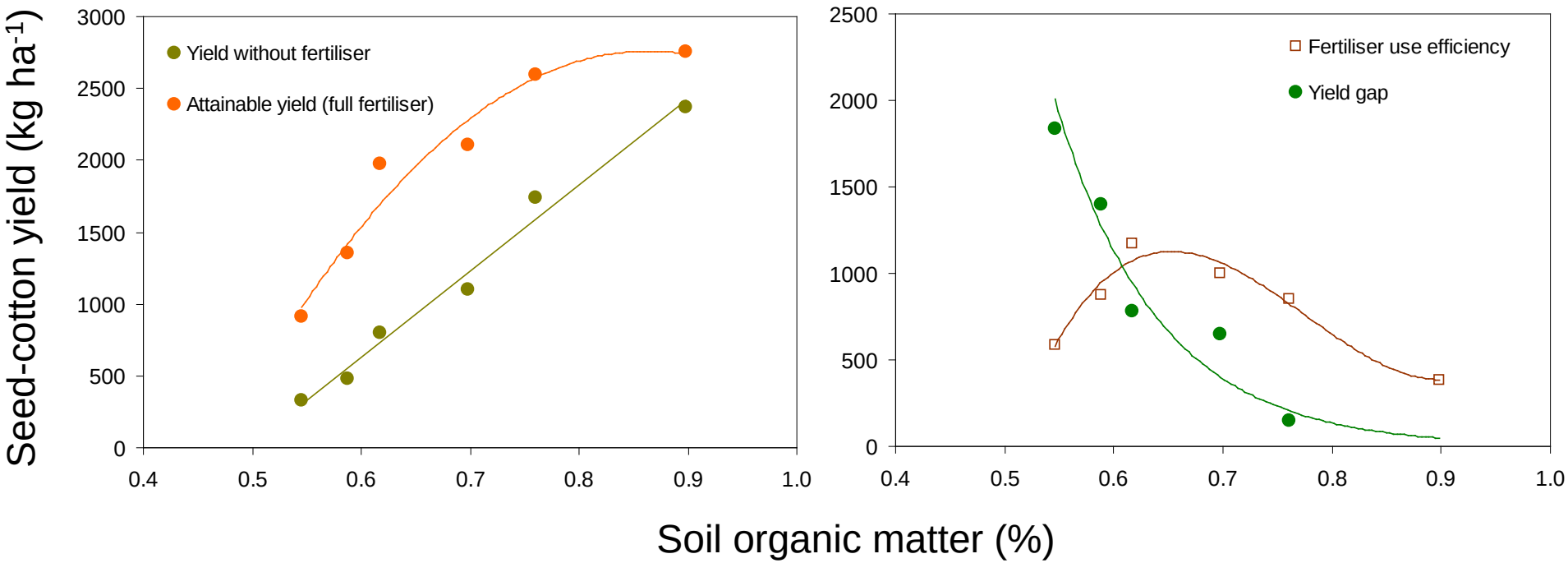


Soil carbon losses and productivity decline

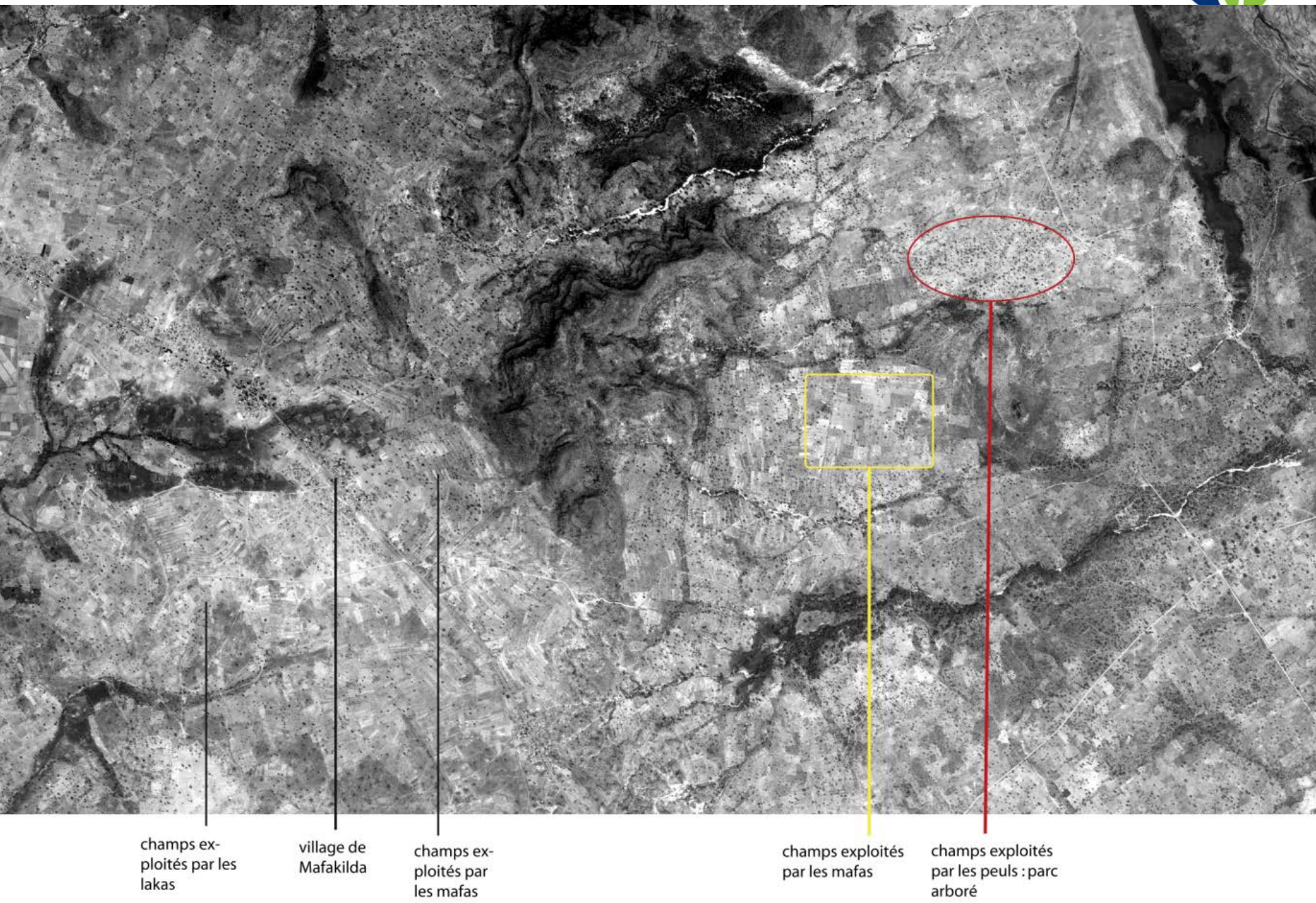
A positive feedback

- Clearence of native savannah vegetation
- Continuous cultivation with poor C restitution

