Kick-Starting Developing Economies With Relevant Technologies

Martin Fisher puts his mind to using technology to facilitate microentrepreneurs in East Africa.

Oil, the military, or academia. Uninspired by the prospect of a career in any of those research sectors, Martin Fisher, on finishing his PhD in theoretical and applied mechanics at Stanford University in 1985, set out to fight poverty in developing countries. Appropriate Technologies for Enterprise Creation, the nonprofit organization he cofounded, creates and sells tools in eastern Africa. Today in Kenya, where the organization started and where it has made the deepest inroads, incomes from businesses based on ApproTEC technologies account for more than 0.5% of the gross domestic product.

SABRINA HALEY

Fisher

Fisher's PhD research involved using acoustics to measure stress in aluminum alloys. "Of course, the reason people care is that residual stress acts to propagate cracks. An application would be when you are building airplane wings, and fatigue cracks are a serious problem," he says. For him, that specific research "is not useful now, except for having learned how to think in a logical way." But, he adds, "I use my engineering training all the time for design work." Going into science was a natural for Fisher, whose father, Michael, and two brothers, Daniel and Matthew, are all theoretical physicists. But, he says, "I came to realize that the more educated I was, the less I was qualified to do."

A better way

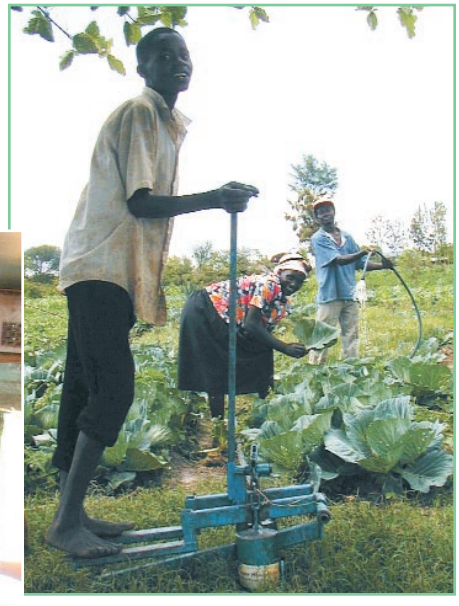
After graduate school, Fisher spent a summer trekking in Peru. "It was my first time in a developing country. I was quite shocked at the poverty and started thinking there must be a better way," he says. He decided to return to Peru to "do something about the poverty." But when he learned that, not speaking Spanish, he couldn't get a Fulbright to go there, he applied instead to go to Kenya, where English is the official language.

At first he was disappointed. The appropriate-technology movement that began in the 1970s with E. F. Schumacher's book *Small is Beautiful* (Blond and Briggs, 1973) had dried up. "Schumacher proposed that low-cost, locally produced technologies, operated on a small scale, were the solution for developing countries," says Fisher. "There was euphoria that little technologies would save the world. I expected to latch right in." Instead, he says, "by 1985, when I went to Kenya, all the donors and partners had given up on appropriate technologies. They said they had never worked."

He joined ActionAid, a UK nonprofit organization, and over the next five years he designed donkey carts and other farm equipment, helped build low-cost schools, taught people to make better bricks, and started a large rural water program. At ActionAid, Fisher met Nick Moon, a carpenter from the UK. "Both of us were getting more and more discouraged with the lack of sustainability of what we were doing," says Fisher. "ActionAid was giving things away, or selling them at highly subsidized prices. We were competing with the private sector." And when they worked with youth groups, "the group would collapse the minute we walked away. We started realizing that if a country is going to develop, it's going to be by individuals who want to get ahead—entrepreneurs. You need to work with the poor, but not the poorest."

Little things, big impact

Before the end of the cold war, says Fisher, "in most poor countries around the world, education was free, basic health care was free, and the prices of essential commodities were controlled and highly subsidized. A farmer could grow enough to eat and keep his family alive. With the end of the cold war, all that changed drastically. Suddenly, money had become the number one need for poor people." In Kenya, he adds, only 13% of the adult population



MARTIN FISHER

Microentrepreneurs in Kenya put their irrigation pump to use (above). Based on her $370 oilseed press, Jane Mathendu (left), a single mother and schoolteacher who lives on the east side of Mount Kenya, has created a profitable business making sunflower oil, which she sells for cooking. She sells the seedcake byproduct for animal feed.

hold formal jobs, with half of them being in the government.

Against that backdrop, in 1991 Fisher and Moon launched ApproTEC. Their aim was to kick-start economic growth by developing locally relevant tools, having them locally manufactured, and selling them to poor entrepreneurs who would start profitable new businesses. As of early this year, ApproTEC products had formed the basis of more than 28 000 new businesses, with 900 new ones created per month. Some 60% of the entrepreneurs are women.

