

TDRI

Quarterly
Review

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The Thailand Development Research Institute Foundation was established in 1984 to conduct policy research and disseminate results to the public and private sectors. TDRI was conceived, created and registered as a non-profit, non-governmental foundation, and is recognized as such by the Royal Thai Government. The Institute does technical and policy analyses to support the formulation of policies with long-term implications for sustaining social and economic development. TDRI has seven research programs: Sectoral Economics; International Economic Relations; Macroeconomic Policy; Natural Resources and Environment; Human Resources and Social Development; Energy, Infrastructure and Urban Development; Science and Technology Development; and two special research projects: "Thailand in the Year 2010" and "Thailand and Economic Cooperation in the Asia-Pacific Region."

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Technology Upgrading in Thailand: A Strategic Perspective*

Chatri Sripaipan

BACKGROUND

The importance of scientific research has been officially recognized since the Constitution of the Royal Thai Kingdom, B.E. 2492 (1949). Article 65 states that "the government should support research in the fields of liberal arts and sciences." Later, in 1956, the government passed the National Research Council Act with the view that the country's progress had to be based on scientific research so that development could be sustained. The establishment of the National Research Council of Thailand (NRCT) can, therefore, be seen as the starting point of encouraging research and development (R&D) to systematically increase the nation's scientific and technological capability.

In 1963, the National Applied Science Research Institute (NASRI) was established to take charge of implementing research in applied science, and to promote the national use of natural resources to develop industry. In 1979, the Ministry of Science, Technology and Energy (MOSTE) was established to take the central role in planning science, technology and energy and

setting national policy. A number of science and technology (S&T) organizations, originally under the Ministry of Industry and the Office of the Prime Minister, were incorporated into MOSTE. They are: the Department of Science Services, National Research Council of Thailand, Office of the National Environmental Board, Office of the Atomic Energy for Peace, National Energy Administration, and Thailand Institute of Scientific and Technological Research (TISTR)—previously called the National Applied Science Research Institute (Boonyubol, 1991a). However, a number of S&T activities remain with other ministries. Research in agriculture is mainly conducted in the Ministry of Agriculture and Cooperatives, which consumes over 40 percent of the government's research budget. The Ministries of Education and University Affairs—two large R&D performers—spend about another half of the country's R&D budget. The Ministry of Industry is responsible for industrial standards and provides technical assistance to small- and medium-sized industries.

After the establishment of MOSTE, the next Five-Year National Economic and Social Development Plan

If sound technology strategies are pursued, the technological capability of the country could be substantially improved by the end of the Seventh Plan.



* Excerpts from a paper of the same title presented at the Conference on the Emerging Technological Trajectory of the Pacific Rim, October 4-6, 1991, Tufts University, Massachusetts, U.S.A.

1982-86 (NESDB, 1982), was the first development plan where S&T issues were explicitly addressed. Issues addressed in the Plan were: the limited use of S&T to increase production efficiency, the protracted time taken to modify or improve imported technology, and the slow pace of technological development. Proposed measures were as follows:

- Promote the survey of basic data essential to technological development
- Promote the transfer of foreign technology
- Increase the country's S&T research and development capability
- Mobilize manpower for S&T development

Achievement of these goals was, in that period, rather limited. More visible results were a number of signed agreements for S&T cooperation with foreign countries. The most significant agreement was the Science and Technology for Development Project which had a total fund of US\$49 million, spread over seven years, and with assistance provided from the U.S.

Another achievement was the establishment of the National Center for Genetic Engineering and Biotechnology (NCGEB) at MOSTE as a funding agency for a network of research laboratories in universities, and TISTR in the same discipline.

The Sixth Plan 1987-91 (NESDB, 1987) also contained a Science and Technology Development Plan. The Plan identified two key issues: that cooperation between S&T units of all government agencies and the private sector was the key to successful development, and that effective linkage between developers and users of S&T was required to meet the needs of the private sector. Four main policies were drawn up under this plan:

- To set up an effective S&T management system and to develop S&T infrastructure
- To increase the efficiency of S&T activities
- To develop S&T manpower
- To increase production efficiency

During the Sixth Plan, the Office of the Science and Technology Development Board (STDB) was established to manage the Science and Technology for Development Project. MOSTE also established two more National Centers: the National Center for Metals and Materials Technology, and the National Electronics and Computer Technology Center. This makes a total of three National Centers at MOSTE, corresponding to STDB's three areas of emphasis – biotechnology, materials, and electronics. These three areas continue to be MOSTE priorities.

One of the most important milestones in promoting S&T in Thailand will be, once passed, the enactment of a law for the Development of Science and Technology. This law will establish STDB as a juristic entity to administer a "Science and Technology Development Fund"

from the government and other sources, including international agencies. The law will also establish the three National Centers as specialized research institutes to carry out R&D, both in-house and through contracts from industry. In November 1991, the draft law was passed in the National Legislative Assembly.

RESEARCH AND DEVELOPMENT

R&D Expenditure

Both the Fifth and the Sixth Plans set a target for R&D budgets of 0.5 percent of gross national product (GNP), or roughly 2 percent of the government's budget. This compares to the actual R&D expenditure from 1983-87 of only 2,272 million baht per year, or an average of 0.22 percent of GNP. Data on R&D expenditure for 1987 is from surveys – the first time such surveys were conducted – whereas those for previous years are budget allocations. In any case, R&D budget is very low – much lower than that of the developed countries, which ranges from 2.5 to 3.0 percent of GNP, and of newly industrialized countries which ranges from 1.0 to 2.0 percent of GNP. Other features are that the R&D expenditure by both state enterprises and private firms in Thailand is very low, being only 277.24 and 181.56 million baht, or 10.41 and 6.81 percent respectively, in 1987. To make matters worse, the state enterprise category includes TISTR – the only major research institute in the country with an annual budget of about 200 million baht. Therefore, the R&D expenditure by all other state enterprises is very low indeed.

R&D Funding

For individual researchers, there are a number of research funding sources. A university lecturer may apply for a research grant from his or her university in the order of several tens of thousands of baht per project. For larger projects, researchers have to seek outside funding. NRCT is a possible source, but grants are limited and the coverage is wide. In 1990, NRCT funded 120 projects, with a total of 21.75 million baht. The three National Centers can provide about one million baht, while STDB sets a limit of six million baht per project. In addition to these sources, there are a number of foreign sources. In 1987, foreign sources accounted for 14.55 percent of R&D funds, or 387.60 million baht.

As clearly demonstrated by the large number of researchers and the interest shown by foreign funding sources, researchers in the area of biotechnology have been able to attract a much larger level of support than those in material technology or electronics and computers. Over the past five years, total funding for research projects in the area of biotechnology amounted to 709 million baht, as compared to 272 and 187 million baht for materials and electronics respectively.

R&D Results

R&D results usually come as reports and articles published in journals or presented at academic conferences. Thailand's research community publishes around 300 articles a year in international journals covered by the Science Citation Index (see Table 1). Of these, health science articles account for 130 articles a year, followed by biological science and physical science at about 50 articles each. Twenty to 40 articles each on natural resources and environmental science, agriculture, and engineering and technology are also published each year. Although the number of articles published internationally by field may roughly reflect scientific strength, it should also be noted that about one third of these articles are written by foreign scientists in joint research efforts. Thus, one interpretation could be that foreign interests and funding also affect the number of published articles in a particular field. The number of research articles published in international journals, however, does not represent the research strength of the whole country, because of the small number of researchers involved (Boonyubol, 1991a). A more comprehensive evaluation would include local journals and papers presented at conferences.

In developed countries, the number of patents registered can be used as a measure of technological capability in a particular field. However, in developing countries such as Thailand, which have very few commercially viable research results, this number is meaningless as an indicator. Since the enactment of the Patent Act of 1979, 1,827 patents had been issued up until June 1990. Of these, 1,304 were for industrial designs, some of which involved rather low technology. Up to August 1990, 526 patents for engineering and chemical inventions were issued; 456 belong to foreign nationals, 63 to Thais, and seven unspecified. It is, therefore, clear that the Thai patent system is more frequently used by foreigners than Thai nationals.

Table 1 Number of Articles by Thai Scientists Published in International Periodicals

Year	Number of Articles	Share of Participating Foreign Scientists %
1986	305	27.2
1987	324	27.7
1988	316	38.0
1989	267	37.8

Source: J. Anderson, C. Sripaipan and S. Jinachitra, "Measuring S&T Activities in Thailand: R&D Data from Published Articles." Annual Conference of the Science Society of Thailand, October 1990.

It should be noted that only a few of the inventions funded by STDB and the three National Centers have resulted in commercially-viable products. More, however, are expected to come out within the next five years.

R&D in the Private Sector

R&D in the private sector is much less than that of the public sector. In 1987, the total amount of public-sector expenditure on R&D accounted for 181.6 million, or 6.8 percent of total R&D expenditure. A previous survey (Sutabutr, 1983) suggests that Thai companies only invest 0.1 percent of sales income on R&D. This low expenditure explains the reported weakness of innovative capacity in Thai companies. A major study (Kritayakirana, 1989) revealed that Thai industry is quite good at "operating" technology as well as "adapting" technology, but is remarkably incapable of "innovation" or of creating new technology.

A study on R&D in the private sector (Sripaipan, 1990) found that a majority of Thai companies concentrate on "operating" or utilizing existing technology. This does not mean that their operations are outdated or primitive. In fact, some have state-of-the-art technology and operate ultra modern plants; some are quite large, and some are subsidiaries of leading multinationals. The only drawback is that these companies have not felt the need to undertake development work locally. A smaller number of companies have undertaken their own "adaptation" and development of existing technology—usually driven to do so by the nature of the local environment or market needs. For example, in adapting to the local operating environment, a foreign joint venture in aquaculture modified Taiwanese hatchery equipment to produce low-cost feed formulas using locally-available raw materials. Other companies have been led to technology development by market needs. Two multinationals producing consumer goods have continuing programs to modify products, such as soap, detergents and foods, to suit local preferences. Predictably, instances of inventing new technology are extremely rare. Only a few large companies can afford them. Recent research advances in such companies are, for example, the production of special, high-grade refractories and also a new formula for shrimp feed which has a better growth efficiency ratio than equivalent products manufactured in Taiwan and Indonesia.

Some of the reasons why private companies do not conduct more R&D infrastructural activities are:

- Due to Thailand's rapid economic growth, firms are escalating production capacity to meet growing demand. Therefore, they do not feel the pressure for innovation or differentiation of products.
- Government policies limit the number of companies entering the different sectors, lessening the competitive pressure required to stimulate R&D activity.

- Import tax on R&D equipment and precision instruments remains prohibitively expensive for small- and medium-sized companies.
- The taxes on royalties and license fees increase costs of foreign technology.
- There is a need to improve the availability of technical consultancy services and information on S&T activities in the public sector.
- There is a clear shortage of technical manpower to satisfy the present demand for production engineers and technicians who can use and absorb imported technology. Although there is no obvious shortage of manpower for technology generation, this is due to too little activity in R&D rather than to an over-supply of R&D personnel.
- Companies finance technology acquisition either by using internal resources or by raising loans from commercial banks as part of overall business development plans. Some financial assistance to small- and medium-sized companies does exist, but its impact has yet to be felt.

Assistance to the Private Sector

The Board of Investment (BOI) provides incentives to R&D projects through exempting import tax on machinery and corporate tax, irrespective of the location of a project. So far, 15 projects have been given incentive privileges, with a total investment of 996 million baht (Auansakul, 1991).

At present, there are three sources of soft loans with low interest rates for private-sector R&D activities: MOSTE, STDB and the Bank of Thailand (BOT). In addition, STDB also operates a grant fund which requires a matching sum from the company. It should be noted that MOSTE's loan fund has the longest history, i.e., three years, and has been the most heavily used, with 10 projects approved totalling 75.3 million baht. STDB's activities have markedly improved since March 1990 from only two to seven loan projects and four grant projects. BOT's fund is least utilized since it is restricted to R&D projects promoted by BOI.

S&T Manpower

In 1990, Thailand had an estimated 36,700 scientists, 49,934 engineers, and 33,847 agriculturalists with Bachelor's degrees or higher levels of education. Below Bachelor's degrees, there were 1,494, 706,317 and 115,256 people educated in science, engineering and agriculture respectively. This amounts to a total of 120,481 people, or 12.8 percent, with Bachelor's degrees and 823,067 people, or 87.2 percent, educated below this level. In 1990, Thailand had a total number of 943,548 S&T personnel, or 2.9 percent of the country's labor force. The country therefore had 15 scientists and engineers per 10,000 citizens (Boonyubol, 1990). This is very

low compared to Korea, with 122 scientists and engineers per 10,000 citizens (Boonyubol, 1991b).

In the past few years, due to the economic boom, Thailand has been experiencing severe S&T manpower shortages. In 1989, 2,745 scientists and 3,619 engineers graduated, but the demand forecasts in 1992 were for 2,532 and 5,136 persons respectively (Boonyubol, 1990). This is despite recent efforts by the Ministry of University Affairs to increase the number of engineers in those fields with severe shortages, i.e., mechanical, electrical, industrial, and chemical engineering. It is expected that this shortage will persist throughout the Seventh Plan (1992-96). This shortage has already resulted in an alarming rate of technically-qualified people transferring from the public sector to the private sector, where salaries are much higher. In the private sector, there are complaints about recruiting difficulties, high salary demands and a high turnover rate.

In 1987, Thailand had a total 8,493 researchers or the full-time equivalent (FTE) of 5,539 persons. Universities had the highest number of researchers at 4,898, but the number of FTEs was only 2,518 – slightly higher than the 2,416 government FTEs. State enterprises, private firms and non-profit private organizations have much fewer researchers at 527, 145 and 21 respectively. As for the number of researchers in the different academic disciplines, medical science has the highest number at 8,261. Ninety percent of these are physicians who are classified as having Master's degrees. Social science and humanities come second at 2,229, and engineering last at 1,176. To make an international comparison, the number of research scientists and engineers (RSE) in Thailand totals 2,846 persons, or one person per 10,000 workers. This is much lower than in other countries, for example, 32 RSE in Taiwan, 44 in Sweden, and 79 in Japan (Table 2).

