

Greetings from Dr A D Damodaran !

&

Foreword : February 2010

**Revisiting “Growing Science” Model
of Homi Bhabha (*Continued*)**

1. “Give me the courage to change the things I can, and the things I can’t; and the wisdom to know the difference”. So said a great philosopher as an abundant caution. Another great one of the same tribe said, “The philosophers have only interpreted the world, the question is how to change it”. In essence, conscious social-cum-national development means ultimately the adoption and implementation of a policy framework to bring about changes within a carefully orchestrated strategy, in turn resting on adequate understanding of ground realities and challenges.

2. Our history is also fortunately enough replete with descriptions of the early urges of our leaders and statesmen championing the cause of national development based on modern science and technology. Totally inspired by the German scenario, the veteran industrialist JN Tata identified steel, electric power and what he called Industrial Science as three pillars of modern techno-economic development; and accordingly he established the steel plant at Jamshedpur, hydroelectric power station at Kapolei near Bombay and a dedicated trust with the then government of India for an advanced research centre for **industrial science** which eventually developed to what is now Indian Institute of Science in Bangalore. It was again an engineer-cum-administrator Sir M Visweswarayya who had worked out the first ever development plan for the country as elaborated in his celebrated book on “Planned Economy for India” published in 1934. An elder statesman, a distinguished administrator and a highly rated engineer by profession, Visweswarayya had formulated his plan resting on the following basic premises: (a) Tremendously impressed by the results of the First Five Year Plan in Soviet Union - he called it ‘the first plan’ in the world which was ‘developed openly and put into execution on a nation-wide basis’ and ‘embracing every phase of national life – political, economic, social and cultural’ (b) ‘The Indian plan should avoid communistic tendencies; its basic policy should be to encourage collective effort...more or less on the lines followed in the United States and in Turkey’. He put it explicitly thus, “It is safe for this country to proceed along the lines practiced in such capitalist countries as France and the United States...We have yet to build up some measure of moderate industrial prosperity, and for the present, capitalism is best suited for that purpose. Only the monopolies incidental to capitalism should be minimized; and wherever they are inevitable, a watch should be maintained and special modifications made by legal enactments and otherwise, in the direction of service to the public”. (c) All the heavy industries and all other industrial, agricultural or other projects are to be in private sector, with the role of the state more or less confined to coordination as well as giving of subsidies (d) He approvingly quoted Stalin for making ‘the main link of the FYP as heavy industry and its core, machine construction because only heavy industry was capable of

reconstructing industry as a whole, and transport and agriculture, and of putting them on their feet...Unless we have industry, unless we restore it, we cannot build up any industry, and without it we shall perish as an independent country'. He accepted that the approach of Stalin and Lenin was relevant and applicable to India as well. His 'picture of a reconstructed India' was one 'which will have been industrialized in the sense that the USA, Canada, Japan and Soviet Russia are today'. *In working out such a strategy, he had surveyed what he considered to be 'important developments' taking place in capitalist countries including United States where 'a new kind of state socialism' is being tried on a gigantic scale under Mr Roosevelt's National Recovery Act, providing for higher wages and shorter working hours to dethrone the unrestricted individual entrepreneur and to make the group the country's economic and social audit.*

3. When Jawaharlal Nehru had taken over as Chairman, Congress Planning Committee in late 1930s, the said plan plus many more ideas worked out by a Bombay group of industrialists were already before him. Due to other political exigencies of the time, Nehru could not complete his task though much of the prevailing views got incorporated subsequently into the well known Tata-Birla Plan. In essence, the then political leaders headed by Jawaharlal Nehru had at the time of independence itself in front of them a possible development plan, quite unlike many other newly emerging countries in the world. It was realized that India did not possess either capital goods or technical know-how; it needed both these from advanced countries abroad.

Since atomic energy was identified to be totally under the state sector due to unique techno-political nature, its known specialist leaders were asked to work out a strategy best suited for developing the sector. This was the national political milieu under which Homi Bhabha could formulate his "Growing Science" model as a follow up of his pioneering efforts in establishing the Tata Institute of Fundamental Research with support from Sir Dorabji Tata Trust, having been convinced and motivated since 1944 that "when nuclear energy has been successfully applied for power production in say a couple of decades from now, India will not have to look abroad for its experts but will find them at home".

4. In Part I of "Revisiting "Growing Science" Model of Homi Bhabha, it was highlighted that *"It is within such a context that one is tempted to attempt a revisit of the "Growing Science" model formulated by Homi Bhabha, the great scientist-engineer for India's Atomic Energy Program and who championed it for the nation itself.* The essence of the Growing Science model (Ref: "Problems of Science Development" International Council of Scientific Unions, Bombay, Jan 1966) and the strategy worked out by Bhabha for nuclear technology under the "growing science" approach had the following major elements: (a) Evaluation of the technology gap in the field between India and advanced countries in all aspects, including the nature of Intellectual Property Rights related to it, (The nuclear reactor was patented in 1945 itself by Fermi and Szilard in an extensive US patent!) (b) Importation of appropriate technology wherever feasible without any pre-conditions and thereby utilizing the opportunity to get a quick "assisted take-off", (c) Systematic development of the appropriate indigenous S&T infrastructure to assimilate the "know-how and know-why" of designs, equipments and systems, and (d) Providing adequate legal/administrative policy umbrella support for implementing the indigenous development program, including support measures to overcome issues connected with

Intellectual Property Rights. Suffice here to say that the Indian Atomic Energy Act 1962 had incorporated all the essential requirements for implementing the DAE program as envisaged. Thanks to such a farsighted strategy, DAE was able to execute its task with great success, in spite of many a major set-backs not unusual in assimilating such an 'unforgiving technology'. This was despite the most rigorous international non-trade barriers – such as embargoes of large number of items including those belonging to the so-called 'dual use' category from the advanced countries – due to which its programs had to suffer for over a decade through delay in achieving the projected targets delay.

