



# Science and technology in Southeast Asia

A survey by Yongyuth Yuthavong

**F**IVE countries form the Association of Southeast Asian Nations (ASEAN): Indonesia, Malaysia, Philippines, Singapore and Thailand. They share many common features, including limited financial resources and a relatively brief acquaintance with science and technology.

With the exception of Singapore, all the ASEAN countries are agriculturally productive and endowed with rich natural resources. They share similar scientific and technological priorities, centred on the development of agriculture and the use of natural resources, while population, health and nutrition also present problems similar to those in other developing countries. Private industry in the area still has a small capacity and mostly involves low and medium levels of technology. Consequently most research and development activities are concentrated in the government sector. Science and technology policy in these countries therefore has a relatively greater impact than in the industrial countries where much activity is in the private sector and less subject to government control.

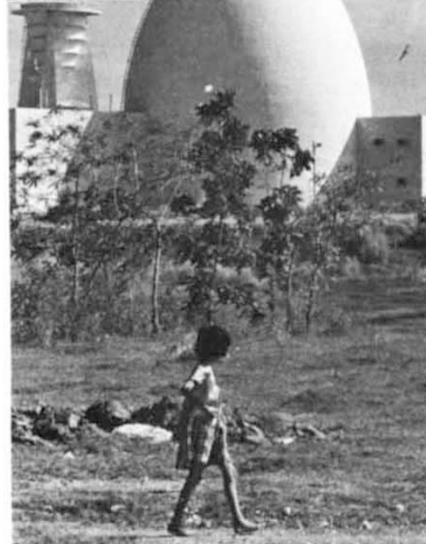
Without exception, research and development activities in ASEAN countries are heavily geared towards urgent socio-economic, food and health problems. This is understandable in view of the limited financial resources and the magnitude of these urgent problems. There are, however, differences in emphasis and detail depending on the resources of the individual countries. Hence, while the other four countries are preoccupied with problems in rural development, Singapore is mainly concerned with problems in industrial technology. Topics of high priority for research and development in the other four countries include agri-

culture, natural resources, small-scale industry and tropical health. Basic science plays only a minor role.

A substantial portion of research and development in the Philippines is supported by the National Science Development Board (NSDB) or done by its own agencies. The development of geothermal power by the Commission on Volcanology, of new ceramic products by the National Institute of Science and Technology and of low cost materials for housing by the Forest Products Research and Industries Commission are examples of such work. Research in universities includes plant breeding and related agricultural research at Central Luzon State University, and aquaculture at the College of Fisheries and the Marine Sciences Centre of the University of the Philippines.

Research of high priority in Indonesia concerns a comprehensive inventory and evaluation of natural resources, comprising land and water, vegetation, aquatic, energy and mineral resources. Biological research, including collection, survey and breeding, is carried out at the National Biological Institute at Bogor, founded in 1817, which has one of the largest tropical botanic gardens. The National Institute of Oceanology, with centres in Jakarta and Ambon, conducts and co-ordinates various fields of marine research. Other national institutes include those of geology and mining, chemistry, physics, metallurgy, electrotechniques and instrumentation, all located in Bandung.

Important research institutes in Malaysia include the Rubber Research Institute, the Agricultural and Research Development Institute, the Mining Research Institute, the Geological Survey Laboratory, the Standards and Industrial Research Institute of Malaysia, and the Institute for Medical Research. Unlike those in the Philippines and Indonesia, the institutes are not under central control but



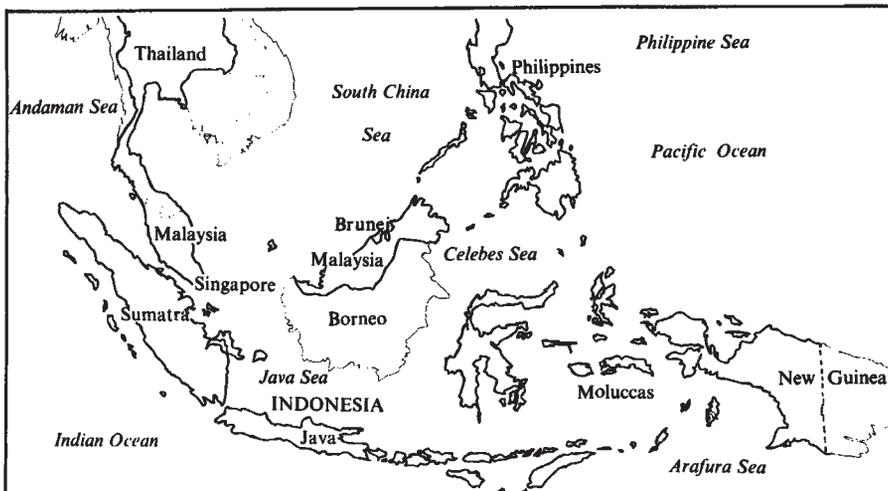
belong to various ministries. Of the five universities in Malaysia, the University of Malaya in Kuala Lumpur and of Sains Malaysia in Penang have the potential for doing good scientific research.

