

Fonio: a small grain with potential

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Fonio (*Digitaria exilis*), a small cereal from West Africa, is much loved by farmers and consumers because of its many advantages. Fonio has a short growing season and is well adjusted to harsh environments. The cereal has excellent culinary and nutritional properties. The only drawback is that the grains are tiny and difficult to peel, which makes processing a tedious job. These difficulties have reduced the crop to a marginal cereal. However, efforts are now being made to develop equipment that will facilitate the processing of fonio.

Old and robust

Fonio is possibly the oldest indigenous cereal cultivated in West Africa. The domestication of fonio seems to go back 7000 years, but the first references to fonio as food date from the fourteenth century. The Dogons of Mali, an ancient people, refer to the fonio seed as “the germ of the world”. They believed that the whole universe emerged from the fonio seed – the smallest object known.

Nowadays, fonio still grows in farmers’ fields over a vast area extending from Senegal to Chad. Fonio is a staple food for many rural communities, especially for communities in the mountainous areas of the Fouta Djallon in Guinea. Farmers in Mali, Burkina Faso, Ivory Coast, Nigeria and Senegal also cultivate the small cereal. West African farmers mainly cultivate white fonio (*Digitaria exilis*), which is also called *fundi*, *findi*, *acha* or “hungry rice”. In Nigeria, farmers grow black fonio (*Digitaria iburua*) as well. In Guinea, farmers also occasionally plant the so-called “fonio with large seeds” (*Brachiaria deflexa*) but this is, in fact, a different species.

The production of fonio declined sharply in the 1960s but began to recover twenty years later. The increase in production can be attributed to larger areas being cultivated. Although average production per hectare remains relatively low, it has remained consistent at 600 - 700 kg/ha. At present fonio is grown on more than 380,000 ha and produces 250,000 tons of grain annually. Fonio supplies food to several million people during the most difficult months of the year when other food resources are scarce.

Fonio cropping cycles vary from 70 to 150 days depending on the variety. Varieties with a very short cycle (70 - 85 days) allow the farmers to harvest early and enable them to cover the critical “hunger” season before the major food crops can be harvested. Farmers generally cultivate fonio on light sandy or stony soils as the crop is not very demanding. The late varieties, in particular, are well adjusted to poor soils. This small grass, which reaches heights of 30 - 80 cm, is very robust and can resist periods of droughts and heavy rains.



Photo: Author

Farmer harvesting fonio.

Tasty and healthy

In West Africa fonio is considered to be the tastiest of all cereals. Serving fonio as a dish at festivals or important ceremonies is always a good choice because of its fine and delicate taste. As a popular proverb says “Fonio never embarrasses the cook”. Fonio is also known for its nutritional properties. Although the protein content of fonio is similar or slightly lower than that of other grains, it contains amino acids like methionine and cystine which are essential to human health. These are often deficient in today’s major cereals. As fonio is known to be easy to digest, it is traditionally recommended for children, old people who cannot digest other cereals, sick people and for people suffering from diabetes or stomach diseases. Local pharmacists also recommend fonio for people who want to lose weight.

Fonio, regarded as a minor cereal for a long time and referred to as the “cereal of the poor”, is attracting renewed interest in the urban areas of West Africa because of its cooking and nutritional qualities. Agricultural policies in the region are also changing in favour of traditional crops to try and decrease dependency on imported food products.

Difficult processing

In order to meet the needs of urban households, small enterprises, set up by artisans' or women's groups, have recently started to sell already-cleaned fonio in the markets. In Mali, Burkina Faso, Guinea and Senegal, small businesses are marketing pre-cooked fonio packed in plastic bags of 500 grams or one kilo. These products are distributed to groceries and supermarkets and are even exported to Europe and the United States. However, the price of fonio prepared in this way is high because the grain has to be prepared manually and this is a long process.

Processing fonio is a difficult and time-consuming task because of the extremely small size of the grain. One gram of fonio contains nearly 2000 grains and each egg-shaped grain is only about 1 - 1.5 mm long. After threshing, the grain is still surrounded by husks. This product is called "fonio paddy" or "raw fonio". Like rice, processing paddy into whitened fonio is done in two stages. The first stage, known as dehiscing or peeling, involves removing the husks from the seed to obtain the dehisked grain. The second stage, known as whitening, aims to remove the bran (the pericarp and the germ) from the grain. Dehiscing and whitening of the grain is done by hand and require four to five successive beatings using a pestle and a mortar alternated with as many winnowings. The productivity of this work is very low. It takes nearly one hour to peel just one or two kilos of fonio paddy. Moreover, in order to obtain a quality product, all dirt and sand must be eliminated. This means that the product should be washed several times which also adds to the amount of time and effort required for preparation. Thus, mechanizing the processing and the cleaning of fonio is essential both to reduce the painstaking work for women and to improve the quality and availability of the marketed product.

Mechanization

To make fonio more competitive on the market in terms of quality and price, it is necessary to improve grain processing techniques at small company and women's group level by modernizing existing and developing new equipment. To meet these needs, a regional project has been initiated that focuses on improving post-harvest technologies for fonio (1999 - 2004). The project is being carried out by CIRAD in collaboration with the national research institutes of Mali (IER) Guinea (IRAG) and Burkina Faso (IRSAT).

Before the project, there was little equipment available to process fonio and the equipment that did exist did not fully satisfy the users. It was, therefore, essential to improve and develop equipment that would make it possible to mechanize as much of the post-harvest operations as possible.

The CIRAD project carried out several technical studies aimed at improving equipment. These studies have so far led to an adaptation of a thresher and to the development of a dehusker - GMBF type Engelberg - that has an average capacity of 100 kilograms per hour. In addition, cleaning equipment has also been developed including a channel for winnowing, drum sieves and a machine to wash out sand.

Some of this equipment has been installed in small existing companies or enterprises operating in rural and urban areas, such as Bamako (Mali), Bobo Dioulasso (Burkina Faso) and Labé (Guinea). It has already helped users to process dozens of tons of fonio. Productivity has increased enormously and the quality of the product is high. An analysis of the cooking qualities of the fonio processed by the GMBF dehusker has been evaluated and found to be very satisfactory. The fonio processed with the machine had a better quality than traditionally whitened fonio: the germs had been removed, the product swells well when cooked and its consistency was smooth.



Photo: Author

A greatly enlarged photograph of one millimetre-long fonio paddy.

Training

But the project would not be complete without training and provision of adequate information to the various stakeholders involved, including manufacturers, those processing the crop, small business groups and the producers. The assistance of local manufacturers is necessary to ensure that the equipment developed can be constructed locally and this is being followed up. Together, these initiatives should make it possible to mechanize the processing of fonio and, in this way, contribute to the revival of this long neglected cereal.

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