5. It is in this context that we reproduce here the relevant extracts from Nuclear India, Nov-Dec 2008, brought out by DAE as a tribute to late Homi Bhabha and Jawaharlal Nehru described therein as "The Architects of Atomic Energy Program in India". The early history and the subsequent formation of the full fledged AEC/DAE, *an independent Department in any field of science and technology for the first time in India*, has been made public recently through a series of letters exchanged between Nehru and Bhabha as early as between April 26, 1948 and January 9, 1962 as part of the Bhabha Birth Centenary Celebration documents. Salient features of the same are given as below:

(a) It is 'reasonable to believe that within the next couple of decades atomic energy would play an important part in the economy and the industry of countries and that, if India did not wish to fall even further behind the industrially advanced countries of the world, it would be necessary to take more energetic measures to develop this branch of science and appropriate larger sums for the purpose.

(b) An immediate objective should be the setting up of a small atomic pile...The quickest and most desirable way of developing atomic energy in India would be to come to an agreement with the governments or atomic energy agencies of one or more countries such as UK, France ...on mutually advantageous terms involving the exchange of raw materials used (since India has so far not been able to locate any large reserves of uranium resources) in the generation of atomic energy and the pooling of scientific and technical information.

(c) Absolute secrecy will have to be observed and ensured with respect to any secret information given to us by a foreign atomic energy agency. This requires that the development of atomic energy should be entrusted to a very small and high-powered body... with executive power and answerable directly to the Prime Minister without any intervening link. For brevity, this body may be referred to as the Atomic Energy Commission. The present Board of Research on Atomic Energy cannot be entrusted with this work since it is an advisory body which reports to the Governing Body of the Council of Scientific and Industrial Research, composed of 28 members including officials, scientists and industrialists. Secret matters cannot be dealt with under such bodies.

(d) The same reason requires that Atomic Energy Commission have its own secretariat independent of the secretariat of any other Ministry or Department of the government, including the envisaged Department of Scientific and Industrial Research.

(e) A sum of Rs 50 lakhs will be required ...to build a small pile while an additional equal amount for purchase of raw materials like uranium, heavy water, etc., the total sum being apportioned within four years.

(f) **Vide his letter dated July 11,1954, Bhabha submits details of his Work Plan itself to the Prime Minister.** This includes setting up of an AEET as the premier R&D Centre at Trombay, systematic survey for atomic minerals especially uranium, beneficiation of the low grade ores to workable concentrates and then going all the way to production of nuclear pure Uranium metal, plants for heavy water, setting up of power reactors through import, plutonium extraction plant, setting up of production plants for other nuclear materials like zirconium, titanium, beryllium, etc and, **last but not the least “to train and develop the necessary scientific and technical staff”.**

And so on. It is now part of history that on August 3, 1954, a separate Department of Atomic Energy was created in the direct charge of the Prime Minister. In order to ensure complete autonomy for the Department in matters of staff, construction, supplies, and finance, the Department was vested with powers (i) to make its own appointments without reference to the Union Public Service Commission, (ii) to carry out all civil engineering work through its own Division without reference to CPWD and (iii) to make its own purchases of materials, equipments and supplies without reference to the DGSD. Atomic Energy Commission itself was enlarged and reconstituted in 1958 as the true apex body, with Chairman, AEC concurrently also Secretary, Department of Atomic Energy. Thanks to the great far sight, administrative prowess and the willingness to change structures to meet the new requirements, the Nehru-Bhabha duo implemented for the first time a new model for S&T governance.

6. All the same time, it must be remembered that Prime Mister Nehru was equally clear as to who held the upper hand on policy matters! In a letter dated July 29, 1956, Nehru amplified clarified the matter as follows: “I have not seen your note about the composition of the Indian delegation to the International Conference to consider the draft statute of the International Atomic Energy Agency. I shall await that. Meanwhile, the question that arises is as to how far this Conference will consider political questions or purely technical and scientific ones. I find that some of the other major countries are sending non-technical people as leaders of their delegations. It would probably be advisable for you and your scientific colleagues not to get mixed up too much with the political aspects”. It was well known that India under Nehru was championing for a democratic structure for IAEA reporting to the US General Council whereas the Big Powers saw to it that IAEA would report only to the Security Council instead! No wonder that over the decades IAEA had transformed itself more as a nuclear policing body rather than as its originally cherished aim of serving as a technological platform for spreading the Peaceful Uses of Nuclear Energy!

