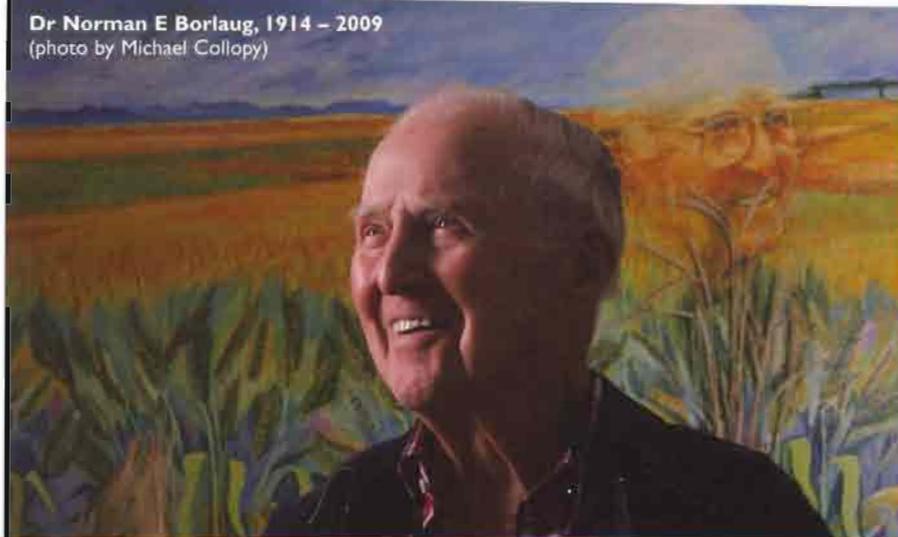


Dr Norman E Borlaug, 1914 – 2009
(photo by Michael Collopy)



HUNGER: the battle goes on

A tribute to Dr Norman Borlaug

September 2009

Yohei Sasakawa,

Chairman of The Nippon Foundation

I was deeply saddened by the death of my comrade Dr Norman Borlaug. For nearly 25 years he had worked tirelessly with us for agricultural development in sub-Saharan Africa.

Dr Borlaug was a man of conviction and courage. Although over 70 years old when we started our Africa project, he was determined, through the establishment of the Sasakawa Africa Association, to incentivise and encourage Africa's small-scale farmers, and thereby confront a deep and fundamental cause of poverty in Africa. He worked for this right up to the time of his death.

I had the privilege of travelling with Dr Borlaug to Africa on many occasions. He was never happier than when he was in farmers' fields talking to Africa's farmers. Much of Dr Borlaug's long life was spent in the cause of developing agriculture. Now we must respect his wishes and continue our concerted efforts to attain the goals he set for us and for himself.

I pray that his soul rests in peace.

Former US President Jimmy Carter

I am saddened by the passing of my close friend and colleague Dr. Norman Borlaug. For more than two decades, I had the pleasure of working with Dr. Borlaug, a senior fellow at The Carter Center, on the Sasakawa-Global 2000 effort to increase agricultural production in Africa.

Throughout his life, Dr. Borlaug was committed to alleviating hunger and improving food production technologies that have saved millions of lives. One day the advancements he shepherded may end our global hunger crisis. I have experienced first-hand the reverence that thousands of Africans have for Dr. Borlaug's untiring efforts to relieve their hunger. His compassion and humanity will continue to inspire generations to come. Dr. Borlaug is a hero, and his contributions to the field of science and the cause of peace were immeasurable. My wife, Rosalynn, and I send our deepest condolences to Dr. Borlaug's family.

Norman Borlaug was one of a small select group who won the Nobel Peace Prize, as well as America's highest civilian honours, the Presidential Medal of Freedom and the Congressional Gold Medal. The following extracts are taken from his statement on the occasion of the presentation to him of the Congressional Gold Medal by Nancy Pelosi, Speaker of the House of Representatives, and the then President of the United States, George W Bush, on 17 July 2007. Here are his views on the key agricultural issues of our time.

When I was born—in 1914—there were only 1.6 billion people on Earth. Today, we are 6.5 billion and growing by 80 million per year. The task of feeding this growing population has been made more complex, since agriculture is now being asked not only to produce food, feed and fibre, but also raw materials for bio-fuels. Thus, there is no room for complacency for those of us working on the food front.

