

# Mapping research systems in developing countries

Country report: The Science and Technology system in  
Bangladesh



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# THE PEOPLE'S REPUBLIC OF BANGLADESH

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## Introduction<sup>2</sup>

During the British colonial period the geographical area that is now Bangladesh was a part of the old Bengal Province of India and most of the S&T infrastructure and R&D institutions were located in and around Calcutta, the capital of the province. The only research station inherited in 1947, when British rule ended and the country was divided, was an agriculture research institute specializing in rice research. However, during this time the only university in the area, Dhaka University had well established science departments that made quite significant contributions. After the division in 1947, the initial S&T initiative taken by the erstwhile Pakistani government was the setting up of the Regional Laboratory of the Pakistan Council of Scientific and Industrial Research in Dhaka in 1954. Later a local centre of the Pakistan Atomic Energy Centre was also established in Dhaka. This centre concentrated primarily on research in theoretical physics and installed the first computer in the country in 1964.



The principal initiatives for S&T activities during pre-independence days were directed towards increasing agricultural production. The Central Jute Research Institute was established to carry out research in genetic improvements of the jute plant as well as on diversified industrial and commercial uses of raw jute, the principal agricultural export of the country. The other R&D initiative taken was in water resources research through the establishment of a modest Hydraulic Research Institute. However, the then Pakistan government did not have any explicit S&T policy; neither was there any Technology Plan, per se, even for research in agriculture.

Bangladesh is one of the world's most densely populated countries with a population of 130 million. It is located on the northwestern part of Indian sub-continent. There were severe funding constraints for science and technology activities during the period 1947 to 1971 (part of Pakistan),

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<sup>2</sup> This Report has drawn from Islam, N (2001); Websites of BANSDOC and other general websites on Bangladesh.

but even in the post-independence period the country did not witness any major boost to S&T or R&D as indicated by the low level of GERD as proportion of GDP during 2002-2005. After independence in 1971, Bangladesh found itself in a difficult economic situation with weak infrastructure for Research and Development (R&D) institutions. The country had to create initial infrastructure and build new R&D institutions and technical universities.

## 1. Organization of S&T institutions and S&T policy

The overall science and technology activity of the country is organised under two sectors. The first is the sector represented by institutions that are directly funded by the government and specifically created for R&D activities. The other sector covers technical universities in agriculture, engineering and other general universities. The R&D institutions carry out scientific research, that directly relate to nation's socio-economic goals. In the universities, both basic and applied research is carried out in addition to the teaching of science and technology that aim at creating skilled personnel in different scientific professions.

The National Council for Science and Technology (NCST), created in 1983, is the main apex body for science and technology at the highest level for policy-making on S&T in the country. It worked for three years to draft a policy, which was formally approved by the government in 1986. There is an Executive Committee of the National Council for Science and Technology (ECNCST) headed by the Minister Science and Information & Communication Technology (MOSICT). Although the ECNCST has been meeting in recent years, these bodies rarely met in the past. The Ministry of Science and Information & Communication Technology (MOSICT) acts as the secretariat for the NCST and is responsible for all matters connected with the growth and promotion of S&T in the country. The primary responsibility of this Ministry includes, among others, assistance to the NCST in policy planning and decision-making and effective management of R&D activities carried out by various research and development institutions under it. As part of the implementation of the National Science and Technology Policy, the ECNCST constituted a committee named the Consultative Committee on Transfer of Technology in 1987. The formal functions of the NCST outlined in the policy are not very broad in scope. It has about a dozen advisory functions including recommending a national science and technology policy, suggesting priorities of research areas, co-ordination of research activity with development activity, supervision of a national science documentation system etc. NCST offers scholarships to students and research scientists and provides funding for a small number of research projects.

