

# TDRI

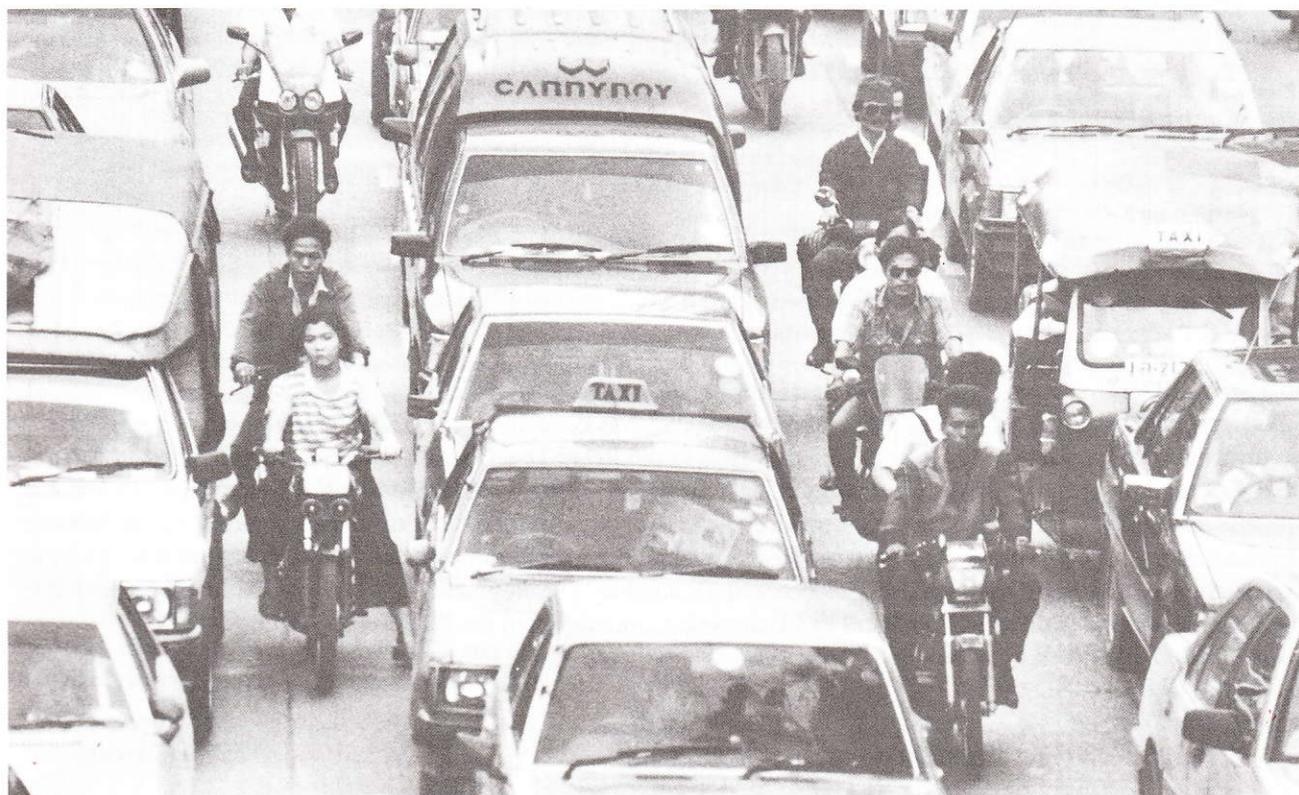
Quarterly  
Review

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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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# Protection of Thailand's Motor Vehicle Industry: Not a Blessing in Disguise

Frank Flatters

**T**he Ministers of Finance and Industry have announced the relaxation of import restrictions on new and used cars, and large reductions in import duties on motor vehicles and their components. Local auto producers object that this will lead to major dislocations in their industry. The Bank of Thailand raises the specter of a large increase in Thailand's balance of payments deficit. The Governor of Bangkok is alarmed that the resulting increase in the level and rate of growth in demand for automobiles will cause total gridlock of Bangkok's already congested streets. And others argue that the reduction in the taxation of this luxury good will sacrifice public revenues for the benefit of wealthy auto consumers.

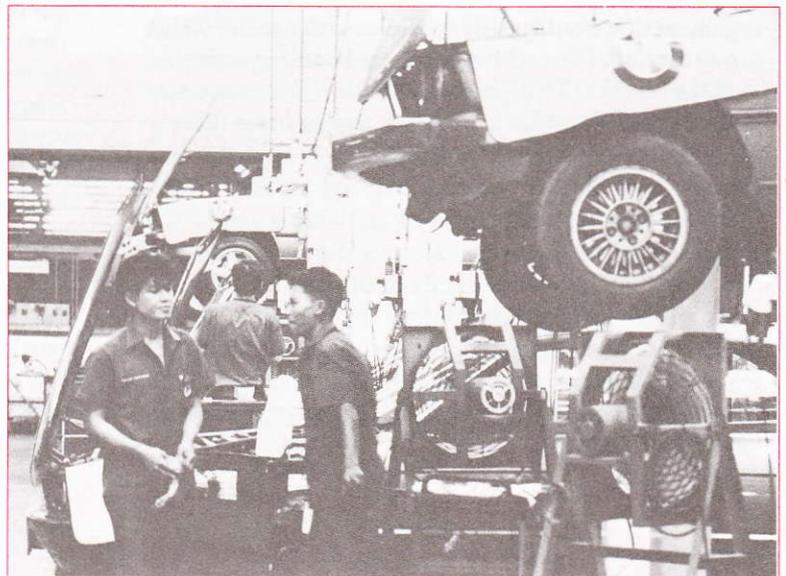
If the critics of the new policies are right, the taxes and restrictions on motor vehicle imports have served a number of desirable policy purposes, and their abandonment will impose considerable social costs on Thailand. In other words, these restrictions and import taxes have been a multi-faceted blessing in disguise. To evaluate these alleged blessings, we look at: a) the effectiveness of the policy change in achieving its primary purpose, b) its possible effects on other social and economic goals, and c) the relative advantages of import restrictions and taxes compared with other possible policy instruments in achieving the primary and secondary goals of the new policies.

## THE PRIMARY PURPOSE OF THE NEW MOTOR VEHICLE SECTORAL POLICIES

The primary purpose of the taxes and restrictions on motor vehicle imports has been to protect the local industry. The principal reason for reducing them is to reduce this protection. Protection of the local industry imposed a heavy tax on consumers and provided an enormous subsidy to those fortunate enough to obtain licenses and franchises to assemble vehicles locally. A 180 percent import duty on fully assembled (or completely built up – CBU) vehicles means that import competition only restrains local producers to sell at less than 280 percent of comparable import prices. A 300 percent duty makes local prices 400 percent of import prices.<sup>1</sup> Non-tariff import restrictions mean that even this minimal amount of competition might not be effective.

But, unlike most other taxes, the import taxes on automobiles do not automatically result in increased government revenues which might be used to meet important public needs. Since very few CBU vehicles are actually imported, the only government revenues that are collected are the much lower duties and taxes on CKD (completely knocked down) component kits and other parts imported by local assemblers. The major part of the tax on vehicle imports is passed on as a direct subsidy to domestic producers in the form of inflated

*“The major part of the tax on vehicle imports is passed on as a direct subsidy to domestic producers in the form of inflated domestic prices.”*



domestic prices. This subsidy breeds some combination of inefficiency and monopoly profits to local producers.

The motor vehicle sector is one of the most heavily subsidized industries in Thailand. The subsidy arises from the much higher import duties on CBUs than on imported CKDs and other components. Assuming that, at world prices, the value of a typical CKD kit is 80 percent of the value of the final assembled product, the current (or old) import duties provide local assemblers with effective protection of 450 percent in the case of small cars (under 2300 cc. engine capacity) and 1,050 percent for larger cars. That is, Thai assemblers could have local costs which were 450 percent (or 1,050%) higher than those of producers in other countries and still be competitive against imports in the local market. Or, if they were as efficient as typical foreign producers, they could price in a manner that would provide excess or monopoly profits that were 450 percent (or 1,050%) of local assembly costs and still compete with imports.