7. Under the Nehru-Bhabha leadership, the AEC/DAE structure was ready for a fast take-off by mid-1950s itself. The short and long term strategies were worked out, so also the detailed break-up into concrete elements. Based on a generous offer from the United Kingdom to provide the required enriched uranium fuel elements,DAE commissioned its first swimming pool research reactor Purnima at Trombay in August 4,1954. This was followed by the 40MWt CIRUS reactor with Canadian assistance by July 10,1960 and so on for advanced studies and research. The Trombay Research Establishment became the research centre for all nuclear research activities, including the first ever S&T HRD effort through the Training School from 1957itself.So also the facilities for producing uranium metal, reactor fuels, reprocessing, and so on in quick succession based on indigenous

efforts complemented through friendly foreign supports wherever possible under terms 'favorable to our country'. By the mid-1960s, permission were obtained to go for setting up a 400MWe atomic power station based on US technology at Tarapur and another one of equal capacity at Rajasthan based on Canadian technology.

To summarize very briefly, the DAE strategy was based on the brilliant twin strategy of selective foreign support and intense efforts on building concurrently the indigenous capability.

(To be continued)

Major S&T Developments

1. The India-France deal for civil nuclear cooperation has now come into force. The agreement will allow France and India to develop a multiform civil nuclear cooperation covering a wide range of activities including nuclear power projects, R&D, nuclear safety, education and training. This would give a new impetus to the Indo-French partnership and would contribute to "further strengthening the deep ties of friendship and long-standing cooperation between the two countries". The Indo-French nuclear agreement allows for reprocessing of spent nuclear fuel from French atomic reactors under safeguards, and gives an assurance of lifetime supply of nuclear fuel for these reactors. It does not bar the transfer of enrichment and reprocessing technologies. The India-France nuclear pact has formally become operational even as New Delhi and Washington have still not been able to finalise their nuclear deal because of differences over reprocessing. In accordance with the provisions of the agreement, it becomes effective from the date of exchange of instruments of ratification. Days after the Nuclear Suppliers Group re-opened the doors of civil nuclear commerce for India on September 6, 2008, after a 34-year hiatus, France became the first country to ink a civil nuclear accord with India. The French parliament unanimously approved the accord in November last year, paving the way for participation of French companies in India's nuclear energy sector. France-based nuclear conglomerate Areva has been allocated the nuclear project site at Jaitapur, in Maharashtra, to construct two nuclear power plants initially. Each of the two plants will have a capacity of 1,600 mw. India has signed civil nuclear pacts with seven countries, including the US, France, Russia, Kazakhstan, Namibia, Argentina and Mongolia.

Meanwhile the excavation work for building two indigenous Pressurized Heavy Water Reactors (PHWRs) of 700 Mwe each at Kakrapara in Gujarat has begun, they being the *biggest indigenous* PHWRs to be built in India by the Nuclear Power Corporation.

According to a PTI report, the safeguard agreement with regard to civilian nuclear facilities between India and the International Atomic Energy Agency (IAEA) has come into force, U.S. President Barack Obama has said. He said this in a memorandum issued to U.S. Secretary of State Hillary Clinton as mandated by the **U.S.-India Nuclear Cooperation Approval and Non-proliferation Enhancement Act** regarding the safeguard agreement between India and the IAEA. Mr. Obama also certified that India

had filed a declaration of facilities that was “not materially inconsistent” with the facilities and schedule described in the Separation Plan presented in Parliament on May 11, 2006, taking into account the later initiation of safeguards than was anticipated in the Separation Plan.

2. According to Business Standard, Pharmaceutical patents are just over a fourth of all patents granted in the country, but domestic drug makers account for almost all post-grant patent opposition filed, official data reveals. Of the eight post-grant oppositions filed at the patent office last year, six were by domestic drug companies Cipla, Torrent, Ranbaxy and Emcure. Wind energy company Enercon was responsible for the other two challenges against patents granted in the country during 2009. “Drug companies are really interested in protecting their home turf. They watch each application to see if there are any legal barriers being created against their domestic marketing plans,” said Varun Chonkar, a patent expert who runs Ipfeathers, a Mumbai-based consultancy. Cipla, India’s biggest drug company by domestic sales, has challenged two patents granted to GlaxosmithKline’s breast cancer medicine, Tykerb. These were filed in February and April. It has also challenged patent protection granted to a lung care medicine of US-based Ivax, a subsidiary of Israel’s Teva. Patent grants to Eli Lilly’s schizophrenia drug, Zyprexa, have been challenged by Ranbaxy and Emcure. In two separate post-grant oppositions, Ranbaxy and Emcure said the protection to the Lilly drug was not valid under Indian laws. Similarly, Eli Lilly’s blood-thinner drug, Efient’s Indian patent was challenged by Torrent. Post-grant opposition can be filed against any Indian patent within 12 months from the date it is published in the official journal.

