

ESSAY



D. PARKINS

Bellagio 1969: The green revolution

Agriculture in developing countries was transformed when scientists met aid officials and convinced them to invest in research. **Lowell S. Hardin** was there, and believes today's food crisis demands a similar vision.

In late April 1969, I took a taxi up a narrow, winding road outside Bellagio on Italy's Lake Como, to a meeting called by the president of the Rockefeller Foundation, George Harrar.

My destination was the foundation's conference centre at Villa Serbelloni, one of the most spectacular settings in the world. The conference had just one aim: to help solve the world food crisis. As we came in sight of the building, with its immaculately landscaped grounds set against snow-capped mountains, I knew I would remember the view, but had little inkling that the conference would have such a profound and lasting impact on world hunger.

The world food situation was becoming ever more precarious. Populations in developing countries were growing rapidly, and traditional farming systems were not producing enough to feed them. Two years before, the brothers William and Paul Paddock had published their

best-seller *Famine — 1975! America's Decision: Who Will Survive?* (Little, Brown), predicting among other things that India would never feed its booming population. In both 1964 and 1965, the US Food for Aid Program had shipped 5 million tonnes of wheat aid to India. Many commentators thought the situation hopeless and famine inevitable.

At the Rockefeller and Ford foundations, we were more optimistic. We already had ten years' experience of collaborating with partners in developing countries in scientific efforts to accelerate food production. One reason that Harrar had called the Bellagio conference was to help agricultural aid organizations understand why and how science — and not food shipments — was a more sustainable way to deal with world hunger. Our thinking was that if the aid groups could grasp more fully the progress being made, they could mobilize the

resources needed from governments and other donor organizations. Together, a sustained assault on world hunger could be made.

No time to waste

Thus, 24 of us met to thrash out a strategy for feeding the world's hungry. There were 16 leaders from the world's major foreign assistance agencies concerned with agricultural development — such as Adekke Boerma, director-general of the Food and Agriculture Organization of the United Nations, John Hannah, director of the US Agency for International Development, and Robert McNamara, president of the World Bank and former defence secretary to President John Kennedy — plus eight of us consultants from the science of food production. There were no women, even though women produce much of the developing world's food.

My colleague and mentor from the Ford

Foundation, Forrest 'Frosty' Hill, set the scene. In an ideal world, he said, developing countries would invest in education, research and infrastructure, building stronger public institutions and private businesses. These, in partnership with the better-educated farmers, would tackle the food crisis using science and technology, as had happened in industrialized countries during the agricultural revolution of the mid-twentieth century. "But," he said, "we are in a crisis. We cannot wait."

Urgent action was needed, but what? Many of the scientists favoured expanding the network of international agricultural research and training centres that was taking shape in developing nations. To illustrate why they thought this would be a good move, two scientists reported on the impact of the first two centres: one for improving wheat and maize, based in Mexico; and another centre that focused on rice, based in the Philippines.

The scientists were Sterling Wortman of the Rockefeller Foundation, whose idea the Bellagio conference was, and Robert Chandler, director-general of the International Rice Research Institute (IRRI) in the Philippines. Wortman described the work of the International Maize and Wheat Improvement Centre (CIMMYT) in Mexico. This was set up in 1966, although the strategy behind it dated from the pioneering Rockefeller-Mexico programme launched in 1943. At that time the country's average wheat yields were about 740 kilograms per hectare (11 bushels per acre). By 1967, average yields were 2,690 kilograms per hectare and Mexico was a net exporter of wheat. These remarkable results were achieved with new varieties that were stocky, disease-resistant, fast-growing and highly responsive to fertilizer and improved agricultural practices.

Success with rice came even quicker. Emulating the Mexican strategy, the IRRI had launched a plant-breeding programme in 1962. At that time, the average rice yield in southeast Asia was 1,500 kilograms per hectare. By 1965, the IRRI was developing semi-dwarf, stiff-strawed, disease-resistant and fertilizer-responsive plants that could double or triple yields. One of the new varieties had a potential yield of more than 9,000 kilograms per hectare. Farmers called them miracle plants, but they were the products of intensive research and testing, and generated through improved production practices and technologies.

