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# GM technology will help advance crop production

17 August 2014 | Interviews | By BioSpectrum Bureau

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The prestigious World Food prize 2014 was awarded to a Mexican scientist of Indian-origin, Dr Sanjay Rajaram. His research has led to the development of hundreds of improved wheat varieties, providing daily food source to more than a billion people. His desire to serve farmers was why he studied agriculture science and his research led him to play a part in eradicating world hunger. Dr Rajaram, an alumnus of IARI, Delhi and University of Sydney has worked closely with Dr Norman Borlough, the father of Green Revolution. He was introduced to Dr Borlough by his professor at the University of Sydney, Dr Erwin Armstrong Watson.

In an email interaction, he spoke about his journey, Dr Borlough and GM crops

**1. Congratulations on winning the World Food Prize. You have made India proud. This is also the first ever award to be received by a wheat scientist. You're Comments?**
This is the first World Food Prize award after the the establishment of the Foundation. I am indeed very happy to receive this award. However, I must clarify that I will be receiving this prize on behalf of all wheat researchers and wheat farmers who have been associated with me. I do share your sentiment that India should take some pride in this regard.

**2. How was it to work with Dr Norman Borlough? What role has he played in your research work and overall professional journey?**
Dr Norman Borlaug hired me in 1969 as post-doctoral fellow, just after I finished my PhD program from Sydney, Australia. I joined his wheat research program in May 1969. If you know the culture of Mexico, then you knows that it is different from ours as regards to food habits, language and religious beliefs. To make some headway, I needed to adapt to the Mexican culture, so you can see there was a lot of inner conflict on what I wanted. At the same time, the opportunity to work with Dr Norman Borlaug was very enticing. I decided that I would work with Dr Borlaug and his team for some years, get some experience and after that pursue a career somewhere in non-Latin American countries including India.

So I decided to work with his team whole heartedly and start contributing to the broader goals of wheat production and productivity worldwide which was Dr Borlaug's objective. He was a hard task master. It was not easy for an Indian young scientist to adapt to his way of working. He was straight shooter, focused on his objective and he warned everybody to line up for the same. Pursuing a freelance career while in his program was not possible. However, I felt his mission was very noble, he was openly talking about humanity and wheat production. He appeared to be a politician at that time, and also came from a small farmer background.
His philosophy of work was field oriented application of science which, many a time, meant sweating in the field, getting your boots dirty, and long hours. So you can see, challenging as the situations were, one needed to adapt to such rules if you wanted to be a part of the team and of course I did. We became great colleagues and good friends. However at times, we did differ in our philosophy and our approach towards achieving the final goal.
In summary, he did inspired me a lot in pursuing my career in International Agriculture, which is more service to farmers than ivory tower research and doing some academic narrow field research.

**3**. **What inspired you to study agricultural science?**
I come from a small farming background in the district of Varanasi, from a village called Raipur. These are all farming communities, however I must confess that I was not interested in agriculture in the beginning. As I moved to secondary school, I was interested in Sanskrit. Later on, as I moved towards intermediate schooling, I was fascinated by Mathematics, Chemistry, Physics, and geography and I was a top student in these subjects. I became inspired to study Agriculture Science because I met a few professors who talked about good agronomy especially green manuring and consequently increasing production. I must say Agriculture to me was my village. Later on I pursued an interest in soil chemistry, and by some default I became interested and entered into plant breeding at IARI, New Delhi. Eventually pursued wheat breeding at the University of Sydney for my Doctoral degree.

**4**. **There is a lot of controversy surrounding this and the world seems to be split in opinion. But we are keen to know what you're thoughts on GM crops are? Do you think it can be helpful in eradicating world hunger?**
Basically, I am pro-GM technology in developing countries, provided we have established sufficient safeguards so that it does not have secondary spillover effects on environment and others on biological ecosystem. Having said that, I do worry that the GM technology is mostly in the advanced countries controlled by Agri-business companies. Some way, we need to share these technologies by purchasing or by free exchanging. I strongly believe that it will help advancing crop production in India. At the same time GM technology should be inclusive with technological advancement in India in crop care, nutrients, water, and soil management.

**5**. **Which are the important countries in Asia that need to start using GM crops?**
This point in my opinion has more political implications and I would not like to comment.

**6. What is your observation on the overall scenario of agriculture?**
In regards to this point, I would limit my observation in relation to wheat R & D and its application up to the farmer level. I believe, we have done very well reflecting the production and productivity rise since green revolution period to 2013. Our wheat production goes from 10-11 million metric tons to 95 million metric tons. This is almost a 9 times increase in wheat production. I believe other crops have experienced similar rise. However, by 2030, India would require additional 20-25 million metric tons. This scenario is very challenging to both the farmers and policy makers, however, it can be done provided we have sufficient funding for R&D and timely availability of inputs to the farmers and their training.

**7. What are the key technology trends that can bring about the next revolution in agriculture?**
Agricultural technology is a continuous process, however, from time to time it requires re-focusing on certain issues which can be very catalytic in enhancing food production. Largest investment would be needed in hybrid wheat production technology, redefining especially micro nutrient balance in our soil, major investment in creating modern silo system for storage, water conservation technology etc. Seed production system has to be revisited through private sector intervention.

**8. What are some of the challenges that you foresee in the future, and what measures/innovations are required to overcome that?**
The biggest constraint I see is proper financial resourcing for R&D. I strongly believe that public sector involvement, sharing some of the burdens is highly warranted.

**9. Would you please throw some light on "shuttle breeding"? How is it helpful in agriculture development?**
It is a technical word which implies that we grow germplasm for evaluation in two contrasting environments, for example such testing in Ludhiana in a highly favorable environment and the resulting progenies of the same material are taken to Himalayan foothills and to the Nilgiris in the summer season. This system allows genetic constellation in a single variety for

adaptation in a wide range of conditions.

Shuttle breeding terminology was borrowed from shuttle diplomacy which was carried by Dr Henery Kissinger, between Pakistan and China, and which led to the opening of China to US and the World.