### 1.1 *National Science and Technology Policy, 1986*

The aims and strategies of national S&T policy as outlined in 1986 still serve as a guiding post 2005. In recognition of the fact that the formulation of a comprehensive and coherent national science and technology policy, designed to contribute to the achievement of the country's development objectives, is necessary for the effective application of science and technology for development, the Government of Bangladesh considers it appropriate to formulate a new National Science and Technology Policy. The Policy is designed to fulfil the following primary aims:

- To attain scientific and technological competence and self-reliance, to help increase production and employment in various sectors and sub-sectors of the economy.
- To be in consonance with the socio-economic, cultural, educational, agricultural and industrial policies of the nation.
- To contribute to the worldwide pool of scientific and technological knowledge.
- To seek out and recognize high talents in various areas of science and technology.

- To strengthen cooperation in science and technology between developed and developing countries, and particularly among developing countries themselves.
- To provide guideline for institutional arrangements or rearrangements in the R&D structure (including education and training) for attainment of the above objectives.

The National Science and Technology Policy initiated in the 1980s is a broad-based document that stresses the 'improvement of standard of scientific knowledge at all levels from the school to the university'. To this effect, it suggests orientation of school curriculum, measures to ensure qualified teachers, physical facilities, equipment, books, journals, teaching aids' together with the establishment of an Open University for expansion of science education. After formal entry of the country to free market economy, there were some changes in the S&T planning in the 1990s. Adjustments to the free market economy and transition were not easy in Bangladesh and the process is far from complete. Some aspects of the S&T policy are being re-examined for possible revision in the context of the changed global circumstances.

In January 1985, the Science and Technology Division (changed to the Ministry of Science and Technology, and then presently the Ministry of Science and Information & Communication Technology) circulated another draft National Science and Technology Policy (NSTP) document. The draft was approved by the National Council for Science and Technology (later renamed the National Committee for Science and technology) in the beginning of 1986. This document is still relevant with regard to its basic objectives of promoting S&T and creating the basic infrastructure for R&D activities. The NSTP recognises that priority should be given to the integration of scientific and technological considerations within the overall development strategy of the country. One sub-section of the NSTP deals with the 'establishment of a national capability for development of indigenous technology and attainment of a national capacity for the assessment, selection, acquisition, adoption and adaptation of foreign technology. The NSTP outlines various clauses with regard to encouragement and incentives for development and commercialisation of indigenous technologies and assimilation of foreign technologies. The S&T policy of the country cuts across many policy areas and development sectors. Among the important domains of current S&T policies is the area of information and communication technology. Government accorded top priority to this area since the mid 1990s.

## *1.2 National Information and Communication Technology Policy*

Recognizing the impact of information and communication technology (ICT) on the economy and its development the country adopted the National Information and Communication Technology Policy (NICTP) in October 2002. This Policy aims at building an ICT-driven economy comprising of a knowledge-based society in the coming couple of decades. It envisions the development of a countrywide ICT-infrastructure to ensure access to information by every citizen to facilitate empowerment of people and enhance democratic values and norms for sustainable economic development by using the infrastructure for human resources development, governance, e-commerce, banking, public utility services and all sorts of on-line ICT-enabled services. The NICTP outlines various clauses with regard to human resources development, ICT infrastructure, research and development in ICT, ICT industry, e-commerce, legal issues and ICT applications in various sectors. The NICTP envisions the Government spending in ICT to be at least 2% of the Annual Development Programme by 2006.

### 1.3 *Policy Incentives for the Promotion of Technology Development*

A few financial and fiscal incentives as outlined in the Industrial Policy of 1996 are mostly included in the Industrial Policy of 1999 (Government of Bangladesh 1999). These include, inter alia, tax holiday, accelerated depreciation of machinery or plant in lieu of tax holiday and special financial incentives for industries in least developed areas. For setting up export-oriented industries, the incentives and facilities include concessionary duty on the import of capital equipment and spare parts and special Bonded Warehouse against back-to-back Letter of Credit. Special fiscal incentives to industries in the “thrust sectors”, and creating industrial fund in the Bangladesh Bank etc. are also in the agenda. Some of the major incentives contributing to innovations in Bangladesh are:

- Tax exemption on royalties given to foreigners: Tax exemption (100 percent) on royalties, expertise fees and the facilities for their repatriation is given to foreign nationals/companies. Royalties and expertise fees paid by local industries to foreigners are deductible under expenses account.
- Tax-free income: Incomes from fish and poultry farming, duck farming, cattle and dairy farming and horticulture with a minimum capital investment of Tk. 10,000 (no upper limit) are exempted from income tax. Incomes from sericulture, mushroom culture and floriculture are also exempted from income tax.
- Tax deduction on industrial R&D: Industrial units spending money because of scientific research is allowed to claim tax deduction on the amount actually spent. In this respect it may be mentioned that in Malaysia, to encourage industrial R&D, local companies are allowed to claim tax deductions for a value of 200 percent (previously it was 133 percent) of the amount spent on R&D.

## 2. **National R&D Budget Trends**

Table 1 shows the R&D expenditure as percentage of GDP over the years. It can be seen that R&D expenditure as a percentage of GDP is negligible and there is no concerted effort to increase the same, although the S&T Policy long ago envisaged increasing the R&D expenditure to 1% of GDP.

**Table 1: S&T Expenditure**

Year	R&D expenditure as % of S&T expenditure	S&T expenditure as % of GDP	R&D expenditure as % of GDP
1994-95	5.93	0.24	0.01
1995-96	7.84	0.19	0.01
1996-97	7.85	0.18	0.01
1997-98	8.54	0.24	0.02
1998-99	8.54	0.24	0.02
2004-05*	9.00	0.30	0.027

Source: BANSDOC.

\* Estimated using the R&D grants by UGC as the basis.

### 3. Institution building in S&T

#### 3.1 Research and Development (R&D) organizations

Bangladesh has 74 organisations engaged in R&D. This list, however, includes universities, some government-run routine testing laboratories, medical research cum hospital centres and scientific support service institutions. Table 3 shows the human resources of some leading R&D organisations in Bangladesh. The percentage of PhDs of the total work force in the major R&D organizations is declining over time. For example, in BCSIR the percentage of PhDs of the total work force was 7.5% in 1986 and 3.71% in 2004. The same applies to other R&D organizations. Recently, the Ministry of Science and Technology in association with the Ministry of Finance introduced a system of keeping a block allocation of fund for research. The Ministry of Science, Information and Communication Technology administers the fund. The Ministry invites research proposals from educational and research institutions nationwide, and provides research grant from the block allocation.

**Table 2: Manpower in leading R&D organizations in Bangladesh, 1997; and 2003**

Organizations	Scientists and technologists 1997	Scientists and technologists 2003	Technicians 1997	Technicians 2003
Bangladesh Agriculture Research Institute	762	780	74	84
Bangladesh Jute Research Institute	261	280	169	189
Soil Resources Development Institute	117	125	8	19
Bangladesh Tea Research Institute	39	45	16	19
Bangladesh Space Research and Remote Sensing Organisation	60	60	30	39
Bangladesh Forest Research Institute	107	125	71	79
Bangladesh Livestock Research Institute	107	120	57	67
Institute of Post Graduate Medicine and Research	251	280	380	400
International Centre for Diarrhoeal Diseases Research	219	226	130	150
Atomic Energy Research Establishment	287	287	184	204
Bangladesh Council of Scientific and Industrial Research	318	345	355	320
Bangladesh National Scientific and Documentation Centre	10	14	10	12
Institute of Nuclear Medicine	32	35	4	9
River Research Institute	53	63	75	80

Source: UNESCO Science Report 2005

The major activities that could lead to viable outputs for industrial technology development are concentrated in the Bangladesh Council of Scientific and Industrial Research (BCSIR). The BCSIR is the only government-sponsored industrial research organisation with the mandate to play a crucial role in the country's industrial development. The BCSIR has a total staff of around of about 1200, out of which one-third are scientists and technologists in the year 2003. The technical-non-technical ratio is 1:3. Income from contract work (mainly testing) is negligible, around 5 percent of total operating expenditures. The range of research activities carried out in the Road Research Laboratory and the Housing and Building Research Laboratory has been limited.