According to a TDRI study, the average effective rate of protection for all Thai manufacturing sectors was 29 percent in 1987 (45% if sectoral rates are weighted by import values).<sup>2</sup> Thus the subsidy to motor vehicles is at least 10 times higher than the average. By any standard, a reduction in the size of this subsidy would appear to be called for. The current proposal is that the duty on CBUs be reduced from 180 to 60 percent (from 300 to 100% in the case of large cars) and the duty on CKDs from 112 to 20 percent. Under the same assumptions as the previous calculation, this would leave the motor vehicle sector with effective protection of 220 percent for small cars and 420 percent for large ones, still many times higher than the average for all manufacturing.<sup>3</sup> The implicit tax on vehicle consumers would remain very high, but much less than previously.

On industrial policy grounds, therefore, there can be no question that the tax and other changes are a move in the right direction. The only real question is whether they have gone far enough. We are aware of no economic argument that would justify subsidies to this sector which are so far out of line with other manufacturing activities. And the fact that Thai-produced motor vehicles are now being exported to North America suggests that there is no need for this sort of protection to ensure the sustainability of at least many important sectors of this industry. Further reductions in protection might see some healthy restructuring of the local industry, but they certainly would not result in its disappearance. Reductions in the protection-induced high costs of components and the basic materials used in their production would, in all likelihood, result in the much faster growth of a more export-oriented vehicle and parts production industry in Thailand.

## SIDE-EFFECTS OF THE NEW POLICIES

While it may not be justified on industrial policy grounds, protection of the motor vehicle sector might still be called for on the basis of the fulfillment of other important social or economic goals. We will consider the principal ones that have been mentioned in recent discussions.

### Congestion and Pollution

One of the principal effects of protection of the local industry has been to tax local consumers of motor vehicles. By raising their domestic price this policy has restrained demand. From elementary economics it is clear that reducing import taxes will increase demand and hence also congestion and pollution, especially in Bangkok. Countering the effects on pollution of increased numbers of automobiles, of course, will be the reduction in the average age and hence the increase in the average quality, including emissions characteristics, of the stock of automobiles being used.

But are these sorts of considerations really relevant? Thailand still has a relatively low number of automobiles and other motor vehicles per capita. Many other countries, with much higher levels of per capita motor vehicle ownership, have far lower levels of congestion and vehicle-related pollution than Thailand. It is apparent that Thailand's, and especially Bangkok's, pollution and congestion are not caused simply by too many vehicles.

Bangkok's congestion is due to inadequate and improperly managed transport infrastructure. Relative to population or land area, Bangkok has only half the amount of space devoted to roads as do comparable cities in the world. The roads that do exist suffer from an almost total absence of feeder or connector roads. The long waiting periods between light changes at major intersections are unique and demonstrably highly inefficient and alternative, public transportation is woefully underdeveloped and poorly organized. The resulting congestion is not only enormously costly in terms of wasted time and fuel, it is also a major cause of vehicle-related pollution. But even under much more ideal driving conditions, Thai vehicles emit far more airborne and noise pollution than is necessary. This is due to the absence of any standards or incentives to do otherwise.

These are the problems that must be tackled. In the short run, of course, it would be desirable to control the use of motor vehicles at peak times and in congested areas. Under current conditions, private vehicle users have no incentive to take account of the very high con-

gestion costs they impose on others when using their vehicles. Even with a much more appropriate road system these costs, while much lower than at present, would continue to exist.

High import taxes, by reducing the number of vehicles per capita, undoubtedly have some beneficial impact but they are an extremely blunt instrument for this purpose. They tax vehicle *purchases*, not their *use* and they certainly do not discriminate between the use of vehicles in Bangkok and elsewhere, or between those used during rush hours and at other times. A major improvement over import restrictions would be excise taxes on motor vehicles that did not discriminate between those that were locally produced and those that were imported. These would be equally blunt with respect to their lack of relationship to the actual use of the vehicle. But they would have two major advantages over import taxes. First, since they would not discriminate between locally produced and imported vehicles, they would not have the costly side effect of subsidizing inefficient and/or monopolistic domestic producers whose products have no advantage over imports in terms of reduced congestion or pollution. Second, the excises would provide revenues to the government which could be earmarked for the provision of improved urban transport infrastructure.

Another suggestion has been to raise vehicle registration fees. If these fees were differentiated according to where the vehicles were used so that those in Bangkok, where congestion and pollution costs are highest, were greater than those charged elsewhere, this would be an improvement over other forms of sales taxes. But these fees would still have no effect in altering actual use patterns and deterring owners from using their vehicles when and/or where congestion costs were highest.

Furthermore, registration fees in Thailand represent only a quite small share of the cost of owning and operating a vehicle. The present value of the registration fees of typical motor vehicles are less than one and a half percent of the vehicle's purchase price. Thus, an extremely large increase in these fees would be necessary to compensate even for relatively small reductions in import taxes. Furthermore, at the moment, registration fees are not differentiated by the region of the country in which the vehicle is registered. Any attempt to implement regionally discriminatory registration fees would probably be frustrated by owners' registering their vehicles in low-fee regions. Bangkok region registrations currently far exceed the number of vehicles actually in use there. This is because finance companies register their legal ownership in proximity to their head offices in Bangkok, regardless of the location of the purchaser to whom they have provided the vehicle purchase loan. Any attempt to impose higher fees in Bangkok would result in a swift change in this practice, not only by

finance companies, but by many other registered vehicle owners as well.

Taxes and other restrictions on vehicle purchases, production or ownership are extremely blunt and not very effective instruments for dealing with the problems of urban congestion and pollution. A significant part of both the short-run and the long-run solution to these problems must consist of measures which discourage vehicle use in areas where and at times when congestion costs are highest. Many such schemes are possible, with the most promising being a fee-for-permit system for driving in central areas of Bangkok during peak times. These and many other schemes for improving urban transport infrastructure have been known and discussed for many years. Maybe the concern that has arisen from the prospect of a vehicle demand spurt due to import tax reductions will be sufficient to provoke some long-needed action on this and other fronts.

Regardless of the short-run effects of motor vehicle tax changes, rising incomes are sure to cause rapidly growing demand for and use of motor vehicles. In the absence of improved policies, congestion and pollution can only get worse. It would be better for the underlying problems to be tackled sooner than later.

### Balance of Payments

Another fear that has been mentioned is that the liberalization of vehicle imports will lead to a flood of new imports and a serious increase in the balance of trade deficit. In other words, protection of the local vehicles sector has been a major instrument in preserving Thailand's fragile balance of payments.

The most important point here is that the balance of payments is not driven fundamentally by sectoral policies, and sectoral policies are an inappropriate instrument for dealing with balance-of-payments equilibria. The balance of payments and its composition are determined by trends in overall productivity, inflation, monetary conditions, savings behavior, budgetary policies, the terms of trade, etc. Changes in a particular sector are important only inasmuch as they affect such macroeconomic variables. To distort investment, consumption and production decisions in one sector to achieve some aggregate balance-of-payments goals is first of all very costly and, second, unlikely to be effective.

But what would be the impact effect on the balance of trade deficit of liberalization of the motor vehicle sector? Such a liberalization could be thought of as having two types of effects on imports. First, at any given level of demand it would raise the share of imports relative to locally produced vehicles in total demand. Second, by reducing local prices it would increase the total demand for vehicles, both imported and domestically assembled.

The high import content of local vehicle production means that the first effect, increasing the share of imports in total demand, would have a very small impact on the balance of trade. The c.i.f. price of CKD kits is only slightly lower than that of CBUs. The foreign exchange savings from marginal increments in local content by eliminating some items from the kits is also very low. In fact, for these very reasons there are instances in which decreasing the local content of domestic assembly operations in this sector has had the net effect of decreasing the balance of trade deficit in this sector. Furthermore, reducing protection of basic industrial raw materials used in parts production, which has also been announced as part of the package, might lead to a substantial and meaningful increase in local parts production which would also have a positive effect on the balance of trade.

The extent to which import liberalization leads to an overall increase in demand for vehicles and hence also in foreign exchange expenditures depends on both the elasticity of demand and the extent to which other measures such as new excise taxes and higher registration fees are used to counteract the effects of trade liberalization on domestic prices. As discussed, there might be some argument, especially in the short run, for such taxes in order to reduce urban congestion and pollution. There might also be some argument on the grounds of equity (see below).

