

The Why Files

Feeding 7+ billion

Twelve years on, and another billion people are sharing the planet.

Starting half a century ago, the Green Revolution doubled or tripled production of the major grains, using modern seeds, heavy use of fertilizer and irrigation. The revolution helped India and China to feed themselves and averted widespread starvation.

Famine in India was averted thanks to the Green Revolution of the 1960s. Wheat research was spearheaded by U.S. agronomist Norman Borlaug (rollover), fourth from right, talking with trainees in Sonora, Mexico, in an undated photo. Photo #1: [International Rice Research Institute](#). Photo #2: [CIMMYT](#)

But those historic improvements are now history, and productivity is leveling off even as demand increases:

Hundreds of millions entering the middle class want more food and especially more meat 

Crop production in many places is edging closer to realistic yield limits 

Irrigation is about maxed out: Many rivers are running dry, and “wells are going dry in some 20 countries containing half the world’s people,” says environmental expert [Lester Brown](#) 

Biofuel already “eats” 40 percent of the giant American corn crop 

The changing climate could threaten staple crops 

A looming shortage threatens supplies of the essential plant nutrient phosphorus 

Graphics: [IFPRI](#) 

As this interactive map shows, most of the world’s hungry live in Sub-Saharan Africa and southern Asia. Click on a country for hunger statistics. 

Today, an estimated billion people go to bed hungry. Hundreds of millions are stunted by poor nutrition. And by 2025 another billion people will want to know what’s for dinner...

What to do?

After World War II, agronomist Norman Borlaug played a role in founding international farm research stations that invented and distributed seeds and technologies to Latin America and Asia, with a focus on the big three crops: rice, wheat and corn (maize).

The green revolution that resulted gave a dramatic boost to farm production. But population continues to rise, and funding for food projects tapered off after the initial gains were realized.

The green revolution averted massive starvation “in some situations, but in others, especially Africa, it failed terribly,” says James Lassoie, a professor of natural resources at Cornell University, and leader of [Agriculture Bridge](#), which attempts to harmonize agriculture with conservation.

Small could be beautiful

As the green-revolution [research organizations](#) continue working on high-yield crops, a newer approach to raising food production is emerging that concentrates on methods and technologies that can be built and maintained locally.

For reasons related to economics, environment, and efficient technology transfer, the new projects have steered away from large-scale provision of food, equipment, seeds and fertilizer, and toward social and environmental goals. Many projects work in Africa, where food and population problems are most acute, and with women, who do most of the farming.

Although few would discount the role of high-yield seeds in feeding seven billion, “Economic development needs to support both environmental protection and livelihoods,” Lassoie says. “Technologies are not going to help if they don’t also deal with the social and political dynamics.”

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Photo: [Shravan Vidyarthi](#)

A Kenyan woman hoes her plot before planting. There’s money to be made on the farm, and raising productivity in Africa may not require billions of dollars or rocket science — just some smart, persistent advice and appropriate technology.



What do we mean by social and economic structures?

Micro-lenders are trying to reach millions of farmers who cannot afford seed, fertilizer or food at planting time

Projects are using videos, radio and the Internet to teach growing techniques

Local farmers are working as extension agents, to deal with the follow-through problem that afflicts ideas “helicoptered” in from the outside

“Ecoagriculture” techniques such as companion cropping are being promoted as alternatives to soil-unfriendly monocultures

Our look at a few of these projects only offer an educated scanning of the horizon. We neither visited these projects nor possess a crystal ball, and so can neither vouch for their results nor predict the end game. But farmers are smart people who gravitate to things that work — if they fit the local culture, economy and environment.

Enough introductory blather. Let’s take a look!

Feeding: The broader picture

Can we feed the planet without wrecking it? Farming and grazing, which occupy 38 percent of the ice-free land, are degrading soil, exhausting aquifers, polluting surface water and damaging biodiversity. In October, a group of international experts proposed¹ a six-step solution to the twin problems of environment and agriculture. “... tremendous progress could be made by halting agricultural expansion, closing ‘yield gaps’ on underperforming lands, increasing cropping efficiency, shifting diets and reducing waste.”

Led by Jonathan Foley of the University of Minnesota, these authors wrote, “Together, these strategies could double food production while greatly reducing the environmental impacts of agriculture.” We cannot further summarize their proposal, but some of their ideas, like reducing rather than expanding meat consumption, will not come easy.



Graphic: [Earth Policy Institute](#)

While the world's grain production has grown over a half century, will the rising slope feed more hungry billions?

Progress on one acre in Kenya and Rwanda

Africa's agriculture is dominated by "small-holders," people who work an acre or two, mainly with family labor, and are an increasing focus of attention in the effort to feed ourselves.

The One Acre Fund began by identifying key obstacles to small-holder success:

Access to seeds and fertilizer

Availability of credit (even micro-lenders were loathe to make risky loans to farmers)

Adequate education and training

Markets that pay fair prices for crops

Services are loans, not gifts, and as is common with micro-lenders, borrowers join small groups that guarantee each loan. [One Acre](#) says 99 percent of its loans are repaid.

