

The Bio and Nano-technology: Concept and Scope

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Biotechnology is a widely used, and much understood, term, so much so that the term needs no explanation and its relevance is already understood. It is, to put it in simple terms, a broad generic term that is centered around the genetic modification of living organisms undertaken with a view to specific goals. The science of biotechnology has acquired significant popularity in the context of our search for optimization of gains of various types, namely productivity gain, longevity gain, improved quality of life, food, etc and so on.

primarily aimed at facilitating precision farming that can serve several purposes, such as enhancing cost-efficiency, optimum utilization of agricultural inputs, cost reduction through waste control, sustainable and environment-friendly agriculture, etc.

A thorough analysis of application of nano-technology would reveal that, with its help, we can indeed address most of the problems confronting agricultural operations in the developing economies like ours. It hardly needs any elaboration, if we claim that in the much-

organizations in the developing countries, including in India.

In our view, the debates are welcome as every new technology is likely to bring with it several concerns and fears, more so when they are related to welfare of the people. Technology, we understand, is not an end in itself, and has to be evaluated in the context of effects on the end-users. When it is agriculture, the end-users are the people, be they producers or consumers. In the ultimate analysis, any technology must be viewed in the context of its ability to enhance welfare, in every respect. Health and food safety concerns are on top of the concerns relating to BNT, but there are other concerns as well.

The basic point is this: While the benefits of BNT is very well established, it must be remembered that agricultural economy is a country specific situation. What has benefited some countries, may not necessarily benefit every country. In order to make it beneficial for a developing country specific situation, one has to keep in mind the specific aspects of agrarian system and practices in that country. Taking the case of India, we have already talked about the structural constraints and characteristics of our agricultural system. One may still mention some of them. Of particular importance in this context are the following facts:

- i) Small size of operational holdings.
- ii) Preponderance of small and marginal farmers who account for roughly 40% of operational holdings but 80% of farming households.
- iii) Low profitability and therefore low remuneration from farming operations.
- iv) Extremely limited capacities to invest on the part of large number of agricultural households.
- v) Already, agriculture suffers from low level of investment. i.e. rate of capital formation is extremely low.
- vi) High degree of vulnerability to natural calamities, leading to crop and economic uncertainty.
- vii) Crop insurance scheme exists, but not very effective.
- viii) Subsidies remain the basic support system, while the government's fiscal situation does not permit adequate subsidization where ever needed.
- ix) Agri-infrastructure still suffers from irregularities and inadequacies.

When we are talking of application of BNT, these and many other aspect of our agrarian system have to be kept in mind. The reality is that while we have a large potential in our agriculture and we can indeed develop it as a dynamic sector of an economy.



Sitting on Dias (LtoR) Ms. Mihoko Tamamura, Country Director, United Nations World Food Programme, India, Prof. V.L. Chopra, Member, Planing Commission and Dr. Santosh Mehrotra, Head, Development Policy Division, Planing Commission.

Hardcore scientists and technologists will better explain the technological processes involved in genetic modification of living organisms such as seeds and plants, human beings or animal, solid or liquid elements, etc. From the perspective of a social scientist, biotechnology is a process that uses genetic modification as a tool for maximization of benefits in the world of constraints and /or limitations that we have to live through. Exercise in biotechnology, and its application, for various purposes in, thus, a welcome development. It is entirely a rational endeavour, and it is no wonder that application of bio-technology is gaining wider acceptance.

Particularly, application of biotechnological process in agriculture is spearheading rapidly in several countries. Its role in enhancing productivity by way of hybrid seeds, pest resistance quality, post-harvest loss minimisation, better storage life of crops, etc is well-established. Its potential in increasing farm income, and thus mitigation of poverty, is also, accordingly, established. Ever since the beginning of commercial application of agro-biotechnology in the early 1990s, the production of GM food and seeds has been increasing, though in the developed countries mainly. The progress has not been without controversies and obstructions. We shall talk about it in the next section. Controversies not with standing, popularity of agro-biotechnology (or Green Biotechnology) has been on the rise.

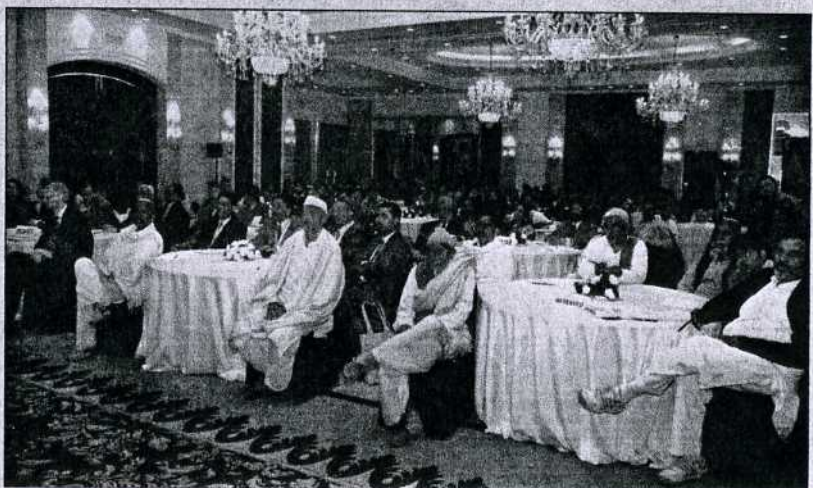
And now we have another technological feat that is coming, which is the rapidly expanding branch of technology that allows us to create tools and materials at the molecular levels of materials and organisms, and has wider applications in various fields, including in agriculture. Application of nano-technology, considered as having the potential for ushering in new industrial revolution, is being increasingly adopted in many countries in their endeavour for a 'knowledge-based economy' in the 21st century.

With respect to agriculture, nano-technology, it is widely recognized, has the potential to revolutionise agriculture and food industry, with application of new tools for the molecular treatment of diseases, rapid disease detection, enhancing the ability of plants to absorb nutrients, etc. It is

emphasised imperative for next phase of technology revolution in our agriculture, nano-technology would have a significant role to play. More specifically, world-wide, combined package of BNT is likely to take agriculture, the oldest economic activity of human being, to its new incarnation as the modern technology-savvy economic sector. Needless to say, rapid use of IT by the farming community will accelerate the process. In fact, the world is on the threshold of an entirely new paradigm in the field of agricultural operations and downstream food industry.

The Concerns

Having said these, we must take note of the issues and concerns that have come to debated in connection with growing use of BNT and food products coming from application of BNT. The concerns relate largely to effects on human health and food safety. The effect and relevance of genetically modified (GM) food, for instance, continue to be a major area of debate that was generated by the European Union, and subsequently picked by several civil society



View of the audience