Power to the People

Modern solutions to ancient problems are changing the lives of thousands African villagers

By Peter Hawthorne

AFRICAN HISTORY HAS BEEN SHAPED BY trial, tribulation and tradition—not by technology. Most of sub-Saharan Africa's 600 million people live in rural isolation, far removed from the benefits of modern science, medicine and telecommunications. Their needs are basic—food, water, shelter and health care—but their means are typically limited to the raw resources of the land. All across the continent the rusting skeletons of tractors, graders and farm machinery bear testimony to the lost cause of technology in places where the infrastructure taken for granted elsewhere is sorely lacking: electricity is rare, spare parts are scarce, and even a hammer and nail can be hard to come by. But the recent introduction of a handful of low-tech inventions has begun to help people in some of Africa's most undeveloped areas upgrade their standards of living and improve their daily lives.

Wind-Up Enlightenment

The BayGen wind-up radio uses clockwork power to broadcast news and information

THE INSPIRATION CAME TO BRITISH INVENTOR Trevor Baylis in 1992 as he watched a television documentary about the spread of AIDS in Africa. World Health Organization experts explained that the epidemic could not be halted by medical means, but only by widespread health education. Baylis realized that the only practical way of transmitting information about AIDS prevention—radio—was out of the reach of the millions at risk because there is no electrical power in most of rural Africa. That night, at home in his London workshop, he assembled the makings of the first clockwork radio, a deceptively simple device that can receive FM, AM and shortwave transmissions without the need for an external power supply. "I thought back to the old-fashioned gramophone," Baylis recalls. "I thought if there is enough power in the spring to make all that noise, there has to be enough power in the spring to drive a small dynamo, which in turn could drive a radio."

The principle of the clockwork radio is relatively straightforward. A single winding coils the spring, much like cranking up an old gramophone, which pushes power through a gearing mechanism to the generator as it unwinds. This power, in turn, fuels the radio, which can run for an hour after a 25-second wind-up. Liberty Life, a leading South African insurance company, provided investment capital to bring the product to market in 1996 and BayGen, another South African firm, is now cranking out 20,000 of the radios a month from its factory in Cape Town. Endorsed by South African President Nelson Mandela, the lunch-box size radio is being snapped up by aid agencies such as the United Nations High Commission for Refugees (UNHCR) and the International Red Cross.

The clockwork radio has already given many Africans their first access to information ranging from AIDS prevention to weather reports to adult education programs. In Kenya and Malawi, peasant farmers tune in for the latest advice on agricultural improvements and pest control. In Angola and Mozambique, the radios are used to warn people about areas where there may still be land-mines left from their civil wars. In Uganda and Rwanda, the UNHCR broadcasts to help move and rehabilitate thousands of war refugees in the Great Lakes regions.

In Liberia recently the radios were used to promote the message of peace and reconciliation and inform potential voters about the general election process. John Langlois, director of a radio station in the capital, Monrovia, describes the wind-up as "a miracle tool" that contributed to the peaceful progress of the recent general election. Says Manjo Borlay, who has helped distribute the radios: "The people love them. Some of them say that it is white man's magic—but it's good magic. These radios are uniting our country."

The technology is already being applied to a range of other devices. "The wind-up radio principle has tremendous possibilities ... as a non-polluting, inexpensive alternative energy source," says Roy Stear, chief executive officer of BayGen. Baylis is now working with General Electric and Apple to develop and mass produce lap-top computers that run on the clockwork principle. Should the wind-up computer prove feasible, Baylis' invention could eventually help bring the information superhighway to the dirt roads of Africa's remotest villages.

Carrying Water

WATER, AFRICA'S LIFE-BLOOD, IS VOLATILE: usually there is too little of it, as in droughts, or too much, as in floods. But even when rainfall is good and rivers are full, but not overflowing, millions of people live many kilometers from a reliable source of clean water, leaving them vulnerable to cholera, dysentery and other water-borne diseases. Village women spend much of their time hauling water to their homes in open canisters and drums, while herdsmen often have to water their flocks at muddy or polluted water holes.

