Farmers who use only their hands and machetes to squeeze food from the stingy soil around the village of Fufuo, Ghana, still recall the crop of 1989 with disbelief.

A team working with Norman E. Borlaug, engineer of the "green revolution" that saved millions of Asians from starvation in the late 1960s, had arrived bearing seeds of a new breed of corn, a few bags of fertilizer and several bottles of weed killer. Villagers bought these curious items with small, low-interest loans from the group Dr. Borlaug runs and then followed his directions. For the first time, they planted in straight rows, with a uniform distance between seeds. They spread the fertilizer on a regular schedule. They sprayed the herbicide in carefully measured amounts.

Then they harvested a miracle. "The crops were so big, and there were ears on each stalk," says Emmanuel Boateng. "We were used to having many stalks with no ears." Farmers accustomed to gathering only five 220-pound bags of corn per acre reaped 15 bags. Never before had the people of Fufuo produced enough to feed themselves and still had something left to sell to others beyond their collection of mud brick homes. They paid off their loans and began planning investments in schools and roads.

But in the years since Dr. Borlaug moved on to spread his methods to other villages, Fufuo has been sliding back toward mere subsistence. Western governments and the development agencies they fund no longer countenance his methods or provide aid on a large scale to support them, as they once did. Instead, they say, the free market should determine how Africa feeds itself. The Ghanaian government, pressured by its Western creditors to keep its fiscal house in order, doesn't provide fertilizer subsidies, crop-price supports or other equivalent to the cheap financing Dr. Borlaug started the farmers on. Local banks charge 30% interest on loans.

So the villagers of Fufuo are skimping on fertilizer, and their plots are yielding a third less. Without a well-functioning market for their crops, they struggle to sell even these diminishing yields before they rot. The temptation grows to switch to cash crops such as cocoa and ginger to sell to the West, though with more than two million of its people undernourished, according to the United Nations, Ghana needs more of a food staple such as corn.

"We have shown we can produce more, but sometimes we wonder, `What's the use?' " says Kwaku Owusu, a Fufuo corn farmer.

The answer is rooted in a profound shift in the international politics of economic development in the decades since Dr. Borlaug was lauded as a savior of the world's hungry poor. In 1970, he won the Nobel Peace Prize for having helped stave off mass starvation in India and Pakistan by introducing high-yielding wheat plants to farmers there. The success of this green revolution depended on Western support, financial and political, as well as local government intervention. The U.S. was unequivocal: In 1965, President Johnson threatened to withhold food aid from India unless New Delhi adopted farmer-friendly policies. It compiled, replacing price limits on grain with price supports. By the mid-1970s, India was growing enough grain to begin building vast reserves.

Now, sub-Saharan Africa is staggering toward its worst food crisis in decades, with as many as 38 million people threatened with starvation in the coming months, according to the U.N. To Dr. Borlaug, the solution is simple: sow the seeds of a second green revolution. With backing of about $9 million a year from a foundation of the late Japanese speedboat-racing magnate Ryoichi Sasakawa, he has been working with President Carter's Atlanta-based Carter Center to develop several million demonstration plots in 10 African countries, including Ethiopia, Uganda and Mozambique, as well as Ghana.
"I've done my job. We could double or triple grain production in Africa in three years," says the 88-year-old scientist, bringing his fist down hard on his desk in his office at Texas A&M University. "Something has to change."

Something has changed but not in Dr. Borlaug's favor. To the World Bank and the industrialized governments that control it, giving free rein to free markets is more appropriate for Africa -- even though the U.S., for one, is expanding the subsidies it pays to its own farmers. The theory, as it applies to policy toward Africa, is that an unfettered private sector will jump in to serve efficiently where governments once served inefficiently, and people and resources will be channeled to their best purposes.

Indeed, given Africa's disadvantages -- thin soil, fickle climates, few paved roads and weak governments -- some development experts now argue that helping farmers produce bigger food harvests may only prolong Africa's penury. In the view of the World Bank and other development organizations, Africa needs to develop businesses that can earn the money to import the food it needs.

