

Thrust Sectors

# Imperatives for stronger South Asian co-operation in IT

by Atiur Rahman

The science has given man great power. The new era will dawn only if this power is utilised for all members of the society. That era has now come. Men will have to commit that this power will be engaged for work, for ethics, and for sustainability. [Rabindranath Tagore, *Collective Works of Tagore* (Bangla), Volume 14, P 366]

logical explosion will indeed be far-reaching and widespread. It will create new opportunities for a new kind of market particularly in the fields of multi-media, finance and education with significant impact on the quality of life. Even the poor can benefit from these new opportunities if there is a co-ordinated policy intervention in favour of them.

countries took a century or more. The opportunities already created in this field have started breaking down the barriers of time and geography. Individual companies have already started using IT as a strategic tool for new generation of business and industrialisation. The cost of IT is falling every day and even a small company in a developing coun-

try like Bangladesh now can acquire global systems and perform as well as a large company in a developed country. However, the biggest constraint to such a possibility is absence of well-developed infrastructure. If we really want to develop ourselves as a knowledge society we have to apply knowledge and network human intelligence in a more co-ordinated way.

Some pockets of South Asia (e.g. Bangalore in India) have already been able to respond positively to the imperatives of knowledge economy. However, South Asia where information will become the core of the society's needs. Information as an economic product will then exceed goods, energy and services in importance. The quality of life, prospects for social change and economic development will mostly depend on information and its multifaceted uses where telecommunication will be the key player. The presence of computers, telephone, cellular phone will then determine strategically the value addition to the economy. The spread of e-commerce will be a determining

factor in such an information society. The extent to which a country can provide its citizens with IT and multi-media capabilities depends to a large extent on the level of education, access to infrastructure (like fibre-optic backbone, dense networking of information providers and users, access to information highways) and the commitment of the policy makers for a change. The growth of information labour force is dependent on the willingness of the policy makers to take up challenge for a change and preparedness for co-operating with the neighbours to work for a change. Only then a bigger share of the global space of information will be attainable by a region which then can work as a hub

for other global actors. The tele-networking, distance learning, remote business processing, electronic conferencing, software development and exporting knowledge-based products can easily be enhanced through co-operation. Such co-operation can provide a wider platform for IT market and greater level of confidence among both providers and users.

Given this background and perspective, it will not be unfair to expect a South Asian resurgence in IT-based commerce and industrialisation with sufficient spill-over effects all over the region. The region has historically been linked with the English-speaking West. A huge number of South Asians are now working in IT industries of the West, particularly the US which has an edge over others in this field. So there is a great potential for region to reap the benefits of IT by making best uses of the strategic contribution of the non-resident South Asians. The satellite television system has already been spread throughout South Asia. Many computer-based educational initiatives are fast capturing nooks and corners of South Asia. The challenge is to take this initiative further and foster an environment where the region as a whole can reap the benefit of the expanding frontier of technologies for poverty eradication and as well as for providing scope for building 'human capabilities' and enlarging 'human choices'. Only then the citizens of South Asia can live in a secure and safe environment with 'equality and dignity'.