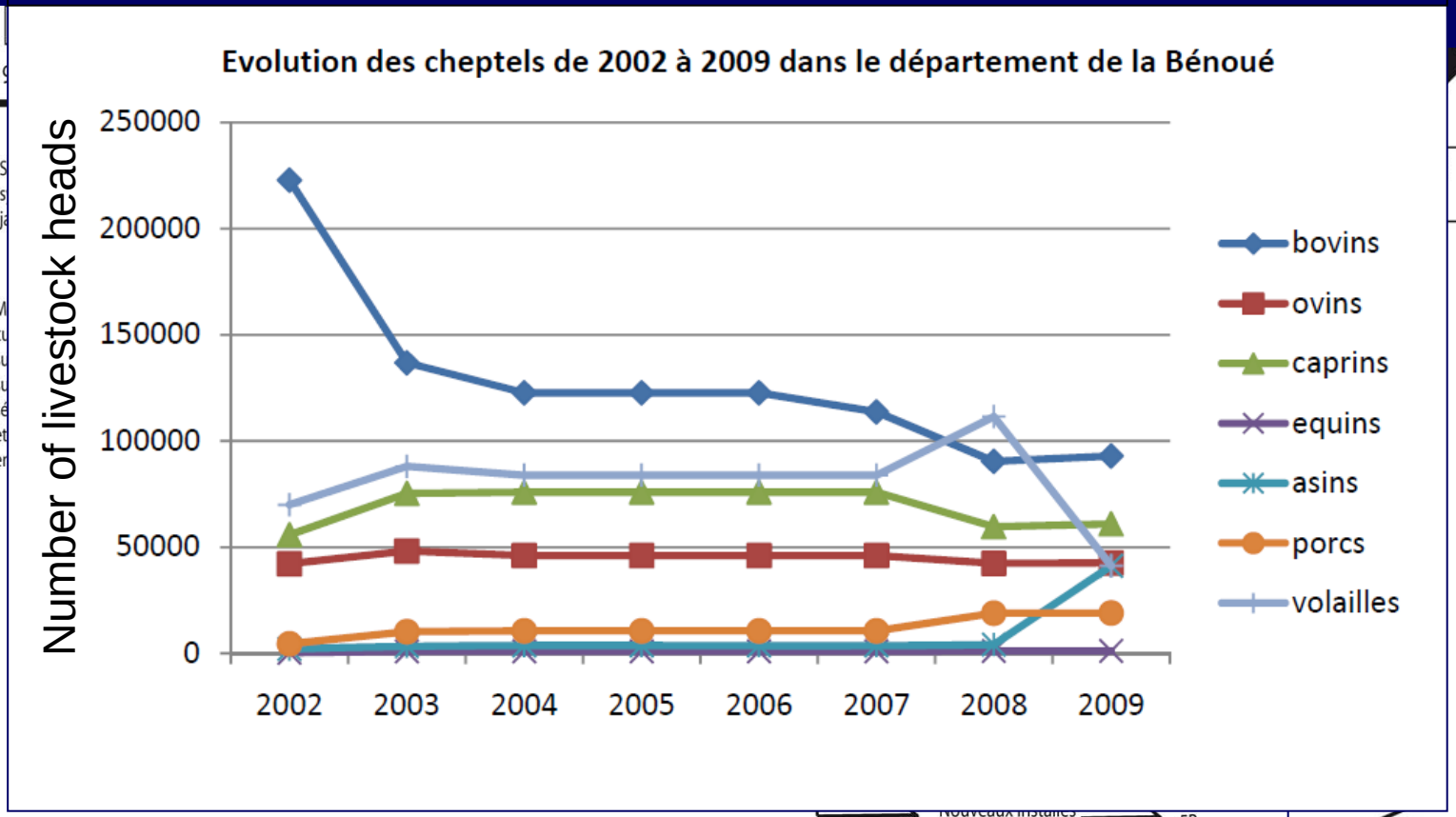
Response parameters, efficiency, yield gaps and soil organic matter

