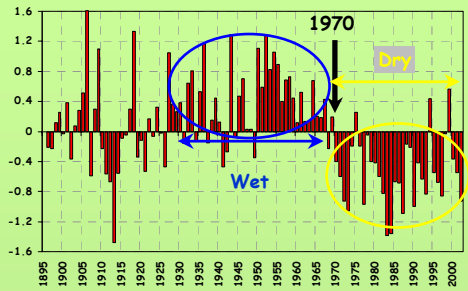
Small reservoirs of North Côte d'Ivoire, West Africa:

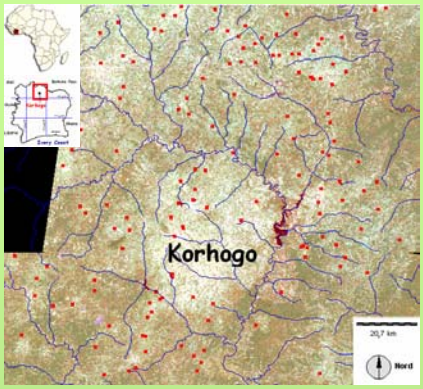
Philippe CECCHI – IRD UR 167 (*FLAG*) – 01 BP 182 – Ouagadougou 01, Burkina Faso. cecchi@ird.bf

In West African Sahel
Small reservoirs consitute a low-cost solution for water harvesting

Drought is persisting...

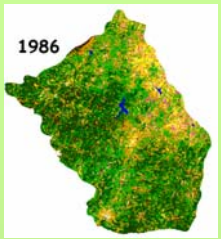


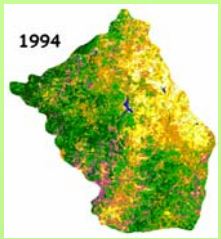
Rain index in Sahel between 1896 to 2002
A succession of different periods is clearly apparent. After a positive series of rainy years between 1930 and 1970, a dramatic and continuous reduction of rain's quantities led to the negative cluster of dry years that begins near 1970. Today, there isn't any signal of inversion of this tendency, with a permanent deficit varying between 15 & 40 %.



More than **250 reservoirs** lie on **Upper Bandama basin** (10 000 Km2, 700 000 inhabitants). Their first vocation was **cattle drinking** but they all exhibit a **multi-purpose** situation, linked to the expansion of **small-scale artisanal activities and domestic usages**. **90% of these artificial water masses are perenial. They represent 30% of available water resources during the dry season.**

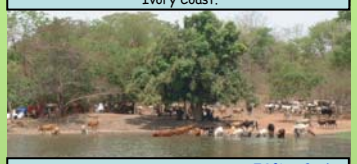
Watershed degradation is increasing...



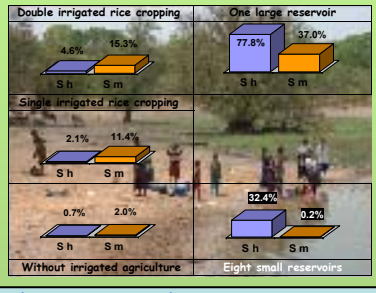


Land Cover evolution between 1986 and 1994
Solomougou watershed (> 1500 Km²). On the right, the **clear patch** associated to the progression of the **Korhogo town** and its peri-urban areas. More than 20 % of **forest and savanna** (**green**) have disappeared. **Eroded surfaces** and **crop cultures** (**yellow** and **orange**) have progressed in the same proportion. **Irrigated culture** in Inland Valleys (**pink**) occupied significant higher surfaces.

At the end of the nineties, **85% of the national cattle livestock** was gathered in the North of Ivory Coast.



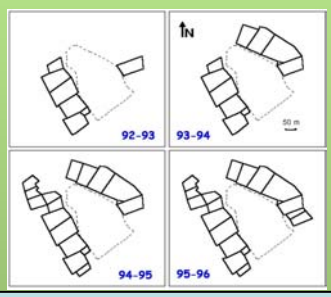
The first goal has been attempted: **50% of the national demand** is covered with, in the North of the country, more than 1,2 million of sedentary animals and around 400 000 yearly migrants.



