

Production of quality sorghum or millet malt for small-scale or semi-industrial food production in West Africa

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Sorghum or millet malting is a widespread traditional practice in West Africa. It is used to produce fermented and unfermented beverages or is incorporated into infant cereals. The malting process has many benefits (nutrition, texturing) but the cottage-scale production conditions cause health risks inconsistent with market expectations. To improve malt production and properties, but also the maltsters' income, a project to support specialised small and medium enterprises (SMEs) was carried out.

Cereal malt is one of the main raw materials used to prepare various traditional alcoholic beverages of West Africa: *dolo* (Mali, Burkina Faso), *tchoukoutou* and *chakpalo* (Benin, Togo, Niger, Côte d'Ivoire), *burukutu* or *pito* (Nigeria, Ghana), *dam* (Togo), but also non-alcoholic beverages like *gowé* (Benin). Malts are also incorporated into infant cereals to reduce their viscosity and increase their energy density.

"Malting" is a process whereby seeds are germinated then dried under favourable conditions of heat and humidity to obtain a product (malt) that is rich in enzymes, vitamins and other soluble compounds. The technology has three main steps: soaking, germinating and drying grains.

Market-aware malt production

Malting is largely a cottage industry, usually performed at home by women, and one that requires great expertise. However, the traditional techniques used are ill suited to market constraints, particularly in cities: the risks to human health are serious, and the malts' technological quality is uneven. Indeed, chancy production conditions affect the malts' enzymatic activity—including amylase—the main reason for adding them to various food products. The development of cyanogenic compounds, enterobacteria or moulds can impair their organoleptic qualities and healthfulness.

The project "Production of quality sorghum or millet malts for small-scale or semi-industrial food production in West Africa" sought to create the necessary conditions for small-scale production, but also marketing, of high-quality sorghum and millet malts for beverage and baby food undertakings. To do so required taking advantage of indigenous knowledge of the varieties (sorghum and millet) and traditional production practices; evaluating the various markets' quality and quantity requirements; developing and validating production methods suited to the scale of these undertakings; promoting and optimising the production and marketing of malt and malt derivatives. Improved malt production methods were validated in the field at two pilot SMEs: ALITECH Industries in Benin and *Unité de Maltage de Ouiditinga* (UMAO) in Burkina Faso.

The project was carried out in three stages:

- Surveys were done in the field to gather data on the socioeconomic production environment, crop varieties and traditional processing methods used.
- The malting process for *gowé* and *dolo* was optimised in the laboratory, then at the SMEs. Good manufacturing practices were developed and transferred to personnel through training.
- The innovations were tested at the SMEs. Malt quality was assessed by measuring diastatic, microbiological and amylase activity. The fluidifying and nutritional properties of malt-based infant cereals were also measured. ...



▲ Cereal malt is one of the main raw materials used to prepare various traditional alcoholic beverages and infant cereals of West Africa.

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A fruitful exchange between researchers, SMEs and maltsters

Beninese, Burkinabé and French scientists worked with various local stakeholders, particularly with women maltsters, who are very important in the sector. Farmers and processors played a key role in sharing their knowledge of traditional materials, technology, markets and finished products. Conversely, they could assess the quality of products of new technologies and make improvements calculated to maintain the desirable characteristics of traditional malts. That participatory approach helped reconcile the views of all stakeholders. It should be noted, however, that it may also cause delays in the protocol.

An immediate managerial, technical and scientific benefit to SMEs

The project helped build SMEs' capacity. The cross-cutting exchanges between countries proved fruitful and concrete: UMAO, for example, developed a new malthouse that inspired ALITECH to produce another.

Proprietors familiarised themselves

with the technology and health criteria used by scientists to assess the quality of their products. Staffs were trained in best practices for manufacturing and hygiene, with positive impacts on business management and quality follow-up.

The results were also positive for young researchers. They benefited from exchanges with SME workers, integrating their advice into their research protocol and becoming more attuned to market issues.

Transfer of scientific results to economic agents

The scientific contributions enabled technologies and products to be developed, matched supply to demand and centralised knowledge by developing an enterprise-focused strategy and channelling efforts and resources. The results were published in trade journals and data sheets, and best manufacturing practices were disseminated.

Product awareness and promotion campaigns took place on local radio stations and at trade fairs and shows. Women maltsters' active contribution should be highlighted. In Burkina Faso, for example, having taken training in sorghum malting,

they participated in fairs on *dolo* and formed an association. That involved some risk, however, for these *dolotières*: First, they cannot afford the necessary investments in new technology; and second, SMEs' adoption of these innovations may be at the expense of their own market.

Gain a better knowledge of malt markets and the varieties used

There is high demand for sorghum and millet malt in the pilot countries. In Burkina Faso, 40% of the total sorghum production (some 500,000 tonnes) is malted each year for *dolo*. In Benin, the beverage industry imports between 3,500 and 7,000 tonnes of malt annually. There is also the infant cereal market, which is smaller but demands higher quality.

In urban areas of Benin, sorghum varieties are defined by colour and size. "Big red sorghum" is the most commonly used for malt production for *gowé*, *tchoukoutou* and *dolo*, although no fewer than 10 varieties of sorghum may be used in manufacturing *tchoukoutou*. In Burkina Faso, red sorghum varieties are mainly used to manufacture *dolo*, while white sorghum is used for food.

The project focused on laboratory testing and classification of 19 varieties of sorghum and four varieties of millet according to their end use. Five sorghums were found quite suitable for beer manufacture in Benin, as against two in Burkina Faso. The use of millets to produce malt for infant cereals was validated.

Scientific and technical improvement of processes in use

Scientific analyses showed that traditional malt production could generate aflatoxins, sometimes in excess of the limits (8 µg/kg) recommended by the *Codex Alimentarius*. The total aerobic and coliform bacteria, yeasts and filamentous fungi identified in Benin and Burkina Faso malts also exceeded the limits set out in the *Codex*.

Technical improvements that could be scaled to the cottage industries were proposed: using an alkaline solution for soaking sorghum malt to increase its diastatic properties; treatments to reduce bacterial contamination; etc.

Dolo and *gowé* production processes were improved. Two new forms of *gowé* were developed: a liquid one resembling yogurt and another that could be stored dry at room temperature for six months.

In view of the high biological risk in traditional maltings, ALITECH developed an optimised method to produce a malt of consistently good physicochemical quality, which however still needs to be improved for use in infant cereals. In Burkina Faso, the *Institut de recherche pour le développement* (IRD), for its part, tested a standard process for producing millet malt for infant cereal: it is in line with health recommendations, but it is unclear whether it can be produced under existing cottage-industry conditions.

A positive employment and food security outlook

Through this collaborative project, SMEs emerged that specialise in the production of quality malt and the partners enhanced their capacity to share and use their knowledge to apply innovative technologies: more in line with consumer demand; with easier market access; and providing value for money.

The promotion of a malt of a consistent quality will allow better use of local cereals throughout Africa.

The productivity gains achieved should generate new jobs and better incomes, facilitate women's work, and allow the sector to better serve an increasingly demanding urban market. ■



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Partnership
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