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### **An Ordinary Miracle**

**ACROSS east Africa, thousands of farmers are planting weeds in their maize fields. Bizarre as it sounds their technique is actually raising yields by giving the insect pests something else to chew on besides maize. "It's better than pesticides, and a lot cheaper," said Ziadin Khan, whose idea it is, as he showed me round his demonstrations plots at the Mbita Point research station on the shores of Lake Victoria in Kenya. "And it has raised farm yields round here by 60 to 70 per cent."**

**His novel method of fighting pests is one of a host of low-tech innovations boosting production by 100 per cent or more on millions of poor Third World farms in the past decade. This "sustainable agriculture" just happens to be the biggest movement in Third World farming today, dwarfing the tentative forays in genetic manipulation. It seems peasant farmers have a long way to go before they exhaust the possibilities of traditional agriculture and have to place their futures in the hands of genetic engineers.**

In east Africa, maize fields face two major pests, and Khan has a solution to both. The first is an insect called the stem borer. True to its name, its larvae eat their way through a third of the region's maize most years. But Khan discovered that the borer is even fonder of a local weed, napier grass. By planting napier grass in their fields, farmers can lure the stem borers away from the maize—and into a honey-trap. For the grass produces a sticky substance that traps and kills stem borer larvae.

The second major pest is Striga, a parasitic plant that wrecks \$10 billion worth of maize crops every year, threatening the livelihoods of 100 million Africans. Weeding Striga is one of the most time-consuming activities for millions of African women farmers, says Khan. But he has an antidote: another weed, called Desrnodiurn. "It seems to release some sort of chemical that Striga doesn't like. At any rate, where farmers plant Desnodium between rows of maize, Striga won't grow."

Khan's cheap fixes for Striga and stem borer are spreading like wildfire through the fields of east Africa. Trials on more than two thousand farms are finished. "It's out of our hands now," says Khan's boss, Hans Herren, who is the director of the International Centre for Insect Physiology and Ecology in Nairobi. "The ideas are being taken up by farmers in countries such as Ethiopia where we have never worked." Khan, meanwhile, is going back to the wastelands of Kenya looking for more grasses to kill common pests.

His miracle is one of dozens of different strategies transforming the lives of millions of poor farmers on small farms across the planet. They replace pesticides with natural predators, and fertilisers with animal dung, crop wastes and plants that fix nitrogen from the air. They choose artful combinations of crops that maximise nature's bounty.

In January this year the world's largest study into sustainable agriculture was published. Jules Pretty of the University of Essex analysed more than 200 projects in 52 countries. He found that more than four

million farms were involved, covering an area the size of Italy—3 per cent of fields in the Third World. And, most remarkably, average increases in crop yields were 73 per cent. Sustainable agriculture, Pretty concludes, has most to offer to small farms that cannot afford chemical solutions to their problems. Its methods are "cheap, use locally available technology and often improve the environment. Above all they most help the people who need help the most—poor farmers and their families, who make up the majority of the world's hungry people." And, hardly surprisingly, many of the successful techniques are now being adopted by agribusiness. Raising fish in rice paddies, for instance, began in Bangladesh but is now developing into a global industry. Khan's alternative pesticides are likewise finding a potential market on large farms anxious to cut the cost of conventional pesticides. The success of sustainable agriculture is dispelling the myth that modern techno farming is the most productive method, says Miguel Altieri of the University of California, Berkeley. "In Mexico, it takes 1.73 hectares of land planted with maize to produce as much food as one hectare planted with a mixture of maize, squash and beans." The difference, he says, comes from "the reduction of losses due to weeds, insects and diseases and a more efficient use of the available resources of water, light and nutrients". Monocultures breed pests and waste resources, he says.

And some experts think GM crops will pale by comparison with sustainable agriculture, at least for the time being. "I don't see GMs making an impact on food production in Africa within the next 10 or 15 years," says Herren. "What Africa most needs is investment in 'soft' biotechnologies such as alternative natural pesticides."

Researchers from the Association Tefy Saina, a Madagascan group working for local farmers, were looking for ways to boost rice yields on small farms. They decided to make the best use of existing strains rather than track down a new breed of super-rice.

Through trial and error, Henri de Laulaine, a local Catholic priest, had stumbled on a system that raises typical rice yields from 3 to 12 tonnes per hectare. His trick is to transplant seedlings earlier and in small numbers so that more survive; to keep paddies unflooded for much of the growing period; and to help the plants grow using compost rather than chemical fertilisers.

Scientists have been sceptical about the ability of poor farmers to achieve such spectacular results, says the association's Sebastien Rafaralahy. Nonetheless, de Laulaine's idea has spread like wildfire: 20,000 have adopted the idea in Madagascar alone.

Following a collaboration with Cornell University in Ithaca, New York, the system has been transplanted to the Asian heart land of rice cultivation. In tests, China, Indonesia and Cambodia all managed to raise their rice yields.

Few countries have switched wholesale to sustainable agriculture. But Cuba has.

The collapse of the Soviet Union in 1990 cut off cheap supplies of grain, tractors and agrochemicals. Pesticides use halved over night, as did the calorie intake of its citizens. The cash-strapped country was forced to embrace low-input farming or starve.

Today, says Fernando Funes of the country's Pasture and Fodder Research Institute, teams of oxen replace the tractors, and farmers have adopted organic methods, mixing maize with beans and cassava and doubling yields in the process, helping average calorie intake per person rise back to pre-1990 levels.

Worldwide, one of the most widely adopted sustainable techniques has been to throw away the plough, the ultimate symbol of the farmer. Ploughing aerates the soil, helping rot weeds and crop residues. But

it can also damage soil fertility and increase erosion. Now millions of Latin American farmers have decided it isn't worth the effort. A third of Argentina's farms no longer use the plough. Instead, they fight weeds by planting winter crops such as black oats, or by spraying a biodegradable herbicide such as glyphosate. "The farmers saw results in a short time—reduced costs, richer soils, higher grain yields and increased income," says Lauro Bassi of EPAGRI, the agricultural research-institute in Santa Catarina state, southern Brazil, which has been promoting the idea.

Zero-tillage also benefits the planet in general. Unploughed soils hang on to carbon that would otherwise escape into the air as carbon dioxide when organic matter rots. A one-hectare field left unploughed can absorb up to a tonne of carbon every year, says Pretty, making soils a vital element in preventing global warming.

Sustainable agriculture is no magic bullet for feeding the world. It is an approach rather than a blueprint. Small farms with low yields stand to benefit the most and agribusiness the least. But it does offer an alternative for the millions of small farms that have plenty of hands to work the land but not the skills or financial resources to adopt conventional mechanised farming.

Pretty says: "Things are happening that are very exciting. If it catches on we can make substantial inroads in reducing the 800 million people who still go to bed hungry every night." Perhaps the most dramatic evidence of its success so far, he adds, is that little of the extra produce ever finds its way to distant supermarkets while the farmers starve. Most of it is eaten by the people who grow it.

Fred Pearce

**Raised Bed Agriculture allows people to feed themselves on a local basis that provides total community food security and is a proven food production system that is**

**ecologically sound, economically viable, socially responsible and Biblically based.**