Decoding jute plant genome – an eye opener

Abdul Quader

Decoding jute plant genome is a breakthrough in the field of genomics research and biotechnology. It is a great achievement on the part of a Bangladeshi research scientist Dr Maqsudul Alam assisted by a dedicated team of researchers from the University of Dhaka and the Bangladesh Jute Research Institute, with technical support from the University of Science Malaysia and the University of Hawaii.

The financial assistance from the Government of Bangladesh was a catalyst for undertaking the research project in jute genome sequencing by Dr Alam and his team. The success of the research project was acknowledged by the government. The prime minister Sheikh Hasina accorded a reception to Dr Alam and other researchers at Ganobhaban on 24 June 2010.

Sheikh Hasina is reported to have committed to provide financial and other support to the scientists and the research community in Bangladesh for strengthening scientific and technological research in the country. This is a step in the right direction and may encourage young and bright scientists and researchers to remain in the country doing innovative and rewarding research projects.

The relatively nascent research sector in Bangladesh cannot progress much without the support and patronage of the government as the private sector assistance to technological research is minimal at this point in time. An important point made by the prime minister Sheikh Hasina is that researchers must have 'specific projects' to access the government support. This means that given limited resources of the government, those research projects will be supported that are well targeted and designed to achieve real outcomes for the benefit of the country.

The potential commercial value of successful decoding of jute plant genome is enormous. Bangladesh is currently the second largest producer of jute fibre after India and is the largest exporter of this agricultural product. China accounts for the third largest production of jute. The key to restore the past glory of jute production and exports lies in improving the quality of jute fibre and the productivity of jute cultivation. Both of these are now a step closer to achievement with the new found knowledge associated with the successful sequencing of jute genome.

Jute has diverse use and is 100 per cent bio-degradable and is one of the most environmentally friendly crops that are sustainable for longer term production. An ancient Chinese proverb says: "*One type of rice nourishes one hundred types of people.*" This reflects the importance of plants in sustaining life and livelihood. Similarly, one type of jute has now the potential to support the livelihood of many farming communities in Bangladesh.

This author in an opinion piece published in the Daily Star in January 2006 entitled *"Investing in science and technology for sustainable economic growth*" (reproduced below) emphasised the need for investment in science education and technological

research to strengthen innovation, economic growth and social wellbeing in Bangladesh. This has been vindicated by Dr Maqsudul Alam when he said,"If government does not invest, we may forget the rest. The brain drain will continue" (The Daily Star, June25, 2010). The government has an important role in creating a facilitating environment for technological research and development.

In the above mentioned write-up, the author held the view that the government should establish a right incentive structure ranging from tax benefits to financial grants to encourage private sector participation in research and development, and commercialisation of research results. Scientific research results could be used in producing new products, services or processes that lead to income and employment generation to the benefit of the society as a whole.

Bangladesh competes with other jute producing countries such as India and China in the world market for exporting raw jute and manufactured jute products. So any innovation that comes out of the successful decoding of jute genome needs to be quick to take the first mover advantage. This has relevance to international patenting of the invention with major international patent registration organisations - the United States Patent and Trademark Office (USPTO), European Patent Office (EPO) and Japan Patent Office (JPO). It is perhaps desirable to register the invention for *triadic patent* which usually has high commercial potential. *Triadic patents* are a series of corresponding patents filed at the USPTO, the EPO and the JPO, by the same applicant or inventor. Of course, patent attorneys can provide better advice on the timing and other issues relating to application for the protection of intellectual property.

"Research is money turned into knowledge and innovation is knowledge turned into money". Now that we got 'knowledge', we need to turn this into 'money' that can come from breeding improved jute varieties, more productive jute cultivation, production of better quality fibre, and manufacture of new or improved products by using jute fibre for domestic use and exports.

If cotton is 'white gold' for some countries, jute could be 'fibre gold' for Bangladesh in the near future. A high value and quality product is what ultimately matters. I believe this will realise a key objective of jute research by the Bangladesh Jute Research Institute - to develop improved varieties of jute with wider adaptability having high quality, finer and stronger fibre.

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Point-Counterpoint

Investing in science and technology for sustainable economic growth

Abdul Quader *writes from Canberra*

Science and technology can play a critical role in increasing the productive capacity of an economy. While the traditional factors (eg, land, labour, capital and organisation) still make significant contribution to production of goods and services in an economy, knowledge creation and its diffusion have become important drivers of innovation, economic growth and social wellbeing in a modern society.

Today's economy is a knowledge-one, especially in the advanced countries. Technological innovation is considered a critical determinant of economic prosperity, and this is only possible through scientific research and development.

Although technological innovation occurs primarily in large corporations in developed economies, a significant amount of innovation is generated

by small and medium-sized enterprises (SMEs), particularly in the high-tech sector such as information technology, telecommunications, pharmaceuticals and biotechnology. However, there are opportunities for private companies and research institutions in developing countries such as Bangladesh to contribute to technological innovations.

Investment in science education and research and development (R&D) enhances the development of human resources which lie at the core of all economic activities. Scientific research results in new inventions which have commercial value in that the research results could be used in producing new products, services or processes. Any new productive activity has the potential to have positive spillover effects on employment generation.