Research activities in the agriculture sector are co-ordinated by an umbrella organisation, the Bangladesh Agriculture Research Council (BARC). Its functions include medium and long-term research, planning, organising and funding coordinated research involving a number of institutions; and regular review of research in output agricultural research. Some of the component units of the



Council, namely, the Bangladesh Agriculture Research Institute (BARI) and the Bangladesh Rice Research Institute (BRRI) have their own programme planning and review mechanisms.

BARI is an autonomous organisation under the Ministry of Agriculture responsible for conducting research on all crops except rice, jute, sugarcane, and tea for which there are separate institutes. It was established in 1908 as the Agricultural Research Laboratory, Bengal at Dhaka. The laboratory was under the Bengal Department of Agriculture, which was created in 1906. After the partition of India in 1947, the Bengal Department of Agriculture became the East Pakistan Department of Agriculture with two wings, one for research and the other for extension. The laboratory formed the research wing. In 1968, the Department of Agriculture was bifurcated into two separate directorates, namely, the Directorate of Agriculture (Extension and Management), and the Directorate of Agriculture (Research and Education). The latter was converted to the Bangladesh Agricultural Research Institute (BARI) in 1976. During the early sixties, BARI moved to Joydebpur to allow the rebuilding of its research facilities. The move was completed in 1980. The original laboratory buildings constructed in 1908 and located on Khamar Road near Farmgate in Dhaka now house several other offices. The research farm of the original laboratory covered an area of about 182 ha.

In addition to the central station of Joydebpur (area: 165 ha), BARI has 6 regional stations and 24 sub stations. The institute has six crop-based research centres (Tuber Crops Research Centre, Wheat Research Centre, Horticultural Research Centre, Pulse Research Centre, Oil Crops Research Centre, Spice Research Centre) to ensure a multi-disciplinary approach. The number of mandated crop in these centres exceeds 100; variety improvement and production have received priority. It has made a good contribution towards the development of wheat, potato, mustard and vegetables. The institute has released 172 improved varieties of different crops. R&D in agricultural sector is mainly confined to crops of which rice is the most important, followed by tea and jute. The BRRI has worked closely with the International Rice Research Institute in the Philippines and has made notable contributions in the last two decades. BRRI developed 36 varieties that are in use at the farmers' level and newer varieties are at various stages of development. This success was due to the consistent investment of a sizeable amount on R&D for a long time. BRRI has all along been responsible for enhancing the level of country's cereal production that is currently self-sufficient. The same type of accomplishment however did not occur in the Jute Research Institute. Although it has developed good varieties, its impact is not noticeable. The Bangladesh Tea Research Institute is an old institution established in 1957, and is comparable with BCSIR. It is working on the improvement of the quality of tea through research on improved breeding and tea processing. Accomplishments include cloned varieties along with others. The country also inherited a reasonably advanced R&D infrastructure in medical and health research in the form of an International Centre for Diarrhoeal Disease Research (ICDDR). The Centre is internationally funded and its contribution towards mitigating the scourge of Cholera is well known.

### 3.2 *Universities*

Educated and skilled work force constitutes the basic requirement for technological advancement. Historically, policies related to human resources in this part of the Indian subcontinent were directed more towards liberal arts rather than sciences or technical subjects. However, several initiatives have been taken to reorient the education system in the country. In addition to Dhaka University, four other universities, namely Rajshahi University, Chittagong University, Agriculture University and University of Engineering and Technology were established during the pre-independence period to meet the need for work force development in the country. During the independence period another

16 public universities were established indicating the total current number at 21 public universities (see Table 3).

