

Tiles: a Low-Cost Building Option

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Africa does not know its own resources. Few people are aware that in Yamoussoukro, Côte d'Ivoire, a team of researchers has developed a space-age tile that has protected houses in Abidjan and in neighbouring Bénin for the last three years, and that will soon appear in other West African countries. Senegal has already begun to test the new material, which was designed for low-cost housing.

Long regarded as a luxury item in Africa, tile is making a comeback and now looks very promising in Côte d'Ivoire thanks to a combination of research and a strong political push for low-cost housing.

Roofing materials

In Côte d'Ivoire and neighbouring countries, roofing materials are often imported and expensive: they can account for up to 30 % of the cost of building a house, and represent a substantial currency drain. While these 'modern' materials are recognized for performance and durability, they are nevertheless unsuited to the environment, and there are problems with corrosion, heat retention, noise, and so on. In urban areas, this has led to a preference for corrugated sheet metal roofing or, in some cases, reinforced concrete or terra cotta tiles. In the countryside, traditional roofing materials predominate including straw, palm leaves, and other local materials which — while abundant, cheap, and comfortable — are not very durable and often constitute a fire hazard.

Given all the unexploited possibilities, quiet optimism was the prevailing mood within the research team led by [Sandé Oladélé](#) of the École Polytechnique in Yamoussoukro, formerly the École Nationale Supérieure des Travaux Publics (ENSTP). From the outset, the team pinned its hopes on tile: the experts found that tile was cooler and quieter. The problem was that terra cotta tile, while comfortable, requires heavy energy consumption in its manufacture, which makes it expensive. The team's stated ambition was thus to make tile an efficient, economical product within the reach of most Ivorians, and to do so using local raw materials to the greatest possible extent.

Vegetable Tile Project

Thus was born the Côte d'Ivoire Vegetable Tile Project, fully funded by the International Development Research Centre (IDRC). The ENSTP researchers are not alone in this adventure. A partnership was quickly organized with the Ottawa-based Institute for Research in Construction at the National Research Council of Canada. By undertaking to verify the project's results, the Institute helped to guarantee the quality of the team's work.

Initially, the research team drew lessons from the experience of the International Labour Office (ILO) which, a few years earlier, had introduced a fibre-cement tile in Côte d'Ivoire. This intermediate material was made from a mixture of sand, cement, dye, and sisal fibre. These products were all imported, however, making its manufacturing cost higher than that of metal roofing. In addition, installation techniques were not fully mastered, and quality control tests revealed shortcomings in the mechanical strength and impermeability of the sisal-fibre tile. Property developers were skeptical, and this hampered both product acceptance and job-creation efforts.

Local materials

Aware of all these problems, the leaders of the vegetable tile project quickly focussed their research on developing ways to use more local materials. For example, sisal was replaced with such local products as coconut, rice, and couch grass fibre; cement consumption was reduced using a combination of kaolin and silica-rich vegetable ash; the proportions were fine-tuned; and a standard was certified through Codinorm, the national standards body. In addition to safety issues, the standard guarantees tile quality. Manufacturing equipment was also simplified with the adaptation of a mortar mould at a very reasonable cost, as well as a vibrating table that is easy to transport, battery-powered, and very competitive with comparable local or imported equipment available in Côte d'Ivoire. To improve manufacturing and installation techniques, training sessions were organized for tile producers and construction workers at various locations.

The success of the fibre-mortar tile did not deter Dr Sandé's team from their pursuit of lower cost and higher quality. They developed another kind of tile that does not contain plant fibres but incorporates coarse sand. This microconcrete tile still uses cement, dye, and water, but the use of sand addresses ecological and economic considerations, since Côte d'Ivoire abounds in sand pits.

Microconcrete tile

Waterproof, long-lasting, reliable, attractive and cost-effective: these are the key words to describe the microconcrete tile, which received a helping hand with the devaluation of the CFA franc, boosting sales by 40 to 80%. Côte d'Ivoire gains in many ways: the tile industry now supports thousands of people, while the use of the product significantly reduces the currency outflow attributable to imports of building materials. At the same time, architects are taking advantage of its functional and aesthetic qualities, and the harmony and balance that tiles contribute. All these factors are appealing to Ivorians, who are starting to forget their perception of tiles as a relic of the colonial era.

Anxious to stay on the leading edge of progress, the ENSTP research team is now thinking beyond tiles. Their next goal is to create a regional 'observation post' that would not only provide information on local building materials but would forge ahead with research into geoconcrete and with efforts to discover other materials. Dr Sandé is now sharing the team's knowhow beyond the borders of Côte d'Ivoire, training tilers in neighbouring countries who have started to adapt the technology to their own requirements, bringing tiles within everyone's reach. This technology transfer involves tilers in Bénin, as well as the engineers and technicians of the École Polytechnique and the Centre Expérimental de Recherches et d'Études pour l'Équipement (CEREEQ) in Senegal, who have already begun to manufacture and market tiles, enabling the countries of West Africa to solve many problems with respect to roofing, while giving themselves an economic boost.

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