

Norman Borlaug to Indian farmers: Don't be afraid of new technology

The country might be on the edge of a severe foodgrain crisis, warns the Nobel Laureate and one of the architects of the Green Revolution



Indian Ambassador to Mexico Rajiv Bhatia presents the Padma Vibhushan to Dr Norman Borlaug. Left, Dr Masaru Iwanaga, director general, International Maize and Wheat Improvement Center. Second from right, Y.P. Singh, minister for economic affairs at the Indian embassy in Mexico City

AJIT JAIN
in Tezoco, Mexico

Nobel Laureate Dr Norman Borlaug was presented the Padma Vibhushan — India's second-highest civilian award — by Indian Ambassador R K Bhatia at a formal luncheon August 23 in Mexico City.

The luncheon was sponsored by the International Maize and Wheat Improvement Center — Centro Internacional de Mejoramiento de Maíz y Trigo in Spanish, or CIMMYT.

Three hundred and fifty agricultural scientists from 70 countries and various disciplines — who were attending an international plant-breeding symposium at CIMMYT — and a number of other dignitaries including Mexican Secretary of Agriculture Francisco Javier Mayorga were present at the luncheon.

Dr Borlaug, one of the architects of the Green Revolution in India, told *India Abroad* he deemed it his greatest privilege to receive this award from the Indian government and that it takes him back to 1965 when India was on the verge of famine. It was then that he started working with Indian and Mexican scientists to introduce high yielding varieties of wheat in India.

He said he had to work with a large number of people — especially renowned scientist Dr M S Swaminathan, then with the Indian Agricultural Research Institute, and then agriculture minister C Subramanian — to persuade the Indian government to accept high yielding varieties of wheat. India finally agreed to import 18,000 tons of hybrid seeds from Mexico. That was the beginning of the Green Revolution, which transformed India's agriculture.

Dr Borlaug said then Indian agriculture secretary Siva Raman also played an active role. "I used to call them 3 S: Subramanian, Swaminathan and Siva Raman," Dr Borlaug, 92, said.

"It was on the research stations and the farmers' fields in Mexico that Dr Borlaug developed successive generations of wheat varieties with broad and stable disease resistance, broad adaptation to growing conditions across many degrees of latitude, and with exceedingly high yield potential," Bhatia said while presenting the Padma Vibhushan, the highest award India can give a foreigner. "These wheat and improved crop management practices transformed agricultural production in several countries, including India, sparking what is known as the Green Revolution."

Dr Borlaug has been awarded 57 honorary doctorates and he belongs to the academies of science in 12 nations, noted Bhatia.

Bhatia said when he wrote to Dr Borlaug about the

award, the legendary scientist sent him a communication "conveying his willingness to accept it in the name of hundreds of Indian scientists, policy makers and millions of farmers, without whom there would have been no Green Revolution. I am deeply grateful to be so honored by my beloved country India."

Mayorga noted Dr Borlaug had saved many lives "in the history of mankind" through his high yielding varieties of wheat and other food crops.

Dr Borlaug recollected that there were some bureaucrats and journalists in India who were dead opposed to India accepting his varieties of wheat. "When would India get rid of this man," they would say, the scientist chuckled.

"These were people who had never in their lifetime produced a single ton of food grain," Dr Borlaug quipped. "Without new technology, we won't be able to provide food for 6.4 billion people [worldwide]... There are people who have lot of theoretical knowledge but have never produced a ton of food. They are causing all kinds of problems and many of these people are in India also causing great problems. They are making it difficult for the political leaders to make decisions."

"Many of these people in India are still against new technology. We should go back to the olden days, say in the 1950s when the world population was about 2 billion people. Now we are 6.4 billion. What was adequate then cannot be adequate now. Many of these people in India and elsewhere are thinking in theoretical terms. They haven't lived around hunger and miserable people," he said.

When asked why the media is negative, Dr Borlaug answered: "Because stories about gloom and doom sell. These are the same kind of people 'who said something should be done about this guy [Dr Borlaug] as he's messing up everything [in India],' he added.