Table 2 Research Scientists and Engineers (RSE)

Country	Year	RSE per 10,000
Advanced Industrialized countries		
U.S.A.	1985	67
JAPAN	1985	79
WEST GERMANY	1985	52
Medium R&D performers		
SWEDEN	1985	44
SWITZERLAND	1979	36
Newly Industrializing Countries		
TAIWAN	1985	32
SOUTH KOREA	1985	27
SINGAPORE	1987	27
THAILAND	1987	1

Source: Boonyubol, 1991b.

Science and Technology Services

Science and technology services are support services. They encompass metrological industrial standards, calibration services, testing services, information services, technical consultancy services and other supportive infrastructural services.

The Ministry of Commerce is empowered by the Weights and Measures Act 1923 to maintain primary standards, and as the licensing and certifying authority for weighing machines and linear and volumetric measuring instruments. In 1985, the Cabinet assigned the Department of Scientific Services to maintain mechanical primary standards and TISTR to maintain electrical primary standards. The Thai Industrial Standards Institute (TISI) is responsible for the preparation and publication of Thai industrial documentation on standards. Most of the calibration services are carried out by the Thai public sector, with the exception of the Technological Promotion Association (Thai-Japan), a private organization. Product testing services are carried out by 30 authorized laboratories in the public sector. To cope with an ever-increasing work load, a further seven testing laboratories in the private sector have now been authorized.

Apart from major libraries in universities, a number of organizations provide specialized information services. For example, the Scientific and Technological Information Division, Department of Science Services, offers patents and industrial standards services; the Technology Information Center, Technological Promotion Association (Thai-Japan), provides practical technical information, such as trade catalogs; and the Technical Information Access Center of STDB supplies online information search services from a number of foreign databases. There is still a pressing demand for information not only from foreign sources, but also for information on domestic S&T activities. Manufacturers wishing to export also complain of the lack of internationally-certified local testing facilities to eliminate the need for testing products abroad.

TECHNOLOGY STRATEGY FOR THAILAND: THE SEVENTH PLAN

The Seventh Plan will include a chapter on Science and Technology Development (NESDB, 1991), summarized as follows:

There have been three main achievements in the development of S&T to date. First, the creation of awareness of the role of S&T among the Thai populace and top government administrators, both becoming more supportive of S&T promotion.

Second, there are now more R&D activities in the public and private sectors. The government has established STDB and three National Centers to fund R&D. The private sector provides low-interest soft loans and

grants for R&D via a number of agencies, and also fiscal incentives for R&D projects promoted by BOI.

Third, each year, about 1,200 scholarships are being granted for advanced degrees in S&T in the industrialized countries.

The targets set include:

- To use industrial technology and agricultural technology to increase productivity at a rate of 2.6 percent a year in the industrial sector and 1.8 percent a year in the agricultural sector, and to support expansion at 9.5 and 3.4 percent a year respectively.
- To increase the number of S&T personnel in the following categories: engineers from 9.8 to 14.9 persons per 10,000 of the population, scientists from 7.2 to 10.2, agriculturists from 6.7 to 10.5, technicians from 141.5 to 221.5, and researchers (FTE research scientists and engineers) from 1.4 to 2.5.
- To increase R&D expenditure to 0.75 percent of GNP by 1996. This will comprise 0.5 percent of GNP from the government and the remaining 0.25 from the private sector.

Strategies to achieve the above targets are:

- Encourage the private sector to use more technology through creating a competitive atmosphere by providing fiscal incentives, disseminating technology to industries, and government regulations to support the development of specific technology for targeted industries. It is interesting to note that this is the first time a Five-Year Development Plan targets specific industries by sector. They are: metalworking and machinery, electronics, textile, food, plastics, gems and jewelry, and iron and steel.
- Promote the use of modern technology and management to increase productivity, reduce costs by stabilizing the price of farm produce, promote farmers' organizations, improve extension services, and increase the role of the private sector in technology transfer. Specific measures have been drawn up for agriculture, livestock, and fisheries.
- Increase the efficiency of technology acquisition and transfer to strengthen bargaining power, promote the diffusion of imported technology, upgrade the technological capability of state enterprises, and monitor technology transfer programs for large projects.
- Develop S&T manpower by increasing the number of scientists, engineers, mathematicians, technicians and skilled labor in areas of high demand, raising the number of university teachers and researchers, stressing the urgency for training, and improving the working environment for academic staff.
- Organize the R&D system to support industrial development by concentrating R&D activities on

the selection, adaptation and improvement of imported technology, re-orienting public R&D institutes to solve industrial technical problems, supporting educational institutes in research and to serve as S&T information centers, increasing the role of private-sector R&D through fiscal and financial incentives, developing the domestic market and intellectual property protection, and encouraging careers in R&D.

Improve the S&T infrastructure by developing metrological and industrial standards and product testing systems, improving the S&T information system, increasing the capability of engineering consultancy services and creating greater awareness of S&T.

STRATEGIES FOR SECTORAL TECHNOLOGY

The Science and Technology Development Plan has to satisfy both the representatives of the various government departments concerned and through those of the private-sector. The Plan also has to encompass all aspects of S&T development. There is, however, a definite shift toward more private-sector participation in all the Plan's strategies. For R&D, a target of 0.25 percent of GNP for the private sector by the year 1996 was set. But only one of the six strategies in the Plan mentions R&D. Most of the strategies are on the utilization, acquisition, transfer and diffusion of technology, and on developing S&T manpower. Even then, R&D strategies concentrate on selecting, adapting and improving imported technology, rather than on domestic invention. Public-sector R&D institutions are to be re-oriented to solve industrial problems. The Plan does, however, have a more pragmatic approach than the previous plan to the present S&T situation.

Another significant feature of the Plan is that it has, for the first time, targeted industries by sector. Those targeted are crucial to Thailand's development over the next five years and tend to be industries already in existence, rather than potential ones. Key technologies and technology strategies for the seven industries targeted have been worked out. They are described below.

The Electronics Industry

Key technologies identified are computer-aided, software engineering, circuit design, process, production management, and mechanical technology. Strategies for development include promoting investment in manufacturing products with a higher level of technology than is presently used, promoting supporting industries, promoting product design, and developing targeted products, such as personal computers, small PABX, mobile telephones, facsimiles and application-specific integrated circuits.

The Metalworking and Machinery Industries

Key technologies are computer-aided, production management, and metalworking technology, such as casting, forging, machining, heat treatment, electroplating and stamping. Development strategies include promoting investment in the machine tools industry, promoting metalworking industries, promoting the development of the mold and die industry, and developing automotive parts, such as engines, transmissions, steering systems and suspension systems.

The Petrochemical and Plastics Industry

The emphasis is on the downstream plastic products industry. Key technologies identified are compounding, molding for plastic products, and production management technology. Development strategies include improving the properties of plastics from commodity plastics to intermediate and engineering plastics, and establishing a design center to provide products and mold and die design.

The Textile Industry

Key technologies identified are the efficient use of modern machinery, production management, and textile chemicals technology. Development strategies include subcontracting the manufacture of world-famous brand-name garments, promoting investment in the dyeing industry, and promoting the switch to modern machinery.

The Food Industry

Key technologies are sterilization and production management, packaging, and waste management technology. Development strategies include planting fruits and vegetables to uniform standards, using modern machinery, and incentives for waste-utilization technology.

The Gems and Jewelry Industry

Key technologies are computer-aided technology, and precious metal metallurgy. Development strategies include establishing gem standards, R&D in alloying precious metal, and tariff rate reduction for R&D equipment.

The Iron and Steel Industry

Key technologies are ladle technology and steel alloying. Development strategies include increasing the efficiency of furnaces, and acquiring alloyed steel-casting technology.

Almost all of the above key industries have computer-aided technology¹ and better production management² targeted as key technologies. These types of technology are called "generic." Though metalworking has not been explicitly identified as a key technology in some of the industries, it is nevertheless a common fact that all industries to varying degrees require production machinery or manufacture products which constitute metal parts. Metalworking is consequently also classified as generic technology.

Other types of technology do not bear directly on manufacturing processes or product quality, but on production costs and environment. These are classified as "auxiliary" technology and include energy conservation, which significantly affects the motor vehicle, metalworking and machining, textile, and food industries, and also waste management technology, vital to the food and textile industries.

STRATEGY FOR TECHNOLOGY ACQUISITION

Thailand's two most popular modes of technology acquisition are capital goods import and foreign investment. In 1990, these totalled 362,008 and 74,818 million baht respectively. Foreign investment brings in product management and process technology, but no design nor product-specific technology. Machinery is imported with minimal instructions on operational procedures given by suppliers resulting in inefficiently operated and inadequately maintained equipment.

Compared to the above import figures, the payments for technology through contractual arrangements on royalties, trademarks, technical fees and management fees, totalling 5,334 million baht in 1989, is simply too little. This is equivalent to an expenditure of a mere 1.1 percent of capital goods imports for purchasing technology and of 0.7 for purchasing technical assistance. This means that Thai manufacturers have not been using licensing or consultancies for technology acquisition.

Although it is certain that R&D activities will increase, judging from the performance of public R&D institutions on commercializing technological products and the levels of R&D activity in the private sector (Sripaipan, 1990), it is unlikely that R&D will become the main mode of technology acquisition for Thai industry within the next few years. Mergers and acquisitions of foreign companies for technology are unlikely to be prevalent, despite some cases of acquisition for access to markets. Therefore, it is suggested that subcontracting be used as a strategy for technology acquisition in the Seventh Plan. The high level of foreign investment presents favorable conditions to develop mutually beneficial projects. This strategy fits well with those for the development of the electronics, metalworking and plastic industries already described. Thailand, however, must not be satisfied with solely producing parts and components to order. New product management and process

technology should be mastered and attempts should be made to learn both product-specific technology and design technology. This will enable Thailand not only to attain higher quality products at lower costs, but also to adopt products according to market demand or to use new raw materials to manufacture more complex products with higher value-added. These types of technological activities lead to better use of existing technology and ultimately to technology creation through R&D. A number of government policies beyond the scope of this paper are required to facilitate the formation of a competitive subcontracting network (see for example Dahman and Brimble 1990, Chintayarangsarn 1991, Santikarn Kaosa-ard 1991).

Another strategy used by some governments of newly industrialized economies (NIEs) is the purchase of technology by government agencies. The technology is then transferred to private domestic manufacturers. This method is mainly used to purchase advanced technology, requiring investments beyond the means of the private sector, critical to the development of a large number of related industries. The Thai government should encourage the development of this method if it wants to support technology acquisition.

CONCLUDING REMARKS

Although the Thai economy is growing at a rapid pace, there are still major weaknesses in the country's technological capability which will make this growth unsustainable in the long run. These weaknesses cannot be remedied over night, but strategies must be worked out now to deal with them.

Despite a number of programs to boost R&D in both the public and private sectors, it will take time for these efforts to bear fruit. If sound technology strategies are pursued, the technological capability of the country could be substantially improved by the end of the Seventh Plan.

The present shortage of S&T manpower, if allowed to continue, will certainly have detrimental effects on investment and industry, and possibly on the development of the country as a whole. In the short term, there is no choice but to import needed personnel and launch massive training programs. In the medium term, unless hiring conditions are substantially improved, the ability of educational institutions to increase enrollment will be limited by the availability of teachers. In the long term, there will be more options and less excuse not to work out viable solutions.

Needless to say, effective implementation is more important than immaculate strategic plans. The NESDB Plan only serves as a guideline for ministries themselves to draw up yearly plans. It is up to the ministries to make the plans work. NESDB should, however, closely monitor these plans to ensure conformity. On the other hand, long-term sectoral plans (beyond 10 years) will have to

be developed to guide us into the type of society we want to live in.

Endnotes

- 1 Computer-aided technology in production include the following: Computer-Aided Design (CAD), Computer-Aided Drafting (CAD), Computer-Aided Engineering (CAE), Computer-Aided Testing (CAT), Computer-Aided Software Engineering (CASE), Computer-Aided Manufacturing (CAM), and Computer-Integrated Manufacturing (CIM).
- 2 Product management technology includes the following:
 - TQC = To control production quality from start to finish;
 - JIT = Time and cost saving inventory management;
 - MRP II = Planning efficient production and control of raw material utilization;
 - SQC and SPC = employing statistical means of controlling the production process and output quality.

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A Preliminary Study of TNCs' Hiring and Localization Policies in Thailand

Mingsarn Santikarn Kaosa-ard

Following worldwide economic recovery in the late 1980s, direct foreign investment flows increased at a much more rapid rate annually than did world trade and output (*Transnationals*, Vol. 3, No. 1, March 1991). Investments by transnational corporations (TNCs) grew by 20 percent, totalling US\$196 billion in 1989.

Although most of the investment took place in developed countries, TNC investment in developing countries also grew at the very respectable rate of 16 percent in 1989. The 10 developing countries that received the largest investment flows in the 1980s were Singapore, Brazil, Mexico, China, Hong Kong, Malaysia, Egypt, Argentina, Thailand and Columbia.

This paper looks at the policies of TNCs on hiring of local staff and localization of top management positions in Thailand. The aim of this paper is to provide some hypotheses for more intensive research, rather than to provide empirical findings. Apart from reviewing existing literature, interviews were conducted with two senior local executives of TNCs producing consumer

products, one senior engineer of an oil exploration TNC, and one former executive of an automobile assembler. Statistics on localization were compiled from 984 firms whose 1989 sales exceeded one million baht.

INDUSTRIAL DEVELOPMENT AND THE LABOR MARKET SITUATION IN THAILAND

The strategies of TNCs on hiring and localization cannot be properly assessed without a knowledge of the industrial evolution of the host country and the local labor market situation. The type of skills and the extent of investment in human capital depend on the quality of available human resources and the environment within which firms operate.