**Table 3: Public universities in Bangladesh (2005)**

University	Year of Establishment / Status
University of Dhaka	1921/ Public
Rajshahi University	1953/Public
Bangladesh Agricultural University	1961/Public
Bangladesh University of Engineering and Technology	2001/Public
Chittagong University	-
Jahangirnagar University	na/Public
Islamic University	na/Public
Shahjalal University of S&T	na/Public
Khulna University	1979/Public
National University	1987/Public
Bangladesh Open University	1987/Public
Bangabandhu Agricultural University	1992/Public
Bangabandhu Sheikh Mujibur Medical University	1980/Public
Sher-e-Bangla Agricultural University	na/Public
Patuakhali Science and Technology University	2001/Public
Hajee Mohammad Danesh Science and Technology University	2002/Public
Mawlana Bhasani Science and Technology University	2002/Public
Dhaka University of Engineering and Technology	1999/Public
Rajshahi University of Engineering and Technology	1999/Public
Khulna University of Engineering and Technology	na/Public
Chittagong University of Engineering and Technology	2003/Public

Source: Table compiled by the author

Twenty-one public universities in the country consist of five general universities, three agriculture universities, five engineering universities, one Islamic university, four science and technology universities, one medical university and one open university. Amongst them the medical university, three science and technology universities, four engineering universities and two agricultural universities have started functioning recently. Amongst the universities, sixteen are mainly teaching universities and four are teaching and affiliating universities. The affiliated colleges include medical, dental, agricultural, textile, leather and teacher training colleges. For the expansion of higher

education, there is another university, namely, the National University. The National University administers affiliated colleges. In addition, there are 52 private universities that were established only after 1992 (See Table 4). Many of these private universities are still in the transition phase. The intake capacity of the public and private universities is 81% and 19% respectively.

**Table 4: List of private universities of Bangladesh 2005 (Created after 1992)**

Ahasanullah University of Science and Technology	Southern University, Bangladesh
American International University, Bangladesh	Pundra University of Science and Technology
Asian University of Bangladesh	Green University of Bangladesh
East West university	World University of Bangladesh
Independent University, Bangladesh	Santa Marium University of Creative Technology
North South University	The Millennium University
Queens University	Eastern University, Bangladesh
The University of Asia Pacific	Bangladesh University of Business and Technology
University of Science and Technology, Chittagong	Metropolitan University, Sylhet
Central Women's University	United International University
Darul Ihsan University	Victoria University of Bangladesh
International Islamic University Chittagong	Uttara University
Comilla University	University of South Asia
Gano Bishwabidyalyaya	Presidency University
The People's University of Bangladesh	University of Information Technology & Sciences
Dhaka International University	Prime Asia University
Brac University	Royal University of Dhaka
Manarat International University	University of Liberal Arts Bangladesh
Bangladesh University	Atish Dipankar University of Science and Technology
Leading University	Islamic University of Bangladesh
University of Development Alternative	State University of Bangladesh
Begum Gulchemonara Trust University	City University, Bangladesh
Premier University , Chittagong	IBAIS University
Sylhet International University	America Bangladesh University
South East University	Prime University
Stamford University	Northern University - Bangladesh
Daffodil International University	

Source: Table compiled by the author

Although the share of education was between 5 to 7% of the national development budget up to 1992-93, it increased to 10% in 1993-94. Subsequently, it was raised further and varied from 12% to 13.5% during 1994-95 to 2003-04. In 2004-05, education received 15.1% of the national development budget (GOB, Budget in brief 2004-05). Out of the total allocation for the development of the education sector, universities were allocated about 10% in 1990-91, and subsequently decreased to about 5% in the following years (BANBEIS, government budget on education). In 2003-

04, the universities were allocated 6 % of the education development budget and 0.81 % of the national development budget (UGC 2003).

The share of education varied between 15 to 19% of the national revenue budget since 1990-1991. In 2003-04, education took about 15% of the national revenue budget. About 7 to 8% of the revenue budget allocated for education was earmarked for universities over the past years. In 2002-03, the figure was 8.17% (UGC 2003). The entire development budget and between 90 and 95 percent of the revenue budget of public universities are financed by the government through the University Grants Commission (UGC). It may be noted that the share of technical education in the total national development budget for the education sector is only around 4 %.