3. According to Business Line report, Monsanto will gross roughly Rs 340 crore from licensing its proprietary Bollgard (BG) gene traits to Bt cotton hybrid seed firms in India this fiscal. In the recent 2009 planting season, 270-275 lakh packets of Bt cotton seeds were sold across the country. Of this, 250 lakh incorporated Monsanto's BG-I or the second-generation BG-II gene constructs. The balance 20-25 lakh were based on the alternate Bt technologies of JK Agri-Genetics, Nath Biogene and the public sector Central Institute for Cotton Research. Bt cotton is a genetically modified plant harbouring foreign genes from a soil bacterium, *Bacillus thuringiensis*, which produces proteins toxic against various bollworm insect pests. In 2009, 35-40 lakh out of the 250 lakh BG Bt seed packets were sold in the northern markets of Punjab, Haryana and Rajasthan, with BG-I accounting for 60 per cent (24 lakh) and BG-II 40 per cent (16 lakh). The maximum retail price (MRP) charged here was from Rs 750 a packet for BG-I to Rs 925 for BG-II. In other regions (Maharashtra, Gujarat, Madhya Pradesh, Andhra Pradesh, Tamil Nadu, Karnataka), controls by State governments meant lower MRPs of Rs 650 for BG-I and Rs 750 for BG-II. Also, in these States, BG-I constituted only 40 per cent (84 lakh) of the 210-215 lakh packets sold, with BG-II making up 60 per cent or 126 lakh packets. What was the technology fee that the BG-licensee seed companies had to fork out from their total sales? It varied depending on the MRP, the gene construct and also the region.

“In the North, our trait fee was Rs 144 for every packet of BG-I, excluding a four per cent value-added tax (VAT) of Rs 5.76. For BG-II, it was Rs 225, besides a 10.3 per cent service tax of Rs 23.175,” informed Mr Jagresh Rana, Director of Mahyco Monsanto Biotech India Ltd (MMB). MMB, the licensor for Bollgard technology in India, is a 50:50 joint venture between Monsanto and its 25 per cent-owned local partner, Mahyco. Legal battle. In States, where the MRPs were fixed at a lower range – on which a legal battle is ongoing – the trait fee was Rs 96.15 (plus four per cent or Rs 3.85 VAT) on BG-I

and Rs 150 (plus 10.3 per cent or Rs 15.45 service tax) on BG-II. If the above rates are computed against the number of packets sold, the technology fee component accruing to MMB from this season's Bt cotton plantings comes to slightly over Rs 340 crore. That would be nearly a fifth of the Rs 1,800 crore worth of seeds (MRP value) sold by the 21 BG technology-using companies.

Incidentally, addressing the nation on the eve of the 61st Republic Day, the Indian President called for urgent steps towards a *second green revolution* to ensure food availability, particularly of agricultural produce, which is in short supply, to avoid spiraling food prices. Urging positive action, including some “out-of-the-box thinking” on the farm front, she said: “We have to involve the agricultural economy more pro-actively into the growth process, both as a centre of production and as a generator of demand for various products and services, in turn also advocating “more intense frameworks,” encompassing “new technologies, better seeds, improved farming practices and better water management techniques,” for closing the gap among the farmer, the scientific community, lending institutions and the markets. It is well realized that the first Green Revolution was implemented during a period when better quality seeds were not controlled by the monopoly intellectual property rights of the inventing agencies; they were in public realm. Obviously the Second Green Revolution will have to be tailored through the new realities under the TRIPS dictated regime. If the BT cotton is any case in point, the task is certainly NOT going to be that easy, that too for a country like India where native inventiveness continues to be a distant dream in contrast to the already powerful presence of foreign MNCs and their monopoly-cum-proprietary seeds in the *desi* market!

4. India has signed an agreement with an international organization to help it implement a national policy on intellectual property (IP) and innovation. However, it is a policy no one has seen or discussed in the country. According to Business Standard, the memorandum of understanding was signed by the commerce ministry's Department of Industrial Policy and Promotion (DIPP) with the World Intellectual Property Organisation (Wipo) during the visit of its director-general, Francis Gurry, in November last year. Signing on behalf of the commerce ministry was outgoing DIPP secretary, Ajay Shankar. The MoU, signed on November 13, as Gurry wrapped up a three-day, high-profile visit to India, is broadly aimed at strengthening cooperation on IP matters between the two sides. But, a key focus of the agreement is the national IP and innovation strategy and an IP Development Action Plan for 2010-2011 which, the MoU states, will represent “activities identified as priority areas of cooperation”. This is the first indication that India has drawn up a national IP and innovation strategy and that a two-year IP action plan has been put in place. However, none of the top industry bodies says it has seen such a strategy or action plan or been privy to any discussion on these. Queries sent to the Confederation of India Industry (CII) and the Federation of Indian Chambers of Commerce and Industry (Ficci) have drawn a blank. Spokespersons for these apex organisations say they have not seen such a document. Both had held round-tables on IP issues during Gurry's visit. While the CII roundtable brought some 50 enterprise leaders from various sectors for a discussion on Wipo's activities, the Ficci meeting was with representatives of the entertainment industry. Top DIPP officials remain tight-lipped on the IP Development Plan. An industry source said, “requests for a copy of the plan have remained unanswered”. According to this source, DIPP “is not even willing to share the contents of the MoU, leave alone the national IP innovation and innovation strategy, which has serious implications for key sectors of our economy”. Similarly, requests from