Dominance of advanced countries

As mentioned above, education and scientific research are key to longer-term and sustainable economic growth and prosperity of a country. This is obvious if we look at the current economic status of the advanced countries such as the United States, Canada, European countries, Australia and Japan. There is a causal relationship between high levels of education, technology development and economic prosperity. Education and training increases skills and functional knowledge which, in turn, improves productivity

and enhances standard of living of people in a society.

The old adage "knowledge is power" is universally true and is not bound by time or borders. The dominance of Western countries in world affairs is mainly because of their superiority in technology, including high technology, achieved through scientific research and higher level knowledge that has helped them to achieve high and sustained economic growth, and accumulate wealth over time. The high military power of many Western countries is also due to the results of their large investments in science, R&D, engineering and technology.

Government's role

We recognise that the science and technology infrastructure in a developing country like Bangladesh is fragmented and has not advanced much compared to a developed country. For obvious reasons, Bangladesh is dependent on overseas technology for its educational and development needs. Any remarkable scientific and technological inventions are rare in the country. However, the government has a role to play in establishing and supporting an appropriate educational, research and business environment conducive to technological innovation in the economy.

While it is the private sector, especially the big companies, which should invest more in R&D, the government should facilitate the process of setting up the right infrastructure through encouraging science and technology education and training geared to the business and development needs. To conduct research and development, companies need skilled scientists, engineers and technicians.

What needs to be done by the government is to take stock of the current state of affairs relating to science and technology education and the industry needs in the context of development goals and targets of Bangladesh. Piecemeal and ad hoc approach to science education will be of little use unless a comprehensive science infrastructure, including science education and research, is developed and nurtured by the government.

The government should encourage the private sector, especially the large companies and corporations, to invest in scientific research and development for longer-tern business gains. Companies should also understand that some level of local R&D capabilities is good for indigenous technology development and growth of new business. This will contribute to increased competitiveness and profitability for companies in the long run.

The challenge is for the government to create an environment in which some technological innovations occur within the country through the development of an appropriate education and research infrastructure, and other necessary facilities. Adequate consultation with relevant stakeholders such as students, teachers, the science community, researchers, companies and corporations should be undertaken by the government to devise a national agenda for the improvement of science and technology education and R&D in the country.

Focus of intervention

The government has established a number of science and technology universities in the country over the last several years. This has enhanced the capacity of science education at higher level. But all levels of education should focus proper attention to science and technology education if the country wants to achieve real outcomes.

Primary and secondary education should get an appropriate focus on science and technology learning. Emphasis should be placed on both theoretical and practical aspects of science education so that students remain enthusiastic about their learning and feel committed to pursing science at later stages of their academic life.

To enhance the practical aspect of science eduaction, more investments need to be made by the government in establishing, operating and maintaining science laboratories in public sector educational institutions, especially at secondary school and college levels. Such investment is needed in the private educational institutions as well. This investment should include, inter alia, the procurement of relevant scientific instruments, equipment and other materials needed for scientific experimentation by students and teachers.

Teacher training and availability of science books at advanced level in Bangla are also critical to spreading, improving and strengthening science education in the country. Integration of science with engineering is also necessary which will facilitate developing new products, services and processes, and also for improving on existing products and processes.

While information technology has received some patronage from the government in recent years in terms of financial and other support, basic and applied science education still largely remains ignored. Of late, we have seen mushrooming of private universities in Bangladesh, most of which teach information technology and business management courses.

The relative absence of science education in the private universities is very conspicuous. Is it because the demand for science education is low compared to IT and business management, or because the costs of procuring necessary scientific equipment and materials and establishing laboratories are prohibitively high, and there is a shortage of science teachers in the country?

Science and technology education at higher levels need to be linked to practical application otherwise it would be a wasteful investment in terms of time, money and energy of students in particular and the society in general. This requires improvements in higher education to be linked with economic opportunities so that knowledge and skills gained through education can be applied to practical purposes.

While trading and commerce sectors employ people, it is the production sectors in agriculture, manufacturing or services that can create sustainable jobs for the vast pool of the unemployed people in the country. It is already clear that applied scientific and technological research has the potential to create new knowledge and ideas that can translate into new products, processes and services. This can contribute to increased productive activities in the economy, with a positive impact on employment creation.

Persistent and perpetual dependence on overseas countries for all technology needs has a risk in that it does not help develop any indigenous technology.

Incentive for local technology development

A viable and practical public-private partnership is a sine quo non for development of science and technology and business innovation in any country. Creating links between knowledge generation done through research and commercialisation of research results (eg, development of new products or business enterprises) is a key challenge for the government.

If Bangladesh wants to promote the development of local technology, then the government needs to establish an appropriate incentive structure which could range from tax benefits to grants programmes for research and development and commercialisation of research outcomes by the private sector companies. Inventors and innovators in the country need to be rewarded someway or other in order to create an innovation culture in education and business enterprises in particular and the society in general.

The use of technology by small and medium

enterprises should also be supported through some incentive mechanism with a view to encouraging business development and improvement that will have a positive impact on employment generation, production and social development in the country.

In any case, if Bangladesh wants to catch up with some of its neighbours such as India in science and technology education and R&D, it must invest more in this field to achieve sustainable economic growth, fight diseases and repair environmental damages, to name a few problems.

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