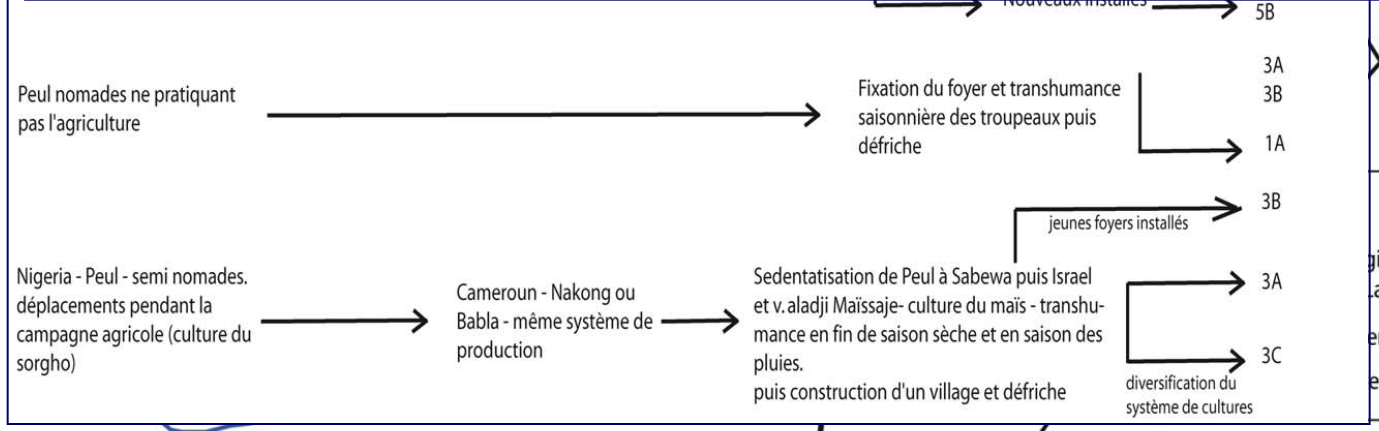


National policies with local consequences



Decline in livestock numbers



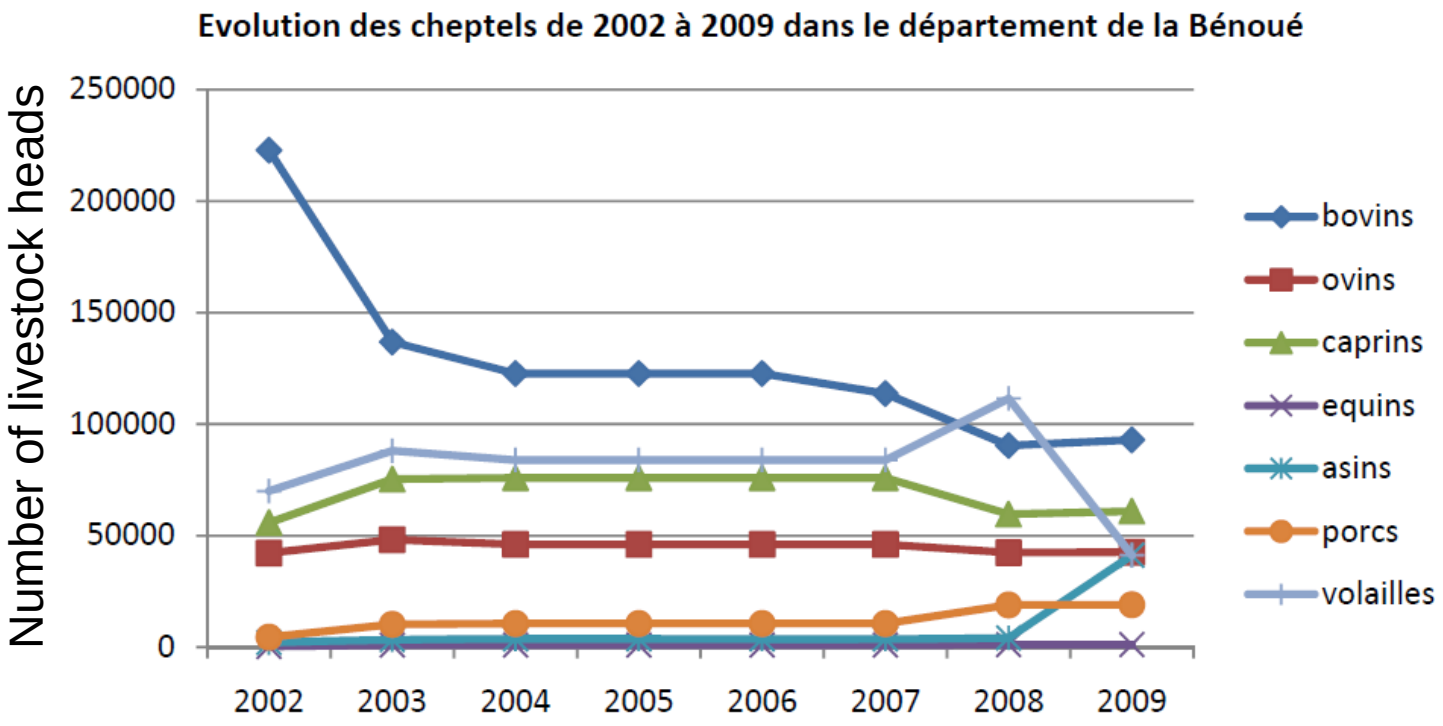


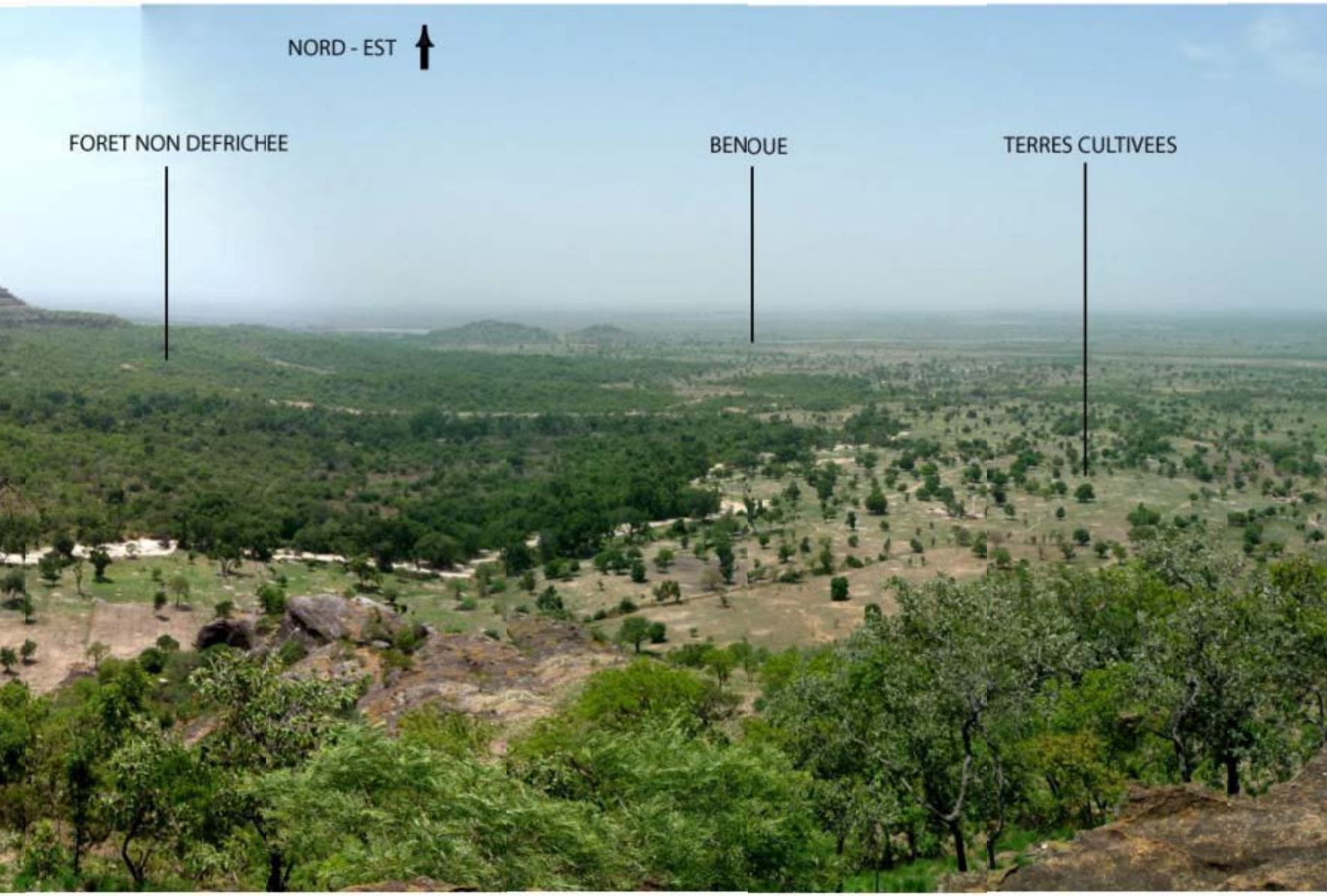
Concluding remarks

- Discontinuous/ insufficient fertiliser use widens yield gaps through cumulative effects
- Lack of reversibility in fertiliser response beyond a certain threshold of soil degradation – hystereis or *la mémoire du sol*
- Soil organic matter as key to restoring soil productivity, but complexity of local land use systems must be embraced
- Policy innovation: e.g. could policy enforce crop rotations or fallows?
- Data mining as a method to inform yield gap analysis