The history of the modern private industrial sector in Thailand is relatively recent, beginning in the 1960s when the Thai government provided industrial protection and fiscal incentives to private enterprises in sectors



The first labor group leaving the agricultural sector was the female workforce.

deemed vital to economic development. In 1960, the manufacturing sector accounted for less than 20 percent of gross domestic product (GDP). In the 1960s and 1970s, the manufacturing sector grew in response to the increase in urban demand for manufactures. Manufacturing establishments were concentrated in Bangkok and its five adjacent provinces, known as the inner ring. In 1981, the share of manufacturing value added of Bangkok and the inner ring was as high as 70 percent. In 1987, this increased to 78 percent. The local manufacturing sector was a typical case of an enclave of relatively capital-intensive firms catering to a small proportion of the population which was relatively well-off. Employment within the manufacturing sector accounted for 16.6 percent of the total employment.

Although numerous factors, including trade and protection policies, hinder the expansion of the manufacturing sector, one major obstacle concerns the availability of a labor force which possesses sufficient education for modern manufacturing activities.

To understand the availability and the quality of the labor supply, one must also understand the impact of the agricultural sector. In 1971, when local industries constituted only a small enclave, the labor force in agriculture was 73.7 percent. Nearly two decades later, in 1989, agricultural employment still stood at 57 percent. Presumably employment in other sectors was affected by the demand for labor in the agricultural sector. In the 1970s, demand for agricultural labor continued to expand and more deforested areas were brought into cultivation. Thailand then had a relatively land-abundant developing economy. The high and seasonal supply of labor in the rural areas rendered industrial regionalization difficult. Another important factor that affects an economy dominated by agriculture is the relatively low requirement for education. Thailand has the lowest secondary enrollment ratio in Asia.

Toward the mid-1980s, as the land frontier gradually closed, Thailand's comparative advantage in agriculture started to decline. As land became increasingly scarce, surplus labor in agriculture emerged. The first labor group leaving the agricultural sector was the female workforce. The resulting availability of a large female workforce gave the manufacturing industries comparative advantage in the 1980s. By 1990, the share of the manufacturing sector in GDP had reached 39 percent.

These developments held two very important implications for TNCs in Thailand. First, most unskilled laborers in Thailand have relatively low levels of formal education compared with their counterparts in many other developing countries. The manufacturing sector must cope with a labor force whose educational background consists of only six years of compulsory education. In the 1950s and 1960s, when Japan embarked on

its program of accelerated industrialization, the country's compulsory education requirement was nine years. Thus, on-the-job training may not be sufficient for unskilled labor in Thailand to achieve the level of productivity of its counterparts in other countries. Second, the relatively short history of industrial development in Thailand implies a small pool of experienced, skilled and managerial staff. Third, the explosion in the demand for engineers may require more off-the-job training of technicians to upgrade their skills so that they may temporarily substitute, even though imperfectly, for engineers.

TNC INVESTMENT IN THAILAND

TNC investment in Thailand is believed to have had little impact on the economy until very recently, as the annual foreign investment flow during the 1960s never exceeded US\$25 million in investment. Prior to 1977, foreign investment accounted for around one percent of gross domestic investment (GDI). Investment flow during the 1970s was severely affected by the oil shock and the political uncertainties in Indochina. The ratio of direct foreign investment to GDI increased to 3.5 percent during 1977-80 and dropped slightly to 2.1 percent during 1981-82. Until the early 1980s, the Republic of Korea and Thailand had the lowest levels of direct foreign investment among the Newly Industrialized Economies (NIEs) and the ASEAN countries.

Since the international currency realignment in 1985, Thailand has been viewed as a profitable export base for Japan, Taiwan and Hong Kong. After 1986, the investment scene in Thailand took on a new momentum. Japanese investment flows in 1988 were four times greater than those in 1987, and by 1990, they had more than doubled again.

THE EMPLOYMENT EFFECT OF TNCs

A conservative estimate of direct employment generation suggests that at least 65 million people worldwide are employed by TNCs, or about 3 percent of the world's active workforce. About two-thirds, or 43 million people, are employed in their home countries, the remainder in host countries (UNCTC, 1988). In developing countries, 7 million workers—less than one percent of the active workforce in the LDCs—are employed by TNCs. Although indirect employment by TNCs is estimated to be at least double, the impact of the TNCs on total employment is not likely to be substantial. However, since TNCs tend to be concentrated within relatively capital-using and high-technology industries (ILO, 1981), the impact of TNCs on the generation of technical and managerial skills could be more significant.

In 1986, Thailand had about 678 foreign manufacturing firms, 667 of which maintained employment data (Sibunruang and Brimble, 1988). These firms hired 192,655 workers, which accounted for 8.8 percent of the workforce within the manufacturing sector, but only 0.7 percent of the country's total workforce.

The foreign investment boom has caused a heavy demand for engineering and technical staff. Before 1987, engineering graduates were normally paid 10-20 percent more than graduates in other fields, but the structure of the incremental income was similar. Within the public sector, there was no price differentiation between engineering and other graduates. Since 1987, the situation has changed. The starting salary for an engineering recruit more than doubled between 1987 and 1990. "Poaching" of workers and managers has become quite common.

DETERMINATION OF TRAINING AND LOCALIZATION

Economic theories suggest that a firm will train workers as long as the marginal benefits (measured in terms of productivity) accrued to the firm exceed the marginal costs of training. The costs of training are not confined to the financial, but also include time and production lost during training.

In addition, the level of investment in training would be concentrated in areas where returns are highest. Thus it can be expected that technical and managerial staff tend to receive more training, while training of unskilled and semi-skilled staff generally results in higher rates of output and reduction of defects. Training of technical and managerial staff tends to multiply overall efficiency and may lead to new commercial and technological innovations.

Technical training tends to be more intense in companies that utilize relatively complicated technology and in which skills are company or industry specific. To fully internalize training benefits, firms sometimes institute specific agreements, for example with employees to remain with the company for a certain period after training, or with firms not to poach employees.

The issue of localization, on the other hand, is related to a firm's decision-making strategies, which in turn depend on:

- The price of decision-making services in home versus host countries (i.e., the cost of hiring local rather than expatriate managers)
- The need to regulate the goals of affiliates, which may differ from a corporation's goals

- The nature and history of a corporation (i.e., a TNC with a relatively short history may have a lower degree of localization)
- The development of the host country, especially the availability and quality of human resources in the host countries

Empirical findings suggest that TNCs from countries of different origin tend to have different strategies on decision-making structures, which in turn affect localization practices.

According to two studies by Dunning of 205 U.S. affiliates in the U.K. in the 1950s and 22 Japanese firms 30 years later, significant differences in the decision-making structure between the two groups were observed. Japanese TNCs tend to employ a higher proportion of Japanese to local staff but normally conform to the national standard on wages, and are very careful not to poach employees from other firms. U.S.-based TNCs, on the other hand, tend to provide much higher financial incentives than the competitive wage. Unfortunately, Dunning's study did not analyze the impact of industrial development or product type on the decision-making structure.

Hiring Policies

Hiring policies refer to the qualifications demanded from local candidates and the selection system adopted by TNCs.

Existing information suggests that the general qualifications of shop floor workers tend to depend more on the type of industry than on foreign ownership (Poapongsakorn, 1991). In the food-canning industry, where cleaning operations often result in unfavorable (damp and smelly) working conditions, workers with four to six years of education are required. Other industries, such as textiles and the production of electronic products, require at least six years of education. TNCs involved in electronics invariably require at least nine years of education. Regardless of origin, TNCs tend to recruit workers at the lowest ladder of each category.

Recruitment is generally conducted via newspaper advertisements, announcement posters pasted on the front of factory gates, and word of mouth by existing employees.

TNCs tend to pay substantial attention to the recruitment of management trainees. In a globalized TNC, staff are broadly divided into two categories: local staff and international staff. Among the local staff, there are also two broad categories: managers and operators. In

one of the TNCs interviewed, about 20-30 management trainees are recruited every year. An applicant has to hold at least a Master's degree from an internationally accepted university. Management trainees are viewed as young cadets who will one day assume the responsibilities of their superiors, and must complete an intense selection procedure which includes an IQ test, a personality test (an interview with middle management), and a written English expression examination. After such preliminary tests, a group of candidates are chosen to participate in a group discussion and respond to on-the-spot questions. Senior managers and directors are present during the discussion. Candidates are then prioritized and have a final interview with senior managers. Management trainees are recruited first as local staff members. After a number of years in service, those with the most potential will be upgraded to join the ranks of international staff.

Skill Formation and Training Policies

The potential skill-formation contribution of TNCs is seen in the difference in productivity between the factories of the mother company and those of its subsidiaries. In Thailand, the productivity gap between a mother company's factories in Japan ranges from 1:1.4 to 1:1.5 in the car battery and the car assembly industry (Koike, 1987). For shop floor workers, skill formation of unskilled workers comprises an increase in:

- the ability to perform at greater speed and accuracy
- the ability to deal with unusual operations (i.e., changes in output mix, input mix and labor mix)
- the ability to locate problems and defects and make corrections

On-the-job training is a major form of skill acquisition for unskilled and semi-skilled staff, and is usually obtained through plural jobs and the ability to cope with unusual operations.

One way to measure the extent of successful skill formation concerns the career span of employees. An empirical study of indigenous Thai firms, Japanese-Thai joint ventures, and Japanese firms reveals that lengthy service is a normal practice for workers in such companies (Koike, 1987). Workers were able to advance in all cases. The career span for employees was shortest among Thai firms and longest among Japanese firms. That of employees of Japanese-Thai joint ventures was in the middle. This may be explained by the relatively low level of education of Thai workers. Skill formation through on-the-job training requires a certain level of formal education, which provides an understanding of the structure and functions of machines and products. Career advancement was found to be relatively slow in

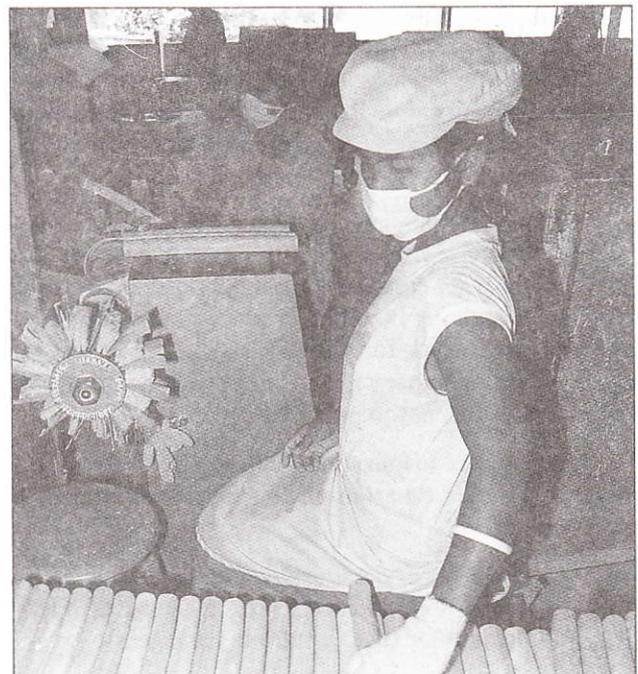
Japanese TNCs, which was compensated to a certain extent by higher fringe benefits and social security.

An ILO research project on the training practices of 15 multinational enterprises suggests that TNCs provide significant training to all categories of personnel, but the training is uneven and specialized. More emphasis is given to medium- and higher-level managerial and technical staff (ILO, 1981).

Interviews support the hypothesis that firms invest more to train high-level staff than low-level staff. For high-level staff of relatively small firms, local or foreign training is usually outside the firm, as the cost of in-house training is high. In the case of larger firms, training may be conducted in-house, outside the firm, or overseas.

One of the TNCs interviewed noted that investments for management trainees begin with recruitment. A TNC executive indicated that training programs are set for each level of staff: Three to five weeks for management staff and trainees, 10 days for supervisors, 12 days for sales staff and four days for operators. Training is mostly in-house, except for management trainees whose training program comprises: a) special lectures by external experts, mostly from local universities, b) overseas training wherein regional affiliates in East Asia and the Pacific generally collaborate and take turns in organizing training, and c) company business schools.

Another TNC, specializing in oil exploration, has a similar training pattern, although the content differs because of the nature of its business. Employees are



Training of unskilled and semi-skilled staff generally results in higher rates of output and reduction of defects.

classified into two categories, local and international employees, and three ranks—junior, senior and executive. Training is provided to staff at all levels, but is most intense for the senior technical staff. New recruits for senior positions are mainly engineers with at least Master's degrees and good communicating abilities. The first training course is an orientation program that describes overall corporate activities and philosophy to new recruits. Next, new recruits must participate in a cultural training workshop, during which foreign staff are informed about the "do's and don'ts" of the country of duty station. At the same time, local staff participating in the workshop learn to readjust their work habits and attitudes. For example, in the Orient it is customary for employees to listen obediently to a superior. If they hold different ideas, they have to find a way to indicate those ideas indirectly and quietly. In the cultural workshop, they are encouraged to speak out.

In the case of highly technical jobs, training is standardized and follows a fixed schedule. For instance, senior technical staff spend three months in Europe at a training center that is equipped with modern devices and machinery to simulate actual situations in exploration fields. Instructors are generally experienced senior staff. When the staff return to their duty stations, they participate in annual in-house training programs which comprise courses on industrial relations and psychology, negotiation techniques, communication and reporting skills. All senior staff in all duty stations follow exactly the same pattern of training, so that should a position be vacated unexpectedly at a critical time, a counterpart from any other duty station can easily be substituted, with only minimal disruption to production flow or work schedule.

As with the previous case cited, after a few years, local senior staff members with high potential may be offered an international staff position, which will enable them to move up to a different pay scale and eventually on to an executive career. International staff are expected to work outside their home country throughout most of their careers.

As regards American and European TNCs, overseas training is limited to senior technical staff. Japanese TNCs, however, send a larger group of technicians and engineers to train in Japan before the start-up of a factory. Studies in the 1970s and early 1980s (Santikarn, 1981, 1984) suggest that training is more generously provided by Japanese TNCs, but usually does not exceed six months. Toward the end of the 1980s, a new situation emerged as a large Japanese TNC reportedly sent a large group of semi-skilled workers and engineers to Japan for an extended training period. This coincided with a period of acute labor shortage among Japanese industries. Because of their trainee status, the Thai workers received lower wages. Engineers who returned from Japan claimed that the training consisted mainly of stock and

library supervision and was not related to technical and research development (Pornavalai, no date). That particular TNC was accused of exploiting cheap trainee labor.