I am now in my 63rd year of continuous involvement in agricultural research and production in low-income, food-deficit developing countries. I have worked with many scientists, political leaders, and farmers to transform food production systems. Any achievements I have made have been possible through my participation in this army of hunger fighters. There are too many to name, but you know who you are. I thank you for your dedication and assistance all of these years. I also thank my family, and my late wife Margaret, for the understanding and unselfish support you have given me

The Green Revolution was a great historic success. In 1960, perhaps 60 percent of the world's people felt hunger during some portion of the year. By the year 2000, the proportion of hungry in the world had dropped to 14 percent of the total population. Still, this figure translated to 850 million men, women and children who lacked sufficient calories and protein to grow strong and healthy bodies. Thus, despite the successes of the Green Revolution, the battle to ensure food security for hundreds of millions of miserably poor people is far from won.

The Green Revolution

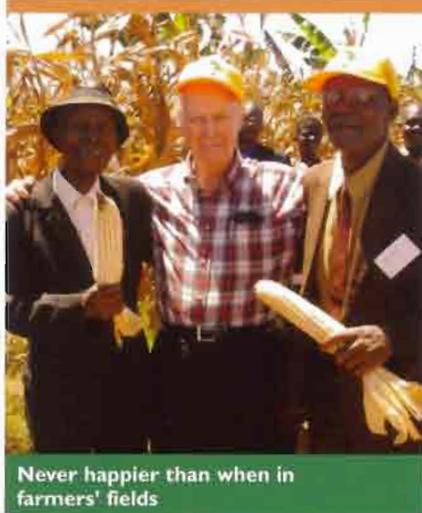
The breakthroughs in wheat and rice production in Asia in the mid-1960s, which came to be known as the Green Revolution, symbolised the beginning of a process of using agricultural science to develop modern techniques for the Third World. It began in Mexico with the "quiet" wheat revolution in the late 1950s. During the 1960s and 1970s, India, Pakistan, and the Philippines received world attention for their agricultural progress. In the 1980s and 1990s, China, home to one fifth of the world's people, has been the greatest success story. China today is the world's biggest food producer and its crop



The future –
a Green Revolution for Africa



A tribute to Dr Norman Borlaug



Africa's food production challenges

More than any other region of the world, African food production is in crisis. High rates of population growth and little application of improved production technology during the last two decades resulted in declining per capita food production, escalating food deficits, deteriorating nutritional levels, especially among the rural poor, and devastating environmental degradation. While there are more signs since 2000 that smallholder food production is beginning to turn around, this recovery is still very fragile.

Sub-Saharan Africa's extreme poverty, poor soils, uncertain rainfall, increasing population pressures, changing ownership patterns for land and cattle, political and social turmoil, shortages of trained agriculturalists, and weaknesses in research and technology delivery systems all make the task of agricultural development more difficult. But we should also realise that to a considerable extent, the present food crisis is the result of the long-time neglect of agriculture by political leaders. Even though agriculture provides livelihoods to 70-85 percent of the people in most countries, agricultural and rural development has been given low priority.

In 1986 I became involved in food crop technology transfer projects in sub-Saharan Africa, sponsored by The Nippon Foundation and its Chairman, the late Ryoichi Sasakawa, and enthusiastically supported by former U.S. President Jimmy Carter. Our joint programme is known as Sasakawa-Global 2000, and has operated in 14 sub-Saharan African countries the past 20 years. We have assisted several million small-scale farmers to grow extension demonstration plots for basic food crops: maize, rice, sorghum, millet, wheat, cassava, and grain legumes.

The recommended production technologies come from national and international

Food and Agriculture Organisation of the United Nations (FAO)

14 September 2009, Rome – "Norman Borlaug was a towering scientist whose work rivals that of the 20th century's other great scientific benefactors of humankind," FAO said in a tribute to the memory of the late Nobel Prizewinner.

agricultural research organisations, and include: (1) the use of the best available commercial varieties or hybrids (2) proper land preparation and seeding to achieve good stand establishment, (3) proper application of the appropriate fertilisers and, when needed, crop protection chemicals, (4) timely weed control, and (5) moisture conservation and/or better water use if under irrigation. We also work with participating farm families to improve on-farm storage of agricultural production, both to reduce grain losses due to spoilage and infestation and to allow farmers to hold stocks longer to exploit periods when prices in the marketplace are more favourable. Virtually without exception, farmers obtain grain yields that are two to three times higher on their demonstration plots than has been traditionally the case. Farmers' enthusiasm is high and political leaders are taking much interest in the programme.

