

## **WORLD FOOD PRIZE SYMPOSIUM October 2001**

### **Norman E. Borlaug**

Thank you, Bob. Ladies and gentlemen, members of the panel. You saw how much time I've had to prepare for this. I've been... the press, the radio, television, and never had time to think. But I'll try to briefly, in five minutes, six minutes, give you my principal points of view on these complex issues.

First of all, I think we forget what the population monster does to put pressures on many fronts. When I was born in 1914, the world population was about 1.6 billion. Today we're close to 6.2 billion, and we're adding at least 85 million more every year. And, remember, our statistics aren't too good. Then in addition to that, we are being pushed by extremists in an environmental movement that I was very much in favor of when it began, because I, too, was... in forest ecology. I lived in the back country in Idaho, not in British Columbia but came from the same kind of environment.

But then in the last decade, I've become very disillusioned by how this environmental movement has been captured by a few elitists who look at the problems of the world from the standpoint of the privileged positions of the affluent nations and forget about the miserable environments in which the Third World nations are forced to live, because they haven't developed their economies and used their science and technology to provide their food and public health services and to conserve, preserve their natural resource base. If you want to see the bad environment, live in those countries. And, unfortunately, a good part of the world's population lives there.

And as the honored World Food Prize Laureate Per Andersen has mentioned several times in the last two days, maybe some of this extremist terrorism is a reflection of the growing uneasiness of many of these underprivileged people, led by a few extremists that have created these disastrous situations.

Remember, when there's no education, people can be led more easily by an extremist in a movement, and I think we need to bear that in mind. Per Andersen at lunch today mentioned that there has to be a great deal of investment in development of education. We have in the past few decades tried to help many of these developing nations improve their universities, which is necessary, and they have functioned to improve technology to improve food production – but the masses are still lacking primary and secondary schools. And unless this education is provided, very often they are going to be led by some very extreme extremists in many of these movements to the detriment not only of the people who are being led but leading to more and conflict between nations and between social and economic groups.

Now let me take a look at the so-called Green Revolution I, of the sixties, middle sixties to the year of 2000. The changes that took place there were largely on two crops, and it wasn't the magic of the new varieties alone. Yes, they lifted the yield potential, they had architecture

and disease resistance that contributed to that yield and also to more stability of yield because of greater disease and insect resistance. But those varieties alone would have done very little to change the world food production. It was the integration of those with improved agronomic practices.

First of all restoration of fertility to worn-out soils, fertilizer. And then we get into the trap of organic fertilizer versus chemical fertilizer – all nonsense. I've said for decades, use all the organic fertilizer, but there isn't enough to feed six billion people.

As Professor \_\_\_ at the University of Manitoba – now, I believe he was born in Czechoslovakia, and I'm not sure where he's a citizen of today, whether Canada or the Republic of Czech – but in any case, two years ago at a memorial lecture he said that without the invention of the \_\_\_ process to fix nitrogen from the air under heavy temperature and pressure to form ammonia and convert it to other forms of nitrogenous fertilizer, the world could not produce food and fiber enough for more than four billion people, without destroying the environment by moving into marginal lands, marginal from a rainfall standpoint, from the shallow soil standpoint, and also from a topographic standpoint where erosion would have made production on a sustainable basis impossible.

And then he went on to say, but I don't see two billion volunteers to get the ... from this planet earth. Here we are with this dilemma – those of us who are trying to help hungry nations to produce food. We're pushed and pulled in many different directions. It's a big and complicated enough problem without all of these confusion things that are added in. Organic foods good and well – use them, but don't misconceive or mislead the world that we can produce the food for the six billion people with that, nor the importance of chemical fertilizer.

And so it goes. Let me just point out how they used the high-yield technology to save the land for other purposes, especially for grazing on shallow soils that would not be productive on cultivation over a continuing basis. And also for habitat for wildlife, but moreover to leave undisturbed in so far as possible much of the native vegetation and therefore the diversity of species.

In 1948, 1949 and 1950, the production of the 17 most important food, feed and fiber crops in the USA was a total production of 252 million tons. In 1999 it was 700 million metric tons on 20 million acres of less-cultivated land. That's the result of application of high-yielding science and technology. Had we tried to produce the harvest of 1999 with the technology of 1950, we would have had to have added 400 million acres of cultivated land of the same productive capacity. We didn't have it. We would have plowed up marginal lands, cut down forests. These are the situations we're up against. And if that was the situation in the USA, how would it have been in many other countries where they don't have this abundance of land?

