


<b>Title</b>	<b>Inter-disciplinary research on Ecological sanitation in seven west African countries</b>
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<b>Photograph attached ( jpg)</b>	

## Introduction

Several of the francophone countries in west and central Africa are found on the bottom of the UNDP list of human development indexes. The populations are living under materially small circumstances and sanitary facilities, safe handling of water and hygienic knowledge are often absent and subordinated the daily provision of food for the family.

The target groups of Crepa, the regional centre for water supply and sanitation, are disadvantaged populations in urban, peri-urban and rural areas who do not have access to basic water and sanitation services.

With support from the Swedish international development cooperation agency (Sida) Crepa has initiated a research programme on ecological sanitation, running from 2002 until 2005. The programme is part of the international research programme EcoSanRes and is administered by Crepa headquarters in Ouagadougou. Pilot projects are executed by the Crepa national offices in seven countries: Benin, Burkina Faso, Guinea, Côte d'Ivoire, Mali, Senegal and Togo.

The aim of this programme is to develop a strong expertise regarding ecological sanitation in west and central Africa through the pilot projects in the region.

By initiating this program Crepa has the long term objective to ameliorate the social and sanitary living conditions of the targeted populations by facilitating their access to appropriate sanitary strategies and systems, adapted to their financial capacity.

The objective for the first two years of research is to study the feasibility of Ecosan systems in given socio-cultural contexts.

Three main results are expected from this programme:

- Ecosan pilot projects for research and demonstration are satisfactory realised in the eight countries.
- Tools for the promotion of Ecosan are developed.
- The Ecosan system is disseminated in the countries where Crepa is active.

The research programme is carried out in three phases: the preparatory phase, the phase of research and testing and the dissemination phase.

### The interdisciplinary approach

Crepa has decided to in each country proceed simultaneously in the four domains of sociology, technique, hygiene and agriculture. For that reason, multidisciplinary research teams have been set up by the national Crepa centres, consisting of four specialists, one of each of the four domains. The technicians and sociologists are normally Crepa personnel, some of the hygienists are Crepa employees and the rest are hired from a university or institute as are all the agronomists.

The research protocols were elaborated by the national teams, including an action plan where the collaboration between the researchers was included. Hence, in every country the whole local team was involved in launching the project at their pilot site by setting up a local committee, informing and sensitising the population. The construction of the toilets was carried out with the involvement of the beneficiaries and based on a socio-economic field study. Laboratory analyses of faeces, urine and compost were made regularly starting from the day the toilets were taken into use and at the same time the fields for agricultural tests were being prepared. As soon as the first laboratory results were available, the urine started being used on the fields. During the whole project the local facilitators have been following the benefiting families: hygienic habits are changed due to the test results, people are testing the products on their own land etc.



**Figure 1.** Collected urine about to be spread on maize in Togo.

In most of the pilot sites this approach has created an open interest in the reuse of toilet products and the repellent aspects of the excreta has in general been forgotten in favour for their obvious advantages as fertiliser. Even in communities where religious traditions advise you not to deal with excreta, the old beliefs have been neglected or reinterpreted to the benefit of the “Ecosan practices”. Many of the beneficiaries have started using the urine and faeces on their own crops, but still there are no, or just a few, private initiatives in building and paying an Ecosan-latrine with one’s own means.

### Organisation

Above the national research teams, a multidisciplinary research coordination team is in function at Crepa headquarters in Ouagadougou. Its role is to put up guidelines for the national work, to organise advisory and supervising activities and evaluate and ratify the

different pilot projects. A regional expert committee (the CTR) has been established, composed by one person of each of the four domains, working on consultancy basis. During the whole project period, from the elaboration of documents in 2002 to the restitution of results during a research Forum in December 2004 international advisors, active in the field of ecological sanitation, have been supporting and supervising the Crepa researchers in different phases and activities. Through the EcoSanRes network the pilot sites all over the region have received specialists on mission in agriculture, sociology and participatory methods in sanitation, hygiene and health, construction and urban planning. The practice of expert missions is new at Crepa and has been highly appreciated by the research teams who have been forced to advance and perform well.

In April 2004 all researchers, the regional coordination team and the CTR gathered in Ouagadougou during three days, with the objective to verify the level of advancement and orientation of the projects with reference to the experts' visits. On the agenda were discussions in mixed groups and in groups of specialists, as well as in the national teams. In November 2004 the research were advanced to such a measure that each national centre could hold a restitution workshop in the country where the results were presented to representatives from authorities, partners, NGOs and others interested. Some took their guests on field visits.