In a report issued in July, the World Bank suggested, among other things, that rural Africans grow cash crops for export and cater to tourists to earn income. While the report does acknowledge that bigger food crops would help some farmers, it suggests that many are so isolated that they should grow only what they need for themselves as cheaply as possible.

"No one wants to fight with Dr. Borlaug, he is one of the greats," says Kevin Cleaver, the World Bank's director of agriculture and rural development. "But he doesn't bring appropriate technology to Africa."

Dr. Borlaug and his backers say that the poorest countries don't have enough of a private sector to take the place of foreign aid and government support, or to find economic alternatives for the poorest farmers. That, they say, is why in Fufuo and other places where Dr. Borlaug has helped farmers expand their harvests, decline has usually followed initial success.

They also point out that wealthy nations have practical motives for their faith in free markets as the key to economic development, even if they don't practice that faith as purely at home. For one thing, it's cheaper. Development assistance to agriculture from rich nations and international lenders dropped by half in the 1990s, to less than $5 billion a year. While the World Bank has recently increased its loans for agricultural projects in sub-Saharan Africa, the total, at $416 million this year, is less than half the 1990 level.

At the same time, the industrialized nations continue to pay their own farmers the subsidies that stymie development in poor nations -- a total of $311 billion last year alone. The subsidies not only protect American and European growers from low world-market prices; they also depress global prices by encouraging overproduction.

"If you want to do an agriculture experiment in Africa, experiment with taking away subsidies in the West for one year," says Kwame Amezah, the assistant director of extension services in Ghana's Ministry of Food and Agriculture.

The World Bank estimates in a recent study that if rich nations eliminated their farm subsidies and agricultural import restrictions, rural income in low- and middle-income nations would jump by $60 billion. As it is, world grain prices have fallen more than 50% over the past two decades, helping sap whatever incentive African farmers may have to push their own green revolution.

"I'm a biologist, not an economist, but even I can see [Western and African] policies aren't working," Dr. Borlaug says. "It's time to face up to reality."

Dr. Borlaug is himself the son of a farmer. Born and raised in Iowa, he studied forestry and plant pathology at the University of Minnesota, where he compiled a wrestling record that helped get him into the National Wrestling Hall of Fame. In 1944, he was working at DuPont Co. testing condoms and other World War II military supplies for their susceptibility to the elements when he learned of a job at the International Maize and Wheat Improvement Center, a research institute near Mexico City supported by public and private foundations.

The young Dr. Borlaug arrived at the center as a plant disease was devastating Mexico's wheat fields, making the nation dependent on foreign grain. He was assigned to create a resistant variety, a process that then typically took a decade. He greatly shortened the time with a trick he called shuttle breeding: After his prototypes produced seeds in a plot in northern Mexico, he rushed them to southern Mexico, squeezing two growing seasons out of one year. His disease-resistant strains were in the hands of Mexican farmers within five years.

By the 1950s, Mexico's wheat fields were so abundant with grain that the plants had to be retooled so they wouldn't topple over. Dr. Borlaug solved the problem by using a dwarf Japanese variety to develop a shorter, sturdier plant.
Mexico was growing all the wheat it needed.

Shuttle breeding also had the unintended effect of creating wheat strains much more tolerant of variations in climate and light conditions than typical wheat. So when the exploding populations of India and Pakistan overwhelmed those countries' antiquated farming sector in the 1960s, Dr. Borlaug had an antidote ready.

Farmers clamored for his seeds after seeing chemically fertilized plots produce five times as much grain as the same amount of land using traditional seeds and old methods. Dr. Borlaug warned political leaders of a public backlash if they didn't encourage construction of fertilizer plants and guarantee profitable prices for growers. In short order, Indian Prime Minister Indira Gandhi ripped up a flower bed in front of her residence and planted Dr. Borlaug's wheat. Farmer-friendly subsidies were created.

Meanwhile, researchers in the Philippines began developing rice plants that would also be used throughout Asia. The Rockefeller Foundation, the Ford Foundation, the World Bank and the U.S. Agency for International Development were among the institutions backing Dr. Borlaug's efforts.

By the mid-1970s, India was self-sufficient in grain, depriving U.S. farmers of a client for their wheat. Pakistan's trajectory wasn't as smooth, but it now produces roughly as much wheat as Canada.