Despite the formidable challenges in Africa, the elements that worked in Latin America and Asia will also work there. With more effective seed, fertiliser supply and marketing systems, hundreds of millions of smallholder farmers in Africa can make great strides in improving the nutritional and economic well being of their populations. The biggest bottleneck that must be overcome is lack of infrastructure, especially roads and transport, but also potable water and electricity. In particular, improved transport systems would greatly accelerate agricultural production, break down tribal animosities, and help establish rural schools and clinics in areas where teachers and health practitioners are unwilling to venture.

yields are approaching those of the United States with every successive year. However, it is almost certain, that China and India—home to one third of the world's people—will become the largest agricultural importers in the coming decades, as their economies shift from being agrarian to industrial.

Critics of modern agricultural technology invariably turn a blind eye on what the world would have been like without the technological advances that have occurred, largely during the past 50 years. For those whose main concern is protecting the "environment," let's look at the positive impact that the application of science-based technology has had on land use. If the global cereal yields of 1950 still prevailed in 2000 we would have needed nearly 1.2 billion ha of additional land of the same quality—instead of the 660 million ha that was used—to achieve the global harvest of that year. Obviously, such a surplus of land was not available, and certainly not in populous Asia, where the population had increased from 1.2 to 3.8 billion over this period. Moreover, if more environmentally fragile land had been brought into agricultural production, the impact on soil erosion, loss of forests and grasslands, biodiversity and extinction of wildlife species would have been enormous and disastrous.

At least in the foreseeable future, plants—and especially the cereals—will continue to supply much of our increased food demand, both for direct human consumption and as livestock feed to satisfy the rapidly growing demand for meat in the newly industrialising countries. It is likely that an additional one billion metric tons of grain will be needed annually by 2025, just to feed the world, let alone fuel its vehicles. Most of this increase must come from lands already in production through yield improvements. Fortunately, such productivity improvements in crop management can be made all along the line—in plant breeding, crop management, tillage, water use, fertilisation, weed and pest control, and harvesting.

Dr Masaru Iwanaga, Vice-Chair of the Sasakawa Africa Association

My sincere condolences to the family of my colleague, Dr Norman Borlaug.

For nearly 25 years Dr Borlaug, as President of the Sasakawa Africa Association, had worked for the alleviation of hunger and poverty in Sub-Saharan African countries. During the time I served as Director General of CIMMYT, Dr Borlaug was actively visiting African countries and encouraging and motivating field scientists. His determination and leadership were inspirational to thousands of people across the world in striving to bring about a second green revolution.

I hope that in the years to come, agricultural scientists and development specialists will follow Dr Borlaug's example and work at the front line for the elimination of hunger in Sub-Saharan Africa.

May his soul rest in peace.

A tribute to Dr Norman Borlaug

Facing old nemesis

While we must continue to push the frontiers of science forward, we also must be mindful of the need to protect the gains already made. Agriculture is a continuing struggle against mutating pathogens and insects. A clear example is the new race of stem rust that has emerged in East Africa, which is capable of devastating most of the world's commercial bread wheat varieties. Ironically, I began my career in agricultural science some 60 years ago combating stem rust and now, that I am in the twilight of my life, once again I am facing my old nemesis. There hasn't been a major stem rust epidemic for more than 50 years, since the virulent race called 15B devastated much of the North America wheat crop during 1950-54. Out of that crisis came new forms of international co-operation in plant breeding, which led to accelerated development around the world of high-yielding, disease-resistant, broadly adapted wheat varieties. However, in the ensuing years, complacency, increasing barriers to international exchange of plant breeding materials, declining budgets, staff retirements and discontinuity in training programmes, has resulted in a much weakened system. This has been evident in the slow international response to a very serious new stem rust race, called Ug99, first spotted in Uganda and Kenya in the late 1990s. Ug99 has now escaped from Africa and begun its migration to North Africa and the Middle East. It won't be long before it reaches South Asia and later China, North America and the rest of the wheat-growing world. Wheat scientists are now scrambling to control this disease before it gains a foothold and causes catastrophic losses to the livelihoods of several hundred million wheat farmers and widespread global wheat shortages that will affect prices and the welfare of several billion