Thanks for your attention

Decline in livestock numbers

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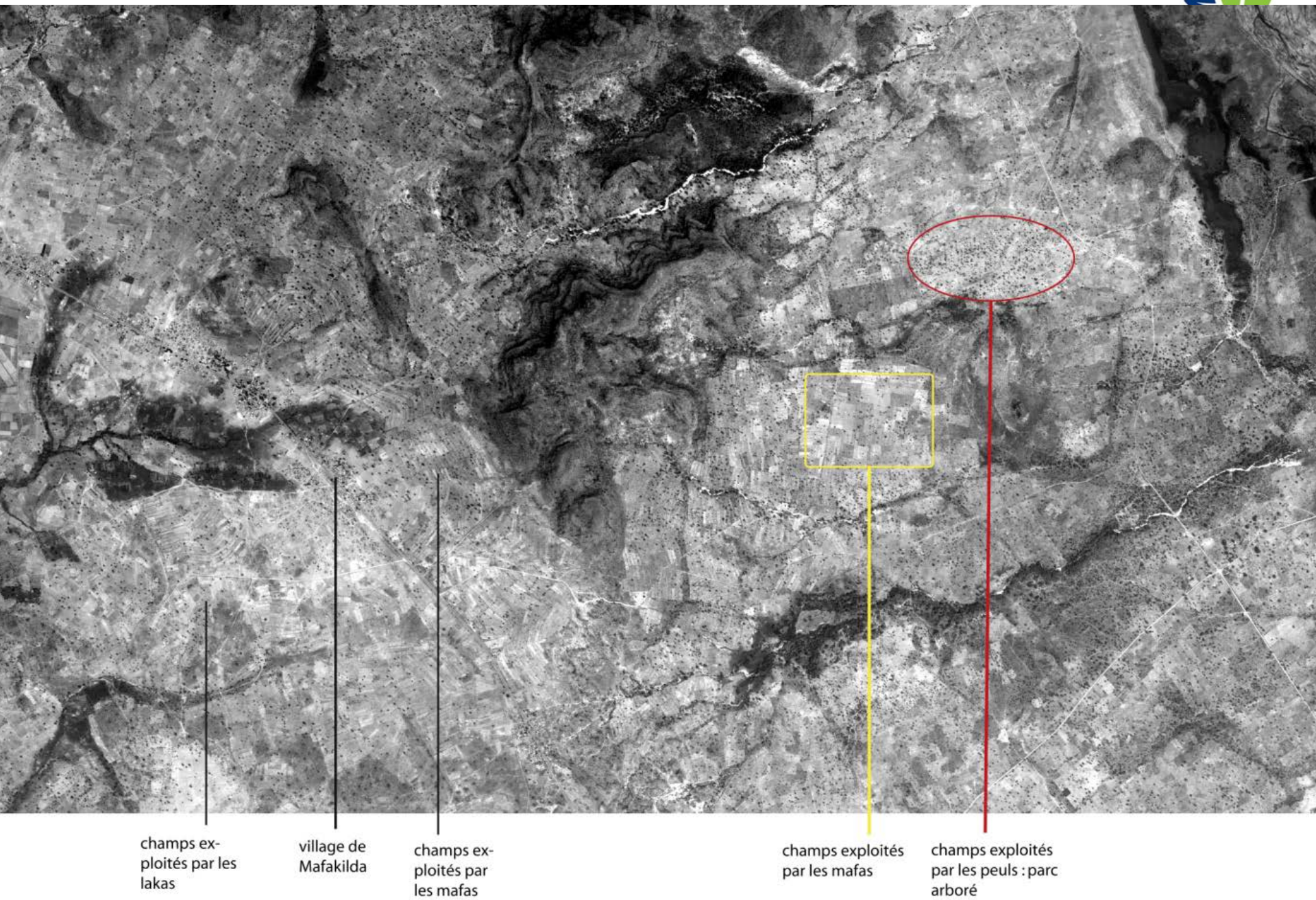
