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CoS-SIS Convergence of Sciences  
Strengthening Agricultural Innovation Systems  
Programme

# Mid-term Evaluation and Adjustments in the CoS-SIS Programme

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## Editors

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## Learning within the CoS-SIS Program about the CIGs - Story telling by PhD Students

### CoS-SIS Benin

#### Institutional changes in agro-pastoral dams water resources management in northern Bénin

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### Background

Water plays a key role in society in terms of food, energy, and industrial activities[1,2]. Pressure on water resources and surrounding ecosystems, such as urbanisation,

population growth, land use change, increased irrigation, construction of dams, pollution, climate change and other impacts related to human activities and economic growth need to be urgently addressed at local and global scales [3-6].

Agro-pastoral dams in northern Bénin are multi-purpose. These waterholes are open to the public, and thus are considered a common good [7-9] by many stakeholders with different interests, background, knowledge, and assumptions, and thus make the management of APDs complex [10-11]. The situation could be characterized as exemplifying the tragedy of the commons [9]. This creates conflicts among the stakeholders who all tend to reproduce their own 'truth' and shift responsibilities for solving the conflicts. For example, trying to achieve a solution by means of centrally imposed taxes or quotas may fail because central authorities tend to misunderstand the local situation.

Optimization of the use of agro-pastoral dam would benefit from further research that starts from an integral perspective, taking into account stakeholders' views and actions, including how these either strengthen or hinder each other, addressing technical, social and institutional challenges facilitated by the Concertation and Innovation Group (CIG)..

### **Addressing Institutional changes in agro-pastoral dams**

Institutions include formal and informal “rules and regulations” governing people's behaviour. Institutions create stability and order in society. The institutional changes in the efficient management of agro-pastoral dams are being investigated by PhD studies and by the CIG.

At the PhD level, the institutional change model investigated is participatory learning with stakeholders on practices that affect agro-pastoral water quality, fish production and crocodiles. Activities of the CIG (facilitated by the Research Associate) includes joint learning to change rules and regulations governing agro-pastoral dam use and management plan for a better water resources management. The PhD study and the CIG activities seek to achieve efficient integrated water management.

## Field experiments and their importance

Three field experiments have been conducted as follows::

### *i. Joint learning to agro-pastoral dam users assessing water quality*

Water quality was pointed out by dam users as a threat for humans, livestock and biodiversity.

The experiment was designed to: (i) Identify local people's knowledge of water quality; (ii) analyse chemical water quality (iii) set an experimental group for monitoring water quality and (iv) find innovative solutions to the potential threats to human health and biodiversity to improve water quality in agro-pastoral dams through good agricultural practices

It appears that local people have their own indicators of water quality (photo 1) viz. colour, odour, spontaneous vegetation, livestock behaviour, and crocodile behaviour. However, the most important water quality indicators are water colour, water odour and vegetation.

Dam water was sampled (photo 2) and the microbiological analysis showed that water is polluted by coliform, *Escherichia-coli*, spore of clostridium, streptocoque, *Salmolnella enteritidis*, and *campylobacter*. Nikki dam was more polluted than Sakabansi and Fombawi (table 1). These results illustrate that water pollution is caused by human activities.

**Table 1. Water microbiological analysis in Nikki, Sakabansi and Fombawi agro-pastoral dams**

Parameters Sites	Total Coliform	E-coli	Spore of clostridium	Streptocoque (feacal)s	Salmolnella tiphi	Salmolnella tiphynurium	Salmolnella enteritidis	Campylo -bacter
Sakabansi	75	0	19	5	-	-	-	-
Fombawi	75	0	22	5	-	-	-	-
Nikki	510	160	uncountable	660	-	-	+	+



**Photo 1.** *Experimental group assessing water quality in Sakabansi dam*



**Photo 2.** *Water sampling in Nikki dam*

**i. Participatory learning to improving fish production into agro-pastoral dams**

This study seeks to identify dams fish biodiversity, to estimate fish productivity, to observe and record crocodile fish predation to seek ways to improve fish production in dams.

The preliminary results obtained showed that the fish biodiversity consists of *Oreochromis niloticus*, *Brycinus nurse*, *Marcusenius senegalensis*, *Schilbe intermedius*, *Hepsetus odoe*, *Clarias sp*, *Tilapia guineensis*, *Barbus callipterus*. The fish species most appreciated by local people and the most valuable fish are *Clarias sp*, *Tilapia guineensis* and *Oreochromis niloticus*. (sse Photos 1, 2 and 3 ).



**Photo 2.** *Oreochromis niloticus*



**Photo 3.** *Clarias sp.*

**ii. Crocodiles habitat use for promoting peace collaboration between human and crocodile**

Crocodiles are part of agro-pastoral dam ecosystem and engage in peaceful collaboration between human and crocodiles in one hand and conflict in the other. The

study seeks to characterize human-crocodile interaction and to investigate crocodile habitat use. This study will start in 2012.

### **Monitoring/Impact assessment (RA-PhD chapter)**

The RA and the PhD are supposed to write a chapter on impact assessment. The outline of the chapter is designed together with the RA as well as the methodology (research design, theories, data collection).

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