After intensive and costly training programs, how can TNCs retain their employees? The interviews reveal that major U.S. and European TNCs in the fields of oil exploration and consumer products have agreements not to poach employees from one another. Earlier studies suggest that the same practice applies in Thailand's car assembly industry, which has been dominated by Japanese TNCs (Puapongsakorn, 1991). Employees often have to sign contracts with TNCs agreeing to return and work for a specified time period following overseas training. In 1989, a Japanese TNC took a local employee to court for breach of employment contract (Pornavalai, no date). The employee had promised to work for the company for at least twice as long as his training period in Japan, but the employee left the company on his return to Thailand. Poaching of engineers by small or new enterprises and job hopping have both become more common. A recent development among firms is the attitude that foreign engineers may have to be imported.

A TNC employee interviewed indicated that he had to sign a contract with his employer stipulating that, in the event he left the company, he agreed not to use the knowledge and information acquired from that company in his next employment for at least two years.

Appraisal and Promotion

Appraisals are regularly made by the immediate superior and, as a rule, those appraised are informed of the outcome. Promotion is determined by a "best for the job" criterion, not by seniority. However, in one of the TNCs interviewed, women tended to be less preferred for several reasons. First, women were viewed as providers of diversified household services, including driving children to school. Thus, they had less time to devote to the company. Second, married women are more reluctant to travel overseas, but management staff are expected to internationalize after the age of 30. An overseas marketing officer or an export manager can expect to travel about 165 days per year. Finally, women tended to leave the company to help in their family businesses.

Localization Policies

The following discussion is best treated as observations leading to hypotheses for further testing, rather than as concrete research results.

In discussing the issue of localization, it is important to distinguish between three types of TNCs—globalized,

Japanese and small non-globalized. Globalized TNCs are those with operations worldwide and who have a relatively long history of transnational operations. In other words, they are multinational corporations in the true sense, i.e., they cease to be national firms although their headquarters may be based in a major city of the country of origin. The international staff are multinationals who strictly follow corporate goals and strategies. These TNCs will source for the most productive resources, including human resources, to maximize profit. They generally have two categories of employees. Local staff with high potential will be offered international staff positions, provided they are willing to be stationed overseas. Thus, host countries may eventually lose high-potential local staff to TNCs.

An interview with a former executive of a U.S.-based automobile firm reveals that in the late 1960s and early 1970s, the pool of local professional managerial staff was small. In those days, the better educated tended to be from well-to-do families and would usually join the public sector or their own family businesses. It was difficult for TNCs to recruit large numbers of high-quality local staff because to be an employee of a foreign firm was not as prestigious a job as those in the public sector.

In the 1980s, as the pool of local professionals began to grow and the salary scale of the public sector lagged behind that of the private sector, the status of government officials became "the new poor," and there was a brain drain from the public to the private sector. Two local executives of TNCs confirmed that it is still quite difficult to convince local staff with high potential to become international staff, as they do not like living outside the country.

In another TNC, the chairman of the company is local. The number of expatriates varies according to need e.g., the opening of a new production line which would temporarily increase the number of expatriates. In addition, some expatriates are despatched according to internalization policies which encourage staff to have opportunities to internationalize. These expatriates normally stay four years or less. Local staff above management level must be prepared to be despatched to other overseas affiliates as well. The employment policy calls for management trainees to begin their careers in the appropriate country of origin, completing a basic training period of three to five years, after which they will be sent overseas to broaden their international experience and perspective. Finally, toward the end of their careers,

Table 1 Localization of Foreign Firms in Thailand

ISIC	Industry	Foreign Firms			Thai Firms		
		F.MD	T.MD	N.A.	F.MD	T.MD	N.A.
31	Manufacture of food, beverages and tobacco	19	7	12	2	109	91
32	Manufacture of textiles, wearing apparel, leather	14	6	17	2	76	42
33	Manufacture of wood and wood products, including furniture	1	2	0	0	11	10
34	Manufacture of paper and products, printing and publishing	2	1	1	1	18	10
35	Manufacture of chemicals, petroleum, coal, rubber and plastic products	38	11	25	3	84	55
36	Manufacture of non-metallic mineral products except products of petroleum and coal	2	1	1	1	19	8
37	Basic metal industries	3	4	4	0	21	10
38	Manufacture of fabricated metal, machinery and equipment	24	10	24	1	55	18
39	Other manufacturing industries	1	2	4	0	9	9
Total		104	44	88	10	402	253
Total Number of Firms		232			662		

Notes: F.MD = Foreign managing director
T.MD = Thai managing director
N.A. Data not available

Source: Compiled from *Million Baht Business Information Thailand 1989*. International Business Research, Bangkok.

they can expect to retire in their country of origin. Each subsidiary is expected to make maximum use of local staff. For globalized TNCs, if local employees have high potential, the issue of national concern is not localization but international brain drain.

Japanese TNCs behave rather differently from other TNCs, in that their international staff are almost entirely Japanese. It is believed that, while western TNCs attempt to encourage their staff to adopt the corporate culture of a particular TNC, the staff of Japanese TNCs must first adapt to the Japanese business culture, before the corporate culture, as Japanese TNCs retain more national traits than other TNCs. Local staff therefore need to become familiarized with Japanese work ethics and business culture. In other words, a Japanese TNC may be internationalized in its operations, but not in its internal business culture. Part of the reason may lie in the need to communicate with high-ranking executives at the headquarters. Consequently, localization in Japanese-related TNCs can become a major issue of concern for host countries.

In the 1970s and early 1980s, Japanese joint ventures tended to use more expatriates than their western counterparts (Santikarn Kaosa-ard, 1984). Moreover, joint ventures with Japanese TNCs generally involved trading and manufacturing partners, and thus tended to adhere to established functional specialization according to their comparative advantage — i.e., the Japanese trading companies specialized in the import of machinery, the Japanese manufacturer specialized in production, and the local partner specialized in local distribution. The possibility of localization in trade and production was, therefore, limited.

When the yen appreciated dramatically following the 1985 Plaza Accord, Japanese joint ventures were forced to hire and upgrade local staff to more important positions.

TNCs from developing countries are mostly regional TNCs and have only a few branch operations. These TNCs have a relatively recent history, and many are family businesses. Their connections are typically overseas Chinese connections. Presently, there is little information on these TNCs.

It was observed during the interviews that the stage of development of the host country could affect a TNC's strategy of localization. Within the consumer products industry where advertising is an important marketing means, TNCs that appointed high-ranking officers from the local staff tended to be more successful, as the local employees were more familiar with local tastes. The wider the income gap between the host and the home country, the more important the contribution of the local staff. As the income gap narrows and telecommunications improve, a TNC's strategy is likely to be more centralized and globalized as regards marketing and

advertising activities (e.g., Coke, Pepsi), and local staff, unless they are international staff, would become less important.

The extent of localization in Thailand can be roughly approximated by the nationality of the managing director. The information in Table 1 was compiled from company data in *Million Baht Business Information Thailand*. Foreign firms are defined as firms having more than 30 percent foreign ownership. Of 148 foreign firms for which the data were available, 44 firms (30%) had a local managing director.

CONCLUSIONS

The preliminary findings of this paper confirm earlier ILO studies which conclude that TNCs' training is significant and of high quality, but that benefits tend to be specific to and internalized by TNCs. As for factors which influence localization, this study suggests a number of possibilities: the human resource base of the host country, the age of a TNC and its corporate strategy, the development gap between the home and host countries, and the type of industry concerned. This study also emphasizes the need to distinguish between the three different types of TNCs — globalized, Japanese and small TNCs from developing countries.

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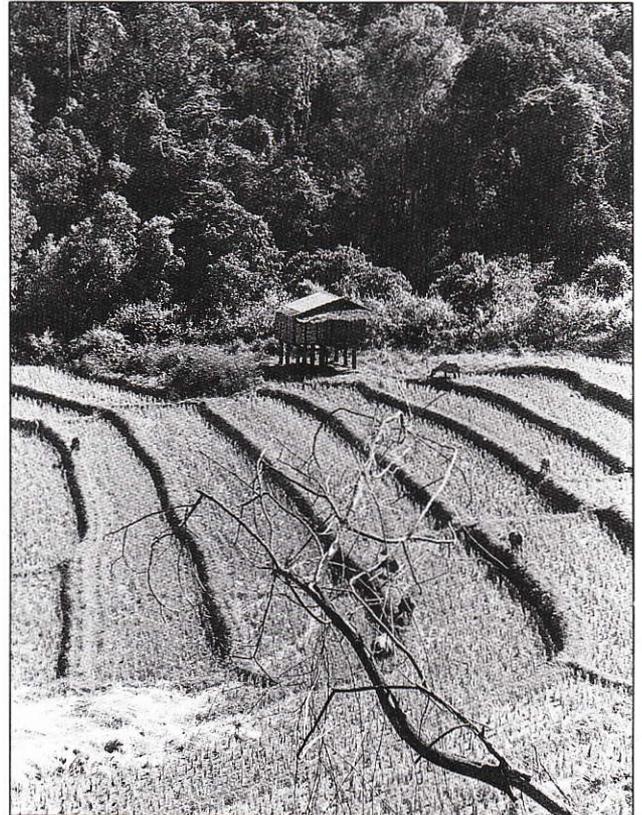
The Value of Thailand's Forests

Claudia W. Sadoff*

Thailand is a resource rich country, endowed with a wealth of natural resources and a varied topography and climate. These natural assets have been exploited in Thailand, as they have been in most countries fortunate enough to face such an option, in efforts toward economic development. The result is a trade-off between environmental and economic priorities. Judging from Thailand's exceptional gross domestic product (GDP) growth and economic progress, it seems that the country's chosen balance of exploiting natural wealth for economic gain is sound. Unfortunately, it isn't quite that simple.

Environmental costs are not fully reflected in conventional economic growth indicators.¹ Economic statistics focus exclusively on market transactions. As a result, wherever the market fails to reflect the full social value of a resource, economic indices will do so as well. (Social value is the value of a product or service to society, while market value reflects payments made by firms or individuals in formal markets.) Distortions often occur between social values and market value. In the case of natural resource exploitation these distortions arise primarily from externalities, costs to society which are not paid by those who create them. For example, if a logging company cleared a forest which had provided soil retention for downstream farms, erosion and siltation costs would be borne by the farmers, not the loggers. Logging would therefore prove economically productive in a market sense, by increasing loggers' income, but in the larger social context the costs of the activity might well outweigh the benefits.

A second important factor is the issue of time. The economic effects of ecologically unsound policies are generally lagged and cumulative in nature. After a long period of exploitation and degradation, which may appear extremely economically successful, thresholds will be reached at which the environment's assimilative capacity or a resource's regenerative capacity will finally be exceeded. Yet the economic statistics used by policy makers will have provided no warning of eminent decline.



If Thailand's resources are being undervalued and over-exploited, a real decline in the country's wealth will take place without being fully reflected in official economic statistics, and the country's long term economic strength will appear more robust than, in fact, it is. As long as economic indicators such as the GDP do not adequately reflect environmental and natural resource costs, the long term ecological viability of economic policies cannot be assumed by simply referring to current economic success.

For these reasons, the role of natural resources and the environment in economic development must be carefully examined, both qualitatively and quantita-

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tively. This paper examines the role of forests in Thailand's development.

NATURAL ENDOWMENTS

Thailand covers a land mass of 513,115 square kilometers, divided into four regions: the northern mountainous region, the northeastern high plateau, the central alluvial plain, and the southern peninsula. Located in a tropical monsoon region of Southeast Asia between the Andaman Sea and the Gulf of Thailand, the country is subject to three distinct seasons. In the cool season, from November to February, the prevailing northeastern winds bring dryness and cold temperatures from mainland China. May to October is the rainy season, when the southwestern Indian Ocean monsoons bring rain and humidity. Occasional typhoons and depressions originating in the South China Sea also contribute to the rainy season weather pattern, often causing serious flooding. The third season, March to April, is extremely dry and hot.

This climate is host to a heterogeneous mix of forest types which can be broadly divided into evergreen and deciduous forests. Evergreen forests, accounting for slightly less than half of the total forest area, are generally found in the zones with the greatest amount of rainfall, the coastal and peninsular areas and river valleys. Tropical rain forest is the predominant type of evergreen forest in the country, and is concentrated in the wettest areas. Deciduous forests occupy the drier areas found farther inland or on steeply sloped mountains. There are over 150 commercially valuable tree species in Thailand.

FOREST POLICY

All forest lands and forest resources in Thailand are considered property of the state. In the nineteenth century, the Early Bangkok period, forests were held by the feudal lords, who, in cooperation with foreign logging companies, over-exploited the teak forests. Various regulations were enacted by the government, for example, the requirement that western logging companies replant four teak seedlings for every tree cut. These ambitious and far sighted policies understandably were difficult to enforce. Estimates suggest a rate of teak harvest that was three and a half times the rate of a sustainable yield in 1895.² To protect and manage the forests, the Royal Forestry Department (RFD) was established in 1896, and by 1899 the government had full ownership and control of all forest lands.