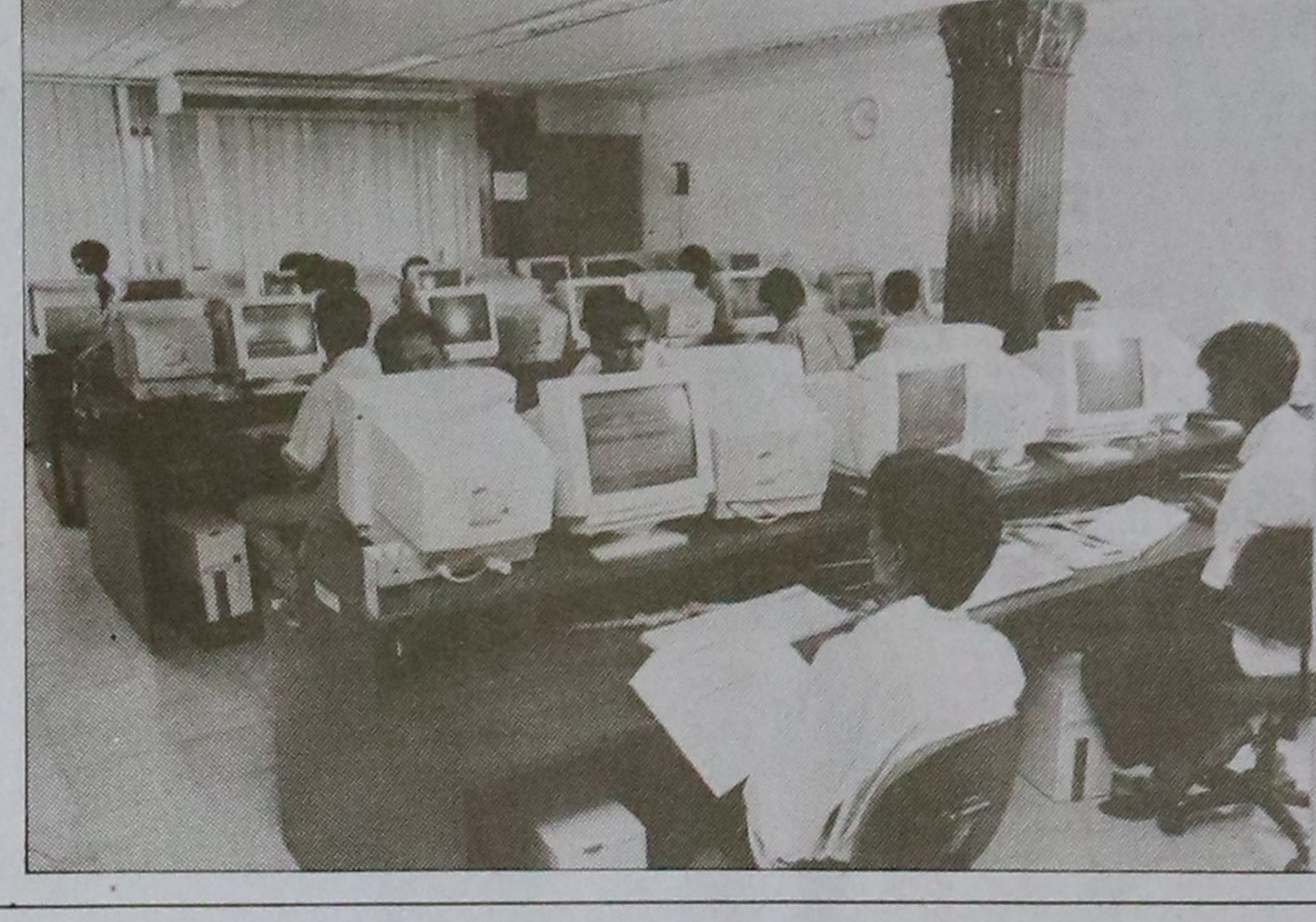
But there is certainly an imperative for the urgency with which we must act. If we do not change our mode of policy intervention and continue to do 'business as usual', the constraints which have been providing ammunition for age-old 'hang-ups' will persist and keep

In Bangladesh, there are at best 30,000 Internet connections now. This may go up to one million by 2003. But to achieve this goal, we need to increase the telephone lines dramatically, have access to the existing fibre-optic backbones (now denied by the bureaucratic complexities) and reduce the fees for Internet user drastically.

It has more or less been established that there exists a positive relationship between communication and development. Introduction of IT does in fact help create greater level of communication. The information which follows contributes towards higher productivity, efficiency, value addition and improved lifestyles. A greater control over IT can, therefore, help even the late-comers in the field of development leapfrogging ahead and thus uplift their status in decades compared to what industrial

countries like Bangladesh now can acquire global systems and perform as well as a large company in a developed country. However, the biggest constraint to such a possibility is absence of well-developed infrastructure. If we really want to develop ourselves as a knowledge society we have to apply knowledge and network human intelligence in a more co-ordinated way.

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Continued on page 14

# Revving up biotechnology

by Zeba I Seraj

## What biotechnology can do for agriculture

- Strengthen existing breeding efforts by providing sources for novel genes such as those for disease and pest resistance. For example, it has been proved beyond doubt that the Bt gene is effective in controlling major pests in respective crops both in the developed and developing countries. All the hue and cry about the Monarch Butterfly is based on weak experimental results. Besides modern biotechnology now has the tools for producing the Bt genes in the leaves of the plant only, so that the grains will not have the foreign protein and therefore will be perfectly safe to eat. Recently, a plant gene conferring resistance to bacterial blight has been shown to be very effective. Bacterial blight also causes serious damage to rice production in our country and therefore this strategy could be easily used. Many genes for viral and fungus resistance have also been identified.
- Shorten breeding time between cultivated varieties and wild or traditional varieties having useful characteristics e.g. use of marker-aided selection for defining molecular or DNA markers linked to useful traits. Only one or two laboratories at Dhaka University have very basic facilities for doing such work.
- Computer data bases on plant varieties (with information on their properties) indigenous to Bangladesh particularly food grains would benefit the whole country and prevent procurement of exotic varieties by international agricultural companies. Training in computer informatics would be important. Efforts on DNA fingerprinting of useful varieties should be undertaken.