CIMMYT Director General Masaru Iwanaga, the chief organizer of the luncheon, noted that India is now self-sufficient in food production. But he expressed concern that India may have to, like Japan and China, import large quantities of wheat. That would increase food prices internationally and developing countries will not take that kindly, he pointed out.

Despite all the talk about the Green Revolution, the task in India has not ended, Dr Borlaug warned. India's wheat production was 11 million tons in the 1960s. It reached 75 million tons by the turn of the century but production is not keeping pace with the increasing population, the scientist pointed out.

"India built buffer stocks to cope with bad monsoons, bad crop seasons. Those buffer stocks have during the last

three-four years declined... So, India is now thinking of importing large quantities of wheat," he added.

Dr Iwanaga was equally concerned that India may have to soon import foodgrains.

Dr Borlaug started going to India in the mid 1960s. His three slogans were 'fertilizer to farmers six weeks before the crop,' 'credit to farmers' and 'fair price to farmers.'

"Farmers in India are still not getting fair price for their produce. That has a negative impact on food production," Dr Borlaug said.

He said archaic, colonial rules and regulations have not changed in India. "There are inter-state taxes, there are restrictions for moving commodities and goods from one state to another and the Indian farmers even now are paid 40 percent less than the international price for their produce," he pointed out.

"When we exported 18,000 tons of that hybrid seed, luckily for farmers, fertilizer was there, the credit was available to ensure farmers used the seeds, and it was made clear that the harvest would be used not for eating but for seeds and simultaneously the Indian government policy on wheat production were changed. Happily everything took off," he continued.

In a lengthy, humor-sprinkled conversation with *India Abroad*, Dr Borlaug said, "India, Pakistan, Iraq, Iran, Egypt were able to do well with hybrid seeds. But they had

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From left: Y.P. Singh, minister, economic affairs, at the Indian embassy in Mexico City, Indian Ambassador to Mexico Rajiv Bhatia and agricultural scientist Dr. Ravi Singh

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to be planted at the right time so that you avoided frost at the time of flowering — before the temperature went too high. You had to plant the proper amount of seeds, fertilize them. If you did that, those varieties were very productive. Those old, tall varieties fell down when you started to fertilize them. So, we had to ensure those crops didn't grow too tall after fertilization."

There were several farmers unwilling to opt for new technology, new varieties, Dr. Borlaug pointed out. "But the same people started to look their neighboring farms producing 4,000 kg to 50,000 kg of wheat on one hectare against their own land — not producing more than 800 kg per hectare. So, looking at the bounty next door, this Indian farmer said to himself, 'I better change this,'" he continued.

"The Indian farmer may not be able to read but he could figure what's good for his family. It spread like a wildfire," he added.

Ambassador Bhatia said, "This is the first time in my long diplomatic career that I had this privilege to exercise [presenting the award]. As ambassador, I represent the President of the Republic. It is kind of him that he asked me to perform this role. It was also a matter of both pride and happiness that one was doing this for a great cause and to a great man."

There were naysayers, not only in India but outside the country, and they repeatedly argued in the 1960s and early '70s that India's wheat production can't be fixed. "This was when the country was almost facing famine," Dr. Borlaug said.

"I said several times in India, if I were a member of India's Lok Sabha [the Lower House of Parliament], I would repeatedly shout: fertilizer, fertilizer, fair price, fair price, credit, credit," he continued.

"I told Indian scientists and Indian politicians that the Indian farmer was becoming impatient and that they needed to recognize their position on fertilizer. Many of them in turn said there was no capital in the country to invest in importing fertilizer. My response to them was capital could come from private sources if the Indian government were to make rational policies. We demonstrated to them our technology — hybrid seeds — had great potential to increase productivity, which would in turn increase the farmer's income so that he becomes part of the country's economic system," Dr. Borlaug said.

"During the last two-three years, wheat production has been declining. So, India is going to import several million tons of wheat this year. I am very concerned," said the man who is considered one of the architects of the Green Revolution.

"I would, therefore, tell the Indian farmers: Don't be afraid of the new technology. There's a lot of confusion about the new biotechnology, transgenic crossings between species... Instead of applying 15 applications of insecticides you now apply just one. This is a wonderful thing," he added.

