

## “REACH FOR THE STARS”

Commencement Address

Norman E. Borlaug

University of Minnesota  
College of Agricultural, Food and Environmental Sciences

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LADIES and GENTLEMEN, FELLOW GOPHERS:

My heartfelt congratulations go out to all of you who receive degrees from the College of Agricultural, Food and Environmental Sciences. This is an auspicious day! I also salute your professors, university staff, parents, families and friends who have helped make it possible for you to achieve this important goal. You will recall with fondness in the years ahead the value and memories and of your years at the University of Minnesota, as I myself have done for more than 60 years.

Many things have changed in the world and in my life since I finally left the University of Minnesota in 1942, with PhD in hand, to embark on a career in agricultural research and technology development. Indeed, change is one of the few certainties in life. It seems that virtually everything changes—either for better or for worse—nothing stays the same. Individuals, communities or nations which accept status quo, most likely are committing themselves to a retrogressive standard of living.

### **Change and Neo-Luddites**

In my line of work I often refer to people with extreme conservatism about science and technology as “neo-Luddites.” The original “Luddites” were followers of Ned Ludd in England during 1810-20 who tried to destroy new, machine-powered textile manufacturing looms, which marked the beginning of the industrial revolution. Today in agriculture, we have “neo-Luddites” who are trying to stop the application of new knowledge in molecular biology—the so-called biotechnology—from being applied to enhance our food system by development of improved plant varieties and animal breeds. Most of opposition against agricultural biotechnology has come from people in industrialized countries who, well fed and bodily comfortable, seem increasingly to want a world without risk. It is rich world argument that is hurting the poor.

### **Taming the Population Monster**

During my lifetime—now 90 years—world population has grown from 1.6 billion to 6.3 billion people—a four-fold increase. Although growth rates are slowing, we are still adding nearly 80 million people per year to world population, most of them, unfortunately, are in food-deficit nations. Population growth, plus increasing incomes that lead to better diets, are the parameters that those of us on the food production front must factor into our work.

Achieving sustainable agricultural production with equitable distribution of sufficient food for the 9-10 billion people likely to be on Earth by the end of the 21<sup>st</sup> Century are daunting challenges. So far, advances in agricultural research and production—and the efforts of the world's farmers, ranchers and fishermen—have kept world food production growing faster than population. Even so, at least 800 million go to bed hungry most nights, not because there isn't enough food to go around but rather because they are either too poor to buy it or to produce it.

I often ask the critics of modern agricultural technology what the world would have been like without the technological advances that have occurred over the past 50 years. Had we tried to produce the two billion metric tons of cereals harvested today with the crop yield technology of 1950, we would need a total 4.5 billion acres of land—of the same quality as in use today—instead of the 1.8 billion acres that are actually used. Obviously, such a surplus of land is no longer available, especially in populous Asia. Moreover, even if it were available, had we tried to bring an additional 2.7 billion acres of land into cereal cultivation around the globe, it would have resulted in soil erosion, loss of forests and grasslands, and impact on wildlife species of unprecedented magnitudes.

The use of high yield production technology—with its consequent savings in land—has done much to protect the environment. This benefit is rarely acknowledged by environmental action organizations and little understood by urban populations. Technology is not the enemy of the environment; poverty is!!

### **The Green Revolution**

In 1944, I joined the first pioneering international agricultural research and production programs—the Mexican Government-Rockefeller Foundation Program. As I look back on my own career of six decades in agricultural research and food

production in the developing world, two major streams of change have had major impacts on my work—one has been unprecedented population growth in the developing world; the other, the has been the enormous impact that the application of science has had on the development of improved food production technology.

This application of modern science and technology to food production in the developing world came to be known as the “Green Revolution,” This term was coined in 1968 in a speech by Dr. William Gaud, the Administrator of USAID, to describe the rapid introduction and diffusion into India and Pakistan of new types of wheat and rice varieties that had much higher genetic grain yield potential and disease resistance than had ever been seen before. When these new seeds were combined with fertilizers, irrigation, and improved crop management, and widely demonstrated on farms, tremendous increases in food production were achieved. Between 1965 and 2000 cereal production in the developing countries Asia tripled, leading to a 25 percent increase in per capita food availability, literally saving hundreds of millions of people from hunger and starvation.