consumers. Since 2005, excellent collaboration has been forthcoming from the USDA, key land grant universities, and USAID. A far-reaching research programme is being considered by a major U.S. foundation located in Seattle that if approved could solidify and accelerate the progress to date*. As part of this research effort we also hope to identify why rice, alone among the cereals, is immune to the rust fungi, and then use biotechnology to transfer this genetic immunity from rice to wheat and other cereals. If we are successful in this quest, the scourge of rust, mentioned in the bible, could finally be banished from the Earth.

Benefits of biotechnology

During the 20th Century, conventional plant breeding has produced—and continues to produce—modern crop varieties and hybrids that have contributed immensely to grain yield potential, disease and insect resistance, stability of harvests and farm incomes, while sparing vast tracts of land for other uses, such as wildlife habitats, forests, and outdoor recreation.

The majority of agricultural scientists including myself anticipate great benefits from biotechnology in the coming decades to help meet our future needs for food, feed, fibre, and bio-fuels. Promising work, now utilising the powerful new tools of biotechnology, is also under way to develop greater tolerance of climatic extremes, such as drought, heat, and cold. Such research is likely to become more important in the future as the world experiences the effects of climate change. We must also persist in scientific efforts to raise maximum genetic yield potential to increase food production on lands currently in use while protecting against serious negative environmental impacts.

Seventy percent of global water withdrawals are used for irrigating agricultural lands, which account for 17 percent of total cultivated land yet contribute 40 percent of our global food harvest. Expanding the area under irrigation is critical to meeting future food demand. However, competing urban demands for water will require much greater efficiencies in agricultural water use. Through biotechnology we will be able to achieve “more crop per drop” by designing plants with reduced water requirements and adoption of improved crop/water management systems.

Developing country governments need to be prepared to work with—and benefit from—the new breakthroughs in biotechnology. Regulatory frameworks are needed to guide the testing and use of

World Food Programme (WFP)

Norman Borlaug was “our great champion in the battle against hunger,” said WFP Executive Director Josette Sheeran. “His total devotion to ending famine and hunger revolutionised food security for millions of people and for many nations,” Sheeran said. “His heart was as big as his brilliant mind, but it was his passion and compassion that moved the world. We thank him for being our great champion in the battle against hunger.”

**The Bill and Melinda Gates Foundation later made a grant to Cornell University to fund an international research consortium to develop new wheat varieties with resistance to Ug99.*

genetically modified crops, which protect public welfare and the environment against undue risk. They must be cost effective to implement yet not be so restrictive that science cannot advance.

Since the private sector patents its life science inventions, agricultural policy makers must be vigilant in guarding against too much concentration of ownership and also be concerned about equity of access issues, especially for poor farmers. These are legitimate matters for debate by national, regional and global governmental organisations.

Even with private sector leadership in biotechnology research I believe that governments should also fund significant public research programmes. This is not only important as a complement and balance to private sector proprietary research, but is also needed to ensure the proper training of new generations of scientists, both for private and public sector research institutions.

Robert Zoellick, President of the World Bank Group

I had the honour of discussing farming – old and new – with Dr. Borlaug over the years. I always came away better informed about agriculture, science, and the ability of one person with a big heart and fine mind to make a huge difference for humankind.

In 2008, I had the privilege of attending the World Food Prize in Iowa, an annual gathering of agricultural scientists, farmers and policy makers, in part to pay tribute to Norman Borlaug's extraordinary work and decency.

Norman Borlaug was and will remain an inspiration for those convinced that sustainable development is possible, within reach, and critical for unlocking earth's promise. At the World Bank Group, we will continue to be guided by his vision.

A younger Borlaug –
the man who fed the world



A tribute to Dr Norman Borlaug

With farmers in Ghana

Every year their yields improved, and then, in 1989, they harvested a miracle. "The crops were so big, and there were cobs on each stalk," said farmer Emmanuel Boateng, his eyes large with amazement. "We were used to having many stalks with no cobs."

