



press clip

Feeding the 9 billion

As world leaders reaffirm their pledge to halve chronic hunger by 2015, we assess four key ways to boost food production

Debora MacKenzie

IT IS humanity's oldest enemy. Despite all our science, a sixth of people in the developing world are chronically hungry. At a summit in Rome this week, world leaders reaffirmed a pledge to end hunger "at the earliest possible date".

The UN Food and Agriculture Organization (FAO) wanted them to promise to end hunger by 2025, but the delegates declined. They

said instead that they would keep trying to meet their previous goal: to halve chronic hunger from 20 per cent of people in developing countries to 10 per cent by 2015 (see graph, below). But can they? Based on their performance so far, the FAO considers it "unlikely".

That, agricultural experts tell *New Scientist*, is because governments have broken their promises and slashed aid budgets for agriculture. The hungry poor fell to 16 per cent in 2007, mainly thanks to Asia's economic boom, but recession and soaring food prices pushed it back to 17 per cent in 2008.

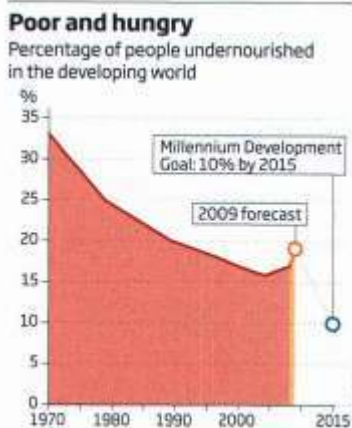
"Ending hunger by 2025 is not realistic," says Joachim von Braun of IFPRI, a food-policy institute in Washington DC. "Halving it might be, but it requires sustained action."

It gets worse: global population is set to grow to 9.1 billion by 2050, while global warming will have a serious impact on farming. What can be done?

The FAO says feeding 9 billion

people will require a near-doubling in food production. All nations will have to take part, but attention will be focused on poor countries, where there is most room for improvement and where better farming will give poor farmers income to buy food. The FAO says farming investment in poor countries must grow from \$142 billion per year to \$209 billion.

Agricultural research must also increase. The Consultative Group on International Agricultural Research (CGIAR) – the international, mainly government-funded labs that perform farm research for poor countries – says agricultural R&D spending for developing countries needs to grow from \$5.1 billion to \$16.4 billion per year by 2025. Its researchers say that in theory, given funds, they can boost agriculture enough to double food production, although global warming may make this impossible. These are their top priorities.





New Scientist
Saturday 21/11/2009

Page: 8
Section: General News
Region: National, AU
Circulation: 22140
Type: Magazines Science / Technology
Size: 705.68 sq.cms.



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1 HOLD ON TO WATER

The UN Food and Agriculture Organization says irrigated areas must expand by 11 per cent by 2025, yet the ancient aquifers that feed much of the world's food production are running dry.

Johan Rockström of the Swedish Resilience Centre in Stockholm says we need to rethink water. "Blue" water, which flows in streams, is the usual basis for farm planning yet accounts for just 5 to 15 per cent of the water flowing through farming systems. The rest, "green" water, is either lost through run-off or evaporation or passes usefully through crops. There are several ways to capture more of this green water in crops, including soil-covering mulches, terraces, and underground tanks filled by the run-off from tropical downpours. In parts of Kenya and China such tanks can get a crop through the dry spell that frequently follows a downpour.

Mapping the potential for combining all of these approaches shows that the largest untapped potential to improve water productivity is in the savannahs, says Rockström. This is sometimes counter-intuitive, he adds. "Dry Namibia and Botswana have more than enough green water to feed themselves."



2 STOP PLOUGHING

For 1000 years, farmers have turned over the top layer of soil to bury and kill weed seeds. This is expensive, damages soils and releases greenhouse gases.

Most maize and soya growers in the Americas have abandoned the plough for "no-till" farming: they merely scratch furrows in the ground to plant their seed and handle weeds with herbicides and herbicide-resistant genetically modified crops.

But farmers do not need those if they smother weeds with organic residue such as straw, and rotate crops to frustrate pests, says Bram Govaerts of the International Maize and Wheat Improvement Centre (CIMMYT) in Mexico, a CGIAR lab. This is known as conservation agriculture, and besides conserving soil, nutrients and energy, it cuts water loss. Govaerts has been managing experimental plots in Mexico using these methods, and finds that conservation agriculture can yield as much as traditional agriculture in good years, and even more during drought.



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No-till systems sow crops without ploughing and so water stays in the soil

3 GO BACK TO BASICS

Creating high-yielding seeds is only worthwhile if farmers have access to them, and can sell their produce for a profit. "There are varieties of maize that resist climate stress or disease, but how do you get them to farmers?" asks Prabhu Pingali, deputy head of agriculture at the Bill and Melinda Gates Foundation.

Nerica rice is a case in point. This dryland variety was bred in the 1990s by CGIAR scientists who crossed Asian rice with an African species. Nerica competes better with weeds than other varieties, yields more and contains more protein. But few African farmers have heard of it.

Government services that taught farmers new techniques were dismantled during the debt crisis of the 1980s, says Papa Seck, head of the CGIAR's African Rice Center in Cotonou, Benin. "We need them back."

Even if they have access to better seed varieties, African farmers often don't invest in boosting production because they don't have access to markets and therefore cannot sell their extra crops for a profit. And sold or not, crops are often poorly stored and lost to rot: half the bananas grown in Kenya are lost each year, says Peter Hartmann of IITA, CGIAR's tropical agriculture lab in Ibadan, Nigeria. He says Africa would not need imported food aid if it could use all the crops it produces.

You have to look at the whole food system to boost production, says Hartmann. For instance, IITA bred higher-yielding, disease-resistant cassava and helped set up factories to grind the crop into flour; but then discovered uptake was limited because there was limited transport: cassava grows in southern Nigeria, the trucking industry is in the north. After publicity brought truckers in, production grew from 35 million to 45 million tonnes, on less land, from 2004 to 2007.

Growing is sometimes the easy part; transportation can be the weakest link

4 BOOST YIELDS

Mark Rosegrant of the International Food Policy Research Institute (IFPRI) calculates that crops that will yield 25 per cent more food would boost African food production more than doubling irrigation would. It might also be easier. "We have tremendous options to enhance yields," says Hans Braun, head of wheat at the International Maize and Wheat Improvement Center.

Last week the world's wheat scientists launched a consortium to raise wheat yield by genetically re-engineering the crop's photosynthesis, no less. "It is inefficient compared with some plants," says Braun. "Improvements are feasible, and will dramatically increase water efficiency, heat tolerance and yield." They plan to equip wheat with more efficient variants of the key photosynthetic enzyme rubisco, and with suites of genes to convert it from the C3 photosynthetic system to the C4 system found in maize, which fixes more carbon per unit of light. Meanwhile, CGIAR's International Rice Research Institute in the Philippines is developing C4 rice.

Braun says the key is money. The yields of new varieties of maize are climbing twice as fast as yields of rice and wheat. This is because maize is bred mainly by private companies, which invest \$1.5 billion a year in it. Wheat and rice breeding, by contrast, is done mostly in government labs. Wheat gets only about \$350 million a year. Apart from Chinese hybrid rice varieties, rice yields have been stagnant for years.



True fieldwork: CIMMYT's research station in Ciudad Obregón, Mexico