The University of Singapore, which was originally a part of the University of Malaya, is also quite well established in various branches of science. In the field of mathematics Nanyang University in Singapore is outstanding, being the home of the famous Southeast Asian Mathematical Society.

In contrast to the other ASEAN countries, a relatively high proportion of research in Thailand is done at universities, especially in basic sciences. Some universities such as Mahidol University and King Mongkut Institute of Technology have research support from international sources in addition to local budget. Most applied research is done in research units of various departments, such as the Departments of Fisheries, Irrigation and Mineral Resources. Since 1963, the government also established the Applied Scientific Research Corporation of Thailand specifically to conduct applied research in selected projects.

Regional co-operation and assistance from international agencies have also influenced the research and development efforts of ASEAN countries. The International Rice Research Institute (IRRI) in the Philippines and the Asian Institute of Technology

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The key subjects for research: food, health and use of natural resources



(AIT) in Thailand are two important international institutes founded on such bases. Established in 1960 in Los Banos at the same location as a campus for the University of the Philippines, IRRI found early fame in the development and release of IR 8 "miracle rice" and subsequently of other varieties of semidwarf rice with such genetic qualities as desirable agronomic characteristics, resistance to insects, diseases and drought, high nutritive values and tolerance to floods, extremes of temperature and other hostile environments. In its genetic evaluation and utilisation programme, IRRI has a germ plasm bank which holds about 40,000 samples of both old and newly developed varieties of rice.

Other research activities at IRRI cover the problems of cropping patterns, control and management of pests, irrigation and water management, post-production technology, development of appropriate small farming machinery, and development of mini-kits for extension services to the farmers. Formal academic training is conducted in co-operation with the College of Agriculture of the University of the Philippines.

The AIT, located in a suburb of Bangkok, is concerned with studies and research in various areas of engineering and development. It has support from some 20 governments and 40 other international donors. Research in water-resources engineering, for example,

concerns the basic hydrological patterns for Southeast Asia, coastal engineering, fluid mechanics, irrigation and drainage. Geotechnical engineering research deals with the problems of local clays and soils as constructional materials, surveying and evaluating land resources, the development of highway materials and constructional technology, and agricultural soil science. Low-cost housing technology, and management and control of the tropical environment, and industrial engineering are other areas of engineering research.

A few educational and research centres are supported through the programmes of the Southeast Asian Ministers of Education Organisation and Ministerial Conferences for the Economic Development of Southeast Asia, ASEAN Permanent Committees and Secretariat, UNESCO, UNDP and various other UN agencies (see box).

#### Philippines

The most forceful planning agency of the five ASEAN countries is perhaps the NSDB (National Science Development Board) of the Philippines. With a direct annual budget of about £6m and an additional £12m for research agencies under its supervision, NSDB formulates policy, sets research priorities, gives research grants to universities and other agencies and also conducts research in its own agencies. There are six research agencies directly under NSDB: National Institute of

Science and Technology, Forest Products Research and Industries Development Commission, Philippine Textile Research Institute, Philippine Inventors Commission, Food and Nutrition Research Institute and Commission on Volcanology.

The role of NSDB in conducting research in selected fields is subject to criticism as being unsuitable for an agency responsible for science and technology policy of the whole country, since there might be a conflict of interest. However, this role also serves to stimulate activities in the fields chosen to be of high priority. An area of 35.6 hectares of public land in Manila is being developed as the Philippine Science Community, containing the office of NSDB, its research agencies and such attached agencies as the National Research Council of the Philippines, a prestigious council of elected scientist members, and the Science Foundation of the Philippines, mainly concerned with the promotion of science consciousness of the public.

#### Indonesia

A rough equivalent of NSDB of the Philippines is the Office of the Minister of State for Research of Indonesia, which has a twofold task of assisting the president in formulating government policy for research and other scientific and technological activities, and in supervising the activities of its own agencies. These are the National Atomic Energy Agency, National Space and Aeronautics Agency, National Coordinating Agency for Surveying and Mapping, and Indonesian Institute of Sciences (IIS).

The IIS is the most important both in formulating science policy and in conducting research. Ten national institutes located in Jakarta, Bogor and Bandung are under its responsibility. Created in 1967 with the aim of eventually forming an Indonesian Academy of Sciences similar to the Academies of Sciences in continental Europe, the IIS with its double function, like NSDB of the Philippines, may be criticised for having a conflict of interests. The subsequent creation of the post of the Minister of State for Research formally transfers policy decisions one step further, but still leaves the task of underlying data collection and analysis with the Institute.

#### Malaysia

Science policy guidelines in Malaysia are outlined by the National Council for Scientific Research and Development, an advisory body to the government formed two years ago, the secretariat of which is in the Ministry for Science, Technology and Environment. The council has five committees dealing with agricultural science,

medical science, marine science, industrial science and technology, and socio-economy.