Dr. Borlaug retired from the leadership of the CIMMYT's Wheat Program in 1979. Since 1984, he has been a distinguished professor of international agriculture in Texas A&M University, where he teaches one semester each year. Since 1966, he has also been the president of the Sasakawa Africa Association — the leader of the agricultural program in sub-Saharan Africa.

The issue is not so simple, says Indian scientist

It's not just tech-phobia that ails Indian farmers, says Ravi Singh

AJIT JAHI
in Tawdoo, Mexico

Agricultural scientist Dr. Ravi Singh doesn't think Indian farmers have any hesitation in accepting new technology. If that was the case, the Green Revolution could not have happened, he said.

Singh is a distinguished scientist at the Centro Internacional de Mejoramiento de Maíz y Trigo, where he has been working for 23 years — the job he accepted soon after doing his PhD in plant genetics in Australia in 1983.

He disagreed with CIMMYT Director-General Dr. Masa Iwanaga that Indian farmers are hesitant accepting new technology (Interview page 9).

"Nowadays hybrid cotton is being adopted in India, and it is coming from genetically modified seeds. If a farmer is going to make profit by adopting any new technology that would also cut his cost of production, he would welcome it," the scientist said.

"What we need in India is a combination of various things," Dr. Singh said. "To plant the best variety of seed which has higher yield potential, Indian farmers have to increasingly opt for what's called 'zero tillage technology.' Through the use of domestically manufactured machines — which can be priced at a mere Rs 20,000 (about US \$444) — you can drill the seeds directly into the field, instead of waiting couple of weeks preparing the land after the rice harvest. That way, you are saving on not only the cost of diesel but saving two precious weeks ensuring significantly higher yields."

Dr. Singh said in some parts of the north Indian state of Punjab, this new method is catching on. About 1 million hectares of land has come under this new method. "But we have a long way to go as India has about 25 million hectares under wheat production," he added.

"If rice harvest is delayed, for whatever be the reason, it would delay planting of

wheat with a resultant adverse impact on the wheat," Dr. Singh said. "By using this new technology you can see the increasing benefit. You will get crop with higher potential which will field more."

He also echoed the three slogans of Nobel Laureate Dr. Norman Borlaug (page 6): fertilizer, credit, and fair price to farmers.

"Look at the international price of wheat and compare it with the price in India," Dr. Singh said. "Indian farmers receive 40 percent less. The international price is Rs 1,000 (about US\$22) per quintal while the Indian farmers get Rs 600 (about US\$13) per quintal."

The government is afraid of inflation, and the Indian farmer gets "the raw deal," he explained. "If you want to keep food prices down, you have also to keep prices of other products low, but that hasn't happened. The price of diesel has gone up, fertilizer prices have increased," he pointed out.

"I have heard from farmers in India and Indian scientists that the farmer is not even able to put enough water in the field because of the cost of diesel. And they have reduced fertilizer application because of the cost factor," he continued.

At one time there was surplus of wheat in India and the government could get any price; but not any more. "India produced about 72 million tons of wheat last year. They would like about 76 to 77 million tons to be comfortable and to be able to build some buffer stock. Production hasn't declined — it has for some time remained steady at 72 million tons — but as people are becoming more affluent, they are eating more and the population is increasing. So, in effect, we can say this 72 million tons is declining production as it is not increasing corresponding with the increase in population."

The yield per hectare of maize is much higher compared to wheat as a winter crop, Dr. Singh said. "If it doesn't get damaged by frost — you have to draw a fine

where you can escape frost most of the year. [The eastern state of] Bihar is one that comes under this category."

Singh, Iwanaga and even Dr. Borlaug believe India will soon import quite a lot of wheat. "It is bad from the long-term point of view," he said.

"Would the import this year be half a million tons? How much would it be 10 years from now when we would face much bigger shortage? It is a simple equation — production is not keeping pace with the increasing population and better eating habits of people as their income is increasing."