Finally, one of the most important effects of import liberalization might be the development of a strong and competitive export sector for both vehicle parts and final products. This depends on the relaxation of import restrictions on basic industrial raw materials as well as on vehicle components. If this were to occur, it would almost certainly swamp any negative balance-of-payments effects arising from increased imports.

### Equity

Motor vehicles, especially passenger cars, are consumed only by the very wealthiest members of the Thai community. Therefore restrictions on vehicle imports which raise the domestic prices of these products are seen as a form of luxury tax. As we have already seen, however, import restrictions have two effects—by raising local prices they tax consumers and also subsidize domestic producers. It is difficult to see how a policy which transfers income from a group of wealthy consumers to a number of inefficient and/or monopolistic producers can cause a significant improvement in overall social equity. It certainly has very little beneficial impact on the poor.

Much more effective would be an excise tax that did not discriminate between imported and domestically produced vehicles. Rather than subsidizing local producers, this tax would raise revenues that could, at least in principle, be used to provide measures that

would benefit the poor. If the revenues were not used for this purpose, of course, the equity effects would once again be minor at best.

In the design of a set of excises on motor vehicles, it would also have to be recognized that vehicles are used for many purposes that benefit the poor. Trucks and other vehicles are used to transport the produce of small farmers to market. They are used by poor commuters. And so on. Increases in the cost of these forms of transport would hurt the poor. Careful study would be required to ensure that any system of vehicle excises did not have serious harmful effects on the poor.

What is apparent in any case is that tax, trade and industrial policies in the motor vehicle sector, if not totally irrelevant, are certainly not ideal instruments for achieving the country's social equity goals.

### CONCLUSION

Critics of the motor vehicle import liberalization have suggested that many different types of harm will arise from this decision. It will cause serious dislocation of the motor vehicle sector; it will lead to a major deterioration of the balance of payments; it will cause impossible aggravation of road congestion and pollution, especially in Bangkok; and it will result in further deterioration in the distribution of income. If all of these claims were true, then it might not be too great a leap to suggest that we had perhaps unwittingly discovered in import protection of the motor vehicle sector an elixir that was capable of solving all of the country's economic and social ills.

Unfortunately, a closer examination reveals that these claims are unfounded. Motor vehicle import protection is not and should not be used as a magic pill to solve problems of congestion, pollution, the balance of payments, and income distribution. In some cases this protection might have had minor beneficial side effects; in many others the side effects have been harmful. But in all instances it is clear that other instruments would be far more effective in dealing with these problems. Import protection is primarily a tool of industrial policy. On these grounds the policy changes are clearly an important step in the right direction.

### ENDNOTES

- 1 The 180 percent duty was applied to cars with engine capacity under 2300 cc.; the 300 percent rate was levied on those with larger engine capacity.
- 2 See Paitoon Wiboonchutikula et al. *Trade in Manufactured Goods and Mineral Products*. TDRI 1989 Year-End Conference "Thailand in the International Economic Community." Background Paper No. 4. December, 1989. Table 2.1.
- 3 These calculations do not take account of the additional protection provided by the differential rates of business tax applied to domestic cars and imports. Nor do they take account of the negative protection to local vehicle producers arising from local content rules, or the reduction in this cost penalty that might arise from reduced duties on basic raw materials used in local components production. 

# The Basis for Thailand's Response Strategies to Global Warming\*

Somthawin Sungsuwan-Patanavanich

**D**espite the uncertainties concerning global climate change, most recent international conferences on this issue have agreed to support the Intergovernmental Panel on Climate Change (IPCC) as the principal forum for its scientific assessment. This implies a basic recognition that climate change is a global problem, and that all countries should share common but different responsibilities. Industrialized countries are expected to take the lead and commit themselves to immediate action and also to cooperate with the developing countries in addressing climate change without obstructing national development goals. All countries should base their responses on the precautionary principle that environmental measures must anticipate, prevent, and attack the causes of environmental degradation. Lack of certainty should not be used as an excuse for postponing preventive measures.

There have been many debates over what should be the basis for deciding how responsibility for reducing emissions should be allocated—current levels of emission, accumulative emissions (stock), emission/Gross Domestic Product, or emission/person basis. The general consensus seems to favor responsibility on a per capita basis as this represents the most practical way of deciding a country's fossil carbon budget. If this method were adopted, some of the industrialized countries would face difficulty because they would not be allowed further burning of fossil fuel unless compensation mechanisms, with a certain degree of flexibility, were adopted. This is why economic mechanisms, tradable emissions rights, taxation systems and a climate protection fund were introduced as tools for emissions management.

Thailand has indicated its commitment to protecting the global climate by participating in many international forums. The country has been a contracting party to the Vienna Convention for the Protection of the Ozone Layer, as well as to the Montreal Protocol on Substances that Deplete the Ozone Layer (chlorofluorocarbon [CFC] control). As to carbon emission reduction, Thailand has also hosted international

meetings including the Meeting of the Preparatory Committee: the Technical Workshop to Explore Options for Global Forest Management, the Technical Workshop on Legal Aspects of Global Warming, and the International Conference on Global Warming and Sustainable Development: An Agenda for the '90s. However, it is not clear, at least to the public, what Thailand's position should be. Although identified as a nation highly vulnerable to the ill effects of climate change, Thailand is less able than the industrialized countries to mobilize the technical and financial resources needed to respond. The country must, however, design policies and preventive strategies to minimize its own emissions without hindering growth. In implementing such policies, the Thai government must also make sure that the benefits of development reach the nation's poor, i.e., the vast majority of its people. Key considerations determining Thailand's position are as follows:

## THAILAND'S SHARE OF GLOBAL GREENHOUSE GAS EMISSIONS

World Resources Institute estimates show that Thailand emits 1.13 percent of the world's net increase of atmospheric greenhouse gases, 67 million of 5.9 billion tons of carbon, or about 6.7 percent of U.S. emissions. In emissions per capita, Thailand emits 1.3 tons per head, slightly above the world average of 1.2 tons. Per capita emissions for the U.S., the U.K., Japan, Malaysia, and South Korea are 4.1, 2.7, 1.8, 1.6 and 0.7 tons, respectively.

## STRUCTURAL CHANGE IN THE ECONOMY

The GDP shares of Thailand's nonagricultural sectors, particularly the industrial and service sectors, have grown at an accelerated rate. In 1970, the shares of industry, services, and agriculture were 26 percent, 47 percent and 27 percent respectively. In 1989, the share of agriculture dropped to 16 percent, while the industrial

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\* Presented by Somthawin Sungsuwan-Patanavanich at the International Conference on "Global Warming and Sustainable Development: An Agenda for the '90s" held at the Ambassador Hotel, Bangkok, 10-12 June, 1991. The author thanks Dr. Theodore Panayotou for his valuable suggestions in the preparation of this paper.

share rose to 36 percent. The share of services has been steady at 47 percent to 48 percent, but is expected to grow with the expansion of the industrial sector. The expansion of industry and services has become a driving force of the economy's growth, and has created a growing demand for fossil energy, thus increasing CO<sub>2</sub> (carbon dioxide) emissions. Thailand's recent economic performance has propelled the country into one of the world's most rapidly industrializing nations, with an average annual growth rate of 6.8 percent from 1970-80, and 7.5 percent from 1980-89.

This economic growth has meant more energy consumption and hence higher emissions of CO<sub>2</sub>. Rough estimates indicate that the emissions elasticity of GDP is about 0.9, meaning that a one percent increase in the GDP induces a roughly 0.9 percent increase in CO<sub>2</sub> emissions.

### CHANGES IN LAND-USE PATTERNS

Deforestation cannot continue to be the major method of opening up new crop lands. Additional crop land must be made available through reducing the amount of land now under rice. Thailand's paddy planted area is, therefore, expected to decrease as farmers switch from rice to crops such as fruit trees or to livestock or aquaculture—all of which offer considerably higher profit margins than rice. These land-use patterns should at least restrain increases of CO<sub>2</sub> and methane emissions and directly reduce the CO<sub>2</sub> released by cutting down trees.

### ENERGY USE EFFICIENCY

According to the National Energy Administration (NEA), the efficient use of energy in the industrial, commercial, and residential sectors could save up to 607 megawatts of electricity. This accounts for 10 percent of EGAT's (the Electricity Generating Authority of Thailand) total capacity.

