How rice residues* transform the economy of women parboilers in Benin

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"*Nothing is useless, not even what seems lost*." Victor Hugo

Rice, a strategic sector

Among the most widely grown cereals, rice is the second emerging cereal, with the volume of regional paddy production increasing from 2.5 million tonnes to nearly 13 million. In Benin, it is one of the staple foods most consumed by households. Among the main crops produced in the region, rice is becoming increasingly strategic, both for food security and local economies. In northern Benin, to improve the quality of locally paddy rice, intermediate activities are carried out by some rural women.



Rice parboiling as a source of income for rural women

In Natitingou, a town located in the north of Benin, women's entrepreneurship is ahuge part of income-generating activities. Agri-food processing activities are mainly female. This is the case of the transformation of paddy rice into parboiled rice and an activity that gathers women, often organized in small groups aspiring to autonomy and financial fulfillment. Indeed, rice parboiling is a process that consists of pre-cooking paddy rice before being shelled and then packaged ready to besold. Through this activity, rural women ensure their financial autonomy and fulfilment, which allows them to contribute to household expenses. However, they have long faced constraints such as access to rice raw materials and the market to sell parboiled rice. A question remained in their minds: How are we going to do it? The arrival of the initiative led by a local NGO in collaboration with an international development NGO whose objective is to support women towards agricultural entrepreneurship has allowed women to see their activity gain momentum. The support of these NGOs to women processors has offered opportunities to them, in particular, access to paddy rice, access to suitable equipment for parboiling, access to a mini-rice mill for selling parboiled rice, and the guarantee to a market. More interestingly,

they benefited from a space to do market gardening while waiting for the availability of paddy rice, which allowed them to have a second source of income.

The setbacks of rice parboiling

The permanent availability of paddy rice, leading to the frequent exercise of rice parboiling, has raised new financial, environmental, and health constraints. From a financial view, rice parboiling is an activity that is done traditionally. It requires the use of a large quantity of firewood. In fact, parboiling 100 kg bag of paddy rice, it costs 10000 FCFA to buy firewood, which diminishes their income. In terms of health, these women are often exposed to the excessive smoke emitted by these woods and to coughing and itchy eyes, which creates additional financial costs for the purchase of medicines. From an environmental standpoint, the commercialization of these woods contributes to deforestation, a practice that has negative impact on environment. Parboiling is also an activity that generates enough agricultural waste, especially rice husks and rice bran, which pollute environment, making it unhealthy. These residues bring a real problem. Difficult to decompose, they accumulate around the shelling factory, invading the spaces available for other agricultural activities such as market gardening. The most common solution to get rid of them is to burn them; however, they contribute to air pollution and greenhouse gas emissions. Similarly, water from the parboiling process is most of the time unloaded into open environment. A reflection on the management of agricultural residues proved that these products from rice production could be used for various purposes such as bio-energy, composting and mulching, animal feeding. The objective being to find alternative solutions to the use of firewood by women, ideas converged towards the production of biological, economical charcoal.



Waste becomes the solution

Residues that were once perceived as bulky, negatively impacting the environment, are now considered an energy source. Indeed, rice husks, long neglected, are now recycled into briquettes, also known as organic charcoal. This product is obtained after carbonization and grinding rice husks to obtain a powder that will be mixed with a natural binder before being compressed and dried. These briquettes are first made available to women parboilers for testing. During their experiments, they stated: "briquettes are very economical, reduce cooking time, no longer expose us to smoke and heat". Since then, the NGO has embarked on this production which is sold to women at 100

CFA francs per kilogram. The women are therefore satisfied. With the briquettes and the use of adapted stoves, with 700 FCFA briquette, they steam 1 bag of 100 kg. This allows them to save enough money. In addition, they can cook quickly and save then enough time and energy. Instead of 45 minutes for steaming, with the briquettes, it is done in 30 minutes. Also, briquettes give off less smoke and the use of eco-friendly fireplaces no longer makes them spend energy to fan the fire because these fireplaces are equipped with blowers that produce wind to fan the fire.



Apart from these briquettes, another innovation produced to lighten the burden on women market gardeners is the production of biochar. It is obtained by pyrolysis (or carbonization) of rice husks. They are transformed into a pure charcoal, rich in fixed carbon.



This final product obtained is spread on the surface where vegetable crops are planted. This product allows to reduce plant watering by half (from 2 times a day to once a day), reduce weed invasion and fix soil nutrients to facilitate plant growth. The use of biochar is now anchored in the daily practices of women market gardeners.



Today, these residues, once referred as bulky waste, have become not only an energy resource that can be used in households, but also an opportunity to create jobs and income for young

people who want to generate incomes. This proves that "Nothing is created, nothing is lost, everything is transformed", a famous proverb by Antoine Lavoisier.