### 3.2.1 Enrolments and Funding in Higher Education

Out of the total student enrolment in the government universities, 42.12% were enrolled in scientific and technological subjects. However, there is a decreasing trend in the percentage of the students enrolled in the science and technological subjects in the government universities. The figure for the private universities is 33 %. The average number of MSc/MPhil and PhDs that graduate per year are 1,307 and sixty-four respectively during the period 1996 - 2002(UGC 1999, 2003), a figure that depicts the inherent weaknesses of the universities with respect to master's and PhD programmes. The teacher-student ratio varies from one university to another, the lowest being 1:7 and highest being 1:28 in 2003. The average teacher-student ratio of public functional universities is 1:17 (UGC 2003). Table 5 shows the total number of teachers, students and the teacher student ratio of the public universities in different years. The government has introduced a fellowship programme from its own budget for PhD studies in abroad in the fields of science and technology. Administered by the Ministry of SICT, 9 PhD fellowship were offered in 2000-2001 and 11 in 2001-2002 (MOSICT, 2003).

**Table 5: Teachers, Students and Teacher-student ratio in Public Universities**

Year	Public Universities			Private Universities		
	Number of Teachers	Number of Students	Teacher student ratio	Number of Teachers	Number of Students	Teacher student ratio
2001	5147	92562	1:17.98	-	-	-
2002	5366	92152	1:17.17	-	-	-
2003	5998	104736	1:17.46	4543	46080	1:10.14

Source: University Grant Commission (UGC) Annual report 2003

For creating Skilled IT professionals the government has allocated 15 crore taka to five public universities namely Dhaka, BUET, Rajshahi, Khulna and Shahjalal science and Technology universities to conduct post graduate diploma course on ICT, under a special programme (MOSICT, 2003).

Table 6 shows the teacher's profiles of in the public universities. In 2003, while 36 percent of the teachers in the government universities have PhD degrees, only 15.4 % of the teachers in the private universities have PhD degrees. It may be pointed out that universities face the problem of brain drain. As the facilities for PhD programmes in universities are not well developed, most teachers

prefer to go abroad to obtain their PhDs. Many of them settle abroad. Exact figures of the brain drain from universities are not available. However, if we try to estimate them on the basis of the number of teachers joining a university at the level of lecturers in a particular batch and the number of teachers of the same batch remaining at the level of associate professors and professors, the average brain drain of teachers works out to be about 60% for universities and about 80 percent for technical universities.

**Table 6: Faculty Profile in the public universities**

Year	Total number of faculty members	Number and percentage in each Position					Number and percentage according to educational level		
		Professor	Associate Professor	Assistant Professor	Lecturer	Others	PhD	MSc MPhil	Others (without higher degree)
2001	5241	1707 (32.57)	821 (15.66)	1462 (27.89)	1095 (20.89)	156 (2.98)	1982 (37.82)	1079 (20.59)	2180 (41.59)
2002	5467	1785 (32.65)	860 (15.73)	1492 (27.19)	1231 (22.51)	99 (1.81)	2103 (38.47)	1292 (23.63)	2072 (37.90)
2003	6101	1887 (30.93)	978 (16.03)	1683 (27.59)	1445 (23.68)	108 (1.77)	2212 (36.26)	1610 (26.93)	2279 (37.35)

Source: UGC annual report 2003

R&D activities in universities are very limited. Most research work relates to student research work. However, faculty members also undertake some research projects, but these are very few. Research activities of universities are usually funded by the UGC. In addition, universities occasionally get research projects from other organisations. The small number of research projects received from other organisations reflects a general lack of university-industry interaction, which is a common problem in Bangladesh. The amount seems to be very inadequate and varies for different years depending on receipt and approval of viable research proposals by the UGC. Table 7 shows the research grant by the University Grant Commission from 1998 to 2003. It indicates that the amount for research is very small, and fluctuates over the years without any consistency. This indicates the absence of commitment and concerted effort to increase R&D expenditure from the government's side. Research publications of faculty members of universities are mainly in the local journals published by universities and in conference/seminar proceedings. Publication in international journals is very few.