In December 2004 the first Research Forum in the history of Crepa was held in Ouagadougou during five days. Both internal and external speakers were presenting results from studies on sanitation and related fields as sociology, financing and agriculture. The forum was an opportunity for the Crepa network to reach out with its results, but it also came out with several pertinent recommendations for the continuing research work within Crepa and in the sector on global level. Those concerned for example the question of cost, marketing and finance. A synthesising report is available.

By the beginning of 2005, Crepa is entering the dissemination phase, during which the results from the research will be synthesised and spread to the identified target groups, the research will be deepened and large scale Ecosan systems will be established in three of the seven countries. This work is basically planned by the HQs' coordination team and the CTR, while every national centre is elaborating its own documents and carries out the dissemination activities and the pilot projects, still with the support from the above mentioned.

### **Activities within the domain of sociology**

The choice of pilot sites was done due to a number of criteria and the work started by a field study on the populations' habits, preferences, opinions on excreta, household compositions, economical status, religions and beliefs. This study was the base on which the technical solutions were elaborated and the benefiting households were chosen. The beneficiaries and participated in the conception of the toilet and did also contribute with labour and material in the construction. The different cultural, climatic, societal and religious conditions have conjured up local variations of the Ecosan concept. In Mali, Senegal and Guinea solutions to take care of water from anal cleansing have been elaborated, in Côte d'Ivoire a great need for fertiliser aroused the idea of public urinals providing a rapid and abundant return of urine, permitting the start of agricultural tests at an early stage.

The establishment of such projects is always made in collaboration with the local authorities and leaders. For the sensitisation and promotion of good Ecosan behaviour, local facilitators have been engaged to all pilot sites, some recruited from the village and some from outside. The facilitators were trained by Crepa and SARAR tools were fabricated to be used in the village. Every Ecosan family is visited at least once week to follow-up the use of the toilet, the cleaning and maintenance and the hygienic precautions.

### **Technical aspects**

The main part of the construction activities was accomplished during 2003 and the final works were finished during the first months of 2004. Local masons were trained by Crepa to do the construction. The following numbers and types of toilets have been constructed:

**Table 1.** The number of toilets presently constructed within the research project.

	Urban zone	Peri-urban zone	Rural zone	Cost
				CFA (656 = 1 EUR)
Benin	13 single and double vault Vietnamese (4 in a school)		17 single and double vault Vietnamese (4 in a school)	160000 / 250000
Burkina Faso		26 (Vietnamese and Tecpan, 1 claysuperstructure)	60 (Vietnamese and Tecpan)	110000 / 75000
Côte d'Ivoire			8 toilets, 2 blocs of public urinals, 14 urinals in 7 private homes	
Guinea			11 vietnamese with wet pit, one in local material (clay)	130 000 – 200 000
Mali			11 vietnamese with special anal cleansing water treatment	240 000
Senegal		25 toilets (19 VIP, 2 vietnamese, 4 tecpan)	15 toilets (13 VIP, 1 vietnamese and 1 tecpan)	120 000 – 160 000
Togo			20 vietnamese (3 in a school)	120 000
Sum	13	51	142 + 9 urinals	

Vietnamese here means a UD<sup>1</sup> latrine with raised slab and an opening for evacuation of faeces, closed by masonry. Tecpan implies that the faecal chamber is closed by metal sheets, sloping towards south to raise the temperature in the vault. VIP is a UD latrine with a pit receiving both faeces and water from anal cleansing. Infiltration of the water into the soil is permitted through the bottom of the pit. The model is used in areas with sandy soil and low ground water table. The household urinal is made of a jerry can, a funnel and a light bulb and used by both men and women.

The inhabitants at the pilot zones have been contributing with 10 – 20 % of the construction cost, but the contribution is in kind: water, gravel, sand, labour, and not in cash. They have also been offered to have the toilet constructed in local material: clay, straw and wood, but refused, even if every other house in the village is made of local material. Some toilets have however been built with a clay superstructure. The cost of clay superstructure is about 10 % less than a concrete superstructure. The foundation and the faecal vaults still have to be made in concrete.

### Agricultural tests

The agricultural research has been conducted by agronomists, hired by the National Crepa centre from a university or research centre, as agriculture normally is not included in the Crepa projects. At every pilot site an experimental field has been allotted by the inhabitants, which has provided for an authentic environment. In some countries agricultural tests has also been made at agricultural schools. The crops that have been tested are: maize, sorghum, cotton, yams, cassava, aubergine, lettuce, tomato, cabbage and groundnuts. Most of them were local varieties and some were improved. To study the effectiveness of urine compared to vulgarised mineral fertiliser (FMV) the crops were given five or six different

<sup>1</sup> Urine diverting

treatments: no fertiliser at all, FMV, three different doses of urine (Q, Q/2 and 3Q/2) and a treatment of phosphor and potassium. The dose Q of urine corresponded to the amount of nitrogen advised on for FMV.

