

2006 Norman E. Borlaug/World Food Prize International Symposium
The Green Revolution Redux:
Can We Replicate the Single Greatest Period of Food Production in All Human History?
October 19-20, 2006 - Des Moines, Iowa

<p>SESSION ONE: Looking Back, Looking Forward October 19, 2006 - 8:15 a.m. – 10:00 a.m. Dr. M.S. Swaminathan</p>

Introduction

Sir Gordon Conway

Chief Scientific Advisor, UK Department for International Development
President (retired), Rockefeller Foundation

Now could I please ask Ismail Serageldin and M.S. Swaminathan, Roger Thurow and Scott Kilman to come up onto the platform and join me here for the next session.

We have today a very distinguished group of speakers, people who've worked all over the world. Most of them are household names to all of you in this audience and so, need very little introduction. I'm going to be brief because we've got a really tight timetable. We've to finish this session by 10:30 when the Secretary of Agriculture arrives. And I've been charged by Ambassador Quinn that if I exceed the 10:30 I'll never be invited back again. Actually, it said it was worse than that, but I'm just joking.

And I'd like first of all to ask my good friend, Dr. M. S. Swaminathan, to come and deliver his speech. He is a man... I was going to introduce you, but you can come up. As you can see, he's a man who's well known to everybody in the room and so doesn't need introduction. He's the father of the Green Revolution in India. He gained, I think, the second World Food Prize, after Norm. And one of the things he did with that money was to set up the M. S. Swaminathan Foundation in Southern India, in Chennai. It's remarkable foundation that's doing pioneering work in sustainable agriculture. And today what he's going to do is to deliver the Third Annual Governor's Lecture, sponsored by Humanities of Iowa, which is the state branch of the National Endowment for the Humanities, and he's going to talk about the cultural and social foundations of the Green Revolution in India.

THIRD ANNUAL GOVERNOR'S LECTURE
Looking Back at the Green Revolution

Dr. M. S. Swaminathan

Chair, M.S. Swaminathan Research Foundation
Co-Chair, U.N. Millennium Project Task Force on Hunger
1987 World Food Prize Laureate

Thank you very much, Sir Gordon, for your kind words and also for the brilliant introductory lecture. I think it has made the task easier in terms of covering the question which Ken Quinn has asked and “Can we replicate the greatest achievement of food production in history?” My own answer is yes. We have been working on what they call the Agricultural Potential Bank of various countries. It is a potential bank, very high in relation to what has been utilized already. So that if you have a correct combination of policies and technologies, as I will show, we can answer this question in a positive direction.

We can't be negative. There is no option. We have to be positive. We have to replicate the greatest achievement. It cannot be one single achievement, it has to go on, achievement has to go on.

Ken Quinn asked me to talk about some historical aspects of the Green Revolution in India. Some of you know there's a statue of Mahatma Ghandi outside Pietermaritzburg Station in South Africa, where he first started, when he was thrown out of a first class compartment because he was a colored person in those days of apartheid. He started the nonviolent movement—that is, he felt that all problems of the world will have to be addressed by consultation, consensus, not by confrontation and conflicts. And if you look at some of the major developments of the last century, 20th century, whether it was the fall of the apartheid itself—Nelson Mandela's book acknowledges what Ghandi's philosophy has done; or Cory Aquino who is a member of the Advisory Council for the World Food Prize, the famous EDSA Revolution; or independence of my own country; or even the fall of the Berlin Wall and the end of the Cold War. They have all been achieved in a nonviolent way. In other words, violence breeds violence, and so long as there is no peace and security, it is impossible to make any achievement. In fact, in many countries it is the problem that we are not able to do.

Ghandi visited the National Dairy Research Institute in Bangalore in the late twenties. The director gave him a visitor's book, and he wrote there, “occupation” – he was a barrister from London – but he wrote there, “occupation: farmer” and his address as Sabarmati. That is because I think he was convinced from the very early days “to a people famishing and idle, the only acceptable form in which God can dare appear is work and promise of food as wages” – the whole concept of food for work program started in this way.