Thailand stands to lose considerably if the international community agrees to freeze the level of fossil carbon emissions by country. In contrast, Thailand would benefit from allocation on a per capita basis. If there were an agreement to set the level of CO<sub>2</sub> emissions per capita at the current world average of 1.2 tons, Thailand would not exceed its present emission quota for at least fifteen years. Clearly, Thailand should give strong support to the per capita basis, with allowance for emissions rights trading. Beyond national interest, Thailand as a member of the global community has tried to identify possible measures that can be implemented at the national level. This is reflected in the country's preparation for the United Nations Conference on Environment and Development in 1992.

### PREPARATION FOR THE UNITED NATIONS CONFERENCE ON ENVIRONMENT AND DEVELOPMENT (UNCED) IN 1992

In preparation for the United Nations Conference on Environment and Development (UNCED), Thailand plans to draft a comprehensive national development report which includes information on the state of its natural resources. It also assesses the environmental and development situation within the country. This requires broad-based independent sector participation. To facilitate such participation, in 1990 the National Environmental Board (NEB) established a National Committee on Long-term Global Environmental Issues which brought in representatives from both governmental and non-governmental agencies working in the environment/development area. Under this committee, a sub-committee, chaired by the Director of Natural Resources and Environment Program of TDRI, was established. The Sub-Committee, through TDRI, has now initiated work to complete the national report draft.

The national report will address the various linkages between environmental problems and the development process, including how the transformation from a subsistence agricultural economy into a rapidly industrializing country has affected natural resources and thus the country's environment. This will include present and potential conflicts over the use of natural resources, particularly land, water, and forests. The main emphasis will be on identifying options to lessen pressure on natural resources.

Equal importance will also be given to balancing national development with global environment protection measures, especially Thailand's contribution to greenhouse gas emissions. In this regard, the national report will cover the country's status and position on global warming. Two central issues will be: how global warming policy will affect the interests of the poor, and to what extent and under what conditions can Thailand contribute to arresting the global warming problem. To ensure the participation of all sectors, and to obtain public comments, the draft report will be discussed at a national symposium scheduled for November 4, 1991.

### RESEARCH EFFORTS AND PRELIMINARY FINDINGS

To formulate the country's response strategies in international negotiations regarding the global warming issue, TDRI conducted a research project in 1990 linking greenhouse gas emissions to changes in patterns of land use and energy consumption. The policy implications of greenhouse gas reduction on the economy were discussed. The findings from this project will serve as a basis to formulate the country's response strategy to UNCED in 1992. Meanwhile, TDRI is working in collaboration with the Environment and Policy Institute of the East-

West Center and the Environmental Assessment and Information Science Division of the Argonne National Laboratory to identify energy technology problems and measures needed to reduce carbon dioxide emissions. A research project relating greenhouse gas emissions to changes in land-use patterns is under way, using a common framework developed at the Lawrence Berkeley Laboratories. Preliminary findings from TDRI's study include:

### **Thailand's Greenhouse Gas Emissions: Sources and Trends**

The major sources of Thailand's greenhouse gas emissions arise from changing land-use patterns and from increased energy consumption, including both fossil and renewable fuels. Clearing of forest land for other use has led to a drastic drop in the amount of carbon stored in standing biomass and soils. The amount of carbon lost adds to the atmosphere in the form of carbon dioxide through oxidation. In 1988, deforestation in Thailand released a total of 35 million tons of carbon, or 69 percent of the country's total carbon release. Growing rice is another source, particularly wet rice. Rice paddy fields release methane which is also an important greenhouse gas. In Thailand, a large portion of the country's land is devoted to rice production, i.e., about 18-20 percent in the 1980s, with wet rice accounting for 90 percent of the total rice-planted area. TDRI 1990 estimates of released methane during the same period were some 10-12 million tons of carbon equivalent annually. A final main source of greenhouse gas emissions is in energy conversion and consumption processes which produce a large amount of CO<sub>2</sub>. CO<sub>2</sub> emissions in carbon from this source were estimated at 9, 9, 12, and 16 million tons of carbon in 1979, 1981, 1986, and 1988, respectively. An increasing rate of fossil carbon emissions and a slowed rate of deforestation resulted in fossil carbon emissions exceeding emissions by deforestation in 1991. It should be noted that Thailand is considered a small user of CFCs. Thailand's consumption per capita in 1988 was 0.07 kilograms. The corresponding figures for the U.S., Europe, Japan, and Malaysia were 1.2, 0.9, 0.9, and 0.2, respectively.

### **Carbon Dioxide Released through Deforestation**

Deforestation has been the major contributor of CO<sub>2</sub> to the atmosphere in Thailand. If CO<sub>2</sub> emissions from deforestation and fossil fuel burning were combined, Thailand, in 1987, ranked as the thirteenth largest CO<sub>2</sub> emitter in the world after Mexico, number 12. These top 13 countries were responsible for 70 percent of the world net carbon released into the atmosphere.

Thailand lost forest area very rapidly during the 1960s and 1970s—fully 3 percent annually. Although the deforestation rate was down to 2 percent in the early 1980s, the annual loss was still high at 240,000-480,000 hectares (1.5-3.0 million rai). The rate dropped to approximately one percent during 1987-88, and during 1988-89 it declined further to 0.3 percent (about 39,000 hectares), due to the logging ban which took effect in February, 1988.

According to a 1989 study on the relationship between tropical deforestation and atmospheric carbon by the International Project for Sustainable Energy Paths (IPSEP, 1989), during the 1960s and 1970s Thailand's deforestation contributed more than 100 million tons of carbon to the atmosphere annually. This dropped to approximately 60 million tons during 1983-86, becoming much lower (approximately 35 million tons) in 1988. In 1989, it was estimated to be as low as 10 million tons. This downward trend shows a slowed rate of deforestation. The most recent study by TDRI, which applies the COPATH model, indicates that emissions of CO<sub>2</sub> from deforestation are expected to be 30, 33, 20, 8, and 2 million tons of carbon in 1991, 1996, 2001, 2006, and 2011, respectively.

### **Carbon Dioxide Released through Energy Consumption**

Thailand's energy consumption, including renewable energy, increased at the rate of 4.6 percent per annum during 1981-86, and rose sharply to 8.4 percent during 1986-88. In 1988, total primary energy demand was 23 million tons of crude oil equivalent. The CO<sub>2</sub> emission caused by such high consumption was estimated at 58 million tons (16 million tons of carbon).

TDRI's projections to the year 2011 indicate that the country's energy consumption will grow at an annual compound rate of about 6 percent, implying an increasing amount of CO<sub>2</sub> emissions. From the beginning of the Eighth National Development Plan (1996), emission rates should be higher because of increasing proportions of coal and lignite in the future energy mix for utilities and the industrial sector's growing energy demands.

CO<sub>2</sub> emissions vary according to economic sector. Since the end of the Fifth Plan (1986), the transportation sector has been the dominant source of CO<sub>2</sub>. Its share of emissions was 47 percent during 1986-88. Estimates for 2011 show increasing emissions for the transportation sector with an annual compound growth rate of about 6.6 percent. The power sector holds the second largest share because of the high levels of lignite used in generating electricity. This sector's emission share is expected to be as large as 33 percent in 1991, and 34 percent in 1996. By 1996, the power sector's share should become very close to that of the transportation sector, and may even surpass it shortly thereafter, unless major shifts in

fuel mix and effective emissions control systems are adopted.

### The U-shape Curve of CO<sub>2</sub> Emissions

The ratios of emissions from deforestation to emissions from fossil fuel burning were roughly 13.7, 12.4, 5, and 2.2 in 1979, 1981, 1986, and 1988, respectively (Figure 1). These decreasing ratios are the result of increased fossil fuel combustion and the slowing down of deforestation. In the foreseeable future (during the Seventh to the Tenth Plans), the carbon added to the atmosphere will come mainly from the burning of fuel by the power, industrial and transportation sectors. This implies a growing significance of fossil fuel consumption as a source of the country's carbon production during the next two decades. It is worth noting that the sum of carbon emissions by both sources form a U-shape curve, possibly a common pattern for many countries with formerly abundant forest resources.