The other impact of importing would be increase in prices of wheat, noted Singh. "That may in fact not be bad for Indian farmers. Increase in prices will help them make a bit more money. But if prices of other products are going up at the same time, that increased profit margin will get eroded," he added.

He was also concerned about soil conditions being affected with farmers continuously taking out so much micronutrients without correspondingly putting those nutrients back — in the form of fertilizers, etc. "Part of the fertilizer also escapes in the water. It impacts on the quality of drinking water. There's technology that would release nitrogen slowly — it won't get released in the water. But the question is someone will have to pay for it. Should it be the farmer alone? Should the population hankering for better quality drinking water also not pay for it?" he asked.

So, environment is a complex issue, conceded Dr. Singh, who was recently inducted as a fellow of the American Plant Pathology Society at its annual conference in Quebec. The citation said it was "in recognition of his outstanding contribution to the profession of Plant Pathology." He was also the recipient of the Outstanding CGLAR (Consultative Group of International Agricultural Research) Scientist Award last year.

Our vision is everybody in the world should have enough food to eat. All children should go to school.

India still has a challenge. As per India's official statistics 53 percent of India's population is undernourished.

IT alone cannot provide enough to meet the needs of 1.1 billion Indians. A large number of Indians live in rural areas.

Masaru Iwanaga

The agricultural scientist spoke to Senior Editor Ajit Jain

The Centro Internacional de Mejoramiento de Maíz y Trigo is a caretaker of the world's genetic resources for maize and wheat. Through networks of partners, CIMMYT germplasm gets evaluated, leading to its use in developing new varieties that benefit farmers worldwide.

CIMMYT Director General Dr Masaru Iwanaga says just focusing on information technology cannot result in all round socio-economic development of a country like India, where a large percentage of the population depends on agriculture.

What is the larger significance of Dr Norman Borlaug being presented the Padma Vibhushan?

It is great recognition for the importance of agricultural science — as to how it can contribute to humanity. The Nobel Prize to Dr Borlaug way back in 1970 was a symbol of what science can contribute to humanity. Now the Indian government has given the same recognition to Dr Borlaug and through him has laid emphasis on the importance of agricultural science for humanity. It is also a symbol of partnership between CIMMYT and India, Mexico and Africa.

Agricultural development requires collaborations of many people. It's different from physics, chemistry, medicines — where some genius makes the breakthrough. Dr Borlaug is a genius; but he's (also) a good collaborator.

We are hosting this international symposium for plant and crop improvement and varieties development, based on previous works, with 300 plus scientists from 70 countries for exchange of knowledge. It is like making a pyramid: Somebody makes a progress, next generation makes more progress. That progress should be shared with others.

If I make progress that becomes a starting line for other countries, scientists. This comes back to CIMMYT. Then we make further progress. In agriculture we share knowledge and technology much more than in other sectors because we know food is the base of a society. It shouldn't be monopolized. We make better progress through partnerships.

What about the Green Revolution in India?

The Green Revolution in India was the result of South-South collaboration [between Mexico and India]. Dr Borlaug and his friends and colleagues developed high yielding varieties of wheat in Mexico. It was exported to India when India was facing major food crisis in the 1960s. Mexico then was willing to share their high yielding varieties with people in India.

What kind of collaboration is happening today between your institute and India?

We have a strong collaboration with India. The difference is that time [in the '60s] India was the recipient of germplasm. Now the Indian government and Indian farmers have made major progress in food production. India has now reached the capacity of exporting food. India's economy is very strong. It is reaching the population size of China and its economy is catching up to the Chinese economy.

Does the Indian government pro-

vide any financial or other help to your institute?

This year India increased its contribution four-fold by committing half a million dollars annually. We will be working on three specific areas for India now: Quality protein maize [corn] — which has twice more amino acid. So, it is good for human beings and also it is a better feed for animals.

Second area of research would be conservation agriculture. The Indo-Gangetic plain is most productive in the Indian subcontinent. That's where the Green Revolution actually started. Through our hybrid seeds, yields increased three times.

The challenge is how we can sustain that yield. This could happen through better utilization of irrigation and fertilizers.