Business Standard for a copy of the policy and action plan have not been successful. Wipo, too, had not replied to an email about the IP Development Action Plan for 2010-2011. A copy of the MoU is with BS and it shows the emphasis is on “a more intense, active and systematic” cooperation on IP matters. The centrepiece, though, is the national innovation and IP strategy “in the context of India’s national development priorities”. One worrying aspect, according to an official of an industry body who did not wish to be identified, is a clause in the agreement that states DIPP can “designate a third entity or entities to coordinate functions” under this agreement. This has raised concerns about the necessity of involving unspecified third parties to implement IP policies which have a significant bearing on the prospects of several industries, not least pharmaceuticals. D G Shah, secretary general of Indian Pharmaceutical Alliance (IPA), which groups the country’s leading pharma producers and exporters, says: “It is odd that WIPO should be involved in the implementation of India’s national IP and innovation strategy and odder still that a third party should be engaged for this purpose. But, even more worrying, he says, is that no consultations were held with the industry or other stakeholder ministries. Other ministries, such as human resources development and information and broadcasting, which have a sizable say in IP matters, do not appear to have been consulted. Shah claims the Department of Pharmaceuticals in the Ministry of Chemicals & Fertilisers has not responded to the urgent clarifications that IPA sought from it. The industry’s concerns stem from the fact that several provisions in Indian patent law have been challenged in different forums and so, secret plans formulated in consultation with Wipo could have a major impact on domestic industry. “I am hoping that at least the Department of Pharmaceuticals would have been consulted, since industry was not, before finalising the strategy and Action Plan. But, the lack of transparency and some of the provisions contained in the MoU are clearly disturbing,” says the IPA chief.

5. The group of four major emerging economies — Brazil, South Africa, India and China — on Sunday expressed their intention to communicate information on their voluntary mitigation actions to the United Nations Framework Convention on Climate Change (UNFCCC) by January 31. This decision was taken at the second Ministerial-level meeting of the BASIC group of countries here. The BASIC members have already announced a series of voluntary mitigation actions for 2020, with India declaring to reduce its greenhouse gas emission intensity up to 25 per cent. The UNFCCC has asked the countries to convey by January 31 their stand on the legally non-binding Copenhagen Accord arrived at in the Danish capital last month. The Ministers re-emphasised their commitment to working together with other countries — particularly the G-77 — to ensure a consensus at the Conference of Parties at Mexico later this year. They underscored the centrality of the UNFCCC process and the decision of the parties to carry forward the negotiations on two tracks — Ad Hoc Working Group on Long-term Cooperative Action under the UNFCCC and the Ad Hoc Working Group on further emission reduction commitments for Annexe I parties under the Kyoto Protocol in 2010 leading up to COP-16 at Mexico. Vice-chairman of the National Development and Reform Commission from China, Xie Zhenhua, said the BASIC group’s objectives were consistent with the interests of the developing countries. **“BASIC will take the lead in large-scale emission reduction and also stick to the policy of common but differentiated principle.”** Meanwhile, as Business Standard correctly warns, “A basic tenet of science — the difference between voodoo and science in fact — is falsifiability. A scientific theory is accepted only after it has survived testing in processes that replicate the original results, while unsuccessfully trying to prove it false. For that process to be rigorous, scientists need to share data and methodologies. Climate

science is a meta-discipline that draws upon many domains including physics, chemistry, meteorology, oceanography, geology, bio-sciences, botany, zoology and multiple engineering streams. The research has been done by independent, publicly funded academic institutions. Hence, there can be no apparent reason for not freely sharing data as the CRU apparently refused to. In the wake of these incidents, and the attacks on Pachauri, it behooves the IPCC, TERI, CRU and other bodies working in climate sciences to review their internal processes. The peer-review and data-sharing mechanisms must clearly be strengthened. Also, given the policy ramifications and political context, clear transparent guidelines for consultative work must be evolved and published to prevent such accusations from arising in future. It would be a tragedy if unchecked global warming destroys our habitat. It would be pathetic if it occurred for these reasons”.

6. South Korean President Lee Myung-bak on Monday urged the Indian government to look at Korea’s expertise in civil nuclear energy production and strike mutually beneficial collaborations in developing India’s nuclear energy capabilities and making the sector globally competitive. Confident after securing a multi-billion dollar order for reactors from the United Arab Emirates, the Korean nuclear industry has identified India as an attractive market. The Korean nuclear industry has been in touch with Indian public sector companies and despatched its senior officials to India in September last year for a business scouting mission. Addressing captains of Indian industry and trade at a business meeting, the South Korean President said that in his meeting with External Affairs Minister S.M. Krishna, the two sides discussed cooperation in the field of civil nuclear energy among other issues. “I apprised him about the Korean capabilities in the sector and told him that this was a very productive area to collaborate for mutual benefit and it would make your nuclear energy sector globally competitive,” he said.

7. Despite its high social return, R&D expenditure on agriculture in our country is low by international standards. Take, for instance, the Eleventh Plan, in which the outlay for various agriculture related schemes is Rs 41,300 crore, or a mere Rs 8,000 crore a year, less than one per cent of the value of agricultural output. The R&D spend is wholly inadequate to meet the enormous challenges of the farm sector. Not only do we need increased R&D expenditure backed by modern technologies and capable institutions, but such R&D must focus on evolving appropriate technologies for areas as diverse as rain-fed, flood-prone and drought-prone. To fight pest and disease menace, greater attention to crops amenable to biotechnology application is necessary. **Cotton has turned out to be an outstanding example of how technology adoption (genetically-modified seeds) can elevate the fortunes of a crop that was, until a few years ago, seen as one with no great future. A breakthrough in pulses and oilseeds — crops perennially in short supply — has been talked about for over two decades, but progress has been limited. To be sure, it is not just the paltry amount spent on R&D, but also lack of accountability among policymakers and research institutions. It is open to doubt whether there is an effective system of monitoring the progress of research and evaluation of the findings as also transfer of technology from lab to land. Adoption of post-harvest technologies, especially for perishable horticulture crops, is crucial.** This calls for greater investment in rural infrastructure. Information technology is a wonderful tool that can link

the farm with the market. Unfortunately, lack of policy support has resulted in limited adoption of technology in Indian agriculture. A conscious effort towards robust infusion of technology is the way forward.