**Table 7: Research grants by the University Grant Commission (UGC)**

Year	1998	1999	2000	2001	2002	2003
Research Disciplines	Amount in Taka	Amount in Taka	Amount in Taka	Amount in Taka	Amount in Taka	Amount in Taka
Humanities	362,500	60,000	-	-	102,000	65,000
Social Science	284,000	63,000	443,600	-	284,000	70,000
Science & Technology	1,082,000	505,000	440,000	105,000	715,000	1,223,000
Total	1,728,500 (\$30,886).	628,000 (\$ 11,214)	883,600 (\$15,501)	105,000 (\$19,660)	1,101,000 (\$19,316)	1,358,000 (\$23,825)

Source: UGC (2000, 2001, 2002, 2003)

Foreign training of technical personnel is usually a built-in feature in most of the sophisticated industrial and infrastructure projects, especially in the externally funded projects. For postgraduate education and training abroad, professionals usually depend on foreign government-sponsored scholarship schemes or research/teaching assistantship offered by foreign universities. The government does not have any significant scholarship schemes of foreign training programmes of its own. Continuing education for practising engineers, technologists and technicians has become essential to keep pace with the dynamic nature of modern science and technology. Bangladesh University of Engineering and Technology (BUET) have taken the initiative in establishing academic linkages with foreign universities of repute for exchange of teachers, researcher and postgraduate students.

### 3.2.2 *Technical Colleges and Schools, and Vocational Training Institutions*

Formal technical education is offered in three tiers: crafts courses offered by vocational training institutes (VTIs) and technical training centres (TTC's), diploma-level courses offered by polytechnics and monotechnics, and degree courses offered by the Universities of Engineering and Technology. The Bangladesh Textile College and Bangladesh Leather Technology College under Dhaka University offers degree courses in textile engineering and leather, technology. The upgrading of faculty competence and laboratory facilities, teaching curricula and materials have not kept pace. Technical education has to be restructured and improved, in order to better respond to the demanding technical changes augmenting productive sectors. It is felt that the vocational and technical education system (VTE) needs to be reorganised to offer shorter and newer courses linked specifically to the needs of the industry and job market. However, in recent years a number of private training institutes have come up. Their training programmes are essentially directed towards market demands.

**Table 8: R&D personnel**

R&D Personnel		Researchers	
FTE	Headcount	FTE	Headcount
n/a	15364	n/a	5569

Source: UNESCO Institute for Statistics 1997

#### 4. Professional Societies and Documentation

The Ministry of Science and Information & Communication Technology lists fifty S&T professional societies and associations in the country. Of the professional associations, the following are some of those directly concerned with cross-sectoral implications for S&T: the Bangladesh Academy of Sciences, the Bangladesh Association for Advancement of Science, the Bangladesh Association of Scientists and Scientific Professions, the Bangladesh Agriculturists' Association, the Bangladesh Medical Association and the Institutions of Engineers, Bangladesh. Others are single discipline societies and associations covering the more conventional scientific and technological disciplines. However, the impact of these professional societies and associations in the field of science and technology is not noticeable. A possible reason may be that these associations are more concerned about the welfare of their respective communities and the development of science and technology is second in the agenda. The government now encourages these S&T societies and associations by providing funds for research and development. Recently the Institution of Engineers has established an Engineering Staff College for continuing education of the engineering professionals.