The country's seven National Economic and Social Development Plans (1961-96), have all set targets for the proportion of the country which is to remain under forest

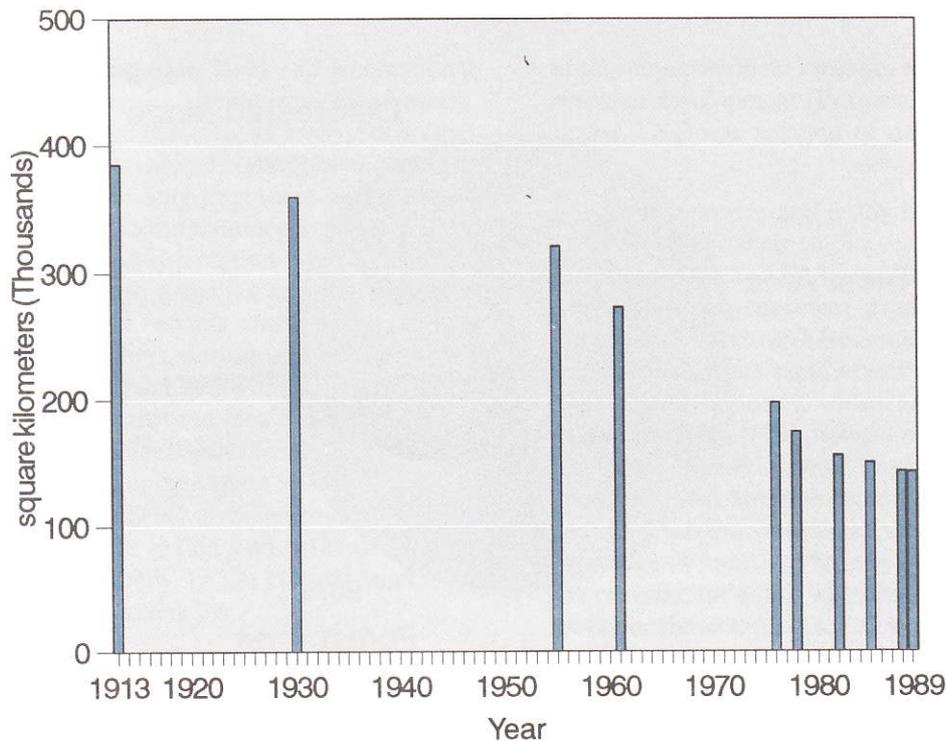
cover – proposing reforestation, conservation, and tree plantations to achieve these aims.

In the First Plan, a 50 percent forest cover target was set for Thailand's total land area. The Fourth Plan revised the target to a more realistic 37 percent. Yet forest cover fell to 29.4 percent by 1985, at which time the National Forest Policy was approved by the Cabinet. A central goal of the policy was to increase forest cover from the actual 29 percent to a new target of 40 percent, specifying that 15 percent of the country's land area be set aside for forest conservation, while 25 percent was to be designated for productive forest uses. Tree planting programs were to focus on fast growing commercial species and community forestry projects. The recently launched Seventh Plan (1991-96) increased its target for conserved forest area from 15 to 25 percent of the total land area in the country. This designation as conserved forest will allow application of the country's strictest controls to these areas.

Logging methods for concessions in productive forest areas have also been legislated. Selective cutting was the standard, and legally required, method of logging until 1985. The Fifth Plan (1982-86) called for a shift from selective cutting to clear cutting in forest timber concessions, with the recommendation that replanting of logged areas take place immediately. This shift in cutting practice was based on the belief that clear cutting was more appropriate to prevailing socioeconomic conditions, that natural forest regeneration has generally been inadequate, and that clear cutting requires less total forest area. At the end of the Fifth Plan in 1985 the system of clear cutting became law in the National Forest Policy. Currently, commercial logging is banned in Thailand. A Ministerial Decree terminated all forest logging concessions in January 1989 following the disastrous floods and mud slides of late 1988. The severity of the slides was believed to be a consequence of soil erosion resulting from deforestation.

Forest Area

Despite Thailand's long history of forest management, deforestation remains a serious problem. At the beginning of the twentieth century over 75 percent of Thailand was covered in forest. By the time of the First Plan, 53 percent of the country had forest cover. Since then, the forest has shrunk at an annual average rate of roughly 2.5 percent, with higher rates in the decade of the 1970s. Calculations derived from LANDSAT images in 1989 showed that only 27.95 percent of the country's total land area was covered by forest (Figure 1). In the past thirty years, over 130,000 square kilometers have been lost. A forest area roughly equivalent to this loss, 143,417 square kilometers,³ remained in 1989.



Source: Richards and Tucker (1988), RFD (1989)

Figure 1 Total Forest Area in Thailand (1913-89)

Causes of deforestation include logging, encroachment for agricultural purposes, and urban and infrastructure development. In Thailand the predominant pattern of deforestation appears to have been one in which commercial logging ventures first enter and create access into the forests, quickly followed by agricultural cultivation which prohibits regeneration of the natural forest. Reforestation has been an important function of the RFD. The RFD has also provided support for private and community tree planting programs. Yet the sum of all of these efforts reforested 6,968.94 square kilometers by 1989, roughly 5 percent of the area deforested since 1961 (Figure 2).

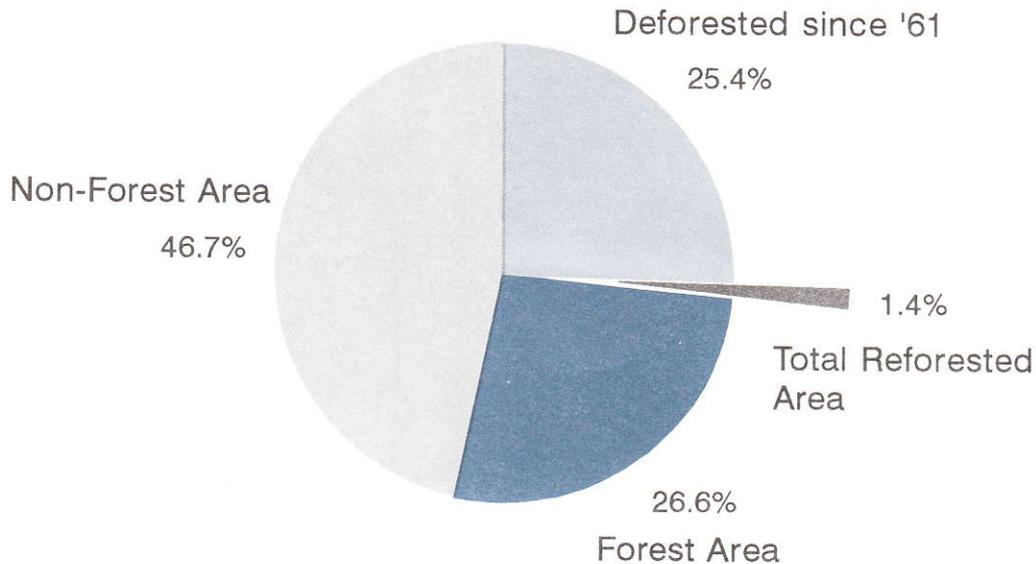
One of the issues which complicates reforestation is land tenancy and ownership. Denuded forest areas that are deemed appropriate for replanting are very often inhabited by farmers. It is estimated that 22 percent of Thai villages are located in national forest reserves, with some 8 million people living and farming there.⁵ Thus, when replanting takes place farmers are displaced. To address this issue and safeguard the rights of the forest dwellers, the government is currently piloting a number of land titling and usufruct rights programs. It is hoped that land titling will encourage the adoption of sustainable agricultural practices and land improvement programs. However, whether reforestation rights are purchased from the inhabitants or leased from the govern-

ment, the result tends to be that the displaced farmers encroach farther into the remaining forest for farm land.

Forests and Economics

Thailand's disappearing forests suggest a significant decline in natural wealth, yet economic statistics show remarkable and consistent growth. The country has followed an enviable development path from subsistence agriculture, to commercial agriculture, toward a complex industrializing economy based on industry and services. In the 1980s alone, the share of agriculture in GDP dropped from over 23 percent to roughly 15 percent. The share of the labor force employed in agriculture remains substantial, however, at over 60 percent. As a result, while Thailand's GDP per capita in 1988 was over 27,000 baht, more than 75 percent of those in agriculture earned 9,000 baht or less.

This shift towards the production of goods and services and away from agriculture will continue. During the Seventh Plan, industry is projected to grow at an annual average rate of 9.5 percent, while agriculture will grow significantly more slowly at only 3.4 percent, for an overall economic growth rate expected at 8.2 percent. By the year 1996 the workforce is expected to comprise 58 percent agricultural workers, with the remaining 42 percent in non-agriculture sectors.



Source: RFD (1989).

Figure 2 Changes in Forest Cover (1961-89) (percent of Thailand's total area)

Forestry represents a small and declining portion of the Thai economy. Commercially marketed forest products include timber, wood products, fuelwood and charcoal, rattan, bamboo, and wood tars. Yet in 1990 forestry accounted for only 0.5 percent of total GDP. The fact is that forest products have not played a large, direct, income generating role in Thailand.

Unfortunately for the forests, the services they provide to society are generally not quantified in monetary terms. Nonetheless they are quite valuable. As long as these services remain unvalued, forests can disappear without apparent harm to the economy, although the loss of these services clearly affects the welfare of the population.

In some cases, services are not valued in the economy simply because they do not enter formal markets. It is assumed, for example, that large quantities of food and fuelwood are collected from forests for individual use or sale in non-formal markets. The apparent consumption⁶ of fuelwood and charcoal in 1989 was roughly 848,000 cubic meters. Estimates⁷ of actual use in Thailand, however, range from 35.6 to 64.1 million cubic meters per year. Assuming the more conservative estimate, this suggests that well over 34 million cubic meters of fuelwood and charcoal were produced and consumed outside the formal market. This represents a value of over US\$ 450 million⁸ worth of forest production which is not recorded in national income, a figure greater than the total recorded contribution to GDP from all forestry-related production. Should this sizable non-formal production

of fuel be stopped due to forest depletion, it would represent a real hardship to the poor, rural populations who depend on the forests. Yet there would be no indication of this loss in the economic statistics. In fact, the national income would increase because those who previously collected fuelwood would then need to purchase fuel in formal markets, contributing to the growth of the market economy.

In some instances forest services remain unvalued because there is no simple market proxy to price them. Forests provide a habitat for both wildlife and vegetation which embody a wealth of genetic diversity, and potential medicinal and nutritional values that are as yet unmeasured. They also provide various recreational services. In Thailand there are 52 National Parks, 57 Forest Parks, as well as numerous wildlife sanctuaries, botanical gardens and arboretums. The majority of these parks are open and accessible for recreation, many even contain luxurious amenities, and they are used widely by the Thai public.

On a global level, forests represent 'carbon sinks.' Forest vegetation absorbs carbon, thereby reducing atmospheric carbon dioxide which is believed to contribute to global warming. In addition, it is believed that forest cover influences heat exchange at the earth's surface, leading to increased rainfall.⁹ Despite the obvious value of these services to society, they have no accepted or recorded economic value.

A final example of the difficulty in valuing the services of Thailand's forests, is the relationship of forests



A Ministerial Decree terminated all forest logging concessions in January 1989 following the disastrous floods and mud slides of late 1988.

to agriculture. It would appear that clearing forests for cultivation is highly profitable. This, however, is only true in moderation. Forests act to stabilize soil, which in turn limits erosion, siltation and flooding. As forests are cleared there will come a point at which the losses associated with soil instability will outweigh the gains provided by the extension of agricultural area. A study by Panayotou and Parasuk found that while converting forest lands for cultivation produced a net social benefit in terms of agricultural production during the 1960s and 1970s, the cumulative effects of deforestation now lead to a net agricultural loss when additional areas are cleared for cultivation. Surprisingly, reforestation should now lead to an increase in agricultural productivity. Diamant estimated that for Thailand in 1987, the direct cost of soil depletion resulting from swidden agriculture on forested land was US \$50 million.

Conclusions

The forests are natural and social assets that are extremely complicated to value, but too valuable to ignore. The services provided by forests are complex and often subjective in their nature, they accrue to too many parties over too many time periods to be easily summed up in a 'back of the envelope' monetary calculation. There is some objection to the very concept of attaching a monetary value to nature. Yet, as long as no clear value is assigned to what society loses when forests are cleared, economic incentives will lead to over-exploitation.

It is likely that forest conservation and reforestation will not directly benefit Thailand's apparent economic

strength. Yet it is fairly clear that further destruction will hurt the economy, most visibly through agricultural losses resulting from soil erosion. Less visible, but equally significant, would be the loss in unrecorded income derived from the forest. In a larger context, the loss of Thailand's forests may effect global biodiversity and climatic conditions.

While the true value of Thailand's forests may be impossible to quantify, it is clear that questions concerning forests, natural resources, and environmental management, cannot be dismissed by pointing to economic success.

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Endnotes

- 1 There is currently serious debate in the literature that the asymmetric treatment of natural and man-made assets in the construction of growth indicators such as the GDP, leads to an undervaluation of resource depletion and environmental degradation, hence an overvaluation of resource related income vis-a-vis income generated from reproducible capital.
- 2 Bhumibhamon, 1986.
- 3 This figure includes reforested areas.
- 4 Technically, these settlements are illegal, though in many cases the villages were settled before the establishment of the national reserves.
- 5 Calculated from RFD statistics as production plus imports, less exports.
- 6 Various studies quoted in Bhumibhamon, 1986.
- 7 This figure was derived using import prices of fuelwood and charcoal reported for Thailand by the Food and Agriculture Organization of the United Nations. If forests were depleted, consumers would be forced either to import or to switch fuel sources.
- 8 See Wyatt-Smith, 1987. 

National Urban Development Policy Framework

Summary of Major Findings*

The National Urban Development Policy Framework study is a National Economic and Social Development Board (NESDB) project, funded by the United Nations Development Programme (UNDP), with the research components carried out by TDRI. The project entails descriptions and analyses of the rapid changes occurring in the Thai economy and the impact of these changes on urbanization patterns and urban development issues in Thailand. The study consists of seven interrelated areas which examine specific issues concerning urban development, including demographic trends, national and regional economic growth, urban-regional spatial strategy, financing urban infrastructure, environmental degradation, changing land use patterns, the urban poor and institutional concerns. In addition, the study provides specific recommendations regarding urban policy recommendations related to projects, programs and strategies to be implemented during the Seventh National Economic and Social Development Plan.

URBAN DEVELOPMENT PATTERNS AND PRIORITIES

Dramatic increases in urban growth, both in the Extended Bangkok Metropolitan Region (EBMR) and in the regional cities, is predicted during the next fifteen to twenty years. It is likely, moreover, that Thailand will be almost 50 percent urbanized by the first decade of the next century. The implications of existing patterns of urban development on future urban growth indicate that a variety of urgent measures are required to facilitate economic growth and opportunities, as well as provide all Thai citizens with an adequate quality of life.