8. Multinationals have graduated from captive units that did low-end work to cutting-edge research in India. Companies like Google, Microsoft, GE Healthcare and Siemens have begun to use India to design and develop products, especially for emerging markets like India. GE thus has developed an electro-cardiogram (ECG) that costs a third of conventional ECG machines. It now sells a baby warmer, used to keep babies warm after birth, at one-tenth of what this machine used to cost earlier. Microsoft, which began with 20 people, today employs 1,500 people at its Indian R&D centre. Work on its key projects, like its search engine Bing and the upcoming Windows 7 operating system, was done in India. India is SAP's largest R&D centre outside Germany and employs 4,200 people. Half of the global development of SAP's customer relationship management software such as CRM 7.0 was done in India. Bangalore was Google's first R&D centre outside the US. Google Map Maker, a global product which allows users to add or edit features such as roads, businesses, parks, schools, apartment buildings and localities, was developed by its engineers in India. News Archive Search, which helps users search archives for events, people or news, too was developed in India. **It has been a long journey. In the early 1980s, multinationals set up R&D units in India to make use of the low costs and huge talent pool. In 1983, Texas Instruments became the first global company to set up a R&D centre in India. In the last 25 years, the captives have matured, acquired competence to develop products for the global marketplace and are being used for innovation and to access new markets.** For instance, SAP has created the Net Weaver centre for excellence. So, any work associated with this technology comes to India. Yahoo does 25 per cent of its all development work in India. Adobe's global print and publishing business resides in India. Zennov Management Consulting, which helps multinationals explore opportunities in India, estimates that 640 multinationals have together set up 750 R&D centres in Bangalore, Delhi, Hyderabad, Pune, Mumbai and Chennai. **Typically, R&D companies operate at four levels. It begins with a loanership or team extension model where a team is started in India but the manager sits in the US. Next is the ownership model, where the entire technology, component and product are developed in India. Next is the partnership model where India may own certain technologies but will work with technical partners around the world on a product. And finally, there's the leadership model, where India takes leadership in a specific field.** Aravind Sitraman, the managing director of Cisco Development Organisation, said that things began as a cost-arbitrage but today an entire line of products is owned out of India. Cisco's centre in India has over the years evolved from a loanership to ownership, partnership and a new leadership model. Today, it looks at Bangalore, its eastern headquarters, as a zone for developing new technologies and products to drive growth in newer markets. Technology companies may have had a headstart with India, but other multinationals are fast catching up. Emerson, the \$21 billion US-based technology giant, has set up a design engineering centre in Pune. It provides product and software design, and engineering services for Emerson's divisions worldwide. Siemens is making India a major hub for R&D related to computer aided detection products for medical diagnostics tools. Siemens Medical Solutions has over 60 per cent of its engineers and scientists in Chennai and Bangalore.

9. The electronics system design and manufacturing industry has called for the setting up of a 'national electronics mission' – a nodal agency which will interface

with the Prime Minister's Office to ease the functioning of the industry. The other recommendations made by a sub-committee of the taskforce set up by the Government's IT Department for promoting the electronics and semi-conductor industry, include setting up of clusters of excellence in various regions across the country, encouraging 'made for India' goods, creating an R&D fund, rationalising the tax structure and promoting skill development. Presenting the recommendations to the media, on the sidelines of the 5th Vision Summit organised by the Indian Semi-conductor Association (ISA), Mr B.V. Naidu, Chairman, ISA, said the demand in the electronics market in the country is at \$45 billion and projected to grow to \$400 billion by 2020. The human capital intensive electronics and semi-conductor industry employs around 4.4 million people. **Currently, the industry's contribution to GDP is 0.7 per cent and it has the potential to grow to 20 per cent by 2020, said Mr Naidu. While the future holds promise, there are many challenges that can shackle the growth of the industry, the committee report says. The challenges are inadequate infrastructure, tax structure, supply chain and logistics, inflexible labour laws, limited R&D focus and funding. India also has to watch out for competition from China and Taiwan, said Mr Naidu, who hopes the Government would take note of the committee's recommendations to stimulate the industry and drive cost competitiveness.**