##### 4.1 BANSDOC

Bangladesh National Scientific Documentation Centre (BANSDOC) was placed under the Bangladesh Council of Scientific and Industrial Research (BCSIR) and was renamed Bangladesh National Scientific and Technical Documentation Centre in 1972. The aim of the centre was to put the scientific literature of the world at the disposal of researchers, teachers, industrialists, technicians, and in general, all those who are active in the field of science and technology. As one of its major functions, BANSDOC provides research and development (R&D) programmes support to the overall economic development of the country. It is entrusted with the responsibility of collecting, processing and compiling information and data on all fields of scientific research and experimental development and dissemination of such information to researchers irrespective of their institutional affiliation. Services provided by the centre include document procurement service, bibliography/literature search service, reprographic service, desktop publishing, printing service, and library service. The literature search service provides bibliographical data from international CD-ROM databases, including biological and physics abstracts, in collaboration with different libraries and information centres. The reprographic service includes providing photo prints, projection slides etc. of scientific and technical papers, information materials and other documents on request. The centre desktop publishing and printing services have considerably increased the speed of publications. Leaflets, brochures, invitation cards, certificates, training manuals, publicity materials etc. are designed by using in-house desktop printing facilities. BANSDOC library now has a rich collection of books on different branches of science. It subscribes to more than 300 national and international scientific journals/periodicals and CD-ROM on Biological Abstracts (1997-2000) and Physics Abstracts (1998-2000). BANSDOC has been running a Cyber Centre since 1999.

Some of the major publications of BANSDOC are

- Bangladesh Science and Technology Abstracts,
- Directory of Scientists and Technologists of Bangladesh,
- Directory of Bangladeshi R&D Organisations and their current Scientific and Technological Research Projects,
- National Catalogue of Scientific and Technological Periodicals in Bangladesh,
- Science and Technology Related Activities in Bangladesh,
- Scientific & Technological Research Institutions of Bangladesh, and
- Survey of Research and Development (R&D) Activities in Bangladesh.

## 5. R&D Linkages with Industry

In Bangladesh, there have been very poor linkages between the industry and R&D organisations. The capability to introduce technological change in the industry depends upon the support provided by the national technology infrastructure. In Bangladesh the triangular linkages between university-government-industry are very weak, partly due to lack of government science institutions effort and partly because of lack of serious innovation efforts on the part of the enterprises themselves to absorb and adapt technologies through a dynamic transfer mechanism. Another crucial reason for weak R&D-industry linkage is the poor or virtually non-existent research base in the private sector.

### 5.1 *New Technology-based Industries*

In recent years computer and software industries are growing in the country, although they are still in the early stages. Private sector entrepreneurs, mostly the young generation, are responsible for this growth. An Information Technology (IT) policy has been adopted in the country. The Ministry of Science, and Information and Communication Technology, along with the Bangladesh Computer Council worked together in preparing the IT Policy. Recently the government has taken the initiative to encourage educational institutions by giving special allocation of funds for the introduction of programmes for producing work force in IT to meet the demand in this sector.

## 6. Concluding remarks

The country's expenditure on research and development activities is very low. The Ministry of Science and Information & Communication Technology formed a committee to look into the modalities for increasing R&D expenditure to a level of 1 percent of GNP in the near future. The Bangladesh S&T system is still undergoing a process of institutionalising science and is yet to catch up with its neighbours. Bangladesh is yet to develop a visible national S&T community, and this depends on the political support and intellectual will of the scientific elite and academics.

There is some evidence of sporadic initiatives for shop-level innovations (blue-collar research). However, they have lacked support and guidance from the top and have not been carried out within the framework of a planned initiative. However, some sector corporations (for example, the Bangladesh Steel and Engineering Corporation, Bangladesh Chemical Industries Corporation and Bangladesh Jute Mills Corporation) have set up R&D divisions that are still in the infant stage.

The relative strength of Bangladesh in the agriculture sector is derived from the continued higher proportion of R&D expenditure and promotion of S&T communities in agriculture research, which



accomplished the task of introducing several new seeds and contributing to the increase in production.

Technology-based development planning requires government interventions at various levels, and needs appropriate policy instruments and application of technology decision support tools. Shortage of competent work force has been identified as the major constraint in R&D institutions. The so-called brain drain phenomenon, attraction for overseas jobs and lack of proper service conditions in R&D institutes have all contributed to the shortage of competent scientist, engineers and skilled technicians.

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