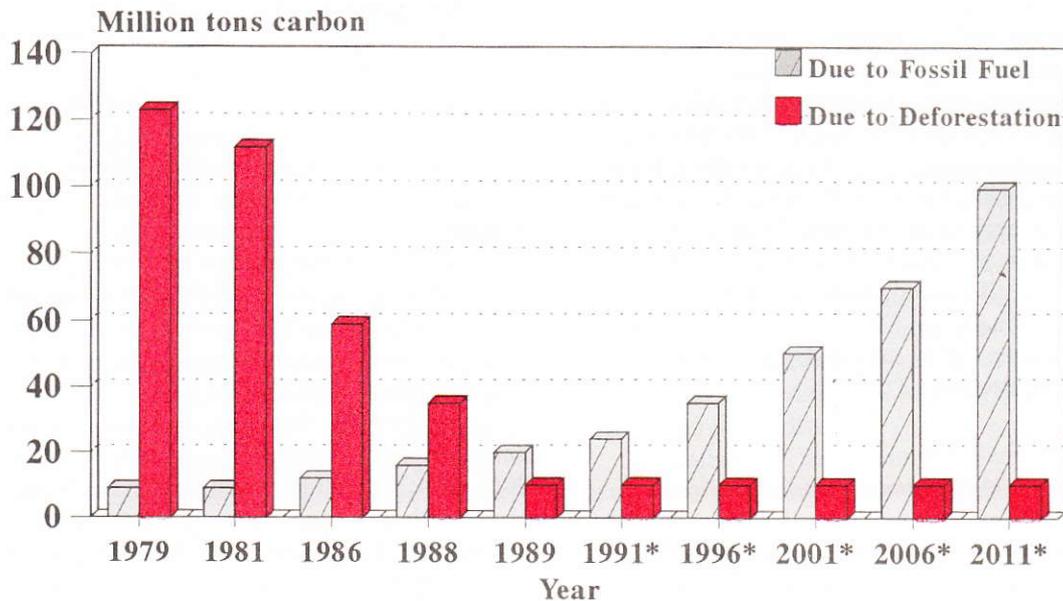
### Carbon Dioxide Reduction and Thailand's Energy Systems

As the most serious current proposals concern strategies for reducing CO<sub>2</sub> emissions, it is crucial for Thailand to understand how these strategies would effect the country's energy system if adopted as measures to reduce carbon dioxide. TDRI's 1990 study concludes that for the country to ensure a sufficient supply of electricity to achieve its targeted growth and industrialization,

while keeping the level of CO<sub>2</sub> emissions low, the government should take immediate action to accelerate the implementation of energy conservation programs. Incentives in various forms should be offered to electricity users, with EGAT taking a leading role. In the medium-run (five to ten years) when increased electricity generation might be inevitable, switching to different fuel mixes, basically toward extensive use of natural gas, liquefied natural gas (LNG), and imported hydroelectric power, will be required. The possibility of adopting unconventional sources of energy (wind, solar) should be explored. Along with other policy actions, effective measures to increase forest areas should be designed, and proper management of forest areas should be made a long-term goal.

### Reforestation as a Carbon Sink

Emission reductions could also be achieved via changing the pattern of land use. Reforestation, in particular, represents an attractive strategy. Although there are some uncertainties in quantifying the relationship between tropical reforestation and carbon absorption, some rough estimates could be made based on the statistics reviewed by the International Project for Sustainable Energy Paths (1989) and the most recent statistics reported by the IPCC working group II. Assuming that the CO<sub>2</sub> absorptive capacity of one hectare of forest is 2.5 tons per year, and that the government's forest policy is able to reforest an area of 0.16 million hectares, or one million rai, per year, Thailand would have an additional



\* Assuming that deforestation remains the same as the 1989 figure

Source: TDRI estimates (January 1991)

Figure 1 Comparison of Carbon Released due to Fossil Fuel Consumption and Deforestation



*If Thailand had an additional 30 million rai of forested area by the end of the year 2020, this would absorb approximately 186 million tons by the year 2020 and would be enough to stabilize the level of the country's CO<sub>2</sub> emission without disturbing energy consumption in other sectors.*

30 million rai of forested area by the end of the year 2020. This would absorb approximately 186 million tons by the year 2020 and would be enough to stabilize the level of the country's CO<sub>2</sub> emission without disturbing energy consumption in other sectors. Reforestation brings many other benefits as well and should therefore be taken into serious consideration by decision makers. Many might argue that past reforestation programs have proved unsuccessful. This is because not enough attention was paid to the trade-off between land for food crops and forest area or to ensuring that local people benefitted from these programs. An additional complication is that more than 7.8 million people currently live in encroached forest areas which the government hopes to reforest.

### **POLICY IMPLICATIONS: A COOPERATIVE STRATEGY**

There are two primary implications for policy to be drawn from the data and information presented in this paper.

The first implication is that Thailand will need to reduce its emissions of CO<sub>2</sub> through fuel switching and conservation measures if it wishes to reduce greenhouse gases. Although the combined potential to effect emissions of CO<sub>2</sub> through these two measures is small compared to global emissions levels, they nevertheless warrant exploration. Thailand's task in reducing emissions will be greatly facilitated through cooperative efforts with neighboring countries who have excess supplies of natural gas and hydropower. Currently, Thailand has small and diminishing natural gas resources and will need to rely even more on lignite to fuel its industrializa-

tion. An acceleration of the Joint-Development Area project between Malaysia and Thailand is one concrete way to ensure that more natural gas is available to the Kingdom. Similarly, implementation of the international hydropower project between Laos and Thailand can speed up access to electricity generated by sources other than lignite. Finally, continued negotiations with the Burmese government for trade in natural gas represents a third viable cooperative strategy to reducing CO<sub>2</sub> emissions.

The second primary implication is the potential for reforestation. The encroached forest reserves, some of which have been rented to private firms, cannot be considered a promising supply of land for tree plantings due to the complication of dealing with some 7.8 million settlers. Although there is some identified unused land, it is not necessarily true that it will be available for reforestation. The opportunity cost of converting the land into plantations must also be taken into account. The financial and technological problems facing Thailand are similar to those facing other developing countries. These factors will significantly determine the rate of change in forests. A national effort is necessary to implement a successful reforestation program, yet not really sufficient. Therefore, external funds will be needed to assist this effort. Specifying the amount of funds needed to cover the costs of planting trees must be done at the national and not simply at the site level. At present, there has been no effort to do so in Thailand. Equally as important as financial and technological factors is the institutional capacity to implement large reforestation programs. The tasks include not only the preparation of land, if available, planting and maintaining but also the overall management of forest-related

systems such as agricultural and forest product trading systems. This, too, will require the assistance and cooperation of other and wealthier nations.

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# Patent Issues in Thailand\*

Mingsarn Santikarn Kaosa-ard

**D**uring the last few years the U.S. government has asserted continuous pressure on the Thai government to broaden and extend protection provided under Thailand's Patent Act 1979. This has raised unfavorable response from the Thai public for three main reasons: local industries might be destroyed; prices of patented products might be increased, especially for some important drugs needed by the poorer sections of the population; and local technological ability could be discouraged. This article provides some preliminary data as to the last concern and investigates the present patent system's effects on technical innovation.

## MAIN FEATURES OF THE PATENT SYSTEM IN THAILAND

The main purpose of the patent system in Thailand is to provide incentives for technology development in the private sector, by granting monopoly rights to the owner for the use of his or her invention during the period covered by the patent.

The Patent Act 1979 protects two types of industrial assets: designs and inventions. Some of the more important stipulations are:

- The protection period is 15 years for inventions and seven for industrial designs. The current act does not protect inventions in food, beverages, pharmaceuticals, agricultural machinery, biological inventions, information systems and computer software.
- Patent fees are fixed at 2,000 baht, starting from the fifth year after the patent is granted and increased by 2,000 baht every year until the final year of the protection period when the fee reaches its maximum of 30,000 baht.
- Foreign patents are not automatically protected under the current system. Foreigners wishing to protect their assets need to apply for a Thai patent no later than 12 months after filing abroad.

- Compulsory licensing may be enforced if the patent is not used after three years since the granting of the patent.
- A special license is required before goods already covered by Thai patents can be imported.