When we became independent, it was the backdrop of the Great Bengal Famine where several million people died, women, children and men, and therefore Jawaharlal Nehru, the first prime minister, said, “Everything else can wait in India, but not in agriculture.” Because

agriculture is the greatest living industry in contrast to other industries, the greatest living industry providing livelihood for 600 million people today.

When our then-president, Mr. Narayanan – he's no more – reviewed the progress of India in the first 50 years after independence, from 1947 onwards, he identified two major accomplishments of independent India. The first was, unlike many of our neighboring countries or elsewhere, we have been able to stick to democratic systems of governance – not only to stick to democratic systems of government but also to extend it to the grass roots level. We have the village-level democracy, which has a mandate representation, one-third representation, the woman, and it's now being extended up to the parliament, one-third will be women.

Now, mention was already made among the various political and religious leaders I have met. Pope John Paul II was really concerned with agriculture, particularly in Africa. In those days when the Swahilian drought in the early eighties, he asked the Pontifical Academy to take, to develop a detailed strategy how we can insulate these countries, Swahilian countries, from the impact, the adverse impact, of drought. I think more and more we had acquired also leaders of this kind, apart from political leaders, who can canalize a lot of support for agriculture. Dr. Norman Borlaug has been always quoting this famous book by Paul and William Paddock where they use the triage hypothesis to classify countries, whether they have any scope for feeding themselves. As you will see in the classification, my country India was called, “can't-be-saved,” in other words – Don't waste time; don't give any assistance because they can't be saved.

It is in that atmosphere the Green Revolution started. Of course, I always think the Green Revolution started in Iowa with hybrid corn, but was the first major development in terms of improving production through productivity improvement. But the term itself was coined by William Gordon in 1968. The pedigree, this famous pedigree which lead to the Norin 10 genes, which were used here by Dr. Borlaug and also by Howard Vogel, a Washington State, Pullman. That became universally used for a variety of purposes.

In India in 1968, again before the term, “Green Revolution,” was coined, Indira Ghandi wanted to bring to the attention of the Indian public that something important is happening in our farms, and she decided to release a special stamp called the Wheat Revolution. It has a histogram showing the quantum jump – we have a revolution unlike evolution – obviously a larger quantum jump in Asian production. But we call it a symphony. The media called the Green Revolution as a “symphony” for the simple reason it had a number of important elements which went into it.

I think I went too fast there. The first was the whole question of technology, which is a prime mode of change. We are eternally indebted to Dr. Borlaug for igniting that change. Secondly, of course, the public policy, the credit, and so on. And services, and finally farmers' enthusiasm – unless all of them come together it is impossible to— I think there was a slide which went off – the farmer/scientist partnership was an exceedingly important ingredient for success.

We started national demonstrations in 1964 in very poor farmers' fields, working farmers' fields, and that sort of— When a poor farmer produces more, it has a tremendous

impact. When you show anything in a rich farmer's field, the success will be attributed to affluence and not to technology.

The question now is – Can Malthus continue to be wrong? Can we continue? This is one of the questions, many questions, posed in a special issue of *Science* last year. And there are many neo-Malthusian predictions largely arising from the kind of problems which Gordon Conway has said: climate change, environmental degradation all these are important problems.

Now, how do we then ensure what Varro, the famous Roman farmer Varro, the beautiful picture which was shown by Sir Gordon Conway? How do we increase productivity in perpetuity, without associated ecological harm? That is the question now. If you want to ask – “Can we replicate the greatest achievement of food production in history?” – the answer is yes, provided we are able to adopt technologies which can enhance productivity in perpetuity without associated ecological harm.

There are a number of ways by which one can achieve an Evergreen Revolution, or a Doubly Green Revolution – that is productivity in perpetuity. Organic farming, slowly in industrialized countries it is becoming important, largely because the price differential for organic foods, and somehow the equivalence of organic foods with health foods. And therefore in markets many people get the priority.

