**SUEZ Initiatives – French Institute Awards**

## “Access to Essential Services” Prize

**2015-2016 edition**

# "CAJOUVALOR", *Burkina Faso*

# RONGEAD, in partnership with CEFREPADE

## Structure

Created in 1983, RONGEAD is a non-profit making non-governmental organisation based in Lyon, whose activities concern the agricultural, agro-industrial and NTFP (non-timber forest products) sectors. Its activity aims to facilitate market access for players involved in the value chain, to reinforce the capacities of producer organisations and to reduce environmental externalities in transformation processes and in agricultural policies in developing countries.

## Context

After supporting cashew nut producers for the past 15 years in West Africa, RONGEAD has turned its attentions to the emergence of local transformation, whose high job creation potential and added value is favourable for socio-economic development. It is therefore within the context of the accompaniment of cashew nut shelling companies which set up locally from 2009, Rongead began to show an interest in recovering the outlet’s waste, cashew nut shells.

This activity is taking place in a globalised marketplace in which India, Vietnam and Brazil are the major players. These countries, more experienced in this outlet, recover the quasi-totality of by-products and are consequently gaining in competitiveness.

It therefore appeared necessary to envisage the recovery of cashew nut shells, which correspond to 80% of the raw nut mass. The high cost of energy in West Africa unfavourably impacts the competitiveness of cashew nut shelling plants. RONGEAD therefore focused on the search for appropriate technical solutions adapted to African contexts in order to recover shells in the form of energy. This project meets several challenges:

- Environmental
  - **The management of cashew nut shells as a waste** poses a problem. In effect, this woody biomass contains a “balm” (CNSL: Cashew Nut Shell Liquid) composed of toxic and corrosive phenolic acids which pollute soils and groundwater sources.

- Cashew nut shell recovery processes require energy, which is both rare and expensive in West Africa. The few pre-existing transformation plants prior to CAJOUVALOR used wood from local forests, which we know to be increasingly threatened on a daily basis, and natural gas. **Transforming shells into energy provides a response to the major challenge posed by deforestation** in West Africa, and also **contributes towards the fight against climate change**.

- Economic:
  - **Recovering all of the by-products is important.** CNSL can be recovered commercially but within market conditions which are not present in West Africa. Nevertheless, CNSL possesses a Lower Calorific Potential (LCP) than diesel, which makes it a very good fuel. Reducing waste treatment and energy costs therefore constituted a significant stake in ensuring the sustainability of cashew nut shell transformation companies in West Africa.
  - By replacing wood or natural gas, the energy produced from cashew nut shell transformation can spur an economic recovery linked to the reduction of environmental externalities, namely via carbon credits.

At an organisational and methodological project implementation level, it consisted in succeeding in **creating a constructive exchange space between "official experts" and "unofficial experts".** The "official experts" are qualified researchers and other engineers from leading universities. The "unofficial experts" are tradesmen and / or astute and inventive workers, who, in an empirical manner, have developed tools or methods. Even though they possess additional knowledge, expertise and know-how, these players have no meeting place.

### Objectives

*Global objective:*

**To reinforce the competitiveness** of semi-industrial structures on international markets whilst **developing their energy-related and environmental performances**.

*Specific objectives:*

- To accompany the necessary transformations at the level of the pilot plant in order to **optimise energy performances** (development of cashew nut shell energy-recovery technologies, use of recovered shells, solar water heaters…)
- To encourage the **development of secondary markets** for transformation plants based on the sale of replacement **fuels** produced from recovered shells, creating an energy surplus in relation to the needs of the facility.
- To promote a "**payment for environmental services"** system (Carbon Credits on voluntary markets and promotion of a multi-indicator approach including biodiversity, water and soil quality).

## Description of the project

The project consists in 2 main innovations:

- The H2CP: the High Calorific Cashew Pyrolyser. It consists in a pyrolysis reactor adapted to the biomass represented by the cashew nut shell. The H2CP permits cashew nut shells to be recovered in two forms.
  - Pyrolysis gases are consumed at the facility in a post-combustion chamber at the reactor outlet. They provide the necessary energy for a boiler which can power the autoclave, which is useful to soften raw nuts prior to shelling, and almond dryers.
  - The shell charcoal obtained at the end of the "batch" represents 15% of the raw shell mass introduced into the reactor. The project ensures that this charcoal is totally free of its toxic compounds before promoting it to replace the wood energy usually consumed in the domestic fireplaces of production plant employees.