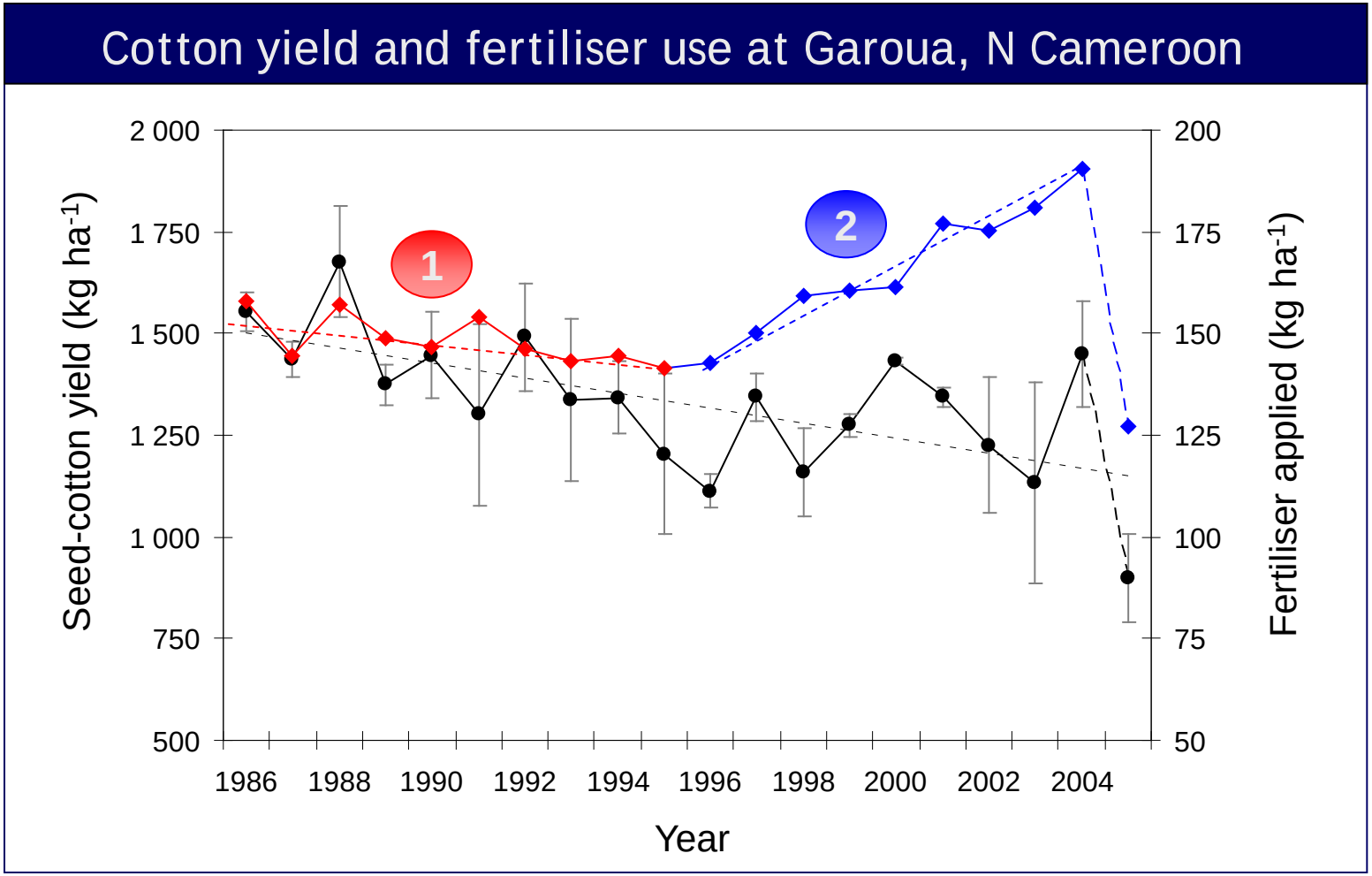
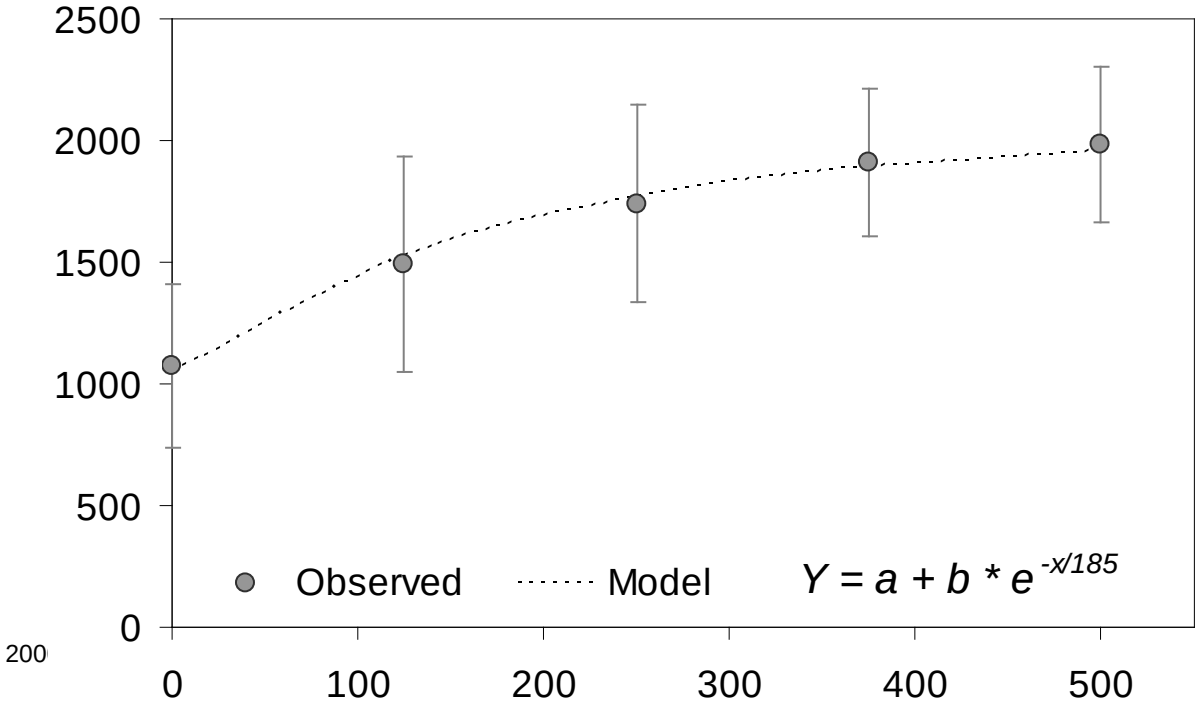
National policies with local consequences



