

## **Commencement Address**

### **“LIVING WITH CHANGE”**

**By**

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First of all, I would like to express my gratitude to the UDLAP Rector, Dr. Enrique Cárdenas Sánchez, Vice Rector, Dr. Jorge Welti Chanes, and the Faculty for inviting me to address the first UDLAP graduating class of the new millennium and for honoring me with an honorary doctorate from this fine institution of higher education. It is a pleasure to be with you all today on this special day.

Change is one of the few certainties in life we can count on. It seems that virtually everything changes, either for the better or for the worse; nothing stays the same. Indeed, a nation, or individual, accepting status quo is, in effect, committing itself to a retrogressive standard of living. I call such anti-technology people, “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, we have “neo-Luddites” in Western Europe, Japan, and the United States, who are trying to stop the application of knowledge in molecular biology, the so-called genetic engineering, from

being applied to the development of higher-yielding plant and animal species.

As I look back on my own career in agricultural research and production in the developing world, two major streams of change have had major impacts on my work—population growth and the application of scientific discoveries to develop improved technology. During my lifetime—86 years—world population has grown from 1.6 billion to over 6 billion people—a four-fold increase. More close to home, since I came to Mexico—46 years ago—the population of Mexico has increased from 22 million to 100 million people. Although population growth rates are slowing, we are still adding nearly 100 million people per year, or approximately one Mexico per year, to world population. This is the challenge facing those of us on the food production front.

### **Agriculture—the Mother of All Sciences**

In 1998 global food production of all types stood at 5.03 billion metric tons of gross tonnage and 2.48 billion tons of edible dry matter. Of this total, 99% was produced on the land—only about 1% came from the oceans and inland waters. Plant products constituted 92 percent of the human diet, with about 30 crop species providing most of the world's calories and protein, including eight species of cereals, which collectively account for 70 percent of the world food supply. Animal products, which constitute 8 percent of the world's diet, also come indirectly from plants.

So far, agricultural research and production advances—and the efforts of the world's farmers and ranchers—have kept world food production ahead of

population. Up until about 60 years ago, expansions in world food production were achieved by opening up new land. Since then, through the application of science to develop high-yielding technology, our world food supply has increasingly been expanded by raising crop yields on lands already in production rather than by adding new land. I often ask the critics of modern agricultural technology what the world would have been like without the technological advances that have occurred?

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 the land during the 20<sup>th</sup> Century, the period of nearly exponential world population growth.

Had we tried to produce the 2 billion ton cereal harvest of 1998 with the crop yield technology of 1950, we would have needed a total 1.6 billion hectares of land—of the same quality—instead of the 600 million ha that were actually used. Obviously, such a surplus of land was not available, especially in populous Asia. Moreover, even if it were available, think of soil erosion, loss of forests and grasslands, and impact on wildlife species that would have occurred had we tried to bring an additional one billion hectares of land under the plow.

Many in this audience may not know the significant role that Mexico has played in sparking the so-called “Green Revolution” which began some 40 years ago in developing country agriculture. The high-yielding wheat varieties that helped save millions of Asians from hunger and starvation during the 1960s and 1970s were developed in Mexico, first under the

Mexican Government-Rockefeller Foundation program that operated between 1943 and 1960, which later gave rise Mexico's National Agricultural Research Institute (now known as INIFAP) and the International Maize and Wheat Improvement Center (CIMMYT), headquartered near Texcoco. Today, these high-yielding "Mexican" wheat varieties are grown on more than 70 million hectares worldwide, and have added more than one hundred million tons of wheat supply to the world harvest.

Maize, whose ancestral home is Mexico and the Central American peninsula, was actually the first cereal crop to experience a "Green Revolution," beginning during the 1940s and 1950s in the temperate climates of the USA and Europe, with the development and widespread adoption of high-yielding hybrid maize varieties, used in combination with much higher levels of fertilizer use. This hybrid maize revolution has continued, later shifted to China, Argentina, Brazil, Mexico, South Africa, and several other developing countries.

Today, high-yielding maize varieties developed by CIMMYT and national research partners are catalyzing new crop revolutions in many countries with tropical and subtropical climates. A "nutritional revolution" is also underway with the quality protein maize (QPM) varieties developed by CIMMYT and several national research institutes. These nutritionally superior maize types have much higher levels of lysine and tryptophan, two essential amino acids, which are the building blocks for protein. A Mexican biochemist, Dr. Evagelina Villegas, was one of the key members of the scientific team at CIMMYT that produced this remarkable type of maize. Today, QPM is grown commercially on more than one million hectares in an expanding

number of countries, including Mexico, China, Brazil, the United States, Ghana, South Africa, and Guatemala. This area planted to QPM is likely to grow to three or four million hectares within the next several years.

Over the past 15 years, I have been involved with former U.S. President Jimmy Carter and Yohei Sasakawa of Japan in an initiative in Africa, called the Sasakawa-Global 2000 agricultural program, which is working in 12 countries to bring a Green Revolution in food production to millions of small-scale farmers. Several Mexican scientists serve as field directors in this initiative and are doing an outstanding job of helping to bring greater food security to the poor of this vast continent.