The fund's advisors offer farming advice during weekly visits that emphasize profitability as much as productivity. For example, because prices are usually lowest during the harvest, the advisors suggest that farmers hold on to their crops for a few months.

One Acre says its growing and marketing strategies double the average farmer's income, allowing small-holders to pay school fees and buy land to improve family income and food security. One Acre is reaching 55,000 families in Kenya and Rwanda, and aims to enroll 150,000 families by 2013.

Fish, water and wetland in Uganda

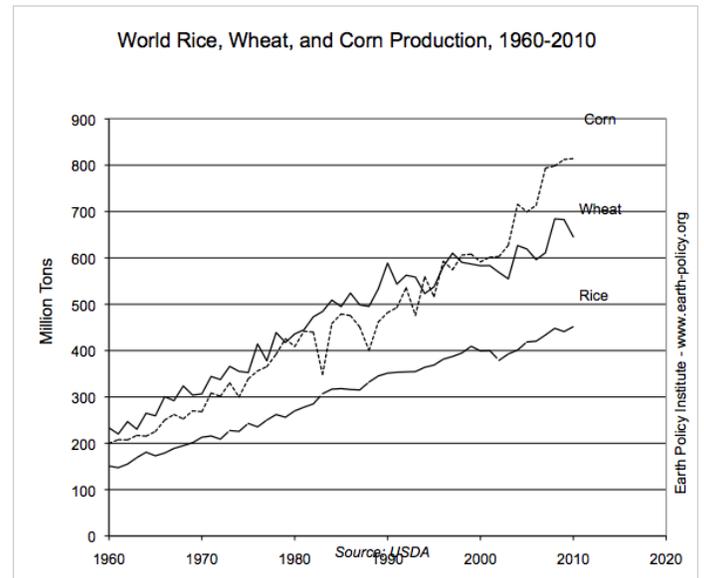
The realization that healthy ecosystems improve water quality and store carbon from the atmosphere has spawned a system called "payment for ecosystem services." After all, if people downstream are getting clean water or hydroelectric power from a well-forested watershed, that should be worth paying for...

It's a simple concept that conceals any number of complexities, but these payments do bring in outside money that can support environmental improvements.

In densely populated southwestern Uganda, the organization Nature Harness Initiatives is combining payment for ecosystem services with collaborative management to protect the environment of a wetland in the [Kanyabaha-Rushebeya region](#).

The wetland provides fish for food, bees for honey, and fiber for thatch, mats and baskets, but farming and deforestation by people trying to make a living are causing serious soil erosion, harming the wetland and its many human and non-human residents.

Although baseline data on water quality is short, [Nature Harness](#) is convinced that it's program works, and can be expanded to regions with similar problems.



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Photo: [sarahemcc](#)

Boys water cattle in a wetland in Uganda. Wetlands are highly productive, and intensely exploited in Uganda and many other nations with dense populations. Notice the banana plantation in the background?

Growing new farmers in Uganda

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Photo: [Bernard Pollack](#), Nourishing the Planet

A pupil in Uganda carries some of his bounty home from school. Could attracting bright, motivated students to farming help Africa feed itself?

In Uganda – and elsewhere — farming is often seen as an occupation best suited to school dropouts and people who cannot afford college. Could interesting the younger generation of Ugandans in growing vegetables reverse this trend?

Through the [Project for Developing Innovations in School Cultivation](#), more than 1,100 children in at least 31 schools have transformed schoolyards into gardens as they learn to grow local crops with traditional and environmentally-minded methods.

Project DISC was inaugurated in 2006 to combat rising food shortages and preserve Uganda's culinary traditions. By allowing children to experience growing, tasting and cooking fruits and vegetables, it is cultivating a generation that values agriculture and quality, local food.

(The whole setup reminds us of the U.S. [urban farming movement](#).)

The farming lessons includes methods for sustainably growing crops in Uganda's increasingly hostile climate, as the children learn about raised gardens, drip irrigation and drought-tolerant crops.

Project DISC does face obstacles, such as Uganda's staggering population growth and declining soil fertility. All the more reason to encourage young Ugandans to see agriculture as a respectable livelihood, rather than a last-resort job.