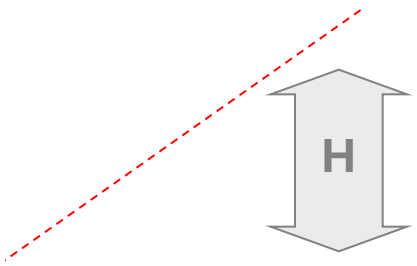
Decline in productivity

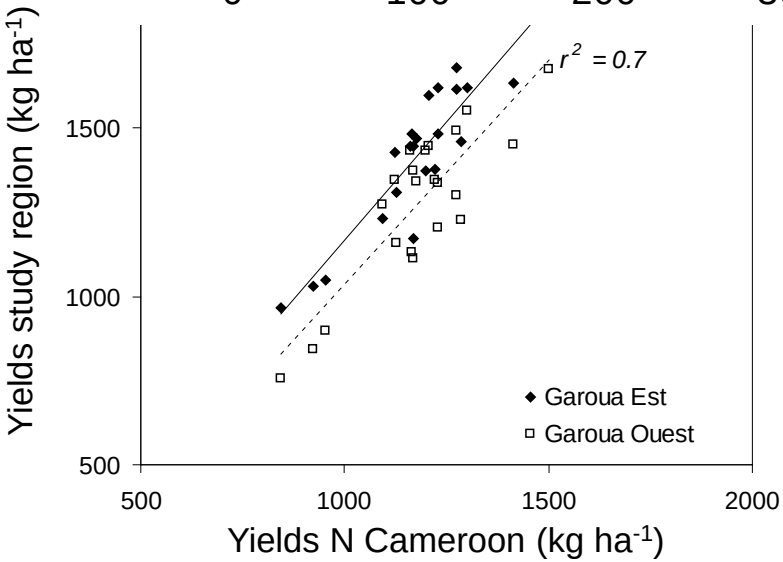


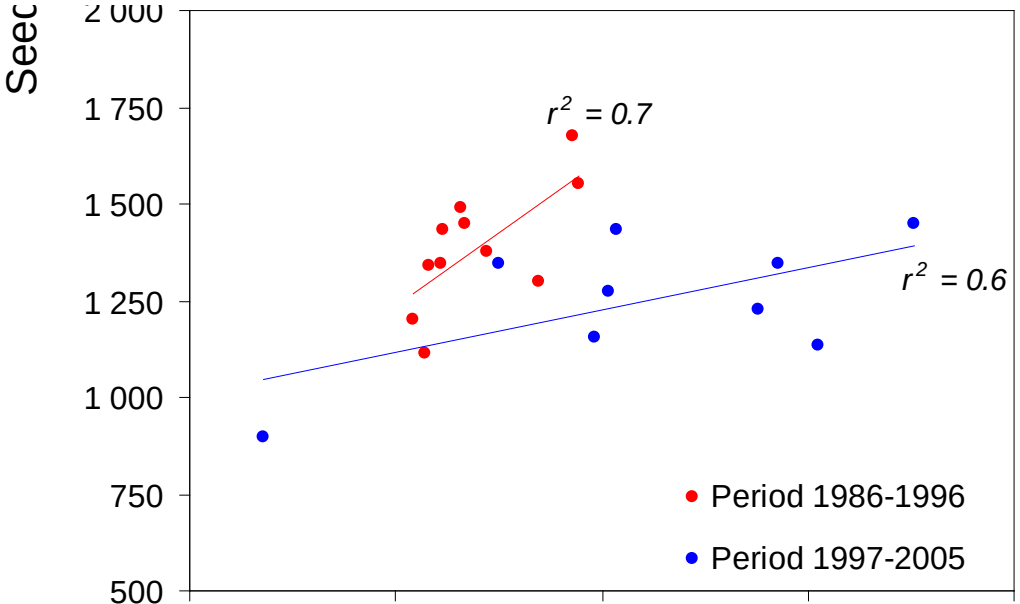
Discontinuous fertiliser use



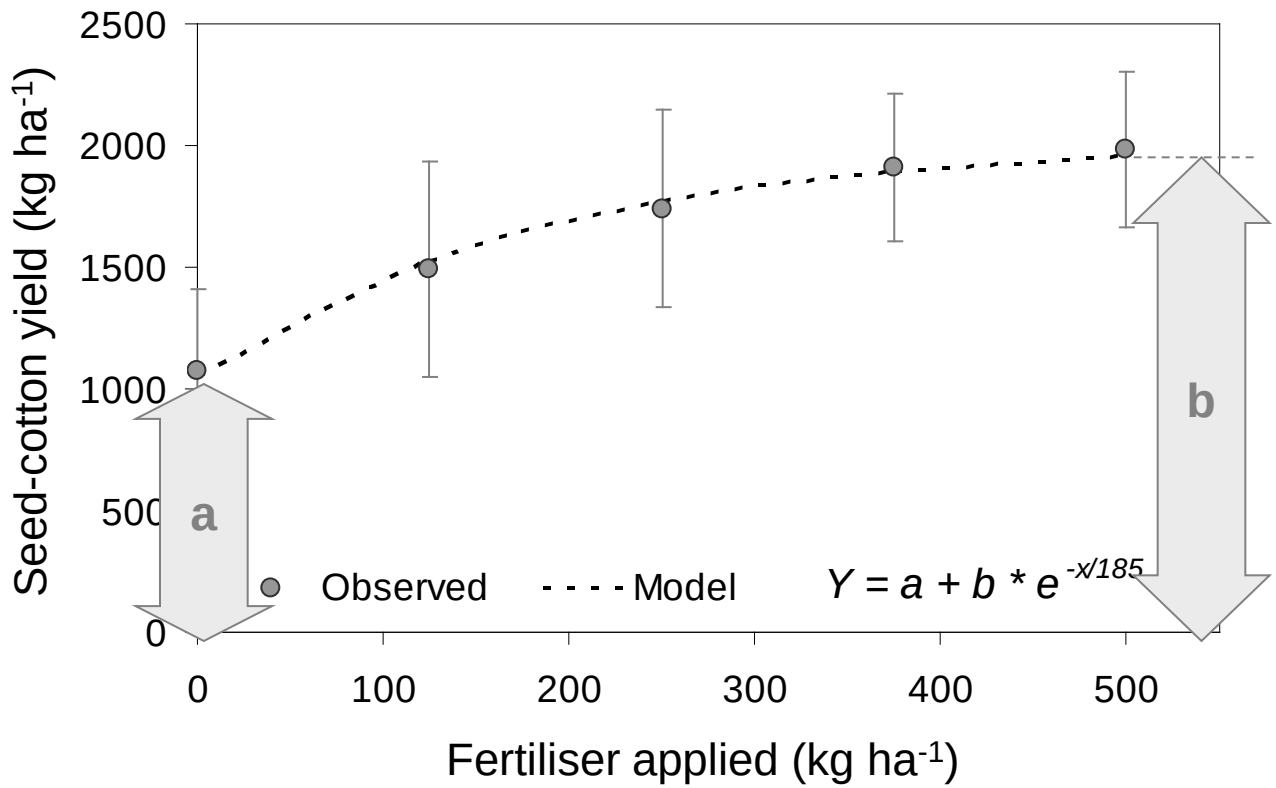
pplied (kg ha^{-1})