## PENDING AMENDMENTS

The Ministry of Commerce is now under pressure to extend the protection period to 20 years for inventions. Pharmaceuticals, biotechnology, and agricultural machinery are likely to be included in the amended law. It will be illegal to produce patented products, even if the production process is different from that used by the patentee. The compulsory licensing clause will be enforced at the end of the third year after patent issuance, or the fourth year after filing, whichever is longer. This clause will be enforced only if a potential licensee can prove that a "reasonable" return has been offered to the patentee.

Proponents argue that these amendments show that Thailand respects the international rules of the game. They also believe that protection of intellectual property rights would stimulate local research and development (R&D) and would also encourage transnational corporations to transfer technology to Thailand.

## WHAT IS PATENTED IN THAILAND?

From 1979 to June of this year, the Ministry of Commerce received a total 11,311 applicants for patent rights. Of this, 1,827, or 16 percent, were issued — 1,304 (or 71%) for industrial designs (Table 1). A closer examination of some industrial design patents at the Patent and Trademark Office (PTO) reveals that most of these required a low level of technology. Examples include designs for bags or belts, designs for ice cream (e.g., shape of lion's head or a smiling child), and a push cart for selling ice cream, etc.

The PTO classifies inventions into two categories i.e., engineering or chemical inventions. Up to June 1990, out of 7,950 applications, a total of 523 patents

\* The data for this article is taken from two reports prepared for TDRI's Science and Technology Development Program. The two studies are: *Enhancing Private Sector Research and Development in Thailand (1990)* and *Barriers to and Strategies for Technology Acquisition (1991)*.

**Table 1 Patent Application and Registration in Thailand (1979-90)**

	No. of Patents	%
A) Patent Applications and Approvals		
Applications	11,311	86
Approvals	1,827	14
Total	13,138	100
B) Types of Patent		
Inventions	523	29
Industrial Designs	1,304	71
Total	1,827	100

Source: Patent and Trademark Office.

were issued, 183 (35%) of which were for engineering inventions and the remaining 65 percent for chemical inventions. Let us suppose that inventions had more substantial technical components. If this were the case, over the past decade only 500 inventions were given patents—fewer than 50 a year. Compared to the Republic of Korea's average of issuing over 2,000 patents per year, Thailand's figures are rather discouraging.

#### WHO APPLIES FOR, WHO OBTAINS PATENTS IN THAILAND?

Up to September 1990, the number of registered patents totalled 527, of which only 63 were inventions by local scientists. Clearly, the local science and technology community is a very minor beneficiary of this particular incentive system.

An obvious question is: Why is the local private sector not interested in using the patent system? Two hypotheses can be proposed. First, local firms have low technological ability and have been unable to produce inventions that are sufficiently novel to be granted patents. Second, Thai firms have other ways of keeping industrial secrets. An examination of the makeup of an inventor's team and the legal ownership of a patent holder indicates that, while foreign inventors are likely to work as a team, Thai inventors tend to go it alone (Table 2). Moreover, only 17 percent of the local patents are held by corporate enterprises (Table 3). Compare this with 96 percent for foreign patents.

Questionnaires were sent to 63 local inventors in an attempt to extract information regarding their background and how their R&D was funded. Only 13 replied. Nine of these had Bachelor's Degrees, the highest education level. Almost all relied on personal funding.

**Table 2 Composition of Inventors' Teams**

Inventors	No. of Patents	%
Foreign		
Single	193	42.32
Team	263	57.68
Total	456	100.00
Local		
Single	60	95.24
Team	3	4.76
Total	63	100.00
Unidentified Inventors	5	—
Joint Thai/Foreign Teams	2	—

Source: Patent and Trademark Office.

**Table 3 Inventors and Patent Holders (1982-90)**

Inventors	Patent Holders				Total
	Thai		Foreign		
	Individual	Corporate	Individual	Corporate	
Thai Individuals	53	10	0	1	64
Foreign Individuals	1	4	18	433	456
Inventors Not Identified	0	1	0	6	7
Total	0	15	18	440	473

Source: Patent and Trademark Office.

Most inventions required rather small amounts of investment. Only two inventors spent more than one million baht for their inventions. Six spent less than 100,000 baht. Four of the 13 inventions have been commercialized by the inventors themselves.

It can be concluded that the local patent system has had little impact on improving local knowledge and technology owing to limited investments in both human and financial resources. Local inventions have low commercial value or potential as they come from lone researchers. Modern inventions generally require a team of scientists and technologists combining their knowledge. If, for example, a biochemist discovered that a part of a particular plant could produce a useful drug and had this knowledge patented, this is still a long way from actual production. A pharmacist would be needed to determine the dosage and the level of potency, an engineer to identify the process technology and to conceptualize a prototype machine, and a horticulturist to determine the most productive way the plant could be cultivated.

Other information, obtained from interviewing private firms, also suggests a low level of R&D activities in the private sector (TDRI, 1990). R&D expenditure is believed to be negligible, constituting much less than a third of public R&D expenditure. It is also very low by international standards, i.e., around 0.22 percent of Gross Domestic Product (GDP) in 1987 compared with the Republic of Korea's 2 percent. Local firms rely mostly on ready-made technology because they produce mainly standardized products.

Industrial development in Thailand is at such a simple stage that in-house R&D is not yet a deciding factor in maximizing profitability for most firms. Most of the 19 firms interviewed do not have a formal R&D department or a budget specifically for R&D. Local joint ventures tend to rely on the R&D of their foreign partners. One joint-venture company with annual sales of over one billion baht has done no R&D at all. The ones that do engage in at least some R&D are involved in product and process improvement and hire only a few people with Master's Degrees, at best. Such companies feel that their research output is not novel enough to be

patented. Only two firms reported hiring more than 10 Ph.D.'s in their R&D departments, but these are Thailand's largest conglomerates in food and construction materials.

The acute shortage of scientists and engineers following the industrial investment boom since 1987 has further lowered the short-run priority of R&D activities in private corporations. Moreover, the necessary supporting industries, i.e., the metalworking and machinery industries, have low (although increasing) technical capability.

It is important to note that private firms lacking R&D departments and weak supporting industries make it difficult for local firms to exploit local patents, some of which contain ideas only, without actual prototypes. As private local firms are rarely involved in the patent system, it can be said that Thai patents are mainly supply driven.

#### WHAT NEXT?

Debates on the patent system so far have centered on anticipating the likely impact of the amendments. Concern over possible trade loss has forced the Thai government to sit at negotiation tables before it has been able to thoroughly scrutinize the whole situation. The threat of Super 301 has superseded many important domestic issues which the patent system has been designed to serve. The information presented earlier is only preliminary and a number of domestic issues need to be examined, regardless of whether the amendments become law or not. Many questions need to be resolved. These include: To what extent are foreign patents used in Thailand? How have foreign patents affected the market structure, exports and local technical ability? Which coverage, claims, annual and renewal fees, and dissemination procedures would most benefit local inventors? What resources are needed by public agencies to evaluate patent applications and to monitor their possible impact on the community at large? Without sufficient understanding of the underlying domestic conditions, debates on public policy in this area are unlikely to yield practical solutions. 

# A Framework for Science and Technology Policy Research\*

Nawaz Sharif

No country can remain isolated in today's world which is moving more and more toward a "new internationalism." Globalization of industrial production and concern over environmental degradation have increased interdependence between nations. This globalization has been made possible by unprecedented improvement in transportation and communications technology during the past few decades. Recent advancements in information technology have also helped establish distributed and flexible manufacturing systems, in which economy of scope has replaced economy of scale considerations in production. Even though comfort and convenience are becoming more important considerations for both product and process design, the cumulative effects of an increasingly polluted environment and the degradation or depletion of natural resources caused by industrial activity now seriously threaten the world as a whole.

In recent decades, technology has been the most important source of industrial growth as well as growth in national Gross Domestic Product (GDP). Globalization of industry and trade is the new reality for economic development. The key competitive advantage now dominant in global trade is the ability of a country's production units to apply technology rapidly and to undertake technological innovations successfully. Comparative advantage based on national differences in factor costs is no longer sufficient to maintain economic growth. Competitive advantage based on a nation's technological ability is now more important.