Community grazing rights in Mongolia

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Photo: [Ronnie Vernooy](#)

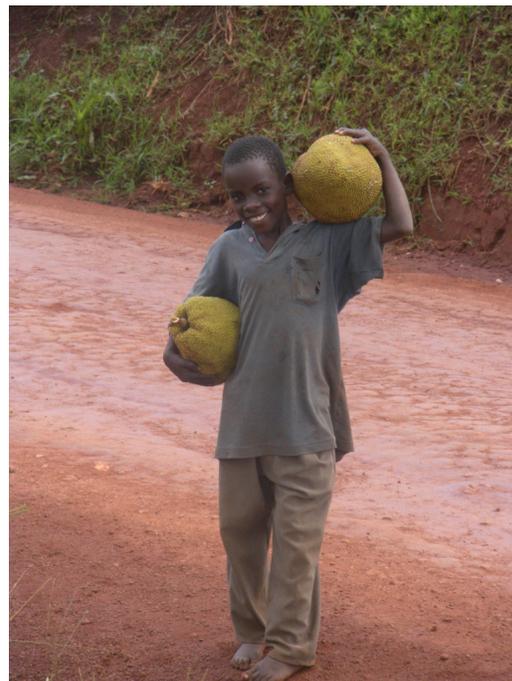
Mongolian herders get a lesson in growing potatoes and other vegetables.

In land-locked Mongolia, 2.7 million people coexist with about 10 times as many horses, cattle, sheep, goats and camels. The people of Mongolia have followed their animals for centuries, living a nomadic life in portable shelters called gers.

This windy, dry and cold land exists at the mercy of the weather; the harsh winter of 2010 killed 20 percent of the country's livestock. Meanwhile, overgrazing is promoting erosion and making the pastures less productive, while the Gobi Desert encroaches from the South.

It's a classic case of the "Tragedy of the commons," the idea that resources owned by all are protected by none.

To avert tragedy, Mongolia is experimenting with "co-management," a system for making joint decisions about the grasslands to maximize benefits and prevent long-term degradation. In co-management, groups of herders contract with the government to assume the regulation and protection of tracts of land. Contracts are adapted as needed during annual renegotiations.



The result has been a reduction in herd size and an attempt to breed better animals to maximize profits from a resources that is now managed with an eye to community prosperity. Evaluations say the process is raising family incomes by 5 to 10 percent annually, and the idea is catching on elsewhere in Mongolia and Central Asia.

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Photo: [©IFAD/David Rose](#), 10224_0651

To stave off hunger during the “hungry season” before planting, farmers deposit and borrow grain at community grain banks like this in the village of El Gueza, Niger.

Banking on the harvest in Niger

In many lands with poor people and marginal agriculture, the months before harvest are called the “hunger season.” In Niger, in the dry Sahel region just south of the Sahara Desert, the hunger season has been exacerbated by droughts and locusts.

Niger is second to last in the United Nations [Human Development Index](#).

Micro-lending is catching on as a way to fight poverty, but there’s a twist in Niger: Instead of lending money, the [Project for the Promotion of Local Initiative for Development in Aguié](#) lends grain through “soudure” (pre-harvest) banks.

The cooperative buys grain from local farmers, and lends it when needed at 25 percent interest, a fraction of what moneylenders charge.

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Courtesy Teri Allendorf

Deforestation on the hilly slopes of Yunnan province doesn't bode well for feeding a growing population. Can agroforestry projects help turn the tide?

By the middle of 2010, about 168 soudre banks, managed by over 50,000 women, were storing enough millet – a local staple grain — to feed 350,000 people for at least a month. That storehouse helped villagers survive the hunger season ([see #38](#)) during the spike in global food prices in 2008.



Beating hillside erosion in Yunnan, China

After a devastating flood in 1998 in Southwest China (blamed largely on deforestation of steep slopes), a new reforestation project focused on planting trees that generate income. (Reforestation projects can drive farmers and herders from their land by planting trees that may offer long-term environmental advantages but do not provide income to local people.)

The World Agroforestry Center has sponsored a different approach to reforestation on a [42-square-kilometer watershed](#) in Yunnan Province. The project began with a collaborative design process that focused on using trees for food, forage or other purposes.

Walnut trees provide edible nuts. Beneath the trees, medicinal herbs are planted as a cash crop. Women may spend four hours a day collecting firewood, but new fermentation devices transform pig dung into biogas for cooking.

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Photo: [R. Raman](#), AfricaRice

With the help of videos and the Internet, Africa Rice is spreading farming knowledge across Africa, as at this rice project in Liberia.

Although the project is said to be working on the small scale, and is producing enough income so parents can send kids to school, these techniques will only provide a meaningful benefit once they are applied more broadly.



WFARM-TV in Benin

Rice, a staple crop and food through much of southern Asia and tropical Africa, is usually grown on small farms. To stimulate and propagate farmer creativity, [Africa Rice](#) develops short videos with significant input from local farmers, and distributes them across the rice-growing region.

Farmers are inherently interested in the ideas of other farmers, and seeing their innovations legitimizes farmer experiments and leads to further improvements.

The 10- to 20-minute videos cover such topics as preparing land, transplanting seedlings, managing weeds and harvesting the rice. AfricaRice distributes the videos through farmer associations; the farmers line up the video equipment and stage the screenings, which are often held outdoors.

By 2009, 11 videos were available to communities in Africa; some have been translated into more than 30 African languages and/or been transcribed for radio broadcast.

– David J. Tenenbaum

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