The major trends of urbanization in Thailand follow those of Bangkok and its region. Urbanization in the EBMR tends to take place along major highways and

roads leading from the central core toward a variety of other major urban centers. Ribbon development along the main routes leading out of and into the metropolitan region contribute to the almost unparalleled levels of traffic congestion experienced by Bangkok residents, and severe environmental degradation at the same time as it substantially increases the cost of necessary infrastructure.

The lack of access and distributor roads in both the inner and outer areas of the BMR also exacerbate the traffic congestion in the metropolitan region. Similarly, the absence of an effective or efficient mass transportation system ensures further that transport conditions will continue to deteriorate in the near term as more and more people can afford to buy and operate private vehicles under conditions of rapid economic growth. Without a coordinated and integrated effort to improve the road distribution and public transportation facilities in the BMR during the Seventh Plan, Bangkok is predicted to grind slowly to a halt.

The increasing numbers of people and levels of manufacturing activity concentrated in and around all urban centers in Thailand is leading to dangerous levels of both air and water pollution. Water pollution has resulted in septic *klongs*, or canals, within much of the BMR and in a few regional cities, while the levels of lead found in Bangkok's air are associated with brain damage and birth defects in both young children and mature adults.

Immediate investment is required in water supply and treatment facilities, sewage treatment plants and solid waste collection and disposal infrastructure in both the BMR and regional cities to prevent further destruction of the environment. In addition, national standards for air and water quality, with effective enforcement mechanisms, will need to be implemented during the

* This summary is part of the Executive Summary of Study Area 8 of the National Urban Development Policy Framework project, "Recommended Development Strategies and Investment Programs for the Seventh National Economic and Social Development Plan (1991-96)," prepared by Amrita Daniere and Chalongsob Sussangkarn.

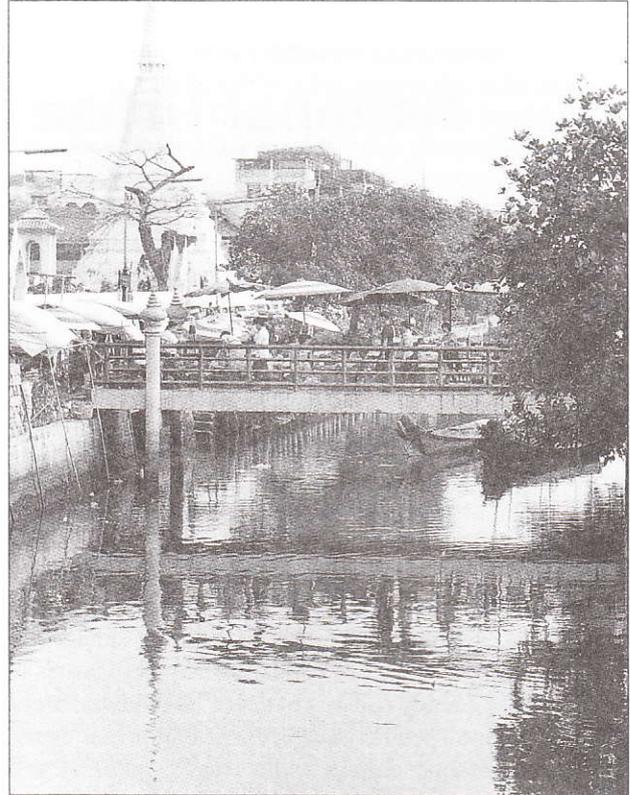
Seventh Plan to prevent major public health expenditures, particularly in Bangkok. Finally, the creation and implementation of an Environmental Impact Fund, financed through the contributions of both industrial and residential developers, will facilitate the implementation of the “polluter pays” principle and allow the government to construct the infrastructure necessary to support further levels of industrialization and urbanization.

Thailand has never had a history of zoning to control land development and use. In addition, urban infrastructure is implemented by a variety of agencies, often at cross-purposes with one another. The resulting urban sprawl of mixed land use and inefficient use of land is costly in terms of the needless destruction of agricultural land, as well as the inefficient provision of infrastructure. The enforcement of existing land use regulations, as well as the use of tax mechanisms to create appropriate land use incentives, are two of the major strategies recommended to deal with these issues in both the short and long terms.

PROPOSED SPATIAL DEVELOPMENT STRATEGY

Given the intensive rural-urban transformation now beginning in Thailand, the answer to the question of where the annual increases of several hundred thousand people in urban population will reside—in which cities in which regions—will have long-term, lasting impact on the formation and integration of the national urban and regional system. Based on past performance and recent indicators of structural change, it appears that, between 1990 and 2010, all the major regions of the country will have absolute increases in population, but only two, the EBMR (the BMR plus the Eastern Seaboard, Chachoengsao, Ayutthaya and Saraburi) and the south, will increase their share of the national population. In the southern region, the increasing share will be due to continuing relatively high rates of population growth while, for the EBMR, the major share of population increase will be from migration and, secondarily, reclassification of rural to urban areas. Even with an assumed slow-down in the population growth of the BMR, it is still expected to garner one-third of Thailand’s total population increase between 1990 and 2010. In absolute terms, the EBMR region will absorb another five million people over the next twenty years.

It is apparent that the effects of Bangkok’s urbanization are no longer limited to just the five neighboring provinces. The economic growth of the region is spreading beyond the closest provinces to Ayutthaya and Saraburi in the north, Ratchaburi and Phetchaburi to the west and all along the coast toward the east, including the provinces of Chon Buri, Chachoengsao and Rayong. The spatial development pattern of urban areas outside of the BMR mirror those within the five provinces.



Water pollution has resulted in septic canals.

In recognition of these trends and development patterns, the government has accepted the view that the lack of land use control in the past had caused uneven and inefficient land use in all directions. The ribbon development seen along the major roads will continue to expand along the major transportation networks and very fragile areas, especially along the Bang-Na Trat Highway. While well-managed and designed infrastructure provision can be used to solve and control the existing problems, historical provision of infrastructure has been very unsuccessful at guiding land use development. Infrastructure provision in the region has lacked the institutional set-up to adequately coordinate and implement infrastructure projects. The strategy offering the most potential for addressing these problems is the creation of a national level committee, called the EBMR Development Committee (EBMRDC), charged with responsibility for establishing policy within the EBMR.

The analysis of the urban spatial development of Thailand also revealed major changes in the existing hierarchy of urban centers. The urban hierarchy analysis, which focuses on determining the economic potential of urban centers, identified a number of different types of urban centers and the need for linkages between them, both within the EBMR and throughout other regions. The classification system ranks urban center between (1) highest and (5) lowest in terms of economic

potential, based on rankings developed from socio-economic data and is presented in Part 4 of this report.

The policy recommendations stemming from this analysis include constructing more and better transportation and communication linkages between urban centers within the BMR, and emphasizing a variety of different “roles” for urban centers in all the regions of Thailand. The data confirms that improving the pattern of urban growth, both within and without the EBMR region, requires implementation of policies which actually expand economic opportunities in urban and regional areas throughout the Kingdom.

The design of more successful urban and regional development programs calls for a broadening of urban planning practices, which are now primarily focused on developing urban infrastructure for urban populations, to more explicitly include region-serving development functions, such as agro-processing services, regional marketing and communication functions, agriculture technology support activities and area-wide planning functions. This points to the need to develop and implement a “regional network” (cluster) strategy of urban and regional development in Thailand.

The central goal of a regional network strategy is to link a number of regional settlements into a tight network of interaction which, as a totality, has a greater potential for generating agglomeration economies than focusing on a single major growth center in each region. Rather than dividing the urban system into a hierarchy of “regional urban growth centers” or “second generation regional urban growth centers,” the network approach views all cities and towns within a region or subregion as members of a cluster of urban centers, the whole of which is greater than the sum of the parts. By integrating these centers through transportation linkages and institutional development, the artificiality of a central core can be overcome.

A regional network strategy will allow the government to target corridors between major urban centers as sites for industrial parks and include the provisioning of higher order services—hospitals, universities, recreation—in nearby towns to provide the type of living environment needed to attract skilled-labor management personnel. The approach is designed to enhance the coordinated expansion of regional clusters of cities and inter-urban corridors, rather than simply focussing on a single municipality. The high-technology industrial park being constructed in Ayutthaya illustrates this approach. Its location appears to have been determined by relatively low land prices, proximity to Don Muang—Bangkok’s international airport—and the possibilities for frequent access to the services and amenities of Bangkok.

FINANCING INVESTMENT STRATEGIES

The successful implementation of the priority recommendations and strategies described in this report requires adequate and efficient financing. The financial resources needed to fund the infrastructure components of urban development in Thailand are significant, running to about 525,000 million baht. This ambitious level of infrastructure investment must be funded from a variety of sources, including the central government and public enterprises, as well as local governments and the private sector. The role of these latter two entities, i.e., local authorities and private firms, is expected to be much greater than in previous Development Plans. As such, the majority of the financial strategies designed to increase the funds available for infrastructure investment rely principally on increasing resources available to local governments and on increasing and identifying privatization opportunities. Examples include:

Improving the efficiency of tax collection and widening of the tax base

Improve the administration and the tax structure of the Buildings and Land Tax and the Local Development Tax. Administrative modifications can be facilitated by the complete updating of tax maps and rolls. As part of this effort, the base of the Buildings and Land Tax will need to be expanded to include owner-occupied houses and public enterprises.

- In the long term, replace the Buildings and Land Tax and the Local Development Tax with a new property tax which is revenue-adequate, income elastic, equitable, incentive-oriented and structurally simple. The base of the tax should be the market value of the property and all properties should be subject to the tax.
- Share revenues generated from the Land (ownership) Registration Tax between local and central government. The share of local government should equal the proportion of their contribution to investments in local infrastructure investments.

Service fee improvements

Establish central government guidelines for fee imposition to be observed by local officials allowing the exact fee to be levied for any specific service to be left to the discretion of local government.

- Fees should be related to the cost of service and should be imposed whenever beneficiaries can be identified and the benefit clearly accrues to each recipient of the service. Initial efforts will focus on a review of existing fees. However, fee imposition may eventually be directed to the types of services which have formerly been provided free of charge.

Restructuring of the present municipal lending organization

Create a new organization, perhaps called the Local Government Development Corporation (LGDC), to facilitate funding of local government development and expand local investment opportunities. The sources of funding for this organization will be from (1) local governments, (2) the central government, (3) private financial organizations, and (4) foreign donors. The LGDC will operate independently under the supervision of the Ministry of Finance and be on a strict financial basis. The LGDC will assist local governments to develop investment projects that are potentially useful for the development of the local economy.

Establish a regional development grant

Establish a regional development grant to be allocated to local governments in high priority or targeted regions and to use to further the goals of the regional network strategy. The minimum area for the grants will be an entire province since an urban center cannot be developed in isolation without supportive development occurring in the rural areas surrounding the urban center.

Modernize the allocation mechanism

Revise the so-called general grant based on a per capita allocation basis to take into account local tax collection efforts. This will provide local governments with incentives to improve their tax collection efficiency.

Natural resource rebate

Introduce a natural resource rebate to compensate local governments for some of the revenues generated from the utilization of local natural resources which are captured by the central government.

- Design the rebate as simply as possible so that the portion of the value returned to local governments reflects the share of total value added contributed to the provincial gross product by

the sector in which the national resource has made some contribution.

- Define natural resources to include not only the traditional notion of mineral, forestry and fishing resources but also tourist attractions.

To facilitate and promote privatization schemes, contracting out of service provision and/or Build-Operate-Transfer projects or concessions, the government will need to devote substantial resources to the legal, financial and policy implications of various types of projects. At present, agencies are developing schemes, especially in the transportation and communications sectors, without regard for the economic costs and benefits of a particular undertaking or how it effects other agencies' plans. In particular, the government should establish a central coordinating body within the EBMRDC with responsibility for assessing privatization proposals at an early stage in their development. The coordinating unit will work closely with the sponsoring agency to ensure that the project is appraised from both an economic and a financial perspective, as well as note potential conflicts with other proposals and implications for future policy. The unit should have the power to amend or merge proposals at the inter-agency level or to reject schemes if they conflict with other projects or are irreconcilable with future policy considerations.

Institutional and Implementation Issues

The Sixth Plan has seen the Thai economy enter an unprecedented boom accompanied by rapid urbanization. This expansion will inevitably effect changes in the urban economy and society, especially in the BMR and its environs, regional cities in other parts of the country, and new towns in specific areas. The future expected urban and spatial development patterns will require more efficient urban management policies and more effective institutional set-ups than are currently in place to guide urban development in more appropriate directions. Changes in institutional structures to manage urban growth will be required particularly in (1) the integration of the BMR and surrounding areas into the EBMR, (2) rapidly growing development potential of regional cities, and (3) the eventual transition of Thailand into an "urbanized" economy.

The Extended Bangkok Metropolitan Region

In the context of urban management policy for the Seventh Plan and in line with the concept of viewing the Extended Bangkok Metropolitan Region (EBMR) in an integrated fashion, new institutional arrangements are needed at three levels, i.e., the policy level, the planning, evaluation and coordination level, and at the implementation level.

The establishment of an EBMR Development Committee (EBMRDC), with institutional responsibility for urban management within the EBMR, is expected to address issues raised at the policy level. The committee should be based on, and yet replace, the current BMR Development Committee. The membership composition of the EBMRDC should be at the highest political levels with the Prime Minister acting as Chairman and all the Deputy Prime Ministers serving as Vice-Chairmen. It is essential that the EBMRDC maintain this high level set-up so that decisions which cut across the responsibilities of various government agencies can be effectively implemented.

The EBMRDC needs to be assisted by a strong secretariat or joint-secretariat which has the capability to (a) plan the integrated development of the EBMR, (b) coordinate with various agencies having responsibility for development within the EBMR, and (c) evaluate major infrastructure projects in the EBMR (including privatization initiatives) to ensure that they are socioeconomically beneficial, do not duplicate each other, and are consistent with the desired development directions of the EBMR.

Of the three functions the third must be stressed since, currently, many infrastructure projects appear to be initiated without clear and transparent socioeconomic evaluations. The evaluation process should be based on internationally accepted methodologies and standards and completed evaluations should be made public and available for distribution to all citizens. This process will contribute substantially to the rationalization and depoliticization of major infrastructure decisions.