I was privileged to have been involved in the development of the broadly-adapted disease resistant, high-yielding wheat varieties and production technology, and to have trained and led an international team of young scientists that sparked the so-called Green Revolution in Asia. These wheat varieties were first developed in Mexico, initially under the Mexican Government-Rockefeller Foundation program and later by its successor organization, the International Maize and Wheat Improvement Center (CIMMYT). Today, the high-yielding so-called “Mexican” wheat varieties and their derivatives are grown on 175 million acres worldwide, and have added several hundred million metric tons to the world wheat harvest.

### **Africa is Our Greatest Challenge**

Over the past 17 years, I have been working in Africa with former U.S. President Jimmy Carter and the Sasakawa family of Japan in an initiative called the Sasakawa-Global 2000 agricultural program. Our aim is to bring a Green Revolution in food production to millions of small-scale farmers. Unfortunately, progress has been painfully slow; and much less than achieved in Asia 35 years ago. Widespread food insecurity and malnutrition persists, and in some areas, has even increased. African food production remains in crisis, even though technology is available to double and triple yields of the major food crops. While technology is available and smallholder farmers are eager to adopt it, unless Africa’s rural infrastructure and institutions are significantly improved—especially transport

systems, energy, water, schools, and clinics—all other efforts to reduce poverty and hunger, improve health and education, and secure peace and prosperity will continue to falter.

During the colonial period in South Asia, Britain needed cotton fiber for its textile industry. Hence, to further increase cotton production railroads were built into the Punjab—the best agricultural region—roads were built to deliver cotton to railhead, and irrigation systems were developed. When the high yield wheat and rice production technology were widely demonstrated in the early 1960s and shown to be capable of increasing grain yield per acre three- to four-fold, the main remaining obstacles to increasing production were unavailability of fertilizer and government policies that denied farmers the needed economic incentive to increase their productivity. When these obstacles were removed, following nasty debates at top governmental levels, in which I was personally involved, production soared!

By contrast in sub-Saharan Africa, the main interest of the colonial powers was minerals and not agricultural products—so the railroads were built to the mines. Agricultural development was largely neglected. Development of sub-Saharan countries continues to be hobbled by lack of infrastructure, especially roads. Roads bring schools; soon schools catalyze development of public health services; bus and truck service begin to break down cultural, ethnic, linguistic and tribal barriers and everything begins to change!

### **Urbanization and the Loss of Our “Agricultural Roots”**

The tremendous progress made in agricultural science and technology, education, medicine, public health, communication and transportation during the 20<sup>th</sup> Century has permitted the majority of people in the industrialized nations to leave farming and move from the countryside to better paying positions in the city. In most industrialized countries, less than 3 percent of the population is now engaged directly in agricultural production, and less than 20 percent live in rural areas. As a result, most people in the industrialized nations have lost touch with the land, and are ignorant about the complexities and magnitude of producing and equitably distributing food for all who come into this world.

Urban ignorance about agriculture in rich countries—indeed about biological sciences in general—has permitted radical environmental elites to capture and distort essential environmental movements and by using fear tactics to confuse the public about modern agriculture. These anti-technology critics argue that

humankind is being poisoned by modern high-yield agriculture and should return to traditional organic methods. Of course, this is nonsense. We live longer, more productive lives than every before.

Today, anti-science and technology zealots are trying to retard—and even stop—the application of new science and technology, especially the new transgenic biotechnological tools that offer so much promise for the future. While it is almost certain that they will not be successful, we still must remain vigilant to make sure that such a catastrophe does not happen. I have had the sad experience of seeing the monstrous effects that T. Lysenko, the leading proponent of pseudo-science in the Soviet Union, had on agricultural science and production. Lysenko-ism contributed enormously to that country's collapse, and also spread this false dogma to many other countries.

### **Use Reason in Environmental Protection**

Over the past 40 years, we all owe a debt of gratitude to the environmental movement in industrialized nations, which has led to legislation to improve air and water quality, protect wildlife, control the disposal of toxic wastes, protect soils, and reduce the loss of biodiversity. However, in looking to the future, our ecological impulses must be grounded in rationality. Logic—based on scientific data not sentiment—will best serve the interests of nature and humankind.