The basic aim of any industrial project is economic growth through higher levels of productivity. Developed countries emphasize innovation and specialization in the process of industrialization for international trade, as the value of a product is determined by the technology that goes into it, not by the raw-materials that constitute it. Industrialized countries expand exports from their more productive industries, shifting less productive activities abroad, and importing goods and services in those industries where the nation is less productive. Developing countries also have to adopt similar policies. The constraints that newly developing nations now face

are considerably more difficult than at any time in the past. They are as follows:

- Size and growth rate of population as compared to the geographical dimensions of the country. This constraint can put enormous pressure for rapid (even revolutionary, rather than merely evolutionary) economic growth on a nation;
- Availability of natural resources per capita. As these shrink, there is a tremendous demand for higher and higher productivity, conservation of resources, and development of renewable resources;
- Rising aspirations of both rich and poor for imported fashion brand-names, fuelled by the mass media and high-powered advertising, deny governments adequate time to design sensible long-range development plans.
- Adverse balance of payments due to the decrease in export prices of many traditional low-technology commodities and the increase in the prices of high-technology products, almost all of which are imported;
- Environmental degradation due to over-exploitation of natural resources and agricultural land to produce exports in an attempt to offset balance-of-payments problems;
- No alternative but to operate within well-established international systems controlled largely by the industrialized world, which insists on patent rights enforcement and restricts wholesale immigration.

These above constraints suggest that a new approach is essential for development planning which explicitly recognizes the current international situation and the emergence of technology as vital to economic advancement.

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\* This is an abridged version of a paper prepared by Dr. Nawaz Sharif, Professor in the School of Management of the Asian Institute of Technology, Bangkok.

## THE ROLE OF SCIENCE AND TECHNOLOGY

The role of science and technology (S&T) in production systems is to increase productivity and efficiency in both agriculture and industry, to lower the cost of production and improve the quality of outputs, to reduce losses and increase value added, to introduce new products and processes, to increase flexibility to respond to changing market conditions, and to facilitate the efficient utilization, substitution and consumption of depleting natural resources.

Technology has forced the world economy to undergo profound changes in the past, and shows every indication that it will continue to do so. Thus, building technological ability has become a must for every country's survival and economic advancement. The technological capabilities of a country lie in its production system. Therefore, capability enhancement must be considered in the production context, where natural resources and semifinished goods are transformed into consumer goods and capital goods of market value. Technological skills, information, and management are just as important. However, if one accepts the critical role of technological innovation as the most dominant factor in productivity growth, it is essential to understand technology better. One way to comprehend production technology fully is to separate it into its four components:

- Physical facilities, such as equipment, machines, structures—all tools for enhancing human capabilities (e.g., increasing power of muscle, brain, sight, reach, etc.) and for improving living surroundings (e.g., increasing comfort);
- Human abilities, such as skills, expertise, talent, that help to generate, operate, maintain and improve the facilities used in production;
- Documented facts, such as specifications, designs and manuals, that store systematized knowledge and reduce the learning time and resources wastage for the production of goods;
- Organizational frameworks, such as management techniques, linkages and networks, for effectively coordinating technological components within the market.

All of the above forms of technology, although differing in degree of sophistication, are required simultaneously for any enhanced production activity. This is not yet fully appreciated in the developing countries. To comprehend the scope of developing technological ability, one should keep in mind that technology is a complex combination of continuously improving physical assets, progressively learned skills, routinely acquired knowledge, and evolving management techniques. It is also

necessary to understand the strategic importance of technology for sustainable development.

Worldwide industrial activity is damaging the environment and creating a serious threat to the health and survival of humanity. Technology to protect and conserve nature is now urgently needed. With environmental awareness high on the global agenda, emphasis is now rightly on the development of cleaner, more efficient, and resource-saving technology. The emphasis, however, should not be on just protecting the environment, but also on promoting economic development. Technology is generally set in motion by necessity, opportunity or human aspiration. There can be no economic growth without technology, and without economic growth there is inadequate capital to support environmental protection.

Sustainable development has been defined as a process of change in which the exploitation of resources, the direction of investment, the orientation of technological development, and institutional changes are all in harmony. From an environmental point of view this means meeting the needs of the present generation without destroying resources needed by future generations to be economically and technologically self-reliant. Sustainable industrial development ultimately results from production technology becoming internationally competitive and environmentally sound. Sustaining competitiveness depends upon three conditions: factor advantage and the availability of technology; cumulative investment and specialization; and constant improvement and upgrading.

Developing countries have to buy industrial technology (imported through transnational corporations). To be able to pay for it, they have to be able to make and sell other kinds of technology. Selling raw-materials and primary goods is a losing business. Developing countries, therefore, have to adopt a "make-some, buy-some" strategy. And experience indicates that "make some" has to begin by adapting bought technology.

In recent decades, technological change has gained considerable momentum. Innovations now occur at an ever-accelerating pace and, with industrial research becoming costlier, specialization is a necessity. Technological leapfrogging, however, may be possible, and perhaps essential, for sustainable development by late-starters. Leapfrogging can be achieved only when due attention is given to the problems associated with the development of the four components of technology previously mentioned.

## CURRENT PROBLEMS

Poverty in developing countries cannot be eliminated overnight. Also, problems are too many to be addressed concurrently. Instead of preparing an exhaustive list of all problems, this section, therefore, presents

only the most common. Understanding current difficulties can help identify major issues and possible action plans for developing technological ability.

#### Common problems with physical facilities

- Generally old, outdated facilities for production and research activities;
- Equipment and facilities are poorly maintained, and break down very often;
- Machines and facilities are of different standards which cannot be interchanged;
- Lack of spare parts and inadequate repair facilities;
- Locally produced equipment is of poor quality and often very unreliable.

#### Common problems regarding human abilities

- Mismatches between the supply and demand of skills required by industry;
- High rates of emigration among technically-skilled individuals;
- Widespread under-performance of skilled personnel due to lack of facilities, or other reasons;
- Education system emphasizing rote knowing rather than innovative doing;
- Training and retraining seldom recognized by management.

#### Common problems in handling documented facts:

- Accumulated knowledge rarely documented for later use by others;
- Generally supply-push (not demand-pull) strategy for knowledge accumulation;
- Inadequate sharing of valuable information both within industry and in the developing countries generally;
- Language barrier limits knowledge accumulation and dissemination;
- Very little appreciation of the value and power of information by management.

#### Common problems in management techniques

- Emphasis on doing things right (efficiency) rather than doing right things (effectiveness);
- Inadequate interest and attention to introducing modern management techniques;
- Failure to adopt and blend imported management techniques with the local situation;
- Paying lip service only to concepts such as networking;
- Failure by management to realize the importance of building technological ability.

#### Common problems impeding competitiveness

- Weak links between the academia, research institutions and industries;
- Poor work environment and adherence to age-old traditions;
- Inability to deal with long-term considerations in planning decisions;
- Failure to generate team spirit for problem solving and promoting innovations;
- Policy instability causing capital flight and lowering investment.

#### Negative aspects for research and development

- Compared to developed countries, total R&D effort in most developing countries is insignificant and generally unproductive;
- Due to overprotection, private industries in developing countries feel little necessity for in-house R&D efforts;
- Most public sector R&D organizations have outdated facilities and rigid management styles, inhibiting creativity;
- Public-sector R&D organizations are often engaged in activities that are too diversified and time-consuming;
- Missing links in the development chain and virtual isolation from the market pull are critical bottlenecks for both technology adaptation and generation.

#### Current environmental problems

- Increase in the scale of rural poverty, putting high pressure on the land;
- Inadequate waste disposal infrastructure for the rural poor and in urban slum areas;
- Depletion of natural resources due to inefficient use and over exploitation;
- Significant pollution from agriculture, transport and industry;
- Lack of environmental standards or monitoring and assessment of projects.

#### IMPORTANT POLICY ISSUES

Since technology is part of the investment cost of production, it is important to understand the rules of the game for technology acquisition through foreign investment.

Transnational corporations (TNCs) invest in foreign countries on the basis of commercial opportunities, such as attractive incentives, including guaranteed profitability, adequate infrastructure for business, protection of proprietary rights, minimal government interfer-

ence, and government stability. Main attractions include access to natural resources, improved access to national/regional markets, protection of existing and potential markets, cheap and plentiful labor force, and investment incentives offered.