The Ministry has responsibility for such agencies as the Standards and Industrial Research Institute, the Tun Ismail Atomic Research Centre, the Chemistry Department and the Wildlife National Parks. The Rubber Research Institute, which is a big and successful institute dealing with development of the most important economic commodity of the country is not under this Ministry but under the Ministry of Primary Industries.

#### Singapore

Science policy guidelines in Singapore are drawn up by the Ministry for Science and Technology, a small ministry which also runs some service departments and has responsibility for promoting public appreciation of science and technology. For the last purpose an impressive Science Centre has been established, and a major part of the activities of the Science Council, an advisory body composed of the nation's scientific and technical leaders, is devoted to such popular television programmes as the science quiz. With the exception of the recent establishment of the Applied Research Corporation, however, the Ministry is not directly concerned with research and development activities. For example, the important Singapore Institute of Standards and Industrial Research is under the Ministry of Finance, and research in universities is supported mainly by the Ministry of Education.

#### Thailand

Thailand has no single organisation on science and technology of equivalent status to a ministry, but has the National Research Council (NRC) with the responsibility of advising the government on natural and social science policy, identifying and supporting research topics of high priority. It has five national committees covering the areas of physical science and mathematics, medical science, chemical and pharmaceutical science, agriculture and biology, and engineering and industrial research, and another five national committees for social science and humanities.

Formulation of Thai science and technology policy with special reference to economic development is also the task of a small division of the National Economic and Social Development Board. Having more than one agency in a small country dealing with science policy can be a source of potential conflicts, which fortunately have not materialised so far. Recently the NRC has recommended to the government that a Ministry of Science and Tech-

## Regional co-operative programmes

A NUMBER of regional programmes in science and technology have been set up through the agreements among Southeast Asian countries. The following are a few of the important ones:

Southeast Asian Ministers of Education Organisation (SEAMEO) programmes involve the support of centres of excellence in various fields in the ASEAN countries. Of the six regional centres, five are concerned with science and technology. These are Regional Centre for Tropical Biology (BIOTROP) located in Bogor, Indonesia; Regional Centre for Educational Innovation and Technology (INNOTECH) in Quezon City, Philippines; Regional Centre for Graduate Study and Research in Agriculture (SEARCA) in Los Banos, Philippines; Regional Centre for Education in Science and Mathematics (RECSAM) in Penang, Malaysia; and Regional Project for Tropical Medicine and Public Health (TROPMED), which is a network of national centres with the head office in Bangkok, Thailand.

Ministerial Conferences for the Economic Development of Southeast Asia, usually attended by ministers of foreign affairs of member countries, which include Japan, Australia and New Zealand in addition to the ASEAN countries, support various programmes in science and technology. Important bodies in the group are Southeast Asian Fisheries Development Centre (SEAFDEC), Southeast Asian Agency for Regional

Transport and Communication Development (SEATAC) and Southeast Asian Medical and Health Organization (SEAMHO).

ASEAN has a Bureau of Science and Technology and Permanent Committees (PC) on various aspects of science and technology, namely, PC on Science and Technology, PC on Food and Agriculture, PC on Communication/Air Traffic Services and Meteorology, PC on Commerce and Industry and PC on Land Transportation and Telecommunications. An important project of the PC on Science and Technology is on soybean and other protein-rich foods funded with an aid of 2.5 million Australian dollars granted by Australia.

The Regional Office for Science and Technology for Southeast Asia of UNESCO actively supports various co-operative programmes. In the past few years with the support of UNESCO and other agencies, regional networks have been developed in specific areas of research, involving a number of national institutions or bodies linked together to facilitate regional communication and co-operation. The headquarters of the Regional Networks for Microbiology and for Chemistry of Natural Products are located in Bangkok, and for Geosciences in Seoul. A regional programme for postgraduate training and research in marine sciences for Southeast Asia, has also been formed with the support of UNESCO, UNDP, SEAFDEC and the host governments. □

nology be created with the main task of formulating overall science and technology policy, and conducting and supporting research and other activities in various fields. However, rather than accepting the proposal, the government will probably modify the structure of the Ministry of Industry to encompass the task of the proposed new ministry as well.

#### Conclusions

Science and technology in ASEAN countries needs much more planning and stimulus both from local and outside sources in order to reach a level of development comparable to, say, South Korea or Australia. For example, a mechanism is lacking whereby the results of locally supported research can be evaluated effectively. This may require the consultation of experts from outside the country, who can give critical opinions without bias. Planning of future programmes can also be more effective with such consultation.

These and other problems in research and development would require more collaboration with international bodies. Academic societies would be potential initiators of such collaboration. The proposed formation of International Chemical Society with key objectives of providing scientific aids to developing countries is interesting in this respect. Existing bodies such as Federation of Asian and Oceanian Biochemists can also provide some help. The main effort must, however, come from the governments of the ASEAN countries themselves since they are by far the largest sponsors of research and development. That international co-operation on the government level is an important factor has been realised on many occasions, including the 1975 Meeting of Directors of National Councils for Science Policy and Research in Asia and Oceania held in Kuala Lumpur. Much more effort is needed still to translate the plans into action. □