Average response to fertiliser by cotton in 1990



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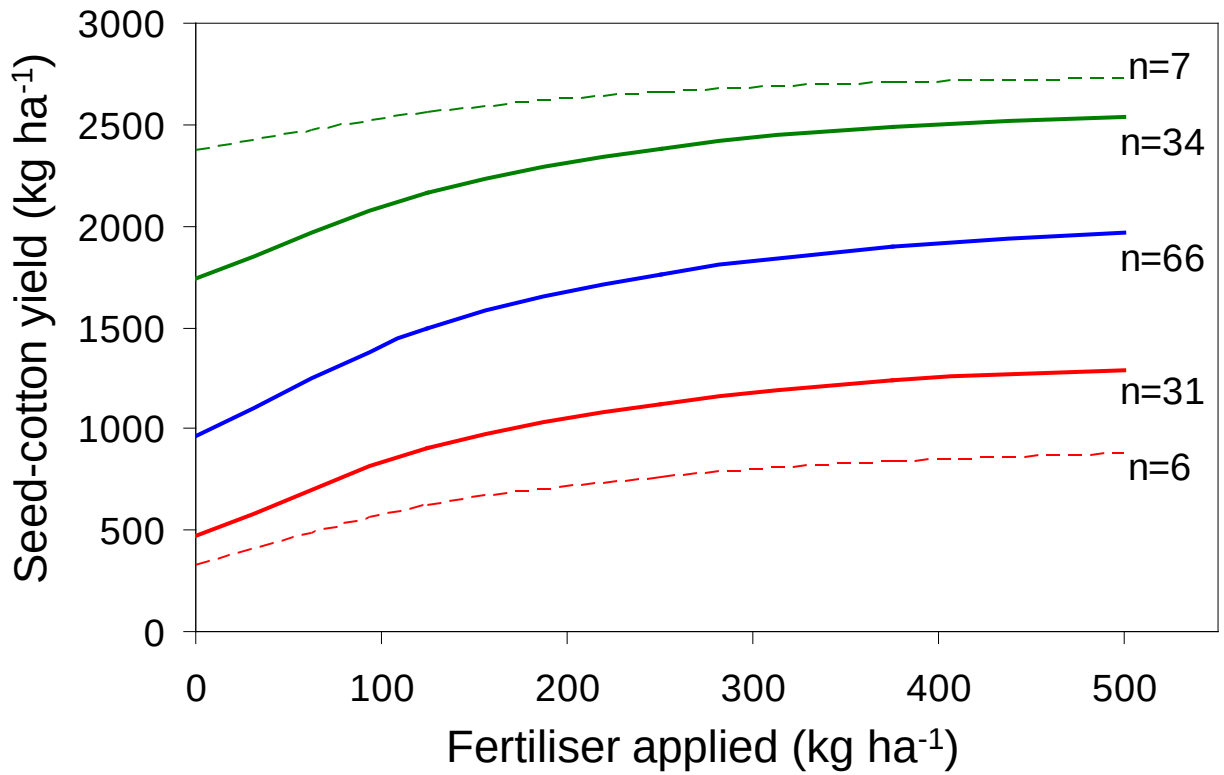
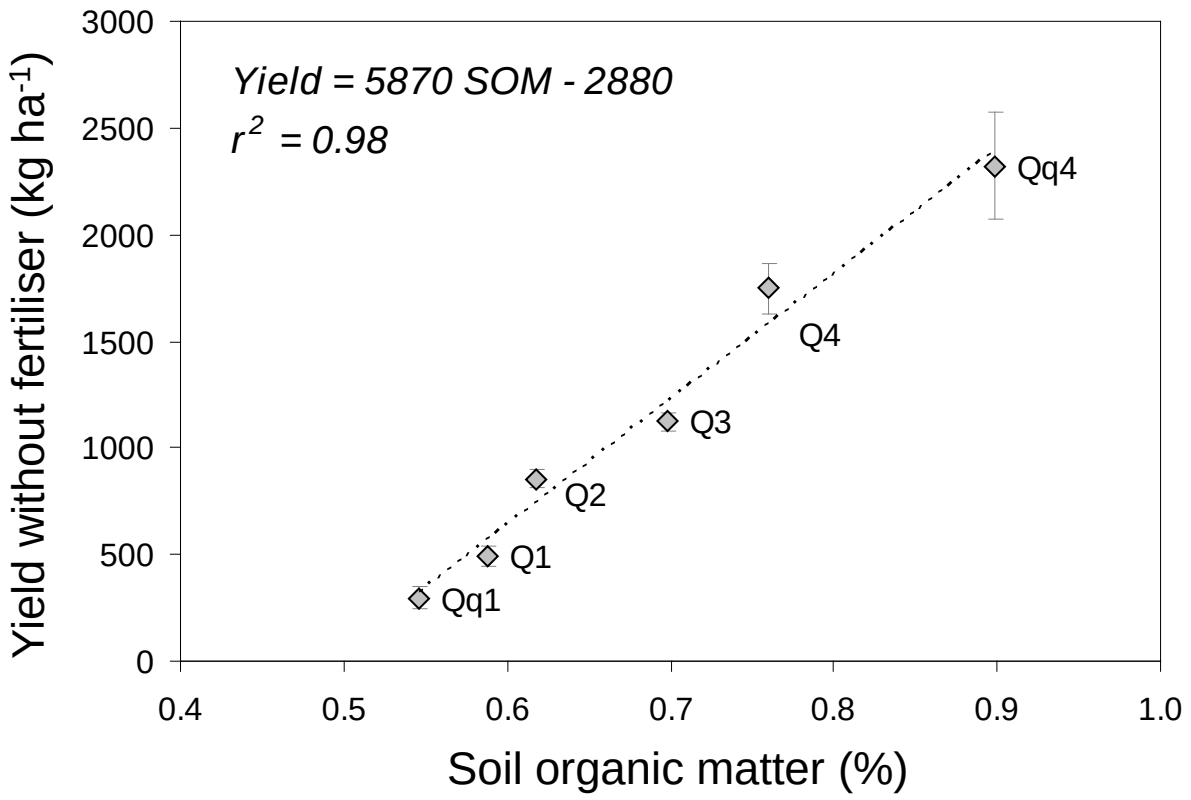