The third is a disease stem rust. It is a disease most damaging to the crops. There are many types of stem rust. Through our work at CIMMYT, and works of many other people, we have developed stem rust-resistant varieties.

Now there's another variety of stem rust called 'UG (Uganda)-99.' As in East Africa, all feed varieties in the Indian subcontinent are also susceptible.

Has UG-99 reached India?

It hasn't reached India as yet. However, there's a clear danger of this disease reaching India soon, maybe within the next three to five years. It's an airborne disease. With the increasing human traffic also, UG-99 could move quickly to other parts of the world. It gets carried on our clothing. We don't become carriers but our clothes become carriers of this disease.

UG-99 is moving from East Africa to the Middle East and then could reach the Indian subcontinent.

How do you feel about India's monetary contribution to CIMMYT?

The money that India has now committed is not too much compared to our annual budget of \$40 million. However, I was so pleased to receive this money — because it is a symbol of India appreciating our work. They have always appreciated our work but the Indian government is now doing it in a more specific way. This way we can enhance collaborations between CIMMYT scientists and Indian scientists in three key areas: Improving nutritional quality of maize; conservation agriculture and how to prevent spread of diseases like stem rust.

Is research in these three areas on here at CIMMYT's station in Texcoco?

Here as well as in India, where we have an office in New Delhi. That office is a symbol of our clear presence in India and our historical collaboration with the country.

There are many Indian scientists participating in our international symposium. This is one way to share knowledge and experience.

CIMMYT is nothing without partnerships. We can contribute to the world community only if we have good partnerships. This year is our 40th anniversary. We have strong partnerships with India and several other countries. We have a strong tradition of ties in agriculture. CIMMYT, as an international organization, can provide a platform for international collaboration in agriculture.



Is research carried out in your New Delhi office?

Yes, the office in New Delhi is conducting some research based on our partnership with Indian scientists. But we don't have a full CIMMYT station there as here in Mexico. It is much better to work with Indian scientists because we are using Indian facilities.

Would you say India is out of the woods as far as its food situation is concerned?

India still has a challenge. As per India's official statistics 53 percent of India's population is undernourished; they are not getting enough food. These people live in rural areas and depend on agriculture for their income. There are also 47 percent of children who are undernourished.

How can India address this problem?

I think we made major success in India by CIMMYT and India working together through the Green Revolution. But I must say that the mission of Dr Borlaug is not complete yet.

What is that mission and when would you say it is complete?

Our vision is everybody in the world should have enough food to eat. All children should go to school.

How does one explain large-scale malnutrition in India despite food surplus and the country having joined the league of food exporters?

It is attributed to the social structure resulting in distribution of wealth, wide disparity in income. Many countries have a similar problem. These 53 percent who are suffering malnutrition don't have money to buy. They are malnourished not because of lack of food in the country. These people are mostly living in rural areas.

To have socio-economic development in the country, India needs to have strong

agriculture. Just having high-edge industries, success in information technology, etc, is not going to provide enough economic development in India. Just like Japan, having Toyota would not provide economic growth to meet the needs of 126 million Japanese. IT alone cannot provide enough to meet the needs of 1.1 billion Indians. A large number of Indians live in rural areas. They depend on agriculture.

Any message for Indian farmers?

They should pay more attention to sustaining their production and they should also be open to new technology. They should be open to genetically improved crops. They shouldn't categorically deny even before assessing and evaluating the new technology. If they find it relevant they should adopt it.

How do you achieve sustainability?

When you are poor, you don't think and plan for five and 10 years from now. You can only think of today. As a parent, your most important priority is feeding your children today. The farmers and the Indian government have to work closely and plan for the future also. They should also think of how the Indian subcontinent can be successful in socio-economic development. Often many countries put emphasis on industrialization. You can refer to the history of economic development in Europe, North America and even in Asian countries to show it is agricultural development that provides excess capacity so that people can move to other areas.

Increased productivity in agriculture is an issue which the Indian government and the Indian farmers have to address. Without that I can't see everybody's life improving in Indian society. Therefore, I am laying more emphasis on agriculture-based socio-economic development rather than having a small number of superstars in the society.