In the seven countries the preliminary results after one or two growing seasons are promising, though further research has to be carried out to confirm the present findings. At this stage no conclusions can be drawn considering yield, optimal doses or effects on soil for example. It is however possible to make certain statements from the first agricultural tests: The population and the farmers in particular have during the period been familiar with urine as a liquid fertiliser. The treatment has indeed shown a positive effect on the tested crops and some effects on the soil properties. Certain casualties are inhibited or diminished. The nutritive compositions of the fertilising products have been established.

### Hygienic aspects



**Figure 2.** Ecosan squatting slab in Burkina Faso. Ashes available.

(greywater or water from dams) for irrigation. This aspect needs to be further investigated.

The urine and faeces have been analysed regularly during the storage time in order to follow the hygienisation process. Samples have been taken after 0, 15, 30 and 45 days of storage for the urine and up to six months for the faeces. The hygienisation period has varied between the different countries, both for urine and faeces. In general the urine is free from pathogens after four weeks and the faeces after 5 months of storage. Some of the pilot projects have arrived at a hygienisation time of two months for the faeces. It is worth noting that a perfect hygienisation of the fertilising products can be spoiled by using contaminated water

### Conclusion

Crepa see the Ecosan project as a big success considering the fact that all the seven countries that embarked on the second phase have been able to proceed satisfactorily with the research in the four domains and come out with valuable results. The research protocols have been followed, just with some delays, and problems have been solved as they appear, either by the researchers themselves or in contact with the regional coordination team at Crepa HQs, the CTR or the international experts within the EcoSanRes network. During the time, new elements have been found important or interesting to include or investigate further. Some have been necessary to add to the project, while others can be considered for an extended program or another phase.

#### *A selection of achievements*

The interdisciplinary approach has shown to be a success; several problems have been resolved by finding a solution in a different domain. For example the problem of liquid faeces in a Muslim society was tackled partly by teaching general hygiene behaviour to the population, which decreased the diarrhoeas, partly by introducing a compost method which speeded up the time for hygienisation.

On the whole the relations between the researchers and the population have been well functioning, assured by the identification of local resource persons and facilitators. Local competencies have also been developed for construction of toilets and operation of agricultural activities. The toilets have turned out to be well functioning, limiting the presence of flies and bad smell, easy to keep clean among other things. The populations have also

accepted and eventually supported the use of Ecosan products in agriculture, convinced by the thriving fields of diverse crops.

It is also considered successful that the hygienic situation at the pilot sites has ameliorated in general and that the hygienisation of the urine and faeces have been sufficient enough to permit the beneficiaries to handle them without sanitary risk. This has paved the way for a common acceptance to manipulate the products. Loads of hygienised faeces are even carried in basins on the head.

#### *A selection of insufficiencies to attack*

The fact that the Ecosan latrine models constructed are not affordable for the target group is a great challenge that will be addressed during the continuing work. The problem has several components: lack of technical innovations or other measures to reduce the cost, local materials are scarcely used, lack of alternative financing mechanisms, the motivation of the population is not big enough to raise private initiatives and on top of this the cost of facilitation is not included in the construction cost.

When scaling-up it will be necessary to find structures (associations, cooperative societies, entrepreneurs, artisans etc) who are willing to do the collection of the products when the beneficiaries don't need them and manage the reuse in agriculture. This approach will also permit to proceed into densely populated areas, where Crepa still has not intervened. Several mechanisms concerning the hygienic aspects need to be further investigated, such as revivification, the dynamics of hygienisation as a function of product origin, alternatives to ashes etc.

It is concluded that the Ecosan philosophy has a potential to be successful in the region, even more when affordable techniques have been elaborated. The reuse of nutrients, using a hygienically safe technique, may have a considerable impact on the economic, social and sanitary situation of a low-income family.

The aim for Crepa during the dissemination phase is to spread this knowledge and awareness in order to benefit the target group in the end. It is decided to capitalise the results in a comprehensive tool box: simply a number of booklets, each treating one of the Ecosan elements in an instructive, pragmatic and practical way, to be used by professionals, entrepreneurs, NGOs, associations and others in the implementation of Ecosan in different contexts. In this work it is natural to include the collection, treatment and reuse of greywater, an issue that already has been addressed by Crepa in a research project. During the following year(s) Crepa will put a great effort in developing tools that can be used by actors in the sanitation business to sanitise the African communities.