Dismayed by the back-breaking labor endured by rural women and children in the traditional transport of water, South African architect Hans Hendrikse and his brother Piet, a civil engineer, reinvented the wheel to ease their burden. Their Q-Drum is a doughnut-shaped plastic drum that can be filled with water and rolled easily along the ground using a rope passed through the middle of the container. To ensure low maintenance and durability, the Hendrikse brothers opted for simplicity. Apart from the screw-top lid, the Q-Drum has no removable parts. Available in 50- and 70-liter sizes, it is made from low-density polyethylene and is virtually indestructible.

Largely financed by the two brothers, the product they launched in 1994 is now being patented internationally and a manufacturing plant has been set up in Zimbabwe. "All around us in the African rural areas we could see the problems caused by the lack of clean, piped water," says 55-year-old Hans Hendrikse. "We could just imagine the agony for women who have to carry open, unstable containers on their heads for long distances. Piet and I went to our drawing boards, we combined our skills and we believe we've come up with the ideal solution to one of Africa's age-old burdens." Their invention is now widely used in South Africa's Northern and KwaZulu/Natal provinces and in Namibia, Ethiopia, Kenya and Tanzania.

According to its inventors, the Q-Drum has transformed the centuries-old drudgery of fetching water into something akin to fun. They say a child can pull a 50-liter drum over flat terrain for several kilometers without undue strain. During field tests by the Hendrikses, a drum that was used daily for more than 20 months traveled 12,000 kilometers, made 7 million revolutions and provided a family of 13 people with 120,000 liters of potable water. During that time, the Q-Drum had worn less than half a millimeter—giving the container a life-span of more than 10 years. "Water is our life," says Grace Tombane, who has been using Hendrikse's drum in her Pietersburg home in South Africa's Northern Province for the past three years. "Now life is easier. I have seen my mother and her mother bent double, walking with sticks even before they were old, because of the days they spent carrying water. Now even the small children can use the drum. They make a game of it. And their parents are free to work on other things for the family." Women like Grace Tombane will be the principal beneficiaries of the Q-Drum's deft combination of modern synthetic materials with ancient design. The ingenuity of the Hendrikse brothers shows that it is still possible to teach an old wheel new tricks.

Children transform the Q-Drum into a useful toy, making fetching water a lot more fun

A child can easily pull a 50-liter Q-Drum over flat terrain for several kilometers

Hans Hendrickse reinvented the wheel to save women the chore of hauling water

Here Comes the Sun

ONE RESOURCE AFRICA HAS IN ABUNDANCE is sunlight. Solar power is now being used in remote community hospitals and as a low-tech alternative to firewood, while solar-powered cookers could help save Africa's forests. In some of the remoter regions of Eritrea some 23 hospitals and health centers use solar power systems developed by Dulas Engineering, a Welsh manufacturer of renewable energy products. At Adi Qwala in central Eritrea, a town that has only five hours of electricity supply daily, solar panels now provide current 24 hours a day to the local health center, which serves as a catchment area for more than 100,000 people.

The system produces enough electricity to power the hospital's lighting and air-conditioning and to refrigerate supplies of vaccines and blood. Constant energy also means that the operating theater can work around-the-clock. "Sometimes women on the way to deliver a child died because of the lack of treatment," says Debesai Dhebrehiwot of the Eritrean Energy Department. "But when the doctors are there, fully equipped with what they need, the lives are saved." Solar-powered refrigerators have been supplied to a further 200 health posts in Eritrea, enabling vaccines to be delivered to the most remote villages and improving the country's immunization program from 65% coverage rates in 1995 to 80% this year.

Maintenance is the biggest problem with solar power systems in undeveloped regions, so Dulas has begun to teach local people to service the equipment themselves. "We have done training courses on installation and basic maintenance, as well as training in the understanding of the complex electronic controls," says Dulas' Guy Watson. "We hope we will eventually do ourselves out of a job."