**How to go about achieving the goals**  
Institutionalised collaboration between agriculturists (breeders) and biotechnologists.

**The role of the government**  
Formulation of a multidisciplinary team comprising personnel from Agricultural research institutes, university and the government to identify or prioritize on a professional basis major agricultural problems facing the country.  
The government can create a biotechnology cell with a mandate for joint work from relevant ministries like agriculture, science and technology, industry, finance, etc. This biotechnology cell should be responsible for formulation and monitoring of the task of the above team. Such examples of governance exist in India, e.g. the department of biotechnology which is a government ministry and is already more than a decade old.

## Commercialisation of mature technologies existing in various laboratories

- A study needs to be conducted on the following:
  - Status of small tissue culture companies in the country
  - Problems facing these
  - market survey of tissue culture products
  - obstacles to mass scale production of forest trees like neem, etc. to foreign countries e.g. middle east, Australia,
  - problems during export, custom duties, refrigeration, etc.
  - government involvement and encouragement

## Creation of a pool of qualified scientists in the fields related to biotechnology

- Creation of sandwich programmes to train bright young students in problems relevant to our country. Sending them abroad to do Ph.D. is counter-productive since most of them do not come back and work on problems relevant to the country where the degree is pursued and which usually does not have any application for Bangladesh.
- Identification of important institutes where scientists can be sent for short-term practical training or for 3-6 month post-doctorals. University scientists can be encouraged to establish collaboration and links.
- Regular, long-term (4 years) and respectable fellowships (equivalent to a lecturer's salary) for the pursuit of Ph.D. degree in local universities on problems relevant to national issues.

## Public awareness about benefits of biotechnology

- Government and NGO can sponsor workshop popularising biotechnology
- Role of media (e.g. TV) in organising debates, discussions involving the government and public.

## Formulation of a national biotechnology policy

- National Biotechnology programme should be taken up with the following objectives:
  - promotion of biotechnology research in Bangladesh
  - building a biotechnology infrastructure conducive to the cultivation and nurture of a biotechnology industry
  - development of manpower required for all levels of the biotechnology industry
  - formation of economic policies which are conducive to the development of biotechnology in Bangladesh including missions overseas to attract biotechnology companies to set up operations in Bangladesh
  - promotion of biotechnology understanding and awareness

among Bangladeshis particularly among venture capitalists and entrepreneurs.

- Establishing the issues of patent, regulatory body and bio-safety guidelines.

## Task of national biotechnology team

- Creation of Biotechnology Cell within the Ministry of science and technology. They will take stock of existing facilities and manpower including list of expatriate Bangladeshis and to oversee and implement a National Biotechnology Policy.
- Development of well-defined, well-formulated and multidisciplinary research teams on a selected few national problems-should be internationally competitive.
- Exemption of taxes on equipment and chemicals for research purposes especially biotechnological research & incentives for industrialists to invest in biotechnology, e.g. tax holidays, exemption of duties and taxes on equipment and chemicals, low interest capital loans.
- Establishment of a central Research facility, e.g. National Institute of Biotechnology (NIB) with state of the art equipment. This institute should be near major institutes in the city working in Biotechnology. Since such an institute has already been announced by the government and a project director appointed, efforts should be placed on proper planning and management of the institute so that it does not turn into a stereo-typed institute which is unable to deliver and is a drain on the national exchequer.
- Protection of our own natural resources (Flora and Fauna). Protection of our own wild seeds/germplasms.

## Management of the national institute of biotechnology

- Pay structure should be conducive to hard and dedicated work. If salary scales have to be similar to the existing ones in national research institutes, extra allowances in terms of house rent, telephone, electricity and transport costs should be arranged. At a later stage, part of royalties against patents should go to the concerned scientist.
- Appointments have to be contractual and the job accountable, like other international research institutes.
- The progress of projects in the institute should be reviewed by an advisory board, comprising of relevant and reputed scientists from within and outside the country. The advisory board may have government members from relevant ministries. The institute directors can be a part of this advisory board. Emphasis should be placed on high quality work which can get published in reputed international journals and or work leading to intellectual property or

patents so that the NBI can gain credibility in the international scientific community. This is very important if the NBI is to access grants from international funding agencies.