To look at the world from a production standpoint and what high-yield technology has done to save land for other uses, indirect primarily, but values that we all would like to conserve and utilize. World cereal production in 1950 was about 800 million metric tons of all of the grains. At the turn of the century, it was a billion 800 million. If we had used the yields and

technology of 1950, we would have had to have cultivated another billion hectare – we didn't have it except in a few countries. Those are the realities.

We heard a lot of criticism when Asia was making big progress on food production with the new technology on wheat and rice in the sixties and seventies and early eighties and a little later in China and Indonesia. We were criticized a great deal. Why isn't something being done for Africa? And I found out much more recently why. Rice is not an important crop in most Sub-Saharan and African countries, nor is wheat. The main food crop is corn, and the varieties that were being developed hadn't reach the productive stage in the seventies. But today, based on work that's continued to be done by not only... IITA and many national programs, the stage is set for a revolution in maize production, if we have the input, if something can be done about improving the infrastructure and if wise policies to stimulate that takes place. And at the same time for the first time in a major crop, improved nutrition through the use of high lysine, high tryptophane corn varieties will be part of that picture.

Before closing, I would just like to point out a couple of other points that I think bear on some of this debate that we are hearing on today. And I think these are important debates, and I've always been of the idea that we should find the middle of the road on these issues. But there's a lot of misinformation or oversimplification being given out when it comes to describing quantitatively the many hundreds of thousands or tens of thousands of interaction going on between micro-organisms and ... plants and their epiphytes and parasites. In any small ecosystem, I defy anybody to write an equation that quantifies all of those reactions. We oversimplify and then with our own biases try to emphasize the one narrow point of view. So don't be misled by any one of us people who are overbiased, and that includes the environmentalists who are the extremists.

Now, I'm sad to say that even affluent countries there is a vast amount of biological ignorance. Something is wrong with our educational system. And no one wants to study biology, except that they're forced to take one course. I'm talking about primary schools, secondary schools, and the early years in the university. Why? I guess it isn't sexy enough. In any case, it's pretty basic to understand. The past technology that's been used in genetics and plant breeding would discourage a tall-corn... of Iowa – they're all short today. But if we don't understand that, how can we conceive of what's happening with biotechnology? The only difference is that to me this is a continuation of ordinary genetics and plant breeding, except we've got tools now. We can reach across ... borders which were unavailable to us before and take a gene... an organism, transfer it to our major crop..., the best one in any of the major crops. That wasn't possible before. It can be done now.

...BTU exchange from the..., ... said was the best possible use, the organic method to control certain insects. It was produced and distributed by... But that gene that's been taken out and incorporated into maize and cotton to control certain of those insects – that seems to be... danger. Was it more dangerous to spray a lot of this natural... around in the environment or to incorporate it so that it produces? There's no evidence to indicate up to now that there's any serious defect or danger of incorporating.

So I plead that we improve the understanding of genetics in its basic form in our school system as well as the new biotechnology. Mother nature was doing these wide crosses long before this came into the seed. Take the case of wheat. The Durham wheats are the cross between two different ... of plants,... to give germ wheat to spaghetti wheat. The bread wheats which came later into commercial use are the results of the cross of three wild grasses that exist still today in their native lands... and two different... Mother Nature did this long ago, but she wasn't in a hurry. She didn't have six billion people on her back. She wasn't in any hurry at all. And we have to adjust to that also when we look at what needs to be done.

I plead that you don't tie up the hands of the plant breeders or for that matter agricultural scientists in general, or you will precipitate something far worse than an imagined, extreme danger from wide crosses.

And let me close by saying, by the year – I have always used the quarter-century mark, so I do in this case – by the year 2025 we will likely be 8.3 billion people. Can we produce the food that will be needed? And can we do it without destroying the environment? I say, yes. If we are permitted to continue to develop the research and to apply the technology derived therefrom, we will be able to do this largely on the land now under cultivation. If you tie up our hands, not true. What's going to happen, not only from the standpoint of food production but the frustration of other undeveloped nations? We may have a lot more terrorism, if you want to call it that.