The green agriculture, what we call green agriculture, which is now becoming very popular in China, the difference between organic farming and green agriculture is, in this case you use integrated pest management, integrated nutrient supply, scientific water management – all methods by which the production potential of the soil is not reduced. And also you can use any variety, whether it is molecular breeding or Mendelian breeding, whichever is most appropriate. Because in organic farming, many of you know, the International Federation of Organic Agriculture Movement precludes the use of any genetically modified crop in the organic farming. It's completely out of bounds. But in green agriculture, you select the best variety, use the best possible techniques of environmentally benign techniques like IPM, INS and so on.

There are many other terms which are being used today, like ecoagriculture. There is the efficient microorganism. Teruo Higa, in Japan, he believes that much more work ought to be done on soil microorganisms, microbiological research in relation to soil fertility replenishment and so on. There is also the one-straw revolution, Fukuoka, Masanobu Fukuoka. That is not applicable because it is one which involves not doing anything at all – no plowing, no weeding and so on.

But I think what is important is the green agriculture. And we have recommended in India, in the National Commission of Farmers, that, like organic agriculture, the green agriculture products should also be certified – should be certified so that they are also bought some.

Now what are the threats to the Evergreen Revolution? Some of them have already been mentioned. The invasive alien species are becoming important, both in animal husbandry, like the Avian flu H5N1 strain, abiotic stresses, biotic stresses, market factors – because internationally market is becoming free but not fair. I think the whole aim of the negotiation,

WTO negotiation, is to have both free and fair trade; otherwise, it will adversely affect the poor. Climate change, constraints in the exchange of genetic resources— by Norman Borlaug and I, many of us working together, there was absolutely no difficulty. You could just move seeds across. But today there are a number of impediments in terms of exchange. Intellectual property rights come in the way of social inclusion and access to technology. And of course diminishing support for public research. These are some of the important issues.

Now, how do we overcome this problem? This is where I think we have to have what I call anticipator research. I think there are two terms now in research which are very important. Anticipator research, which will be largely laboratory-based, high-tech research, and participator research, with farmers in the field level. They both are important – farmer participator research as well as scientific anticipator research.

Give you one example. We had tsunami in Asia, 26 of December 2004. One thing local communities observed is that where there was very heavy mangrove plantations, or casuarina, or some other what they call bioshields, then the effect of tsunami was somewhat reduced because it acted as a speed breaker – it acted as a speed breaker. Now people are taking interest in replanting mangroves and are reclaiming the old mangrove areas. But what bio-technologists in my laboratory have done is to map the mangrove genome, identify the genes responsible for seawater tolerance, and then transfer it to rice, to the mustard and many other crops. This particular super-oxide dismutase gene, very powerful in terms of conferring resistance to salinity tolerance.

So this is the final stage of testing. We have a lot of problems in terms of... mechanisms, but nevertheless it was a remarkable example of the power of modern science, what you can achieve if you have a problem. Same has been done by my own colleague. She has transferred genes from *Prosopis juliflora* for drought tolerance – very effective, dramatic impact of drought tolerance. So this work and common opportunities have been opened up by these technologies.

And so the way ahead, in my view, is our ability to achieve a paradigm shift from a Green to an Evergreen Revolution and our ability to face the challenges of global warming and sea level raise will depend upon our ability to harmonize organic farming and the new genetics. We can't allow... That's why I said it started with Ghandi, who has said most of the problems can be solved by conversation and consensus building. I think we'll have to have some scientific methods of trying to resolve differences within organic farming and the other forms of farming.

Well, the best form, Dr. Sir Gordon Conway showed you, in spite of all the progress, still over 800 million women and children and men will go to bed hungry tonight as we eat our dinner. The best thing we found in many areas, local communities, is to help the communities to build a community food security system. In our own community food security system in some of the tribal areas, the hunger hotspot in Orissa, it has four components: conservation, cultivation, consumption and commerce. It has a gene bank *in situ* – on-farm conservation of local varieties. It has got a water bank, it has got a grain bank. There are methods by which one can promote local-level food security system. This also helps to conserve agro-biodiversity, because the gene banks, the local *in situ* on-farm gene conservation, is very important.

