Session C.2

Land clearing, rainfed cropping and increased groundwater resources in semiarid SW Niger

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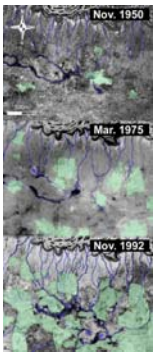
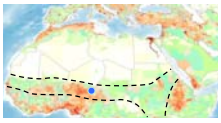
Regional changes



LULC C in the Sahel

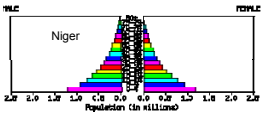
◄ millet fields

Population ►



Human density, 2000s

◄ Long-term dynamics ►

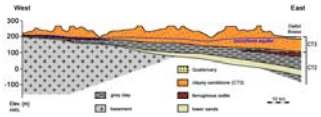


Rain-fed millet crop
(Pennisetum sp.)

expanded in surface area to meet food demand

Weak groundwater pumping

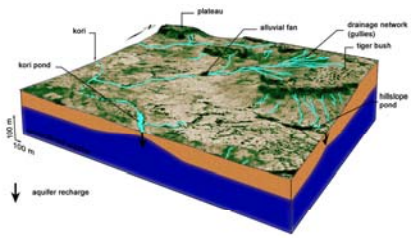
- Sandstone aquifer 150,000 km²



- Domestic water use is ~20L/inhab./day

- Irrigation is < 1% cultivated areas mostly from surface water groundwater pumping supported by WB and projects

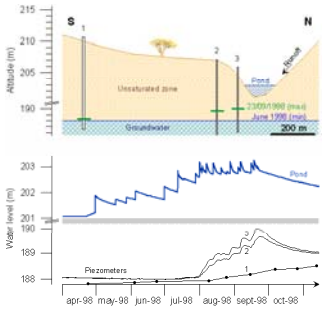
Landscape: no large river (endoreism)



- Intense rainfall events
- Soil crusting
- Slopes of ~1–3%

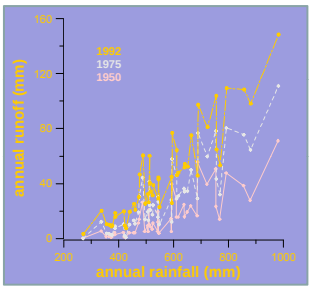
Watersheds of a few km²

Focused recharge

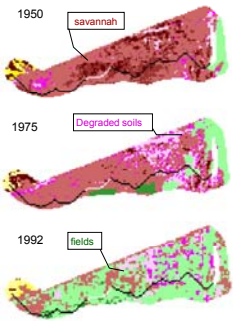


Pond during monsoon rainy season

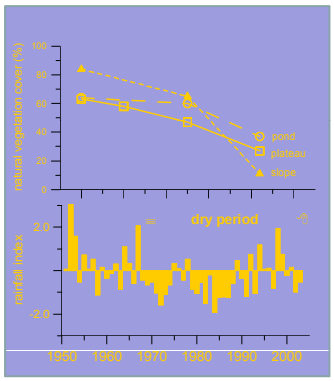
Soil crusting increased runoff



a × 3 increase in runoff capacity



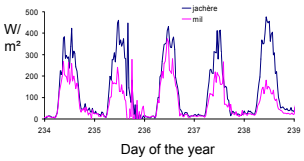
Groundwater recharge increased



Drainage increased

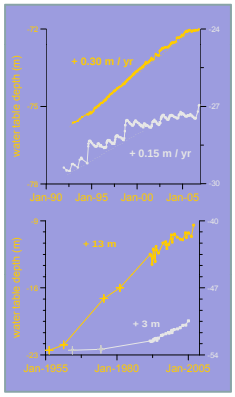
Flux station in millet field ▶

◀ Flux station in fallow area



Increase in drainage
and soil water content

Long term rise in the water table

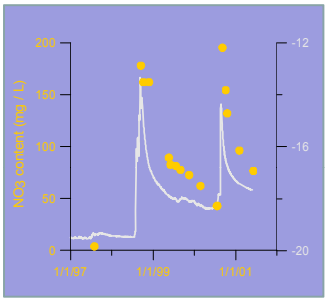


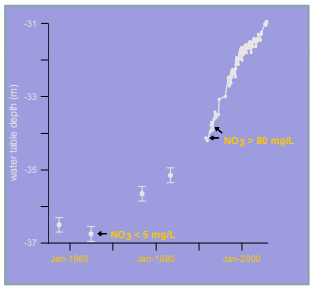
Aquifer resources have increased
by 15% in 50 years

Net recharge ~25 mm/yr

Increase in GW NO_3 near ponds

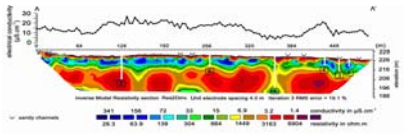
Seasonal changes in NO_3 content



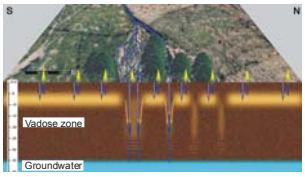


Long-term dynamics in NO_3

Leaching below gullies

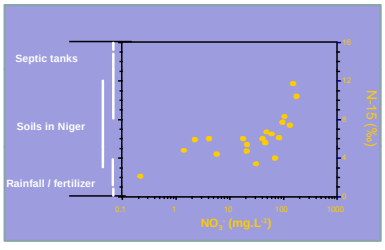


Solute accumulated at depth
is being leached to the water table



A natural origin for nitrate in groundwater

Valley bottom cleared



20% of pumped ground waters > WHO limit

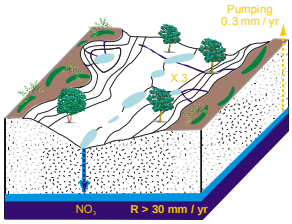
Summary

CLIMATE VARIABILITY

Rainfall : - 20%

Runoff: - 40%

No NO_3 input



LAND CLEARING

Runoff × 3
Recharge × 10

Net NO_3 input

Representativity at a regional scale, feedback on the monsoon dynamics ?

Technical / Science talk

Key consequences for decision makers :

- Excess of groundwater recharge of ~25 L / m^2 / year
- Land clearing increased NO_3 in groundwater near ponds
- irrigation should be encouraged to avoid soil salinization on the long-term
- Irrigation should be promoted near ponds

Irrigation wherever highly profitable...

Flat sandy to clayey landscape
1950s-60s

Irrigation started
In the 1970s