### **Resist Anti-Science Elitist Attacks**

The tremendous progress made in agricultural science and technology during the 20<sup>th</sup> Century has permitted the majority of people in the North to leave farming and move from the countryside to the city. In most industrialized countries, less than 3 percent of the population is now engaged directly in agriculture, and less than 20 percent live in rural areas. As a result, most people in the developed 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 the rich nations—indeed about biological sciences in general—has allowed a radical elite to confuse the public about modern agriculture. These anti-technology critics are arguing that humankind should try to “turn back the clock” and use the low-yielding traditional technologies that were employed 50 years ago, when world

population stood at 2.5 billion people. This is no longer a viable option for a world of 6 billion souls. These anti-science and technology lobbyists are trying to retard—and even stop—the application of new science and technology. 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.

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

Over the past 30 years, we all owe a debt of gratitude to environmental movement in the industrialized nations, which has led to legislation to improved air and water quality, protect wildlife, control the disposal of toxic wastes, protect the soils, and reduce the loss of biodiversity. However, in looking to the future, our ecological impulses must be grounded in rationality. Logic, not sentiment, will best serve the interests of nature.

Protecting the land, water, and atmospheric resource base of planet Earth is obviously important to quality of life, and even perhaps to the long-term survival of humankind. However, let me assure this audience that nature is not ending, nor is human damage to the environment “unprecedented.” Indeed, nature has repelled forces of a magnitude many times greater than the worst human malfeasance. Nature still rules much more of the Earth than does the genus *Homo*, make no mistake about that.

In principle, the human population is no enemy of nature. Someday, human population may be many times larger than at present, without ecological harm. But the world of the present has more people than current social institutions and technological knowledge can support at adequate standards

of living. Thus, short-term global population stabilization is desperately needed. Intermediate population projections of the United Nations estimate that the earliest we can level-off human growth in numbers is around 2050, when world population will be between 10 and 12 billion people, with 90 percent living in what are classified today as low-income developing nations. All of us must strive to bring human numbers to an equilibrium population.

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 the people in this audience. As positive as trends towards clean technology are in the developed nations, they are negative in the developing nations. This is why it is so important for Western Europe, the United States, and Japan to free themselves from their “doomsday” thinking so that resources can be diverted to the ecological protection in the developing world.

### **Strive for Social Justice**

There has always been inequality in the animal and plant kingdoms. From the early days of prehistoric man, some had more privileged access to resources and food than others. I have no doubt that the rich and the poor will continue to be with us forever. However, growing inequity of income and food distribution is a matter that should concern us all. Certainly, a world in which a very few enjoy most of the wealth is not likely to be a peaceful one. Today, roughly 15 percent of humankind enjoys 85 percent of global income, and this imbalance is becoming increasingly skewed.

At least in a relative sense, I assume that everyone here today is among the economically privileged. Thus, we should count our blessings. I urge you not to become arrogant and close your eyes and hearts to the less fortunate, especially the nearly 1 billion people who begin and end each day hungry. By helping the less fortunate, you serve God as well as your country. Remember, compassion is the greatest of all human virtues.

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

Take good care of your body. Remember, you must live in it for your lifetime. Don't destroy it with hard drugs, alcohol, or other excesses. In Follow good authentic nutritional, medical, and exercise recommendations, and avoid fads.

Graduation may be the termination of your formal education and the commencement of your self-independent life. Enjoy it! Congratulations to all of you have achieved this honor and to your professors, parents, families, and friends who have all helped to make it possible for you to achieve this goal.

But remember, as the late American historian Will Durant so eloquently phrased it, "Education is a life-long discovery of our own ignorance. 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 that I am 69, 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 his comment I might add, as we become more specialized in our knowledge, there is a danger that our ignorance becomes more pervasive, which is also destroying the gene for common sense. Try to read broadly and across several disciplines. Don’t be ignorant of history, since it can teach us many lessons of relevance today.

In closing, let me challenge you to not be satisfied with mediocrity. Beware of complacency and the ease and comfort of affluence. Utilize your inherent talents to the utmost of your ability. Reach for the stars. If you keep reading and learning across many disciplines, you will be surprisingly pleased to see the successes that you can achieve, and to the contributions you can make to your families, friends, communities, the great nation of Mexico, and to humankind worldwide. Now God speed and best wishes as you set out along the road of life.

## Norman E. Borlaug's Words to the Young

Mine is a simple philosophy. To the young I say:

### **ON THE POSITIVE SIDE, we have these "Do's":**

- 1) Educate and train yourself broadly.
- 2) Be optimistic and positive in the outlook on life.
- 3) Give your best-motivation comes from within.
- 4) Develop a concern for others.
- 6) Become a team player.
- 7) Nourish common sense.
- 8) Work hard.
- 9) Learn to play and relax
- 10) Take good care of your body.
- 11) Remember, it is difficult to construct.
- 12) Remember, there have been many brilliant people in this world in previous generations. Learn from history to avoid repeating the same mistakes.
- 13) Remember, there is a force in this universe greater than man—God.

### **ON THE NEGATIVE SIDE, we have these "Don'ts":**

- 1) Don't expect to build a better world without education.
- 2) Don't be a drop-out.
- 3) Don't be mediocre-this way you cannot build a better world, and mediocrity is in oversupply.
- 4) Don't become arrogant.
- 5) Don't forget the less fortunate.

- 6) Don't believe you alone can achieve much.
- 7) Don't become over-sophisticated.
- 8) Don't under-estimate the value and dignity of honest hard work.
- 9) Don't over play.
- 10) Don't become a slave to drugs.
- 11) Remember, it's easy to destroy.