PAEC harvesting nuclear technology for socio-econ

ISLAMABAD (APP): Pakistan Atomic Energy Commission (PAEC) is harvesting nuclear technology for socio-economic uplift and it has evolved 43 high yielding, pest resistant and soil suitable crop varieties.

The net effect of these improved varieties to the farmers is an additional income of Rs. 6 billion per annum. The most unknown areas where PAEC is directly contributing to common good is agriculture and health through the application of nuclear techniques.

The crops developed by PAEC mainly pertain to wheat, cotton, rice and pulses and some other have been found to be popular with the farmers and at present these varieties cover 60 per cent of the total sown area in NWFP, 50 per cent in Sindh and 20 per cent in Punjab.

Through the application of nuclear techniques, PAEC has also evolved such trees and crops which are salt-tolerant and can grow in the saline land.

The government of Pakistan has recently allocated Rs. 178 million for the rehabilitation of 25,000 acres of saline-hit lands in all four provinces by using these techniques. PAEC has provided expert services in this technology to ten member countries of International Atomic Energy Agency (IAEA). Besides PAEC has developed vaccines for the deadly diseases to live-stock and poultry.

Dr. Kauser Abdullah Malik, Member (Bio-Sciences) PAEC said the organisation has also evolved a bio- fertilizer which substantially reduces the requirement of chemical fertilizers, whose over use was degrading the soil and polluting the environment.

The bio-fertilizer, being much cheaper than chemical fertilizer, is under the stage of mass production and extensive marketing. He said net additional income of Rs. 7,000 to 8,000 per acre in the case of legume crops, Rs. 2,000 to 3,000 for rice and Rs. 1,200 to 1,500 for wheat crop can reach the farmers using this biofertilizer.

PAEC is providing expert services in this technology to China, Mangolia, Indonesia, Sudan and Sri Lanka.

Regarding the use of atomic energy in healthcare, PAEC is running 13 nuclear medical centres throughout the country which provide diagnostic and treatment facilities to over 320,000 cancer patients annually.

Five more such medical centres would come to service in near future. Assisting the industry to enhance its competitive capability is PAEC's basic objective and the spin-off of its own research and development is meant for the industry.

For this purpose, PAEC has established a welding institute which imparts training and certification to industry personnel apart from providing installation services to the private sector.

All manufactured goods need a verification and assurance to the level of the quality which they bear. PAEC is running a national centre for non-destructive testing where training and certification is imparted to the industrial inspectors for quality assurance regime and culture.

Design services for industrial plants and their manufacturing is also a major activity in the category of assisting industry programme.

The most spectacular thing pertaining to Research and Development activity of PAEC is provision of scientific solutions to the local industrial problems. An off-shoot of such research is development of laser Land Leveller, which reduces the levelling cost by 35 per cent.

The cost of this land leveller is half that of its equivalent in international market. Laser range finder is another outcome of such basic research of this segment.

Manpower for PAEC high tech programme was not available from the conventional education system of the country, nor training from abroad was abundantly available.

On the basis of this PAEC launched its own education programme which now offers degrees up to masters and Ph.d levels in nuclear engineering, system engineering, medical physics, IT, material engineering, process engineering and nuclear power engineering.

Kausar Abdullah said that National Institute for Biotechnology & Genetic Engineering (NIBGE), Faisalabad is undertaking basic and applied research in crop improvement and health related problems.

In health sector, the NIBGE has developed diagnosis tests for Hepatitis C, TB and Typhoid. Vaccines against Typhoid and Hepatitis B have also been prepared and the same will be out shortly.

In agriculture sector this institute has played a significant role in identifying curl leaf virus of the cotton crop, which resulted in huge losses to the country during the last few years. On experiments demonstrated in the fields, NIBGE varieties have withstood the attack of this virus.

Many cotton varieties which will be inherently resistant to any virus are under preparation and will be released in near future. Dr. Kauser informed PAEC was planning to have its own seed company for mass multiplication of quality seed and its delivery to the farmers.

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added two new high value crops - oilseeds and vegetables, in its research programme.

Talking on the genesis of cotton varieties, he said the first cotton variety, NIAB-78, released in 1983 brought a revolution in cotton production.

It up-scaled the cotton production from 4 million bales to 12 million bales and played a pivotal role in bringing affluence to farmers in the cotton belt in particular and Pakistan in general.

Similarly, the first chickpea variety, CM-72, having resistance against the common blight disease, increased the yield and production and stabilized market price of chickpea in the country.

The cumulative income from all these varieties has been to the tune of Rs. 50 billion. Presently, many promising mutant lines of these crops are at various stages of testing and hopefully will be released as new varieties in the near future, Dr. Kauser said.

Pakistan has large reservoirs of coal but unfortunately, contaminated with Sulphur which makes this coal unsuitable for use as such. NIBGE has conducted a bio solution for desulphurisation of this coal.

The study has been demonstrated as effective. Bio approach of desulphurisation is handy, cheap and promises great economic worth.

Open science: Boon or bane?