At the 1970 ceremony where he received the Nobel Peace Prize, Dr. Borlaug predicted that the new crops sweeping Asia would give the world three decades of "breathing space" from famine. He retired from the International Maize and Wheat Improvement Center nine years later, with plans to teach at Texas A&M.

He didn't anticipate the food crisis that then swept Africa. In the 1960s and '70s, the newly independent nations of Africa, though using primitive farming methods, managed to grow enough to feed themselves when Asia couldn't. But then Africa's population began growing so quickly that subsistence farming couldn't keep up. In 1984, a famine centered in Sudan and Ethiopia killed about one million people.

Mr. Sasakawa, the Japanese philanthropist, called Dr. Borlaug at Texas A&M amid the 1984 famine and offered to finance him if he would help farmers in Africa. "I told him I was too old to start over and hung up," says Dr. Borlaug. "The next day, he called back and said `Young man, I'm 15 years older than you.' "

Dr. Borlaug agreed to five years. They organized the Sasakawa Africa Association, which started work in Ghana in 1986. "I had no idea what I was getting into," he says.

Many of Africa's farmers are poorer than Asia's were before the green revolution. Tractors and irrigation systems are rarer. Livestock for pulling plows are scarcer in many places, killed off by parasites transmitted by the tsetse fly.

Corn, the most important food crop in several African countries, is so naturally promiscuous that its descendants tend to quickly dilute any traits bred into it by scientists. As a result, farmers who want to raise high-yielding corn must regularly buy seed, an enormous expense for a subsistence producer. In Asia, farmers don't face so much expense. They set aside some of their wheat and rice harvests to use as seed the following season. These self-pollinating plants change little between seasons.

The ranks of the world's hungry are swelling the fastest in Africa. One-third of the 590 million people living south of the Sahara desert are chronically undernourished. Foreign food aid puts only a dent in the problem: The food deficit -- the amount the region lacks for meeting its population's nutritional needs -- is five times the amount donated.

Sub-Saharan Africa's vulnerability to famine is only growing as its farm economy falls further behind its swelling population. The amount of food the region produces for each person has been dropping for two decades. Its farmers now reap just half as much grain from an acre of land as do poor farmers in Asia.

But even on a continent degraded by years of famine and war, Dr. Borlaug has been able to deliver flourishes of farming success. In the highlands of Ethiopia, where the government has backed the work of Dr. Borlaug by lending him personnel, legions of subsistence farmers doubled and tripled their corn harvests in the mid-1990s, some even obtaining the per-acre yield of the average American corn farmer. By 1997, the perennially hungry country was able to export some grain to Kenya. Now, drought once again threatens millions in the country with starvation. To lock in his advances, Dr. Borlaug wants the Ethiopian government to do far more to make fertilizer and credit available to farmers.

His successes have made the white-haired Iowan a household name in parts of Africa. "He's our hero," says Mr. Boateng, the secretary of the Fufuo Growers Association, who fondly recalls Dr. Borlaug sitting with the villagers and husking corn. "Every time we pray, we pray for Dr. Borlaug: `Lord, we know he's elderly. Please extend his life.' "

With a small staff of its own, the Sasakawa Africa Association has concentrated on training a network of government farm advisers throughout the Ghanaian countryside. It provided a fleet of motor scooters so agents could reach areas where roads are too rough for cars.

The organization also has intervened where the free market has failed. When the Ghanaian government, under pressure from international lending agencies, stopped supporting the money-losing state seed-production company in the late 1980s, the business collapsed. At the time, the government, desperate for development funding, adhered strictly to lenders' requirements that the state withdraw from costly and inefficient agriculture supports.

Ten former employees of the defunct state seed business banded together in the village of Asuoyeboah, not far from Fufuo, to begin growing seed on their own. But they lacked money and technology. Then one of the Sasakawa-trained extension agents came by. He instructed them in Borlaug growing techniques, and production boomed. He also brought a herbicide from Monsanto Co. that greatly reduced the time farmers spent hoeing weeds, allowing them to expand their fields.