Soil productivity without fertiliser



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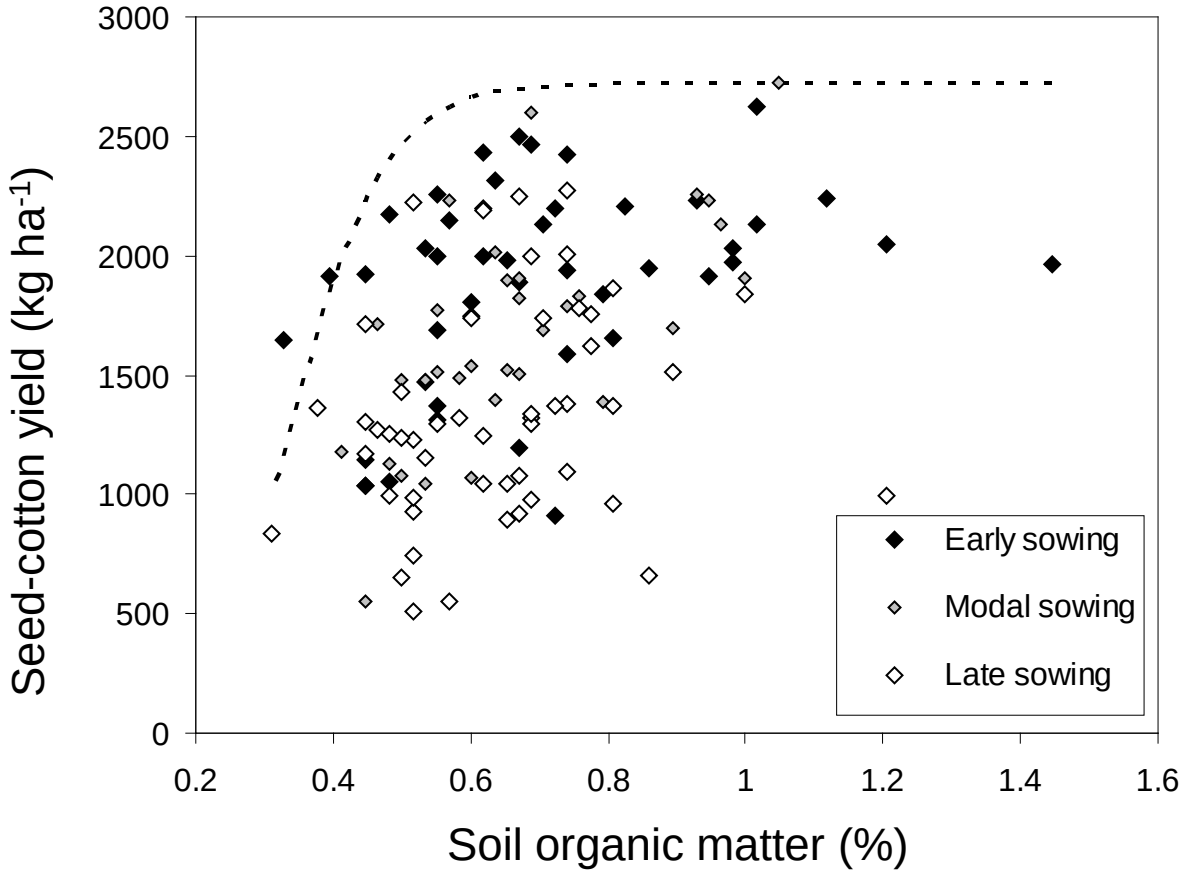
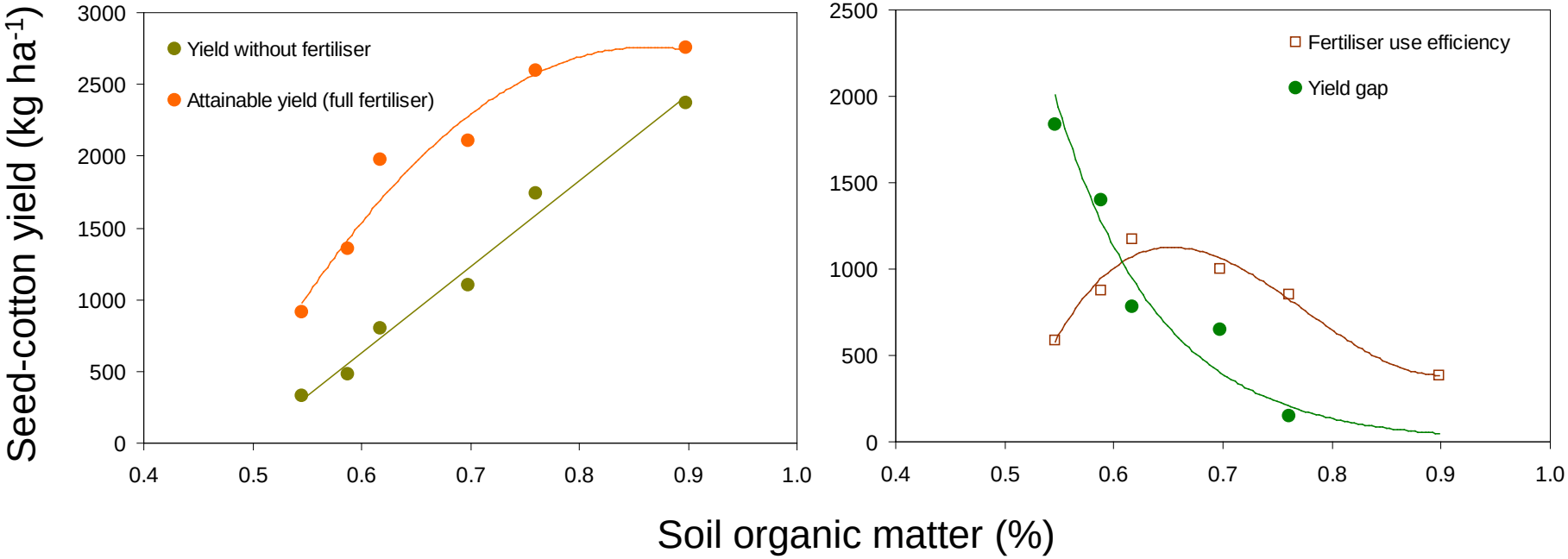


Response parameters, efficiency, yield gaps and soil organic matter



Discontinuous fertiliser use

Global fertiliser productivity at Garoua, N Cameroon