A typical buyer of ApproTEC's $76 Super-MoneyMaker, a treadle-operated irrigation pump that can pull water up from eight meters below ground and spray it onto a field, is Janet Ondiek in western Kenya, says Fisher. When her husband died, she and her six children were left destitute. She took her kids out of school and used a bucket to irrigate one-eighth of an acre of cabbage. "That kept her alive," says Fisher. "Then she saw the pump. It took her six months to save money to buy one. Today she irrigates 2.5 acres and employs three people. She sells her produce in a local shop. She made $3200 last year. She has sent all her kids back to school."

The average Kenyan has only one asset, he adds. "A small plot of land. And one skill—farming. If you are a farmer, and you start doing irrigated commercial agriculture, you can grow more crops per year, and you can grow fancier vegetables."

After the success of its original MoneyMaker water pump—a variation of a pump first sold in Bangladesh by IDE, another promoter of microentrepreneurs—ApproTEC designed both larger and smaller pumps, including the latest rendition, a hand pump that sells for $18. Out of 31 992 pieces of ApproTEC technology that had sold by the start of this year, 28 614 were irrigation pumps, according to Fisher. The organization has also designed and sells an oilseed press, a hay baler, and equipment for making concrete pit-latrine slabs, roofing tiles, and bricks. In the works are a deep-well manual irrigation pump and well-drilling technologies.

Designing and building locally appropriate tools is a challenge, Fisher says. "We do analysis and calculations. Things have to be robust and practical and operational. What we are designing is utilitarian—we don't care how it looks." In poor countries, he adds, the technologies should also be low-cost, manually operated, energy efficient, easy to repair, and profitable for the buyer in three to six months.

Even when those conditions are met, selling the technologies is difficult, says Fisher. "An $18 irrigation pump is a big-ticket purchase for a poor farmer, and convincing them to buy it requires a major marketing effort." At present, the pumps are sold at about 200 rural shops in Kenya and Tanzania. "We get a database of all the sales and then randomly select some and visit within the first month, before they have seen any benefit, and again 18 months later, to see the impact." On average, he adds, people's incomes have gone up by more than a factor of 12. "Clearly, these little things are having a big impact."

ApproTEC expansion

But Fisher and Moon want to have an even bigger impact. The next step in ApproTEC's expansion, says Fisher, will be to sell the pumps more widely. They've just begun moving into Uganda, Malawi, Mozambique, and South Africa. "We are starting with the irrigation pumps because the vast majority of the people in developing countries are still rural farmers who can benefit by moving from subsistence to commercial farming. The relative impact of other new technologies will generally be smaller," says Fisher.

At the same time, ApproTEC is considering moving its manufacturing from Africa to China, where production costs are lower. Manufacturing has created comparatively few jobs, Fisher says, "and setting up manufacturing is a huge training task. We will be able to take our technologies to new countries much more quickly if we can import them rather than setting up local production."

ApproTEC currently has 68 employees and an annual budget of about $2 million. To realize the expansion plans, last year Fisher left Africa after 16 years and moved back to the US to focus on fundraising. From his base in San Francisco, he aims to amass $30 million in three years. "What we are really trying to do in Africa is build a middle class from the bottom up. Ninety percent of the wealth is in ten percent of the hands. Most countries have a democracy, but it's meaningless with this disparity." **Toni Feder**

US Research Grants Are Critical to Former Soviet Weapons Scientists, but Not a Long-Term Solution

Russia and other former Soviet republics inherited a massive nuclear weapons program they could no longer afford. Thousands of former weapons scientists have been subsidized by US grants, but finding them permanent, civilian jobs has proven to be extremely difficult.

For about a decade, tens of thousands of former Soviet Union (FSU) nuclear weapons scientists and engineers, working through centers in Moscow and Kiev, have received millions of dollars in grants from the US, the European Union, Japan, and other countries to do nonweapons civilian research. Although the research grants are for science projects, their underlying purpose is to keep at least subsistence amounts of money flowing to the weapons scientists so they won't, in the words of a US scientist familiar with the program, "become desperate." (See PHYSICS TODAY, January 1997, page 55.)

US involvement in the science centers program was endorsed by a recent Bush administration review of all US nonproliferation and threat-reduction programs. The review recommended that the science centers program be expanded. The program is run out of two centers: the International Science & Technology Center (ISTC) in Moscow, founded in 1992, and the Science & Technology Center in Ukraine (STCU) in Kiev, begun as a sister project in 1993.

The administration's endorsement of the centers a little more than a year ago prompted Andrew Hood, the program's senior coordinator in the State Department's Office of Proliferation Threat Reduction, to put renewed emphasis on a project that would pair US industries and FSU scientists on research projects with potential commercial value. The partnership efforts, begun in 1997, have met with only limited success and have revealed some fundamental differences between the US free market economy and a Russian system that is struggling with the very notion of capitalism.