Soon, the corn cribs were overflowing. Sasakawa arranged a loan of about $1,500 for the farmers to build 18 more storage bins. Within three years, the farmers had paid off the loan.

The agents also brought a new seed strain that Dr. Borlaug had rescued from the reject pile. The variety, discovered by Purdue University researchers in the 1960s, didn't produce yields big enough to win over U.S. seed companies. But the seed is unusually high in protein, which Dr. Borlaug figured would be attractive to Africans short of meat and milk.

The seed, locally called Obatanpa, or "good nursing mother," now produces one-fifth of Ghana's corn. This corn is a vital ingredient in the mix used by mothers weaning babies from breast feeding and is one reason the number of undernourished people in Ghana has been halved over the past decade.

Today, the Asuoyeboah cooperative is standing on its own but precariously. The 17 members of the group net about $250 a year each, which still leaves them below the rural poverty standard of one dollar a day. Their shelling machine is a 1957 model. They, like the farmers of Fufuo, have begun skimping on fertilizer. And their inventory of harvested seed continues to mount -- and sometimes rot -- for lack of a private or government marketing agent that can purchase the seed and store it until the market improves.

"We have increased our yields, but what do we do with it?" asks William Barnes, the group's chairman.

He points to piles of seed corn covered with plastic and canvas tarps. Farmers won't be buying until planting season begins in March. Mr. Barnes pleads for some kind of inventory credit or other form of intervention from a marketing middleman.

"All of our money is tied up in the seed," he says. "So what are we supposed to do for the next four months, go hungry?"

These questions find echoes in Fufuo.

"Our capital base is so small, where can we get loans from?" says Fufuo farmer Daniel Yaw Banahene. "We know how to use the techniques, but where do we get the money to apply it?"

Sasakawa provides small loans over a couple of years to get farmers in one village started, and then it leaves those farmers on their own and moves to another village. The Fufuo farmers got about $12 for each acre to buy the necessary fertilizer. A pittance in the West, it is a big sum for subsistence farmers who had never profited from their crops before.

"We paid it back 100%," Mr. Boateng says, swelling with pride.

For the first couple of years, the farmers could fund their purchases through sales of their surplus production. But then their fragile economics shattered. The cost of imported fertilizer and herbicide soared from about $12 per acre to nearly $30 per acre over the past decade. At the same time, income from their corn fell as local bumper crops and international gluts depressed the market price.

Some farmers have turned to the rural bank in the bigger village up the road, where interest rates can top 30%. Others have started to cut corners on fertilizer and herbicide use. A few have even stopped using fertilizer and returned to carving new fields out of the bush. That negates an environmental benefit of the Borlaug method, which emphasizes intensive farming on existing fields to reduce the pressure on farmers to constantly slash and burn new land.
The Ghanaian government elected two years ago is trying to tilt the focus back to rural development, but it has neither the financing nor the foreign support to pump huge volumes of state money into agriculture. "With the mere mention by us of subsidies, our development partners start howling, and want to catch us and chew us up," says Franklin Domkoh, a top official in Ghana's Ministry of Food and Agriculture.

So the farmers of Fufuo are once again looking to Dr. Borlaug and his organization for help, not to prepare their growing fields, but to compete better with U.S. and European farmers. Sasakawa's Ghana office, with an annual budget of $250,000, can't offer much more than advice on how the farmers can organize to negotiate lower prices for fertilizer, market their corn and lobby for a better deal. "If the farmers are strengthened, they can walk up to the development agencies and state their case," says Benedicta Appiah-Asante, who heads the Sasakawa program in Ghana.

That will take time -- something that she fears Dr. Borlaug may not have. She recalls a conversation with her mentor three years ago in Accra, Ghana's capital. "Dr. Borlaug was pouring me a cup of tea, and he said, `Look at me, I'm old. I won't live to see the breakthrough in Ghana's agriculture. But you will. I'm counting on you.'"

Now, as Ms. Appiah-Asante bounces along the rutted road to Fufuo, she says, "Dr. Borlaug should have seen the breakthrough. It should have come by now."

(See related letter: "Letters to the Editor: Aid and Trade Combo Is Needed to Save Africa" -- WSJ Dec. 12, 2002)