Think Again: The Green Revolution

Noble Prize-winning scientist Norman Borlaug died Sept 12, but his ideas and the green revolution they produced are still transforming agriculture in Asia. Next stop: Africa.

BY PETER HAZELL | SEPTEMBER 22, 2009

"Asia Could Have Fed Itself Without the Green Revolution."

Hardly. Critics of the Green Revolution question whether technologies such as new seeds, irrigation, pesticides, and fertilizer were really needed to feed Asia. They claim that indigenous technologies in combination with good policies would have been sufficient.

It is true that food production was growing before the Green Revolution -- mostly through expanding crop areas. But yields were increasing at too low a rate to keep up with the surge in population that followed decades of improvements in public health. By the early 1960s, famine was looming across much of Asia, and the continent's farmers were ill-equipped to meet the challenge. Asia was running out of suitable agricultural land, and increased productivity looked unlikely. Despite government investment in irrigation and fertilizer, most farmers still relied on traditional crop varieties and low-input, low-output farming practices. As the food balance deteriorated, chronic poverty and hunger worsened, and it only took a poor monsoon, which came in 1964, to tip millions of people into famine. Major catastrophes were only averted in the early 1960s with the help of food aid from abroad, especially from the United States.

Only when the new high-yielding wheat and rice varieties developed by Nobel Peace Prize winner Norman Borlaug and others came along did crops really take off. The new varieties were much more responsive to fertilizers and irrigation, and many farmers doubled or tripled their yields. Borlaug's seeds also grew faster and were insensitive to daylight length, enabling more

crops to be grown each year on the same piece of land. The result was the doubling of cereal production in Asia between 1970 and 1995, from 310 million to 650 million tons per year. Although the population increased 60 percent over the same period, the rise in food production was so great that cereal and calorie availability per person actually increased nearly 30 percent, and wheat and rice became cheaper.

"The Green Revolution Was Bad for the Rural Poor."

On balance, no. Some have argued that small farmers and landless workers lost out as the Green Revolution spread: Only large farmers could afford the improved seeds and fertilizer; mechanization displaced laborers; and many tenant farmers were evicted by their landlords. The Green Revolution, these critics say, is partly to blame for the staggering 800 million Asians who still live on just $1 a day. These skeptics forget, however, that the number of poor prior to the Green Revolution was far higher -- 1 billion Asians at the time when the total population was only about half as large as it is now. The Green Revolution was certainly one of the forces accounting for that shift.

Most small farms did in fact successfully adopt Green Revolution technologies, even if not always as quickly as larger-scale producers. Agricultural laborers benefited from more job opportunities, more uniform patterns of employment through the seasons, and better overall wages. And rapid agricultural growth also stimulated growth in the rural nonfarm economy, creating countless more jobs for the landless and the poor. The increased food supply also lowered food prices, enabling the urban and rural poor to purchase more calories and diversify their diets.

It is true that the benefits to farmers were greater for those living where land was equitably distributed and where governments actively intervened in credit, fertilizer, and product markets to ensure that small-scale operations did not fall behind. Inappropriate farm mechanization and rapid rural population growth also muted some of the gains. And the Green Revolution failed to reach many poorer unirrigated areas, so regional inequalities sometimes worsened. But on balance, matters would have looked far grimmer had the Green Revolution never come along.

"The Green Revolution Was Bad for the Environment."

Yes and no. Undoubtedly the Green Revolution saved huge areas of forest, wetlands, and hillsides from being converted into cropland. Up to the mid-20st century, higher production could only be achieved by cultivating more acres. But thanks to new seed varieties, Asia doubled its food production with only a 4 percent increase in land use. This remarkable feat prevented the otherwise inevitable soil erosion and loss of biodiversity that follows the deforestation and cultivation of fragile lands.

The Green Revolution did, however, bring environmental problems. Fertilizers and pesticides were often used excessively or inappropriately, polluting waterways and killing beneficial insects and other wildlife. In some places, poor irrigation and drainage practices caused salt to build up in the soil to such an extent that farmers had to abandon some of their best farmland. Often, water was being used faster than rain could replace it, sending groundwater levels into retreat. Biodiversity also suffered as the new crops took over; many traditional plant varieties were lost.