The other is the mixed farming, crop/livestock integrated production system, and the utilization of all farms for aquaculture purposes. These kinds of mixed farming – crop, livestock, fish – integration is very powerful. India today is the largest producer of milk in the world, because we have a very decentralized production. But one of the World Food Prize laureates, Dr. Verghese Kurien, he had the initiative of organizing women and men into cooperate use, so that you had the power of scale, the economy of scale for very small producers. Otherwise, they can't compete. Today it's one of the largest industries in the world.

Now, the other technology I talked about, uncommon opportunities opened up by modern technology, biotechnology is one. But more importantly immediately is the information technology. Because there's a great knowledge deficit. When I started by saying my answer is yes, that we can produce more because there is this untapped reservoir in the agricultural production bank, as they called it, I think today we can leapfrog in terms of communication, by mobilizing all the tools, whether to the Internet or the cable TV or the FM radio, the community radio, or the cell phone, the mobile phone – the Grameen Phone had been used by Muhammad Yunus as a very effective method of communication, – and the local language newspapers.

We have therefore established a virtual academy, a national virtual academy. The academicians are grassroots academicians. They are men and women from the villages who are just underschooled but will master the technology. They take to technology like fish to water, provided your pedagogic methodology is learning by doing, not by lecturing – learning by doing, they learn very fast. It is wonderful academicians, and in their midst is our president, Dr. Abdul Kalam. He says they're the best academy in the world – he likes to have the largest.

So no time to relax. I quote Dr. Borlaug again. In the year he got the Nobel Prize, he gave a lecture in India. We had invited him soon afterwards; he came within a month after receiving the Nobel Peace Prize. And his title for his lecture was, "No Time to Relax." Population-rich, but land-hungry countries like China, India, Bangladesh, we have no other option except to produce more food grains and other agricultural commodities. But units of land and water under conditions of diminishing per capita availability of available land and irrigation water and of expanding biotic and abiotic stresses. Such a challenge can be met only by harnessing the best in frontier technologies and blending them with the rich heritage of ecological prudence, eco-technologies for an Evergreen Revolution should be the bottom line of our strategy, to shape agriculture in the future.

Ladies and gentleman, I want to conclude with George Washington Carver. I started with Mahatma Gandhi. Mahatma Gandhi and Carver were in correspondence, as Mahatma Gandhi used to take his advice on nutrition. For example, his own diversification of food diet, whether it is peanut or soybean. And George Washington Carver was a great person in terms of, when we look at his papers and his approach to food security, including his point that we must reach the last person – "unto the last." Gandhi called it, "unto the end." Any scientist uses a – you ask yourself whether your work is going to benefit the poorest person you have seen. If the answer is yes, go ahead. That's the way to end all the inequity, the various divides in this country.

But I want to give a tribute to John Ruan and John Ruan III and Dr. Borlaug and of all Ambassador Quinn. I think they have brought to Iowa here. I said, Iowa gifted to the world, great missionaries and missionaries and Henry Wallace, Norman Borlaug, Aldo Leopold, George

Washington Carver, and many others. Norman Borlaug's epic against hunger is well known. George Washington Carver served as an advisor to Mahatma Ghandi on matters relating to eliminating poverty and improving human nutrition. It is therefore appropriate that Iowa is the home to the World Food Prize Foundation.

And you're seeing, I think, one of the greatest things which happened in the world history is the establishment of the World Food Prize Foundation here and also the encouragement given to scientists around the world and the opportunities given for all of us to get together for what has been the symbiotic conservation. I thank you very much for your listening.

Sir Gordon Conway

Chief Scientific Advisor, UK Department for International Development
President (retired), Rockefeller Foundation

Thank you, Dr. Swaminathan. I remember talking once to Subramanian, one of the great heroes of the Indian Liberation Movement. And he said the Green Revolution meant that India became truly independent for the first time in its history. And what we're seeing with Dr. Swaminathan is his continued fight to reduce poverty, reduce hunger, and give real freedom to the poor in the villages of India. Thank you very much.