Schistosomiasis prevalence (Sh: urinary; Sm: intestinal) are enhanced by the presence (and usages) of reservoirs, comparatively to irrigated rice devices or unused inland valleys. Small reservoirs appear however less harmful than large ones. Within neighbouring communities, contrasted situations occurred, depending mainly on social status of inhabitants (autochthonous, allogens, migrants, etc.).

Reservoirs	*T/year*
Kossou	5000
Buyo	8000
Ayamé	960
Taabo	650
Small Reservoirs	**535**
Morrisson	410
Fahé	180

Fish stocking has been practiced in many reservoirs and artisanal fisheries have been promoted. **With more than 500 T/year, the annual production** of small reservoirs is **closed** to the amount produced in **larger systems** but easily available because of the **scattering** of reservoirs in rural areas (proteins availability).



Market demands have stimulated the development and intensification of irrigated gardening around small reservoirs. In some place, gardens have progressively saturated all favourable areas for crop cultures, quite **closing** in the same time the **access to water for herds**. Here, in 96, culture occupied the same surface than water: 6 ha. Yearly inputs ranged from 63 to 126 Kg for Urea and NPK respectively; 1.25 kg of Pyrethrinoid was also used. **Impacts of such potential pollutions on aquatic communities remain poorly known.**

Excedentary nutrients inputs both associated to herds and agricultural practices are main responsible of ecological disturbances. Goods and services expected from small reservoirs may be directly threaten by eutrophication.

(Harmul) Algal Blooms are frequent.

contemporaneous practices as laboratory for future perspectives

Main positive impacts	at the local scales of individual reservoirs	Main negative impacts
domestic usages		
easiest access to water		target population for high schistosomiasis prevalence
recreationnal areas		other water borne diseases (diarrhoea)
fisheries		
exploitation of local resources		overexploitation potentially inducing ecological disequilibrium
controlled access to water masses		precarity of fishermen
rent directly payed by fishermen		redistribution of rents within local communities
proteins at village scale		target population for high schistosomiasis prevalence
pastoralism		
organic manuring of surrounding fields		overgrazing and erosion
milk at village scale		excedentary nutrients inputs and risk of eutrophication
animal power for agriculture		Land and water use conflicts with agriculture
irrigated gardening		
work diversification		conflicts linked to access to water for herds
crop availability at village scale		xenobiotics, nutrients and pollutions of aquatic ecosystems
cash flow		land tenure and exclusion within neighbouring communities
gender issue (women)		target population for high schistosomiasis prevalence
at the regional scale of network of reservoirs		
diversification of activities		
cash flow and protein productions		selective access within neighbouring communities
enhanced relationships between rural and urban areas		unknown retroaction in terms of poverty reduction of rural communities
new interregional connexions both for crop and stakeholders		poor controls of transboundary exchanges
densification of reservoirs		
enhanced water storage capacity		unknown Impacts on hydrological properties (global runoff, groundwater)
network of socio-economical hot spots		spreading of potentially associated risks
attractivity		usages and users conflicts

Inequity between & within communities
-food security
-poverty reduction
-exposition to water borne diseases
-access to water & resources

Complementarities and conflicts
-users and usages

Real threats regarding water quality
-eutrophication and Harmful Algal Blooms
-xenobiotics pollutions

Hydrological insecurity
-cascading of reservoirs

Small reservoirs are (artificial) man-made ecosystems. They constitute a real innovation in the landscape and for stakeholders. Natural resources produced or extracted could be the foundation for sustainable social development. But, in the framework of both global and local changes (climate, pop. densities) which may enhance the various threats (social, ecological, sanitary) that are still apparent.

Small reservoirs constitute already in the North of Ivory Coast a patrimonial heritage. Clear perception of their value by local stakeholders justifies the growing demand for the creation of new reservoirs. BUT, independently of actual political disturbances, small reservoirs have never been really explicitly considered. First actions to be developed could be institutional and should be oriented to an integrated management of these largely scattered resources. A clarification of status of reservoirs and associated resources (*are they public goods?*) is also absolutely necessary. Averting a "Tragedy of the Commons" involves restraining both consumption and access. This should be a political issue, not a local and extemporaneous decision.