Fufuo's farmers were accustomed to gathering only five one hundred-kilogram bags of corn per acre. Now they reaped fifteen bags. The promise of their elderly white-haired visitor had come to pass. So abundant was the harvest that Borlaug pitched in with the work, and he insisted on a strict harvest protocol. For example, he gave orders that the husking needed to be done in the field, so any pests would stay there and not come into the areas where the

corn would be stored. One day, farmers brought the corn into the village while the corn was still in the husks.

"Bring me a chair," Borlaug barked. For hours, into the evening, he sat with the women, pulling the husks off the corn. "You did all this work, growing the corn, and now you endanger all you have done," he scolded them. No one slept in Fufuo that night until the last ear was husked.

"He really knocked our heads together that day," Boateng recalled. "Oooh, it was a bad day for us."

An extract from 'Enough' by Roger Thurow and Scott Kilman, published by Public Affairs, 2009

Break the deadlock

As the pace of technological change has accelerated the past 50 years, the fear of science has grown. Certainly, the breaking of the atom and the prospects of a nuclear holocaust added to people's fear, and drove a bigger wedge between the scientist and the layman. Rachel Carson's book *Silent Spring*, published in 1962, which reported that poisons were everywhere, also struck a very sensitive nerve. Of course, this perception was not totally unfounded. By the mid 20th century air and water quality had been seriously damaged through wasteful industrial production systems that pushed effluents often literally into "our own backyards."

We all owe a debt of gratitude to environmental movement in the industrialised nations, which has led to legislation over the past 40 years to improve air and water quality, protect wildlife, control the disposal of toxic wastes, protect the soils, and reduce the loss of biodiversity. However, these positive environmental trends are not found in the developing countries, where environmental degradation, especially in Africa, threatens ecological stability if not reversed.

There is often a deadlock between agriculturalists and environmentalists over what constitutes "sustainable agriculture" in the Third World. This debate has confused—if not paralysed—many in the international donor community who, afraid of antagonising powerful environmental lobbying groups, have turned away from supporting science-based agricultural modernisation projects still needed in much of smallholder Asia, sub-Saharan Africa, and Latin America. This deadlock must be broken.

We cannot lose sight of the enormous job before us to feed 10 billion people, 90 percent of whom will begin life in a developing country, and many in poverty. Only through dynamic agricultural development will there be any hope to alleviate poverty and improve human health and productivity, and reducing political instability.

Educating urbanites about agriculture

The current backlash against agricultural science and technology evident in some industrialised countries is hard for me to comprehend. Less than four percent of the population in the industrialised countries (less than two percent in the USA) is directly engaged in agriculture. With low-cost food supplies and urban bias, is it any wonder that consumers don't understand the complexities of re-producing the world food supply each year in its entirety, and expanding it further for the nearly 80 million new mouths that are born into this world annually? I believe we can help address this "educational gap" by

making it compulsory in secondary schools and universities for students to take courses on agriculture, biology, and science and technology policy.

One exciting high school programme, in which I am personally involved, is the World Food Prize Youth Institute programme originated by Des Moines philanthropist Juan Ruan and led by the World Food Prize Foundation. Each year, more than a 100 high school students, mainly from Iowa but now expanding to other states and countries, convene at the George Washington Carver auditorium at Pioneer Hybrid Company headquarters in Johnston, Iowa, with teachers and parents, to present their well-researched essays on about how to increase the quantity, quality, and availability of food around the world. They make these presentations in front of past and present World Food Prize laureates and other experts, and lively discussions ensue. Each year, a select few graduating seniors win travel fellowships to go to a developing country where they live and work at an agricultural research institute, and learn first hand about hunger and poverty, and the role that science and technology can play to alleviate these calamities. It is especially gratifying to see the growth and development of these young, mostly female, summer interns. It literally is a life-changing experience for them, and it shows in their performance at university and in career selections.

With former US President Jimmy Carter and Yohei Sasakawa, Chairman of The Nippon Foundation, which funds the SAA programme



His last words were "take it to the farmers," and we will.

Christopher Dowswell, SAA Executive Director (programmes) and Aide-de-Camp to Dr Borlaug 1979-2009