Some of these outcomes were the inevitable result of millions of largely illiterate farmers adopting modern inputs almost overnight. The problem, however, was exacerbated by inadequate training, ineffective regulation of water quality and use, and subsidies that made modern inputs so cheap as to encourage their excessive use.

The good news is that Green Revolution farming doesn't have to be synonymous with environmental decay. Practices such as low-till farming, precision placement of fertilizers, integrated pest management (which combines pest-resistant varieties,

biological control mechanisms, and pesticides), and improved water management have been developed to increase yields even while reducing water and chemical use. The unfinished agenda of the Green Revolution is reforming policies and institutions so that these kinds of best practices are much more widely used.

"The Green Revolution Was Driven by Commercial Agribusiness Interests."

Not at all. The idea of increasing farmers' dependence on purchased seeds, fertilizers, and pesticides might inspire visions of agribusiness ruling supreme. But the truth is, Asia's Green Revolution was initiated and led by the public sector. The research and development that produced new seeds were undertaken almost exclusively by public research institutions. It was government-run banks and marketing agencies that dominated the distribution and pricing of water, fertilizer, seeds, and credit Those same institutions stored and marketed most of the surplus grain that farmers produced. Accomplishing these tasks was considered a job too large for the private sector alone at the time, especially if small farmers were not to be left behind.

All this required massive levels of public investment. And even long after the Green Revolution had spread, Asian countries continued to pour money into agriculture to sustain the gains. The return on those investments -- in terms of economic growth and poverty reduction -- has been impressive. Only recently have some Asian countries begun market liberalization programs to expand the private sector's role. So far, this has been of greatest benefit to small- and medium-sized local businesses rather than multinational corporations.

"Africa Doesn't Need a Green Revolution."

Dead wrong. Critics of Asia's Green Revolution argue that it would be better if Africa focused on organic and other low-input farming rather than going the route of its neighbors to the east. But this advice describes exactly what African farmers *have* been doing all along, and as a result, average cereal yields on the continent have hardly changed in 50 years and now hover at about one-third of those achieved in Asia. Such a predicament has left Africa mired in poverty, with levels of hunger and malnutrition in drought years resembling those witnessed in Asia in the mid-1960s. Africa badly needs to raise its farmers' productivity, and this cannot be done without increasing fertilizer use to offset low and declining soil fertility, capturing and using more rainwater for irrigation, and planting improved crop varieties. In a word, it can't be done without a Green Revolution.

Africa can't simply copy Asia's feat, however. The continent's geography is not conducive to Asia's irrigated rice and wheat, which helps explain why the Green Revolution has not spread to Africa already. More fundamentally, Africa has invested relatively little in developing its rural infrastructure, leading to unusually high transportation and marketing costs for its farmers. Importing fertilizer is pricey because many African countries are small and landlocked -- and anyway, most buy too-small quantities to secure a good price. Nor do African governments have a record of creating a supportive policy environment for their farmers. The net result is that it is simply not profitable for most African farmers to shift to high-input, high-output farming.

Still, the promise is there. Many experts agree that Africa has the biophysical potential to dramatically increase cereal production -- perhaps by as much as 100 million tons or more per year. And on a continent where small farms are the norm, a locally driven Green Revolution could prove a win-win for both growth and poverty alleviation. Africa is also less likely to be exposed to the same kind of environmental problems that arose in Asia. The diversity of crop-growing conditions in Africa means that widespread monocropping is not practical. There are also few river basins to permit large-scale irrigation, and

modern inputs are costly -- all of which should encourage farmers to turn to ecologically rich farming practices that are less dependent on modern inputs as those in Asia. None of this can happen, however, if Africa remains locked out of the Green Revolution.

DESHAKALYAN CHOWDHURY/AFP/Getty Images

Peter Hazell was director of the development strategy and governance division at the International Food Policy Research Institute in Washington. He is now retired and living in England.