Harrar and Hill had invented the 'centre model' for international agricultural research. The Ford and Rockefeller foundations had already developed and financed the IRRI and the CIMMYT, as well as the International Institute for Tropical Agriculture in Nigeria and the International Center for Tropical Agriculture

in Colombia, both established in 1967. The capital and operating costs for this effort had reached US\$41.3 million and more donors were needed if the model was to be expanded to include other countries, crops and animals. We desperately needed the aid organizations as major financial partners.

Gathering momentum

At one point, someone asked Hill if traditional farmers would adopt new technologies. It was the moment that the conference really began to gel. "Sure, if they are profitable enough," replied Frosty, in his homespun and persuasive tones. "In India, the new wheat varieties are in such demand that they have to guard their seed multiplication plots around the clock to prevent theft." Later the same day, when we described how investment in rice research had resulted in financial rates of return of more than 50%, McNamara stood up and said: "If you with your centres can generate returns like that I will help you raise the money you need." Hannah nodded, even suggesting that the US government might contribute a dollar for every three provided by other donors.

As this played out, I began to think: "Yes, we are getting to a meeting of minds." By the second day, it was clear the conference was going well. People from the aid side who had just met were on first-name terms. Equally important, aid people were talking to scientists. Serious conversations continued at tea breaks on the patio, during evening cocktails and at meals. By the closing session on the third day, our thinking was converging.

What did we agree on? First, that the key to increasing agricultural productivity in developing countries was to apply modern scientific techniques and technologies. Second, that setting up international centres of expertise in research and education was a proven shortcut to achieving this. Third, that the existing four centres should be fully funded and that another six to twelve centres should be created.

But there were concerns, too. We worried that a widespread green revolution could have unintended consequences, such as aggravating the inequalities between small farmers and large landowners. Furthermore, without careful management, intensified cropping could deplete soil and water resources and become unsustainable — which in some instances has happened. However, we concluded that world food needs outweighed such potential difficulties. Making advances in productivity sustainable remains a high-priority research goal today.

Bellagio was the catalyst. It mobilized the

world's agricultural-development organizations to set in motion plans for rapidly increasing food production. It took the right mix of open-minded aid officials and dedicated scientists to achieve this, and it succeeded beyond any of our imaginings. After two follow-up conferences at Bellagio in the spring of 1970, it was agreed to set up a Consultative Group on International Agricultural Research, and in 1971 the organization that carries its acronym (CGIAR) was formed, under the leadership of the World Bank.

McGeorge Bundy, president of the Ford Foundation, called the CGIAR's creation "a remarkable chapter in the diplomacy of international assistance". Robert McNamara kept his pledge to help mobilize the necessary funding. By 1975, the year the Paddock brothers had

forecast famine would strike India, the green revolution in Asia was under way. India, instead of starving, had achieved food independence. More

than half the wheat and rice crops planted across Asia were high-yielding varieties.

Funding for the international centres rose substantially in the years after the Bellagio meeting. In 1969 the Rockefeller and Ford foundations provided \$2.3 million for four centres. Today, the CGIAR has 64 donors providing more than \$450 million a year in support of 15 centres and their 850 research scientists. Regrettably, some of the centres are critically underfunded, along with most of the agricultural research programmes with which they work.

As we confront today's food crisis, it is imperative that the green revolution in Asia is revitalized and a new one launched in Africa, which missed out almost entirely the first time round. As well as the research centres' ongoing work, promising new initiatives are under way, such as the Alliance for a Green Revolution in Africa, spearheaded by the Rockefeller and Bill & Melinda Gates foundations. Science and technology, including the exciting opportunities offered by genetically modified plants, have a lot more to offer the world's poor and hungry. As Norman Borlaug put it: "Responsible biotechnology is not the enemy; starvation is." ■

Lowell S. Hardin was a participant in the Bellagio Conference on Agricultural Development. He is assistant director of International Programs in Agriculture at Purdue University and was the Ford Foundation's program officer for Agriculture, Office of the Vice President, 1965-81. e-mail: lhardin@purdue.edu

"Bellagio mobilized the world's agricultural-development organizations."

For more Meetings that Changed the World, see www.nature.com/nature/focus/meetings