- The RIVATECH network: Le Réseau de l'Innovation sur la Valorisation des déchets et les TECHnologies adaptées (Network for Innovation on Waste Recovery and Adapted Technologies) is a group of players united by their common interest for agro-industrial waste recovery. Now a national association, RIVATECH brings together waste treatment experts but also tradesmen from welding or general mechanics workshops, technical colleges, researchers, NGOs and the local authority via the Hauts Bassins Regional Council or the French Regional Development Agency.

## Description of the innovation

The technical solutions provided by the CAJOUVALOR project correspond to innovations which respond both to waste management problems and access to a renewable energy source for the poorest populations. In West Africa, as well as the rest of the African continent, and thanks to the H2CP, it is now possible to envisage economically viable and complete management of waste from this industry which the local population can benefit from by making available a renewable fuel at a competitive price: charcoal from cashew nut shells.

## Results

On an environmental level:

Since the installation of H2CP pyrolysis reactors in the Bobo Dioulasso units:
- 400 tonnes of shells have been transformed into energy permitting 500 T of wood and approximately 13 T of butane to be saved ;
- 50 tonnes of cashew nut shell charcoal has been produced ;

This corresponds to approximately 450 T $CO_2$ equivalent saved every year and to approximately 600 hectares of Sahelian forest safeguarded.

It should be noted that the elimination of this waste also reduces the risk of fire breaking out among the piles of stored nut shells. In addition to their very poor environmental impact, the latter generate acrid toxic fumes which can seriously affect the health of surrounding populations.

On a socio-economic level for project target groups / beneficiaries:

The companies directly targeted by the action count almost 300 employees. Their jobs are secured thanks to the improved competitiveness of the company which employs them thanks to the H2CP. In addition, it is generally the employees who directly benefit from the charcoal produced by the H2CP in addition to their salaries.
In an indirect manner, the maintaining and development of the transformation industry is a favourable element for cashew nut production, given that it ensures a commercial outlet for producers.

## Reproducibility of the project

When the H2CP was developed, RONGEAD and CEFREPADE took the appropriate steps to optimise the reproducibility of the technology by anyone wishing to do so. In effect, a "Soleau envelope" was submitted to the INPI (French National Institute of Industrial Property). This simple initiative permits the ownership of the innovation to be guaranteed, but more particularly, it prevents any other organisation from filing a patent which would stop its diffusion.

In addition, RONGEAD has joined forces with IED (Innovation, Energy, Development) to submit a project proposal to the AFD (French Development Agency) within the context of the FISONG. This concerns a change in scale of the H2CP in order to respond to the stakes emanating from much bigger industrial plants. It consists in developing solutions, based on the fundamental principles of the H2CP, able to recover waste from industries whose transformation capacity would be between 10 000 and 30 000 Tonnes of raw nuts per year. This project, accepted and financed in 2015, should begin in 2016 and will aim at developing a pilot device permitting electricity to be generated from nut shells husks originating from an Ivorian industrial plant. The challenge is also to innovate so that the electricity produced can be distributed via independent micro networks.

## Conditions of reproducibility

Since the end of the CAJOUVALOR project, we are continuing to work towards overcoming existing shortcomings in order to generalise this technology in West Africa. To this end, we can see that there is a need for technical – commercial expertise for its diffusion and for capacities linked to the design of new facilities.
The methodology of the AGROVALOR project is essentially based on the boosting of local expertise within the context of the research and development project involving numerous local players. In the same dynamic as CAJOUVALOR, the main difference of this project will be its scope and the number of outlets concerned.
The FISONG project, concerning the development of solutions adapted to much larger industries, is based on the complementary nature of expertise between RONGEAD and IED. The technological level necessary for this project required the specific expertise of the company IED. As for RONGEAD, it provides its expertise on the cashew nut value chain and the sub-region.

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## Internet Site

- SUEZ initiatives – French Institute Awards: www.prix-initiatives.com
- RONGEAD : www.rongead.org
- CEFREPADE : www.cefrepade.org