10. **A team of scientists at the National Institute of Plant Genome Research in New Delhi has developed a technique to create transgenic tomatoes that do not become squishy even one and a half months after being plucked.** The same method may well be able to extend the shelf life of other fruit too, including banana, mango and papaya. The technique, which has been **patented**, could help reduce the country's post-harvest losses that run to thousands of crores each year, observed Asis Datta. He is one of the corresponding authors of a paper with details of the research that is being published this week in the journal *Proceedings of the National Academy of Sciences* of the United States of America. India is the world's second largest producer of fruits and vegetables, but 35 per cent to 40 per cent of such produce is lost because of softening that accompanies ripening. The softening increases the damage during handling and transportation. No new gene had being introduced into the plants, he emphasized. Instead, a method known as RNA interference was used to silence genes for two key enzymes. The two enzymes, α -mannosidase and β -D-N-acetylhexosaminidase, were present at high levels during the ripening of many fruits, noted the scientists. Genetically engineered tomatoes in which production of either of the two enzymes was blocked retained their texture and firmness for up to 45 days while the ordinary variety started shriveling after 15 days. The team found that suppressing these enzymes slowed the degradation of compounds that make up the cell wall. The transgenic tomatoes, however, showed normal ripening and colour development while attached to the plant. Several transgenic lines of tomato had been created using this technique, Prof. Datta told this correspondent. These lines could go into field trials after appropriate clearances were secured. What about if both enzymes were suppressed in the same plant? "Let us see if we do both what happens," he responded. "That is for the future." The high levels of the two enzymes in fruits such as banana, mango and papaya suggested their potential involvement in the softening process, the paper noted. It should be possible to extend the technique to such fruits too, he believed. But even though the genes for the two enzymes would be largely similar to the ones in tomato, it would still be necessary to first clone those genes.

11. BL reports that In a major test of the five-yearold product patent regime, the Delhi High Court dismissed an appeal by multinational drug-maker Bayer Corporation

regarding its advanced renal cancer drug Nexavar. Bayer had urged the regulatory the Drug Controller General of India (DCGI) to not give marketing approval to Cipla's generic version of the same drug. In what is referred to as "patent linkage" in pharmaceutical circles, Bayer had initially approached the Delhi High Court seeking to link the patent status of an innovative drug to the marketing approval given by the DCGI to generic versions of the same medicine. In its judgment, the court said that the scheme of both the Patents Act and the Drugs and Cosmetics Act (DCA) are "distinct and separate" and that the attempt by Bayer to establish a linkage cannot be "countenanced". "Whether patent linkage should be introduced is an issue that requires a policy decision to be taken by the government. It is not for the court to determine if the Government should bring in a system of patent linkage," the court said. Bayer's initial writ petition, filed in November 2008, was dismissed in August 2009 by the Delhi High Court. Subsequently, in late August, Bayer filed an appeal to rehear the case before a Division Bench of the court. And on Tuesday, the two-judge Bench ruled against Bayer concurring with the earlier, single-judge, decision. "Bayer is disappointed about and disagrees with the court's decision and will consider its legal options in this regard," a spokesperson told Business Line. The directive outlines the role of the DCGI and also clears the way for Cipla to launch its drug in the market, an industry-watcher said. Cipla, though, did not comment if it was ready to launch the drug. In its judgement, the Court said that Bayer's argument would mean that instead of testing the validity of a patent, the DCGI will begin with the presumption that the patent granted in respect of the drug for which marketing approval is sought has been validly granted. This would block generic manufacturers who could have made the drug at affordable prices, subject to infringement suits by the patent holder, the Court observed. **According to industry information, Bayer's Nexavar (Sorefenib tosylate) is sold at Rs 2, 85,000 for 120 tablets for a month's dosage.** Also, if the patent holder did not apply for a marketing approval, then the drug will be virtually unavailable in India till such time the patent holder decides it should be available, it noted.

12. BL reports on Bt brinjal that **Legitimacy of safety tests cooks Bt brinjal's fate**

Can't ignore doubts over their reliability, says Jairam Ramesh.

WHAT THE STATES SAY

 <p>Mr K. Rosaiah <i>Andhra Pradesh Chief Minister</i> .. the data generated, the tests conducted and the information disseminated by GEAC are not sufficient for suggesting the commercial release of Bt brinjal.</p>	 <p>Mr V.S. Achuthanandan <i>Kerala Chief Minister</i> The Government of Kerala has taken a decision to prohibit all environmental release of GMOs and keep the State totally GM-free.</p>
 <p>Dr Raman Singh <i>Chhattisgarh Chief Minister</i> All tests to establish full impacts, including negative impacts, on human and animal health and on the environment should be carried out.</p>	 <p>Mr B.S. Yeddyurappa <i>Karnataka Chief Minister</i> The commercial release of Bt Brinjal should be deferred till the issue is thoroughly examined from all angles.</p>
 <p>Mr Nitish Kumar <i>Bihar Chief Minister</i> The Rajya Kisan Ayog is not in favour of the introduction of Bt brinjal in the State at this point of time. The State Government fully endorses the view.</p>	 <p>Mr Buddhadeb Bhattacharjee <i>West Bengal Chief Minister</i> I feel that the matter needs thorough examination by the experts in the field.</p>
 <p>Mr Naveen Patnaik <i>Orissa Chief Minister</i> The Orissa Government does not support introduction of Bt brinjal at this stage and until sufficient trials are made and interests of small and marginal farmers are safeguarded.</p>	 <p>Mr Shivraj Singh Chauhan <i>Madhya Pradesh Chief Minister</i> Bt brinjal should be introduced only after all doubts and fears have been properly dispelled.</p>

