

## Norman Borlaug's Legacy and the Urgent Need for Continuing Innovative Wheat Technology



Much has been written about Dr. NORMAN E. BORLAUG, the eminent wheat scientist, 1970 Nobel Peace Prize Laureate, father of the Green Revolution, the man who saved more humans from starvation than any other person in history. But nothing expresses better what great human being he was, the vision he had for global food security, his life-long fight and commitment to reduce poverty and to provide adequate food to the poor and the need for continuous investments in agricultural research than his quotes. We therefore let Norman Borlaug speak once more for himself.

*"I personally cannot live comfortably in the midst of abject hunger and poverty and human misery, if I have the possibilities of – even in a modest way, with the help of my many scientific colleges – of doing something about improving the lives of these many young children."* (NORMAN E. BORLAUG)

NORMAN BORLAUG was often heard to say that *"...impact in farmers' fields, not learned publications, is the measure by which we will judge...our work."* Along with his famed and dedicated fieldwork, BORLAUG's wide-ranging intellect and abiding interest in the natural sciences—filtered through a pragmatic humanitarian vision—brought technological innovations that hold their value after more than half a century, continuing to benefit farmers and consumers. The most notable include incorporating dwarfing genes and making other changes in wheat, so that more nutrients flowed to the grain and plants could remain erect under a heavy head. When early development of the new wheats went more slowly than he wished, Borlaug decided to grow two breeding crops a year by shuttling experimental lines between locations 10-degrees-of-latitude apart. Unorthodox at the time, the approach not only sped selection but helped craft a new generation of wheat that could be sown worldwide, irrespective of differing day lengths. Stem rust disease has once again emerged as a global threat to wheat harvests, but the resistance Borlaug bred into Mexican wheat varieties proved so effective that it held the pathogen at bay for nearly 50 years. Finally, Borlaug established an international wheat testing and sharing network that to this day constitutes a pillar of global wheat improvement.

*"I now say that the world has the technology – either available or well advanced in the research pipeline – to feed on a sustainable basis a population of 10 billion people. The more pertinent question today is whether farmers and ranchers will be permitted to use this new technology? While the affluent nations can certainly afford to adopt ultra low-risk positions, and pay more for food produced by the so-called 'organic' methods, the one billion chronically undernourished people of the low income, food-deficit nations cannot."* (NORMAN E. BORLAUG)

High-yielding wheat varieties and improved farming practices, first developed by BORLAUG and his team in Mexico during the 1950s, were introduced into South Asia in the 1960s, saving hundreds of millions of people from starvation and helping to promote science-based agriculture in developing countries. Today, high-yielding, disease-resistant wheat varieties based on the pioneering efforts of BORLAUG and his partners are sown on 70 million hectares worldwide and around 50% of all wheats grown today in developed and developing countries are related to CIMMYT lines.

*“Future food-production increases will have to come from higher yields. And though I have no doubt yields will keep going up, whether they can go up enough to feed the population monster is another matter. Unless progress with agricultural yields remains very strong, the next century will experience sheer human misery that, on a numerical scale, will exceed the worst of everything that has come before.”* (NORMAN E. BORLAUG, 1970)

BORLAUG always considered himself a teacher as well as a scientist. In Mexico, from 1960–1965, he trained more than 100 young researchers from North Africa, the Middle East and South Asia. When they returned home they took Mexican-bred wheat seed with them and became members of an international wheat fraternity, which included organized wheat seed testing networks. When famine struck South Asia in 1964–1965, BORLAUG’s former trainees had already tested the Mexican wheat varieties and high-yield production practices. They knew that they fit local production conditions and could revolutionize cereal production. Between 1966 and 1970, a revolution in wheat production occurred throughout the Developing World – one of the great milestones in the history of world agriculture.

*“For, behind the scenes, halfway around the world in Mexico, were two decades of aggressive research on wheat that not only enabled Mexico to become self-sufficient with respect to wheat production but also paved the way to rapid increase in its production in other countries.”* (NORMAN E. BORLAUG)

Today, several thousand men and women agricultural scientists from more than 50 countries are proud to say they were BORLAUG “students” or BORLAUG’s hunger fighters. Over a 63-year career, he used his fame and influence to champion the cause of smallholder agricultural development around the globe and travelled tirelessly to more than 100 nations, visiting farmers and agricultural scientists in their fields. It is estimated that over his lifetime he personally spoke to more than 500 000 students and ordinary citizens, explaining the challenges and complexities of world food production. His spirit and ethos also live on in organizations such as CIMMYT, Texas A & M University, and the Sasakawa Africa Association, or the World Food Prize whose creation in 1986 was spearheaded by Borlaug. His work touched the entire global wheat research community; that community now confronts a serious crisis in wheat grain supplies and prices.

*“I am but one member of a vast team made up of many organizations, officials, thousands of scientists, and millions of farmers - mostly small and humble – who for many years have been fighting a quiet, oftentimes losing war on the food production front.”* (NORMAN E. BORLAUG)

In 1969, BORLAUG predicted that the Green Revolution boost in food production would last 20–30 years, buying time for humanity to adopt more responsible policies to manage population growth and natural resources.

*“In a policy makers office, you say brutally, frankly, look, things are seething down there, if you want Government Stability, the games you played by in the past won’t serve.”* (NORMAN E. BORLAUG)

The latter did not occur, and in his final days BORLAUG painfully witnessed the results: a food crisis in 2008 and the population of the hungry surpassing 1 billion in 2009, the year he died.

*“Man can and must prevent the tragedy of famine in the future instead of merely trying with pious regret to salvage the human wreckage of the famine, as he has so often done in the past.”* (NORMAN E. BORLAUG)

Accounting for a fifth of humanity’s food, wheat is second only to rice as a source of calories in the diets of developing country consumers, and it is first as a source of protein. Wheat is an especially critical staff of life for the approximately 1.2 billion wheat dependent to 2.5 billion wheat consuming poor – men, women, and children who live on less than USD 2 per day – and approximately 30 million poor wheat producers and their families. Demand for wheat in the developing world is projected to increase 60% by 2050.

*“Civilization as it is known today could not have evolved, nor can it survive, without an adequate food supply.”* (NORMAN E. BORLAUG)

At the same time, climate-change-induced temperature increases are likely to reduce wheat production in developing countries by 20–30%. As a result, prices will more than double in real terms, eroding the purchasing power of poor consumers and creating conditions for widespread social unrest. This

scenario is worsened by stagnating yields, soil degradation, increasing irrigation and fertilizer costs, and virulent new disease and pest strains.

*“The only way that the world can keep up with food production to the levels that are needed with a growing world population is by the improvement of science and technology, and with the right policies that permit the application of that science and technology.”* (NORMAN E. BORLAUG)

Perhaps the time has passed when a single man like BORLAUG could have an outsized influence on food supplies. But maybe wheat scientists, we the participants of the 8<sup>th</sup> International Wheat Conference, in the global network BORLAUG helped create have a chance at addressing the challenges to sustainable production of one of humanity’s oldest and most important staple crops.

*“There are no miracles in agricultural production.” ... “If you desire peace, cultivate justice, but at the same time cultivate the fields to produce more bread; otherwise there will be no peace.” ... “Food is the moral right of all who are born into this world.”* (NORMAN E. BORLAUG)

*HANS-JOACHIM BRAUN, Mexico*