The secretariat must have sufficient technical manpower to perform the above functions in a timely and professional manner. It may be possible to either strengthen existing government agencies to be able to effectively carry out the tasks (primarily NESDB) or to set up a new specialized unit for the purpose.

Implementing the various major development projects in the EBMR will involve numerous agencies which will, in turn, require sufficient authority to enforce implementation and develop adequate coordination mechanisms. Authority is provided by the high-level nature of the EBMRDC. To further ensure implementation, it is suggested that projects get carried out through two types of institutional frameworks:

- Implementing subcommittees of the EBMRDC.
- New Urban Development Corporations with authority to implement urban development projects in specifically defined areas, such as the Eastern Seaboard, new towns, or urban fringe areas.

Regional Cities

Better management of urban development within regional cities during the Seventh Plan is very important in that the development of regional cities to their full potential will lessen regional inequality and income distribution. Regional cities and the role they play within their provinces and hinterlands, however, are so diverse that planning and urban development management should be decentralized to local urban centers or *changwats* (provinces). This will ensure that local knowledge of the comparative advantages and needs of the areas will be fully integrated into regional development investment packages.

The greater participation of local authorities in both political and economic arenas entails strengthening the existing regional cities development framework through the establishment of more effective organization at the local levels. More stress on a regional network approach to urban and regional development in Thailand will do much to justify and further the goal of greater local government authority. Implementation of the regional network approach will require significant investment on the part of the central government, particularly the NESDB and the Ministry of Interior, in the training of local officials. The training should encompass urban and regional planning skills, project selection and evaluation techniques, institutional strengthening, and managing the project implementation and monitoring process.

In addition, NESDB should substantially strengthen its various regional offices. More manpower and resources should be allocated to these offices and incentives established so that capable staff will be attracted to regional offices. The regional offices should be capable of preparing regional and provincial development plans in coordination with local officials. Furthermore, local municipalities should be allowed a larger and more direct role in formulating city plans than is currently the case. Improved land use development patterns will result from the design of town plans which rely on local expertise and knowledge. Regional offices of the Department of Town and County Planning should be set up and/or strengthened to support the training of local officials in land use planning and providing technical support for locally-developed plans.

Long-term Urbanization

In the long term, urban management in Thailand will require either a wholly new or significantly modified institutional framework. As urban centers proliferate and their interlinkages become more complex, urban management will need to be thought of in a national context. One approach to these changes is to envisage an evolution toward an institutional structure, based on

what is proposed for the short term. Another is to contemplate a radically new institutional set-up.

A logical evolution from the institutional framework outlined above is to gradually increase the scope of coverage of the EBMRDC to the national level. The committee could become a National Urban Development Policy Committee, functioning in a manner similar to the EBMRDC. In the long run, the secretariat of the EBMRDC will gain sufficient expertise and technical manpower to allow such an expansion in scope. Various implementation committees can be given responsibility for projects with substantively different urban problems and settings. Existing organizations, at the provincial and local government levels, will also have been strengthened over time so that they have sufficient autonomy to initiate projects for consideration by the National Committee, as well as the ability to implement approved projects.

This model has the advantage of building on an evolving institutional framework. Major shortcomings of the framework will already be known and solutions may have been found. The disadvantage with this approach is that the whole structure may well become unwieldy. As the scope of the committee expands, the membership of the committees and sub-committees will increase as well and, perhaps, cause the framework to become ineffective. Additionally, as the issues addressed by the committee multiply, the advantage of a committee separated from the Cabinet or Council of Economic Ministers becomes unclear. The specific sectoral areas of responsibility will have to be carefully defined to be effective as the area of coverage expands to the national level.

Alternatively, a new institutional framework might be contemplated. A new bureau, i.e., the Urban Development Bureau, or even a new ministry, i.e., the Ministry of Urban Development, or an Office of National Urban Development, could be created. The new ministry will encompass all urban governments under the same umbrella, as well as the Public Works Department, the Department of Town and Country Planning and other agencies primarily involved in the provision of urban infrastructure and services, including any existing urban development corporations.

This approach also has its drawbacks. Urban development involves so many different issues and agencies that putting all of the relevant agencies into a single ministry may usurp too many of the responsibilities of the existing ministries to be politically feasible. Furthermore, many of the various agencies to be absorbed currently serve both urban and rural communities which implies that a number of units will have to be divided. If, on the other hand, the scope of the new ministry is restricted, it may not be able to handle key urban development issues requiring the creation, once again, of some form of high-level policy committee.

While the implementation of one of several alternatives will be required to manage and facilitate the long-term urban and spatial development of Thailand, it is not clear, at present, which alternative will be most effective or politically feasible. Detailed cost-benefit analysis, as well as analysis of the institutional impact of various options will be necessary before a judgement can be reached. This assessment should be initiated during the Seventh Plan to allow the development of the required long-term institutional framework to begin in the near future. 

NEWSBRIEF

TDRI 1991 YEAR-END CONFERENCE "Educational Options for the Future of Thailand "

This year's TDRI Year-End Conference, to be held from 14 to 15 December at Ambassador City, Chon Buri, will have as its theme "Educational Options for the Future of Thailand." Her Royal Highness Princess Maha Chakri Sirindhorn has graciously consented to open the conference. Over 400 participants are expected to attend.

The conference will provide a major forum for examining Thailand's formal education system, its non-formal education and training systems, and on-the-job training.

Five themes will be covered:

- Education and Development of the Thai Economy: Reversing the Imbalance
- Education and Social and Cultural Values: The Changing Role of Teachers
- Educational Management: Public and Private Sector Roles in the Provision of Education
- The Changing Face of Agriculture: Designing Appropriate Information and Training Systems for Farmers
- Education and Training: Supporting the Development of Industries and Services

Overseas Government Officials Attend TDRI Seminar

TDRI's Sectoral Economics Program recently organized an executive seminar on "Managing Industrial Growth," hosted by Dr. Ammar Siamwalla, the Institute's President, and held from 10 to 17 November at the Dusit Thani Hotel. Senior government officials from China, Lao, Mongolia, Myanmar, Vietnam, and Thailand attended the seminar, sponsored by the Asian Development Bank, which aimed to provide participants with experience on the functioning of a market-oriented economy and the private sector's role in such an economy.

On Monday, November 11, participants visited TDRI for a panel discussion with Program Directors.

As part of the one-week event, TDRI arranged field trips to the Charoen Phokpand Group, the Siam Cement Co., Mab Ta Phud Industrial Estate, the olefins plant of the National Petrochemical Corporation, Lamphum Industrial Estate, and the Mae Moh power plant of the Electricity Generating Authority of Thailand.

Participants were also taken to visit the Stock Exchange of Thailand (SET), where they met with SET President Maruey Phadoongsidhi, and attended a slide presentation on the "Development of Financial Markets and Mobilization of Local Funds" given by Dr. Chaipat Shasakul, Senior Vice-President of SET.



From left to right, U Saw Myint, Managing Director, Myanmar Pharmaceutical Industry; Dr. Ammar Siamwalla, President of TDRI; Kikham Vongsay, Vice-Minister of Economy, Planning and Finance, Lao; and U Tin Maung Myint, Director General of the Ministry of Livestock Breeding and Fisheries, Myanmar.

UNOCAL DONATES 6.4 MILLION BAHT TO TDRI ENDOWMENT FUND



To support TDRI in the first step of its campaign to enlist support from companies doing business in Thailand, the UNOCAL Corp. has donated 6.4 million baht to the TDRI Endowment Fund. Pictured opposite, TDRI President Dr. Ammar Siamwalla receives the donation from Richard Stegemeier, UNOCAL's Chairman and Chief Executive Officer.

Policy Conference on Women's Roles in Rural Development

At the beginning of 1991, TDRI, in cooperation with the Population and Community Development Association (PDA) and the Organizing for Development, an International Institute (ODII), conducted a research project on Women's Organizing Abilities in Northeastern Thailand. To disseminate lessons learned and research findings, the National Commission on Women's Affairs (NCWA) and the three institutes mentioned above organized a policy conference on "Women's Roles in Rural Development" on October 11, at the Arnoma Hotel, Bangkok.

Over eighty participants from both governmental and non-governmental organizations and international organizations attended the conference. Minister Meechai Veravaidya, Minister of the Prime Minister's Office, opened the conference. Minister Saisuree Chutikul, Minister of the Prime Minister's Office and H.E. Johan H. Dahl, Ambassador of Norway, gave keynote speeches. Ms. Turid Sato (ODII), Ms. Somjitt



Ministers Meechai Veravaidya and Saisuree Chutikul.

Tipprapa (PDA) and Dr. Orapin Sopchokchai (TDRI) presented research findings. After the presentations, participants were shown a video film entitled "Threads of Change: Voices of Women in Development."

TDRI and NIRA Coorganize Seminar

The Science and Technology Development Program (STD), in collaboration with the National Institute for Research Advancement (NIRA) recently organized a seminar to discuss findings on a TDRI research project entitled "Development of Machinery and Equipment for Information Industries in Thailand," held at the Imperial Hotel, November 5, 1991.

SEP Organizes Conference

TDRI's Sectoral Economics Program (SEP) recently organized a conference on the "Impacts of Political Changes in Europe on Its Agricultural Policies," sponsored by the Ministry of Commerce and held at the Regent Hotel, on November 5.



Presiding at the seminar "Development of Machinery and Equipment for Information Industries in Thailand" from left to right, are Dr. Chatri Sripaipan, Director of STD, Dr. Narongchai Akrasanee, President of the GF Holdings Co., and Dr. Raichain Chintaya-rangsan, research fellow of STD.

Preparation for the United Nations Conference on Environment and Development (UNCED) in 1992

Thailand considers UNCED as an opportunity for world governments to move beyond the realm of rhetoric and initiate concrete steps toward international cooperation for sustainable development. The country's preparation for UNCED began in 1990, with the establishment of two committees—the National Committee on Long-Term Global Environmental Issues (NCLGE) and the National Preparatory and Coordinating Committee for UNCED (NPCC).

The establishment of NCLGE was initiated by the Ministry of Science, Technology and Energy (MOSTE) to assure broad-based participation by all sectors in the preparation of the National Report for UNCED. Under the chairmanship of the Minister of Science, Technology and Energy, NCLGE has brought in representatives from both governmental and non-governmental agencies (NGOs), working in the area of environment and development. Under this Committee, a Sub-Committee on the Global Environment, chaired by Dr. Dhira Phantumvanit, Director of TDRI's Natural Resources and Environment Program (NRE) and with TDRI researchers Dr. Chartchai Parasuk and Ms. Somthawin Patanavanich as members, was assigned to study the effects of national development strategies on the global environment to be used in the preparation of the National Report for UNCED.

The NPCC, chaired by the Permanent Secretary of the Ministry of Foreign Affairs, and including members of governmental and NGO organizations, has been representing Thailand in the international negotiating process. This Committee is also responsible for articulating Thailand's negotiating strategies vis-a-vis the issues addressed in UNCED and for determining the composition of the Thai delegation to UNCED, which will be graciously led by HRH Princess Chulabhorn, Director of Chulabhorn Research Institute.

Thailand's UNCED preparation involves three major activities: research on problems related to the global environment, preparation of the National Report for UNCED, and development of a national consensus on global environmental issues.

Research

Details of completed NRE projects follow:

Carbon Reduction and Energy Policy. Based on its first estimation of greenhouse gas emissions conducted in 1990, TDRI has studied the implications of carbon dioxide reduction for Thailand's energy systems. In collaboration with the East-West Center, the scope of the project has been expanded to incorporate the exploration of technology response options to deal with global climate change issues. The final report for this project

was a collaborative effort of members of the Sub-Committee on Global Environment, representatives from the TDRI, King Mongkut Institute for Technology, Electricity Generating Authority of Thailand, and International Institute for Energy Conservation.

Greenhouse Gases and Forest Policy. This study was conducted in collaboration with the Lawrence Berkeley Laboratory. The project was to estimate carbon flows associated with deforestation and changes in land use patterns in Thailand. The project were greatly supported by the School of Forestry, Kasetsart University and the Royal Forestry Department. The reports for the above two projects were presented at the National Symposium on Response Strategies to Global Warming and Preparation for UNCED organized by the National Environment Board and TDRI and held on November 4, 1991, at the Landmark Hotel, Bangkok.

Preparation of the National Report

Preparation of the National Report has been an open, interactive process in Thailand. Industry, NGOs, academics and governmental agencies were considered equal partners, responsible for drawing up the national strategies highlighted in the Report. The material for specific chapters was independently prepared by members of this diverse group, and consensus was achieved during regular meetings of the Technical Committee. This level of participation was to ensure a commitment to the strategies being proposed and in turn to ensure implementation of UNCED's recommendations.

Building a Consensus

Thailand has involved all sections of the community in the preparatory process for UNCED. It has not confined contributions to the government sector alone. This approach reflects the principle that the government alone cannot deliver sustainable development, but requires concerted effort on the part of business, NGOs and the public.

The National Symposium of November 4 allowed government agencies, research institutes, NGOs, the private sector, and the media to openly discuss the competing needs of the development process and environmental protection. Many of the organizations represented had made direct contributions to the National Report. The views expressed at the symposium were taken into account during the Report's revision.

Thailand's National Report was submitted to the UNCED Secretariat in December 1991 and will be disseminated worldwide.

PROJECTS COMPLETED

Cassava : Year 2001

As international trade negotiations increasingly raise uncertainties regarding Thai tapioca's long-term markets, the Ministry of Commerce and the Cassava Fund, have seen the need to examine supply potential and possible options for a more economic use of cassava. This study is the first attempt to project cassava requirements and output to the year 2001.

On the basis of the TDRI Sectoral Economics Program's dynamic model of Thai agriculture, cassava output in the year 2001 should range from 19-27 million tons. Sugar cane is the most important substitution crop.