The main issue that seemed to have worked against granting clearance to Mahyco's Bt brinjal was the tests undertaken for establishing its safety, both from the human consumption as well as the environment angle. In this case, the data as well as the tests were carried out by the developer itself and not in any independent laboratory. "This does raise legitimate doubts on the reliability of the tests, doubts that I cannot ignore," said the Union Minister for Environment Minister and Forests, Mr Jairam Ramesh said announcing the Centre's moratorium on the commercialisation of Bt brinjal. Quoting the Director of the Nagpur-based Central Institute of Cotton Research, Dr K.R.Kranthi, the minister noted that the baseline data on susceptibility of the fruit and shoot borer to the 'Cry' toxins — produced by the Bt brinjal — was generated by Mahyco and not in a government institute laboratory known for its expertise in resistance management. Similarly, the "refuge strategy" proposed by Mahyco to prolong the effectiveness of Bt brinjal against the dreaded insect pest was based on "simplistic assumptions and not through defined algorithms and modelling". "This only points to the need for more tests that are well-designed, widely accepted and independently conducted," Mr Ramesh pointed out. Besides insufficient credibility of the data and tests, the other factor that apparently tilted the case against approval for the Bt brinjal was the bio-diversity concerns raised by crop scientists like Dr M.S.Swaminathan. Apart from being the world's largest producer, India happens to be the country of origin for brinjal with the

National Bureau of Plant Genetic Resources alone having a recorded collection of 3951 varieties. Mr Ramesh said that Dr Swaminathan had drawn attention to the long-term implications of the numerous local strains of brinjal being replaced by just one or two BT varieties. This was inevitable in the event of farmers finding it more profitable to opt for BT brinjal just as they did in the case of BT cotton. Dr Swaminathan is said to have urged the Centre to embark on a strategy to collect, catalogue and conserve the existing genetic variability in brinjal before taking a decision on release of BT brinjal for commercial cultivation.

According to Live Mint, Independent scientists, and experts involved with the approval process, seem unhappy with the decision. "If there were more tests needed, you should have got them prescribed 10 years ago, when BT brinjal first came for an approval," said a GEAC official, who didn't want to be identified. "No technology can take root if ad hoc tests are prescribed randomly." G. Padmanabhan, a former director at the Indian Institute of Science and an expert recommended by Ramesh for designing new tests, said: "I am disappointed and surprised at this decision. Open-ended moratorium has no meaning. I had thought he would say one or two years of study. I don't buy the safety concern argument. They say do chronic feeding (to rats) but how long can this feeding last? For a lifetime? What would be the control for such studies? All the existing protocols have been followed (by GEAC). I have read the report and I think they have analyzed all comments very well...". The Deputy Director General of ICAR, Swapan Datta, denied it. He said no ICAR scientist had any dissenting view on Bt brinjal. "I don't know if any ICAR scientist would disagree." He said the science was sound. "It is written on the wall. Science will prevail." Referring to the approval of the commercialisation of Bt brinjal by the scientific body, Datta said, it had received the go-ahead from top authorities. "The agriculture minister endorsed it, the minister of state endorsed it, the Minister for Science and Technology endorsed it and the Secretary, Department of Biotechnology, endorsed it." Asked if he agreed with the environment minister's view that public-funded effort had to be encouraged in biotechnology in agriculture, Datta said: "If the Ministry of Environment thinks so, it should come up with a \$5 billion investment so we can design crop research." The senior government scientist added: "In my office no one knows if we got any money from the Minister of Environment. He should put some money on science. I would love to have some money from him."

Environment Minister Jairam Ramesh, according to reports, has hit back at scientists who had accused him of holding biased public consultations on Bt brinjal. He said Vikram Sarabhai and Satish Dhawan, the two science stalwarts of India, would not have behaved in similar manner. "Scientists are not Gods," he told Business Standard, refusing to accept as final the word of GEAC (Genetic Engineering Appraisal Committee), a statutory body. Some GEAC members have been accused of ignoring conflict of interest issues, even as they took a critical decision of approving Bt brinjal for commercial cultivation.

Commenting on the controversy, Business Standard writes succinctly thus, "the truth also is that, despite all this, the controversy over the Bt brinjal issue is unlikely to die down. For, neither the manner of taking the decision nor the decision itself is wholly incontrovertible. The way the minister reopened the matter for public scrutiny — and not scientific peer review — after the Bt brinjal got the approval of the GEAC, was suggestive of a lack of confidence in the technical competence of the GM crops regulator. If so, the minister should have taken the logical next step of disbanding or

reconstituting the GEAC. By allowing public opinion to stymie the regulator, the minister has willy-nilly created an unfortunate precedent for policy-making. While apprehensions about the insect-protected Bt brinjal wiping out genetic diversity in local brinjal varieties are well founded, these issues can only be settled by competent authorities, not populist campaigns. When the high-yielding Mexican dwarf wheat varieties came in the late 1960s and early 1970s, they soon covered the entire wheat-growing belt, elbowing out the traditional wheat varieties, most of which are now preserved in gene banks. The same was the story with transgenic Bt cotton hybrids which, within seven years of introduction, have spread to nearly 90 per cent of the cotton acreage. But the country is now surplus in both wheat and cotton, which were perpetually in short supply earlier. Traditional varieties can survive only either on merit or consumer loyalty. The issue now is how will the Bt brinjal episode affect the fate of several other transgenic strains of vegetables and other crops, including rice, which are awaiting formal approval. Some of these have been evolved by smaller seed companies which may not have deep pockets like the big companies and cannot wait endlessly for approvals. The environment ministry should clear the air on revised testing procedures without delay.

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