- Two to three projects of national importance should be formulated which the NBI will work upon. These projects should be formulated and prioritised by a panel of relevant scientists as well as government officials, so that the right projects in the context of national needs are chosen. Preliminary work on these projects can start even before the building of the NBI is ready and necessary foreign inputs given for smooth operation of the projects in question. It will be worth while to take stock of what expertise we have within the country (and among expatriates willing to serve in the institute on a contractual basis) and to identify the areas of research we might be internationally competitive in. Once projects are chosen, prospective project directors should be invited to submit proposals or work plans stating how they would go about tackling the selected problems to a satisfactory solution. Project directors should then be selected on the basis of the best work plan.

- There should be several directors of the institute, e.g. a research director, a director of core facilities, an administrative director, maybe even a public relations director. The administrative director can be a civil servant able to steer the institute through governmental channels. There should be a high level engineer in charge of the sophisticated instruments who would be responsible for the smooth functioning and repair of instruments and computers. There should be a scientist in charge of internet, library, photographic and documentation facilities. In the initial teething stages, the institute should be under the leadership of an experienced scientist who has held a similar post (of management) in research institutes of truly international status. Such a person may be hired through advertisement in international journals.
- This institute should collaborate with and provide high technology support to existing biological research laboratories in Dhaka and rest of the country.
- The NBI should also function as an advanced learning centre, where experts, including expatriate Bangladesh scientists can be called upon to organise and conduct workshops and seminars in new techniques and emerging areas of research.
- Special facilities should exist for the smooth and swift procurement of equipment. Extra special arrangements should exist for the trouble-free import of perishables, many of which need to be imported at -20 C.

# Biotechnological research in Bangladesh

Continued from page 10  
to name a few. All important journals in molecular biology devote 25-50 per cent of their articles on Arabidopsis: identification, isolation and cloning of important genes, isolation and determination of their exact functions and how similar they are with genes which perform similar functions in other plants, human and animals.

What is most interesting is that the genes found to regulate different functions in Arabidopsis can also activate the same type of functions in other plants. For instance, Lfy gene in Arabidopsis disrupts different phases of growth shortening its life cycle. An individual, containing this gene, may flower before the emergence of the first true leaves. When this gene was introduced in aspen tree, which does not flower before it is eight years old, it blossomed in the first year. Another gene FT1 was found to shorten growth phases in individual without disrupting them and another gene FT2 to delay flowering. By manipulating FT1 and FT2, it may be possible to programme any plant to flower at any desired time.

**FT Gene that Speeds Maturation Process in Plants:** One of the short-term NIB programmes may include incorporation of FT1 gene in European mustard varieties, making it suitable to grow in the mild climate of Bangladesh. The scientists at the Salk Institute, La Jolla, California, who have isolated and cloned the above gene, describe it to be capable of fine-tuning the maturation process in plants resulting in their earlier development and flowering. Obviously, the discovery of this gene is a landmark in plant breeding because it will help farmers to regulate crop yield potential and breeding process. In Arabidopsis, the scientists

found another gene called FT1 (terminal flowering) causing delayed flowering. In other words, an increase of FT function causes earlier flowering while an increase of FT1 causes delayed flowering. By using these two genes, FT and FT1, in right proportion, breeders may be able to regulate how fast or slow a particular variety should grow.

Last month the same institute has discovered in Arabidopsis another gene called BAS1. It produces a steroid brassinosteroid similar to animal steroid and halts stem elongation of the plant containing the mutation. Professor Joanne Chory, the leader of the investigation team, thinks that this gene when inserted in lawn grass or any other horticultural ornamentals, will permanently reduce their height thereby doing away with the necessity of lawn mowing or trimming boundary hedges. Since the Plant Biology Laboratory, The Salk Institute for Biological Studies is a non-profit organisation, it may be possible to seek their help in initiating this kind of research in NIB. Newly recruited scientific staff members may be trained in the Salk institute on a non-degree programme to be engaged to carry out a similar project aimed at producing plant varieties with limited growth for beautifying home gardens and lawns

In Bangladesh situation, we may take advantage of FT gene to save 'Tossa' varieties of jute crop from early floods. The FT gene will make the crop grow and pass through its various phases faster, so that by early August late maturing 'Tossa' varieties may be ready for harvest.

At the Tenth International Congress of Immunology, held in New Delhi, March of 1998, Professor Charles Arntzen of the non-profit Boyce Thompson Institute for Plant Research declared that in the near future, one need to eat only a banana for protection from hepatitis B. His team has completed clinical trials with raw potatoes fortified with colin bacillus (*E. coli*) vaccine. Professor Arntzen thinks that such raw potatoes giving immunity against colin bacillus will be available in 3-4 years' time for immunisation against *E. coli*, the commonest

cause of diarrhoea. There will be another 2-4 years when oral cholera and hepatitis B vaccines will appear in the market (It may be mentioned here that at present, one vaccine shot for hepatitis B in the Indian sub-continent costs \$ 10 and one needs three such shots for immunisation against it for life.) Commenting on their success, the professor remarked that 'Kids in any part of the world will prefer a banana to a needle prick.' It is a very effective immunisation strategy. He also thinks that in the not too distant future, his lab will come up with an oral cancer vaccine.

