Wind power

'Tilting at windmills: the boy who harnessed the wind'

Malawian teenager William Kamkwamba built a generator out of a bicycle and tractor fan. Now he's lauded by environmentalists

▲ Reaching for the skies: Kamkwamba, 14, fine tunes his invention. Photograph: Flickr

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Back in 2001 William Kamkwamba was a semi-educated 14-year-old Malawian who had been forced to drop out of secondary school when, during a terrible drought, his parents could no longer pay for him to go. This week, he has been in California and Chicago on a whirlwind book tour, hailed as a "genius" and appeared on TV chat shows. He has been the toast of international technology conferences, lauded by Al Gore and environmentalists and shared a stage with Bono and Google co-founder Larry Page - as well as co-writing a book about his life, with journalist Bryan Mealer.

When Kamkwamba stopped going to school because his family could no longer afford the fees, he went to his local library, read up on his science, found a DIY guide to making a wind generator and set about trying to build it. Using a tractor fan, shock absorbers, PVC pipes, a bicycle frame and anything else he could lay his hands on, he then built a rudimentary wooden tower, plonked his home-made generator on the top, and eventually got one, and then four bulbs to light up. He is now known as "the boy who harnessed the wind" - the title of his book.

"I managed to teach myself about how motors and electricity worked. Another book featured windmills on the cover, and said they were used to pump water and generate power. I was so inspired I began collecting scrap metal and old bicycle and tractor pieces. Many people, including my mother, thought I was crazy," he wrote in his blog this week.

Kamkwamba is presented to the west as the "humble hero", an extraordinary Malawian who has overcome everything to improve his family's situation, but the reality is that most of Africa, India and the developing world depends on equally innovative and inventive people coming up with ways to make a living with no cash and next to no resources.

In Katine, the Ugandan village which the Guardian supports, the weekly market sees Joseph with the bicycle he has adapted to become a knife sharpener; Matthew, who charges batteries with pedal power; and several women who strip plastic sacking to weave strong rope. The shells shot by the Sudanese army into Nuba territory in the late 1980s have all been collected and been beaten into farm tools, as have the tanks and guns handed in by soldiers after the Sierra Leone war in 2002. Mosquito nets throughout Africa now double as fishing nets. Masai villagers have devised a simple water distillation process by placing pipes over volcanic steam vents. Elsewhere in Africa, people make low-cost batteries from aluminium cans and plastic water bottles. Many Malawian and Congolese communities have devised ingenious ways to lift water from rivers and wells for irrigation.

How many British blacksmiths could fashion a tool which makes curved bricks to build round houses, as they do in Kenya? And how many IT managers could set up a DIY Wi-Fi phone network? In Tanzania, groups of women are learning to make and then adapt fireless cookers insulated with old clothes which save cutting down trees and can improve the air quality in their homes.

The Gingira district, just outside Dhaka in Bangladesh, is one of the world's least-known technological hotspots. Here, thousands of untrained people use rudimentary tools in small workshops (which would be condemned in Britain as unsafe) to make and copy everything from sophisticated car parts to watches and high fashion. Markets in Ghana, Senegal and South Africa are full of metal artists who take old pesticide cans and turn them into artworks, toys and gadgets.

Meanwhile, villagers in southern Bangladesh have found how to weave together water hyacinths to make large floating gardens on which they can grow food when their land is flooded. Sudanese innovators have developed what looks like a metal syringe to extract the seed pods from hibiscus plants because the flowers earn more money if the petals are left intact. Nepalese villages have developed gravity-driven rope ways which can move tonnes of produce several miles up and down steep mountainsides without electricity.

William Kamkwamba is the sort of child who would be welcomed to the Barefoot college in India, set up by educationalist Sanjit "Bunker" Roy. This takes some of the poorest, most uneducated people and taps into their traditional knowledge and practical resourcefulness to train them to become water and solar engineers. So far, 15,000 people have learned to become "barefoot" engineers, architects and teachers. "These grassroots technologists have solar-electrified thousands of houses and installed handpumps in places that urban engineers say would not be technically possible. The college has now opened in seven other countries," says Roy.

Kamkwamba shows that innovation and resourcefulness are not lacking in the poorest countries, so much as the financial or physical resources, says Simon Trace, the chief executive of Practical Action, the charity founded by "small is beautiful" development expert Fritz Schumacher. "The technologies are mostly available. The main problem is improving people's access to them," he says.