Protecting the land, water, and atmospheric resource base of planet Earth is clearly central to preserving our quality of life and probably, the long-term survival of humankind. While many continue to argue to the contrary, in the rich, industrialized western world, the age of pollution is nearly over. Aside from armaments, technology is not growing more dangerous and wasteful but cleaner and more resource-efficient. I predict that almost all of the remaining pollution issues will be solved in the lifetime of most of you.

As positive as trends towards clean technology and a better environment are in the developed nations, they are negative and worsening in the developing nations that employ primitive traditional agricultural methods. This is why it is so important for Western Europe, the United States, Canada and Japan to break free from their “doomsday” thinking so that resources can be diverted to ecological protection in the developing world.

In principle, the human population is no enemy of nature. Someday, human population may be several times larger than at present, without serious ecological harm. But today, many developing countries have population growth rates that are too high for current social institutions and technological knowledge to support with adequate standards of living. Thus, short-term global population stabilization, especially in densely populated nations, is desperately needed. Intermediate population projections of the United Nations estimate that the earliest we can expect leveling-off of human growth rate is towards the end of the 21<sup>st</sup> Century, when world population will be between 9 and 10 billion people with, unfortunately, 90 percent living in low-income developing nations. All of us must strive to bring human numbers to a more satisfactory equilibrium.

### **Striving for Social Justice and Political Stability**

There has always been inequality in the animal and plant kingdoms. From the early days of prehistoric man, tribal hunters that occupied the best grassland environments with herds of large ungulates had access to an abundant supply of wild meat. Weaker tribes of hunters were pushed into drier or harsher environments where wild meat resources were less and more difficult to harvest. These inequities continue today, despite our technological power to assure food security for all that come into this world.

Currently, more than one billion people in the industrialized world, primarily because of contributions of science and technology, enjoy a standard of living that was unimaginable—even in the fondest dreams—of their grandfathers and great grandfathers.

Unfortunately, another nearly one billion people in developing nations remain illiterate, malnourished, hungry, ill, poverty stricken and without hope. Another 2-3 billion live outside formal economic systems, in varying degrees of poverty and want. These environments of human misery and hopelessness are fertile seed beds for sowing and cultivating seeds of terrorism that is potentially a serious threat to civilization and the future well-being of humankind everywhere.

I urge you not to close your eyes and hearts to the less fortunate, especially the 800 million to one billion people who begin and end each day hungry. These inhumane injustices must be lessened in the decades ahead. Remember, compassion is the greatest of all human virtues. By helping the less fortunate, you serve God and your country.

### **Cultivate a Healthy Body and Mind**

Take good care of your body. Remember, you must live in it for a lifetime. Don't destroy it with hard drugs, alcohol, or other excesses. Do we really need so many mind-numbing stimulants? Is life so meaningless? Moreover, look at the disastrous consequences on world society that drug trafficking is bringing, through the violence and corruption that it breeds. For your own health, follow good and authentic recommendations on nutrition, medicine, and exercise.

### **Knowledge and Lifelong Learning**

The late American historian-philosopher Will Durant once said, "Education is a life-long discovery of our own ignorance. Sixty years ago, when I was 19, I thought I knew everything and my father knew nothing. By the time I was 29, I was amazed at how much my father had learned. Now at 79, I realize I know nothing."

Will Rogers, the late cowboy, humorist, and philosopher, put it more simply, "We are all ignorant; the difference is that we are ignorant about different subjects." To this I might add, as we become more specialized in our knowledge, there is an ever-present danger of our gene for common sense becoming seriously eroded. So try to read broadly and across disciplines. Don't be ignorant of history, since it can teach us many lessons of relevance today.

### **Reach For the Stars**

In closing I urge all of you to apply yourselves to the fullest. Never be satisfied with mediocrity. Reach for the stars! Although you can never really touch one, if you stretch yourself, you will get a little "star dust" on you, and you will be surprised what you will be able to achieve for yourself, your families, communities, nation, and indeed the world!!