The above programme of engineering a fruit variety such as banana containing a particular vaccine may be launched in Bangladesh. Fortunately, we have a number of Bangladesh expatriate scientists working in this line in US laboratories and possibly in laboratories outside US. They may be invited to initiate this extremely valuable research programme in collaboration with Cornell University/Boyce Thompson Institute may also be launched for this purpose. Imagine vegetable and fruit markets of Bangladesh full with genetically engineered banana and potato varieties giving immunity to kids and grown-up people against the dreaded diseases

ment and Bangladesh Medical Association may play a catalytic role in clinching the issue. Dr. Ahmed Azad, who is already well-known in our circle for his unique contribution in the field of vaccine biotechnology and now a member of the Council of Scientific Advisors, ICGEB, would certainly offer his helping hand, if he is approached to resolve the issue.

## Human identification by means of DNA testing

Whereas identification of animal is enough to provide gas to one household. Completion of this job will greatly contribute to the health and happiness of the rural people who are vested of all kinds of comforts. Such a chapter will be written in golden letters being a great gift of the millennium to the teeming millions of the villagers.

**Human identification by means of DNA testing**  
Whereas identification of

criminals by means of DNA matching has become a routine matter in the developed world, this technique is yet to be used by the Home Department. The technique known as STR (short tandem (=segments) repeats) is very sound and based on matching STR typing of one individual with the other. This project of immediate value could be launched in the forensic section of the Police Department. Setting of a small lab on a moderate scale will cost only 10,000 US dollars and testing of DNA per sample costs only 10 dollars in US in reagents.

Introduction of DNA testing will be a strong deterrent to criminals because DNA testing, backed up by biological evidence, provides unmistakable proof of the involvement of the criminal if DNA samples are available at the site of homicide. Such tests also provide tangible proof of the identity of war victims, filial relationships and verification of an unknown person.

**Funding should not be a big problem,** provided infrastructure is built up in the form of skilled manpower. The Rockefeller Foundation, in its latest announcement, has indicated that it would no longer support basic research on rice as such after having provided funds for such activities during the last ten years. What it intends to do now is to divert its funds to support projects aimed at production of suitable varieties based on research results on various crops including rice and release them in the market. For the last ten years Bangladesh has been recipient of Rockefeller Foundation grants for basic research and surely she would be a very strong candidate for grants provided suitable projects such as 'Production of BRR1 version of Golden Rice, or Production of early variety of European mustard, Pink boll worm resist and American cotton varieties are submitted for their financial support.'

The German government's Bundesministerium für Technische Zusammenarbeit (BMZ) may provide us sufficient funds if we approach them with a suitable project.

In conclusion, I would like to recall a story narrated by the Nobel Laureate late Professor Abdus Salam to a packed audience of scientists in Dhaka. He began by saying that a high-powered Korean delegation sought an interview with him at his office at the International Centre for Theoretical Physics (ICTP) at Trieste, Italy. Professor could not figure out before-

hand what the purpose of their visit would be! A very big surprise awaited the Professor when the leader of the delegation asked him, 'Professor Salaam, we would like our scientists to be Nobel Laureates. Please give us advice as to how in terms of facilities, equipment, etc. we could accomplish this objective.'

I would like to appeal to the policy makers to judge the statement of the Korean Delegation in its true perspective and make arrangements to develop the National Institute of Biotechnology (NIB) as one of the best in the subcontinent where qualified Bangladesh scientists will carry out their investigations in approved projects without let and hindrance and Bangladesh expatriates can periodically come and work on invitation and help these scientists to complete the tasks they are assigned to, benefiting the country to an unprecedented level. The immediate task in my opinion will be to relieve the Project Director of NIB of his duties in the Atomic Energy Commission enabling him to devote all his time and energy to the building of infrastructure of the Institute.

I may add that in order for the Government of Bangladesh to gain firsthand information about different fields of biotechnology, their scope and kind of experts whose services may be available on a specific short time job, I would request the Ministry of S&T to send an observer, not below the rank of joint secretary to attend the Technology Transfer Convention to be held from April 28 through 30, 2000 at the Atlantic City, New Jersey, USA. Detailed information about this convention may be obtained at: <http://www.TechBangla.org>.