Daniel Sarewitz

How much of science needs to be secret? Since 9/11, this question has been fiercely debated in the scientific community. A raft of new and proposed laws, regulations and recommendations, coming mostly from the federal government but also from within the scientific community itself, are beginning to clamp the lid on everything from the types of results that scientists can publish to the types of people who can work in American labs or collaborate with American scientists. Researchers handling a range of possibly dangerous biological materials must now register with the government; federal agencies are scouring potentially "sensitive" scientific information from their Web sites; and journal editors are establishing voluntary rules of self-censorship over scientific results that might be used by terrorists. The assumption is that secrecy will protect us from the malicious use of new knowledge and innovation. Meanwhile, science and technology are charging forward at unprecedented rates on many different fronts, such as computer science, molecular biology, biotechnology, advanced materials and nanotechnology, yielding on a day-by-day basis new opportunities not just for benefit and profit but for mischief-making and worse. Much of this science is motivated not by military needs but by the desire to cure diseases, to improve agricultural productivity, to clean up the environment and a host of other applications.

The secrecy debate pits scientists, mostly at universities, who argue for openness, against government officials and other scientists who believe that we need to considerably expand our control over access to scientific data and research results. The same debate raged at various points during the 45-year Cold War, stoked by such incidents as the espionage case of Ethel and Julius Rosenberg, convicted of selling nuclear secrets to the Soviet Union and hastening Soviet development of atomic weapons. The spectre of global terrorism has re-ignited and broadened the dispute. The argument in favour of openness is that science cannot advance unless scientists can collaborate freely with one another on an international basis and subject their results to the scrutiny of the peer-review process. Science is an inherently collaborative process, where the work of one researcher inevitably depends and builds upon the work of others. Free communication is therefore essential for scientific advance. Yet experience shows that scientific openness and secrecy can happily coexist. Throughout the Cold War, much high-quality research and development were carried out behind a veil of secrecy. Scientists at weapons labs and other classified facilities, including at many top universities and industrial labs, were free to interact with others who had security clearances, but not with the outside world. While some in the scientific community howled in protest at government security restrictions, there have always been plenty of top scientists willing to work on classified projects and eager to receive the often generous government funding that accompanies such research. While many physicists during the Cold War objected to classified research and refused to participate in it, choosing instead to work on unrestricted research at universities, even more built productive careers out of defence-funded, secret science. Much of our knowledge of the oceans, of the atmosphere and of outer space emerged from government research that was originally classified. And entire industries, such as electronics and aviation, were built on a foundation of defen-

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originally classified. And entire industries, such as electronics and aviation, were built on a foundation of defence research that was conducted in secret. As the definition of potentially dangerous research spreads wider and wider across the realms of science, it is important to remember that ultimately scientists want to do science. Given the choice of secret science or no science, most will opt for secrecy.

If America suffers another major attack, perhaps on the food or water supply, perhaps from a chemical or biological agent, there will be strong political pressure to bring an expanding range of institutions, including universities, under the wing of the security state. While the progress of science may in some cases be slowed as a result, scientists will continue to work, and science will continue to thrive. But if such changes are little threat to science, they are a considerable assault on democracy. Scientific and technological advance are the most powerful shapers of culture and social change today, and putting them out of the view of the political system is a simple formula for increased state control over every aspect of our personal lives. Vigorous debates over such issues as cloning, biotechnology, nuclear energy, women's health, water and air quality, climate change and ownership of genetic information have been possible only because of public access to technical information. Significantly reducing such access means that citizens will have no way to participate in decisions that will determine what tomorrow's world will look like. At the height of the Cold War, President Eisenhower understood precisely this threat when he warned, in his 1961 farewell speech, that "in holding scientific research and discovery in respect, as we should, we must also be alert to the equal and opposite danger that public policy could itself become the captive of a scientific-technological élite." While advanced technologies in the wrong hands is an extremely serious problem, we must remember that the perpetrators of the 9/11 attacks were armed with weapons that could have been produced in the Dark Ages. And while some avenues of research may indeed be too dangerous to be made public, the weapons-grade anthrax attacks and the nuclear capabilities of countries like North Korea remind us that secrecy does not guarantee control. Yet politicians are bound to call for more secrecy should we suffer new attacks. Scientists, as they did throughout the Cold War, are likely to accept secrecy as the price of continued government support for their research – so long as they can maintain control over what goes on in their own laboratories.

But the increases in security that may ensue would be paid for through a sacrifice of the very thing that most deserves protection: our democratic system. No formula can determine the best mix of secrecy and openness. This is a matter for open political debate. But that is precisely the point. The demand for more secrecy should not be cloaked in the language of patriotism or panic. It must be openly assessed in terms of the possible benefits for security and the irretrievable costs to freedom. Interestingly, the conflict between secrecy and openness almost never includes consideration of an obvious third option that could help resolve the dilemma. During the Cold War, we let the advance of science and technology carry us to the brink of self-destruction. In the war against terrorism, we could decide instead to not pursue, or slow down, some of the avenues of research that experts believe would create a high potential for misuse. There is nothing radical about this suggestion. In the 1970s, molecular biologists imposed a voluntary moratorium on recombinant DNA research until its safety could be demonstrated. Highly public controversies over animal testing, missile defence technology, transgenic foods and stem-cell research show that society is continually making choices about what types of science to support and what to forgo. In choosing to avoid research with a high potential for use by terrorists, we might not only enhance our security, but we would also strongly affirm that the protection of democracy is more important than the pursuit of science.

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