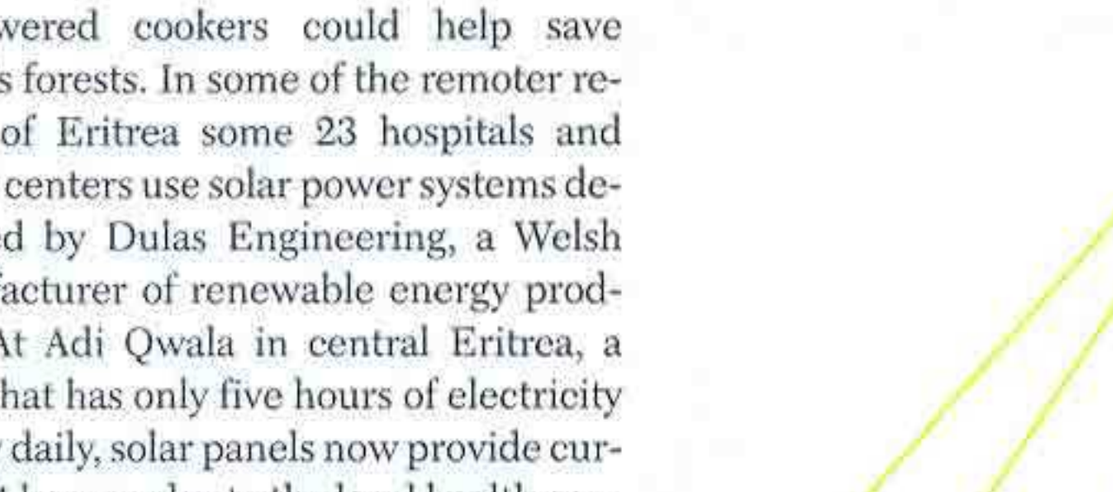
Probably the lowest-tech of all the solar-powered solutions is the solar cooker, which, by reprieving forests, could have a profound impact on Africa's environment. Made from thick cardboard folded into an open box with a curved back that is lined with aluminum foil, the cookers also save the time and drudgery of foraging for fuel, and the expense of buying it. After being taught how to cook with solar power, women are given the cooker with the dark-colored pot and supply of plastic bags needed for successful use.

The United Nations is promoting solar cookers in refugee camps, where they can also be used to boil drinking water. In a target scheme in Kakuma, Kenya, 3,000 refugee families have been given the cookers. "They are seeing immediate benefits," says Christopher Talbot, a U.N. official involved in the project. "Apart from saving trees, the people can spend on food money they would otherwise have had to spend on fuel."

In another example of simple technologies overcoming difficult problems, Josh Silver, a physics lecturer at Oxford University, devised a pair of self-adjusting, fluid-filled spectacles. The glasses consist of an inert silicon oil sandwiched between two lenses made of thin polyester film. They can be adjusted to correct a person's vision simply by varying the amount of fluid in each lens with a syringe. Silver's aim is to produce spectacles for as little as $3 a pair that would not need to be fitted by an optician. For the estimated 1 billion people around the developing world who may need vision correction but either cannot afford it or don't have access to an optician, these adjustable specs are a sight for sore eyes. After a successful trial last year in Ghana, Silver is now working with the World Health Organization and commercial producers to distribute an initial run of 500,000 pairs.

A wind-up radio that brings information to the backwaters of the continent, a water carrier that reinvents the wheel, an oven that cooks without fire, spectacles that can be fitted and adjusted by the wearer without an optician: these deceptively simple inventions are helping Africans solve some of the continent's most daunting and persistent problems.

—With reporting by Kate Noble/London



The solar cooker, a simple combination of folded cardboard and aluminum foil, harnesses the sun's power to cook meals and boil water

The solar cooker runs on sunlight, so villagers can spend on food money they would otherwise have to spend on fuel