Among several options open to the European Community, the reduction of grain price by 30 per cent would in turn reduce the prices of Thai cassava by 45 per cent, or from 1.50 baht to 1.28 baht per kilogram. The bonus measure to diversify export away from the EC would weaken tapioca prices offered by the pellets industry and growth potential would shift from the pellet to the starch industry.

The factor underlying domestic market potential is the change in per capita income. For external markets, the introduction of physically and chemically modified starch technology has provided new outlets, especially in the Japanese and Taiwanese markets. Improved modified starch technology could further enhance exports to other advanced economies. Barriers to Thai starch imports in major markets, such as Japan and the Republic of Korea, stem from the need to protect declining local agriculture. This is despite Thai cassava starch being among the lowest priced starch in the world.

The projected amount for domestic cassava in the year 2001 is 10 million tons. If the policies of the major starch importers (Japan, Korea, and Taiwan) remain unchanged, then starch exports in 2001 should total seven million tons. If Japan alone liberalized trade, approximately seven more million tons of cassava would be needed. Thus the growth of the starch industry should more than compensate for any losses in the EC market.

Other options for the domestic use of cassava include animal feed and alcohol production. Both products have similar requirements in that there is a threshold price below which substantial demand will flourish and above which there will be little demand.

Demand for cassava for feed is significant only when the price is lower than 0.70 baht, given the price of maize is just three baht per kilogram. If the price of maize is relatively low – around 2.75 baht – demand for cassava will exceed one million tons.

An attempt has also been made to re-examine the economic viability of using cassava for making ethanol. Under the assumption that ethanol will receive the same fiscal treatment as benzine, the "break-even" price of cassava should not exceed 0.54 baht.

It is clear that the cassava industry will slowly shift from pellet to starch production. The requirements of the starch industry will compensate for losses in the EC market by 1997 and, by the year 2001, the starch industry will need 17 million tons of cassava. *Research Reports, Working Papers, and Offprints for this study are available through the Publications Office.*

Development of Machinery and Equipment for Information Industries in Thailand.

This joint research effort of TDRI's Science and Technology Development and International Economic Relations Programs, partially funded by National Institute for Research Advancement (NIRA) of Japan, concentrates on four sectors: machine tools, molds and dies, telecommunications equipment, and computers and peripherals. The study looks at the past and present status of the four sectors and the prospects and probable future course of development for each sector from two different perspectives.

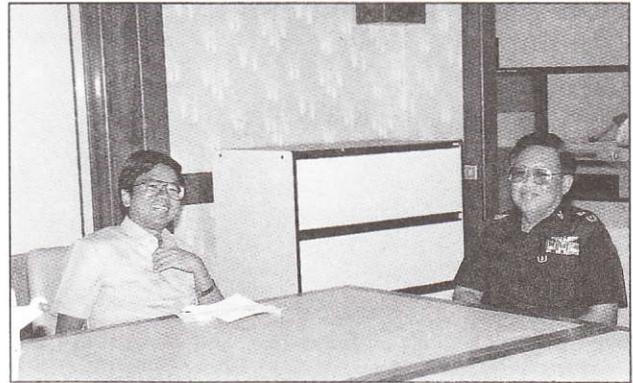
For manufacturing firms, the concept of technological contents is extended to contain four components: production-management technology, process technology, product-specific technology, and design technology. The study also draws on lessons from development strategies and policies of Japan and Asian NIEs in presenting strategies and implications for the future development of all four sectors.

The machine tool industry has, paradoxically, a long history but little progress, a high demand but low growth, and high protection but little expansion, due mainly to the lack of a sound technological base. The industry cannot be developed without a strong base in metal-working technology. The mold and die industry's rapid growth is due to the demand from the automobile, electronics, and other industries. Emphasis should be placed on training highly-skilled personnel specifically for each type of product.

The telecommunications equipment industry should be encouraged by domestic demand and spillover from such large-scale projects as the installation of 3 million telephone lines and the satellite project, which will involve user equipment, such as telephone receivers, facsimiles and satellite receiving dishes. Good opportunities exist for creating and upgrading local industries. The computer and peripherals industry produces far more peripherals than computers, due mainly to direct foreign investment. The strategy recommended is to develop supporting industries so as to increase local value-added, and to build up domestic capabilities so as to become OEM subcontractors in the future. The success of the National Electronics and Computer Technology Center (NECTEC) in assisting local microcomputer manufacturers in creating their own designs should provide both breadth and depth for further expansion.

RTSD Visits TDRI

On November 15, a top management team from the Royal Thai Survey Department (RTSD), led by Major Generals Pridi Sumpuranabhand and Sanoh Koomsanit, met with TDRI's Natural Resources and Environment (NRE) Program Director Dr. Dhira Phantumvanit and Geographic Information System (GIS) staff to discuss GIS issues in Thailand and to seek ways to cooperate in furthering the growth of this technology. Among the topics discussed were basemap updating, freedom of information, and RTSD's upcoming GIS meeting to be held in early 1992. RTSD, a department within the Royal Thai Army, is the agency responsible for creating Thailand's topographic basemaps.



Dr. Dhira Phantumvanit and Major General Pridi Sumpuranabhand

STD Organizes S&T Workshops

TDRI's Science and Technology Development Program organized two workshops on "New Dimensions in the Analysis of the Science and Technology Manpower Situation," on September 6, and September 28, at the Arnoma Hotel. The first workshop was to enable policy planners and academics to find the best ways to develop manpower in the industrial and service sectors. The second was to solicit ideas from those who presently employ science and technology manpower.

SEMINARS/CONFERENCES ATTENDED AND PAPERS PRESENTED

Dr. Ammar Siamwalla, TDRI's President, gave a speech on the theme "The Impact of Interim Government Reforms on the Economy" for the annual State of the Economy Seminar, American Chamber of Commerce in Thailand. The Regent Hotel, Bangkok, September 12.

Dr. Ammar Siamwalla attended the conference on "Agricultural Sustainability, Growth and Poverty Alleviation Issues and Policy," organized by the German Foundation for International Development, Food and Agriculture Development Center (DSE/ZEL), and the International Food Policy Research Institute (IFPRI). Germany, September 23-27.

Dr. Ammar Siamwalla visited the U.K. as guest of the British Government. September 29 to October 7.

Dr. Ammar Siamwalla attended the workshop on "The Economics of Global Warming Issues for Developing Countries," organized by the Massachusetts Institute of Technology. Italy, October 9-11.

Dr. Ammar Siamwalla attended the Annual Meeting of the International Policy Council on Agriculture and Trade (IPC). Chiang Mai, November 4-6.

Dr. Ammar Siamwalla attended as meeting on the Mekong Delta Master Plan. Viet Nam, November 11-4.

Dr. Ammar Siamwalla attended the symposium of the "High Road Forum," organized by the Organisation for Economic Cooperation and Development (OECD). Paris, November 25-26.

Dr. Ammar Siamwalla attended the press conference for the TDRI Year-End Conference. TDRI, December 4.

Energy, Infrastructure and Urban Development Program (EIU)

Dr. Tienchai Chongpeerapien of the EIU program presented a paper entitled "The Impact of Energy Consumption on the Environment" at a meeting of the Association of Development Research and Training Institutes of Asia and the Pacific. Macau, October 8-11.

Dr. Tienchai Chongpeerapien gave a presentation on "Energy Sector Management in Thailand" to a delegation of high-level govern-

ment officials from several Asian countries. The Dusit Thani Hotel, Bangkok, November 11.

Dr. Tienchai Chongpeerapien gave a presentation on "The Impact of Oil Price Deregulation" at a seminar at Sukothaithammarat University. November 28.

Macroeconomic Policy Program (MEP)

Dr. Bhanupong Nidhiprabha, research fellow of MEP, participated in a conference on "Exports, Foreign Investment, and Growth in East and Southeast Asia: A Model Simulation Workshop," hosted by the International Center for the Study of East Asia Development (ICSEAD), where he presented a paper entitled "World Business Cycle and Policy Response: The Case of Thailand," co-authored by Khun Chanin Kamheangpati-yooth. Kitakyushu, Japan, August 1-2.

Dr. Damkirng Sawamiphakdi, presented the Forecast for the Thai Economic Outlook: 1990-95 for the Project LINK Fall Meeting, hosted by the Academy of Sciences of the USSR. Moscow, September 23-27.

Dr. Damkirng Sawamiphakdi, research fellow of MEP, and Khun Nipat Somjitt, research assistant of MEP, were participants at the "Fourth Asian Economic Outlook Workshop," hosted by the Asian Development Bank, where they presented a paper entitled "The Economic Outlook for Thailand: 1991-93," co-authored by Khun Chanin Kamheangpati-yooth, Khun Prasert Chakepaichayon, et al. Manila, October 28-31.

Sectoral Economics Program (SEP)

Dr. Mingsarn Santikarn Kaosa-ard, Director of TDRI's Sectoral Economic Program (SEP), attended the seminar on "The Emerging Technological Trajectory of the Pacific Rim," as a commentator. Tufts University. Massachusetts, U.S. October 4-6.

Science and Technology Development Program (STD)

Dr. Chatri Sripaipan, Director of TDRI's Science and Technology Development Program (STD), led a group discussion on industry at the seminar on "Future Scenario of Science and Technology in Thailand," organized by Chula Unisearch. The Asia Hotel, August 26.

Dr. Chatri Sripaipan co-authored a paper on "Research and Development of Electronics Technology in Thailand" for presentation at the annual conference on "Thai Science and Technology in the Year 2000," organized by the Office of the Science and Technology Development Board. Ambassador City Hotel, Chon Buri, September 13-15.

Dr. Chatri Sripaipan presented a paper on "Technology Upgrading in Thailand: A Strategic Perspective" at the conference on "Emerging Technological Trajectory of the Pacific Rim Nations." Tufts University. Massachusetts, U.S., October 4-6.

Dr. Chatri Sripaipan gave a lecture at a round table discussion on "Science and Technology Policy in Thailand: Trends and

Challenges." The International Development Research Center, Ottawa, Ontario, Canada, October 10.

Dr. Anupap Tiralap, research fellow of STD, gave a lecture on "Technology Management and Marketing of Information," organized by the Higher Education Librarians Forum of Thailand. October 11.

Dr. Anupap Tiralap participated in the panel discussion at the PECC Workshop on "Science and Technology Industrial Parks," organized jointly by the PECC S&T Task Force and the S&T Subcommittee of CNCPEC, and sponsored by the Science and Technology Commission of Shanghai Municipality. Shanghai, China, October 21-24.

Dr. Chatri Sripaipan and Dr. Anupap Tiralap, as resource persons, participated in an academic seminar on "Technology for Industrial Development: Whose Responsibility," organized jointly by the King Mongkut's Institute of Technology, North Bangkok and the Technological Promotion Association (Thai-Japan). King Mongkut's Institute of Technology, North Bangkok, November 2.

Dr. Chatri Sripaipan gave a lecture on "Technological Capabilities Assessment of Industries," at a training course on "Management of Technology Transfer," for ASEAN participants at the Asian Institute of Technology (AIT). On the same day, Dr. Chatri gave a lecture on "Technology Strategies in Thailand" to the MBA students of the AIT's School of Management. November 12.

Dr. Anupap Tiralap served as guest speaker on the topic of "The Future of the Information Industry in Thailand" for a seminar organized by the Ministry of University Affairs. November 22.

Dr. Chatri Sripaipan and Dr. Sakarindr Bhumiratana, as experts on the United Nations, participated in a three-day National Seminar on "Technological Capabilities Assessment of Industries in the Philippines." The Philippines, December 4-6.

Dr. Anupap Tiralap was invited by the Library Association of Thailand as a panel discussant on "Information and Technology Management." December 18.

Socio-cultural Change and Political Development in Thailand Project

Scott Christensen gave a presentation on economic policy reform in Thailand at the conference on "Economic Policy Reform in Southeast Asia," sponsored by the Asia Foundation, San Francisco. Manila, the Philippines October 14-16.

Scott Christensen's article "Thailand After the Coup," appeared in the *Journal of Democracy*. 2:3 Summer 1991. Published by the National Endowment for Democracy, Washington D.C.

THE THAILAND IN TRANSITION IV PHOTO CONTEST

TDRI gratefully acknowledges Kodak (Thailand) Ltd. and the Photographic Science and Printing Technology Department of the Faculty of Science, Chulalongkorn University, for again co-sponsoring our Photo Contest, the fourth in as many years. The contest, in accordance with the theme of the TDRI 1991 Year-End Conference "Educational Options for the Future of Thailand," was entitled "People: Thailand's Greatest Resource."

We asked contestants to capture on film what is being done to develop the potential of the Thai nation. With the support of both Kodak and Chulalongkorn, who distributed the entry forms through their networks, we received over 200 entries.

The judging, organized by Khun Apiwat Aganidad, Advertising and Promotion Supervisor of Kodak, was held on November 14. TDRI extends its appreciation to our distinguished judges—Dr. Chalongsob Sussangkarn, Director of the Human Resources and Social Development Program, TDRI; Mr. Phaichitr Opaswongkarn, President of the Photographic Society of Thailand under Royal Patronage; Dr. Sompongse Limpanondh, D.D.S., President of the Bangkok Photographic Society; and Mr. Bhairat Leenavat, President of the Siam Color Slide Club.

The Award Ceremony for contest winners, hosted by TDRI President, Dr. Ammar Siamwalla, will be held on December 24.

Cash awards of 15,000, 10,000 and 5,000 baht, respectively will be given to the top three winners and they will also receive a plaque, plus a Kodak camera. The 10 runners-up will receive certificates of merit.

The winning photo is on the cover of this year's *TDRI Annual Report* and twelve of the top entries illustrate the report. Kodak has prepared a selection of 50 photographs from the contest for the photo display at this year's TDRI Year-End Conference.

The names of the winning photographers and the titles of their photographs appear below.

First: Theerapong Leardpratom

Second: Mukkapol Maneenoi

Third: Kriengkrai Waiyakit

Honorable Mentions: Mukkapol Maneenoi, Sompong Poca, Manit Dechsupa, Suwimon Watanawichien, Vechayan Lekvuthikarn, Jitraporn Kijpermpoon, Mani Dejsupa, Vichien Charoensri, Mani Lapluechai, Teerapongsa Lusapanand



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