The relationship between foreign investment and technology transfer is complex. It is possible, however, to observe the following flow of technology components under an open market situation:

- Physical facilities for production, other than state-of-the-art, can normally be bought internationally for a price determined by the relative bargaining position of both buyer and seller. A TNC will locate its production unit in a developing country if it is profitable to do so with minimum risk.
- Highly-trained people migrate from poor countries to places offering superior standards of living. Salary, work environment and living conditions are the three most important determinants of labor mobility. Technically-skilled people can be imported, but a country's technical acquisition will, in the long run depend on the learning ability of its people.
- Documented facts are not sold on the open market and such information is a powerful bargaining tool. Valuable raw data generally move from developing to developed countries, while processed and packaged promotional documents normally flow in the other direction.
- Imported management techniques nowadays require very sophisticated computer and communications facilities and bring in alien cultures and values. To be effective, organizational frameworks have to be adapted to local conditions.

It should be clear that, internationally, financial incentives rather than welfare dictate the direction of technology flow. Developing countries, therefore, find TNCs hard to live with, yet impossible to live without. TNCs are the biggest exporters of technology, most of which are matured, material-intensive, energy-intensive, labor-intensive, and sometimes pollution-intensive. Experience has demonstrated that TNCs can establish profitable businesses in developing countries through direct investment, joint ventures, or licensing agreements. Market mechanisms ensure that the beneficiary of technology transaction is the one who pays. Therefore, it is obvious that one who cannot pay for technology cannot benefit. Under a free and open market situation, technological components naturally move to rich countries, as demand is dependent upon absorptive capacity and purchasing power.

Since technological innovations have become progressively novel, costlier to develop, faster in pace and more pervasive, it is inevitable that the cost of technology imported by developing countries will continue to rise. As balance-of-payments situations become increasingly worse for most developing countries, they will have less money to buy newer (environmentally sound) technology. Hence, the market mechanisms will ensure further deterioration of the plight of the poor countries. For sustainable development, market mechanisms would require that the production systems of the developing countries also become internationally competitive and achieve a balanced trade situation on the basis of technology content of goods traded. In the developing countries, therefore, technological innovations must be made to permeate all production activities—a process that cannot be left to chance and must be guided by governments, although driven by the marketplace.

However, the ability of a country to use a specific technology as its economic growth develops is critical and very dependent on the infrastructure and the degree of industrialization of a country. Fiscal and monetary policies promoting industrialization by reducing cost of production through subsidies, raising product prices through protection, and increasing profit margins through tax holidays seem to have failed in most cases to produce sustainable development. Instead, they have caused distortions, widespread inefficiency and misallocation of resources. Also, poorly managed technology import has led to patterns of development that are not sustainable.

Governments in developing countries need to create an economic and regulatory regime that encourages international technology transactions. A government's real role in national competitive advantage is to create a climate that encourages innovation. Government incentives should help specialization and promotion of clusters of industries that draw on common inputs, skills and infrastructure. It is the responsibility of the government to reduce the crippling mismatches between the supply and demand of human skills, and to provide an up-to-date information infrastructure for technology-based development. This would also require committed, comprehensive and concerted action on the part of the entire nation. Finding the appropriate mix between using market signals and government regulations is critical. Moreover, successful government intervention depends on sound policy research.

## **MAJOR DIMENSIONS OF S&T POLICY RESEARCH**

Considering the present situation, it is possible to enumerate the following key issues of S&T policy research in developing countries:

### **Vitalizing the S&T Management System**

- Affirmation of conviction and strong determination of leadership in using S&T
- Strengthening a central authority for effective management of S&T and R&D
- Establishing an effective S&T management information network

### **Accelerating Utilization of Available Technology**

- Identifying, transferring and adapting pertinent foreign technology
- Strengthening national consultancy and design engineering services
- Enforcing standards, quality control, and certification schemes for production

### **Strengthening R&D Activities**

- Increasing the fund allocation for industrial R&D
- Fostering in-house R&D in private industry
- Establishing direct formal linkages between S&T producers and users

### **Intensifying Technological Human Resource Development**

- Involving private enterprises in skill development and continuous upgrading
- Increasing S&T content of education, placing more emphasis on know-how
- Improving the compensation and reward structure according to quality of education

### **Fostering Specialization in National Capability Building**

- Monitoring world technological trends and market opportunities
- Continuously assessing technological impacts, capabilities and needs
- Selecting areas of specialization by a flexible-learning strategy of make-buy

### **Providing Essential Support for Technological Innovation**

- Providing technological consultancy service to small- and medium-sized enterprises
- Providing venture capital for starting new technology-based firms
- Enabling participation in international seminars and trade fairs

### **S&T Culture and Future Orientation**

- Popularizing S&T through the mass media
- Instituting an award system to encourage creativity and innovation

### **QUESTIONS THAT NEED TO BE ANSWERED**

For each of the major areas of S&T policy research a large number of key questions can be identified. This section provides a list of questions which need to be answered through S&T policy studies. This is not an exhaustive list. Nor are the questions placed in order of priority. Only the most important questions are raised here.

#### **Vitalizing the S&T Management System**

- How to ensure sustained political commitment which would allow S&T to play a leading role in promoting socioeconomic development?
- How to secure a disproportionately high level of resources allocation for S&T development which can no longer be neglected?
- What should be the proper role of government intervention with respect to type (fiscal, financial, legal), time period and target (producer, user) of S&T?
- How to strengthen the effectiveness of linkages between the supply and the demand sides of S&T for development?
- What kind of organizational infrastructure would be the most suitable to manage the S&T-led economic development strategies?
- What lessons can be learned from the experiences of newly industrialized countries and other developing countries?
- How can the government, as the primary engine of economic growth, hasten technological ability?

#### **Accelerating Utilization of Available Technology**

- How to provide an effective service in identification, transfer and adaptation of foreign technology for local small and medium enterprises?
- How to improve local management capability to apply technology rapidly and to undertake technological innovation continuously?
- How to encourage R&D investment for adaptation of imported technology?
- How to promote the use of the patent information system for the benefit of local industries?
- How to consolidate governmental procurement policies and procedures to encourage local adaptation of imported technology?

### Strengthening R&D Activities

- How to ensure effectiveness of R&D activities by the public sector organizations?
- How to strengthen support services for commercialization of R&D results?
- How to foster industrial technology development by private sector enterprises?
- How to select, evaluate, and prioritize national R&D projects for funding and joint operation?
- How to strengthen the national capability for design engineering, industrial consultancy, standardization, quality control and certification scheme?

### Intensifying Technological Human Resource Development

- How to secure and nurture a cadre of creative scientists and high-caliber technologists needed by industries to be internationally competitive?
- How to keep S&T manpower up-to-date, functional and flexible in an age when knowledge is doubling every five years?
- How to encourage creativity and self-reliance at all levels of education and promote training and retraining as a life-long process?
- How to emphasize know-how (application) as well as know-why (theory) in education and training at all levels?
- How to reduce the crippling mismatches between the supply and demand of human skills?
- How to determine skill requirements for the future and evaluate the characteristics of the current skill structure?

### Fostering Specialization in National Capability Building

- How to monitor and continuously assess the impact of world technological trends and evaluate international market trends?
- What ways and means could be introduced to encourage the formation of new technology-based firms in the country?
- How to implement the strategy of make-some, buy-some technology for sustainable and internationally competitive industrialization?
- How to identify areas of specialization and determine priorities for research programs and manpower development in new and emerging technology?
- How to assess technological ability and determine the technological needs of local industries?

- How to create and sustain a competitive technological edge in selected industries?
- How to achieve technological leapfrogging in selected areas to take advantage of the unique characteristics of the technological change process?

### Providing Essential Support for Technological Innovation

- How to strengthen international linkages (personal and organizational) for intelligence gathering with respect to S&T?
- How to make local industry realize that not to invest in factor creation is a fatal error in international competition?
- How to establish special mechanisms contributing to the synergistic partnership of business and government?
- What needs to be done to maintain the natural resource base of the country and ensure environmental protection for future generations?

### S&T Culture and Future Orientation

- How to ensure that the decision-making process will not shy-away from the long-term considerations essential to building technological capability?
- How to instill in the minds of the people that quality is more important than quantity?
- What should be done to deal with intellectual property rights and the brain-drain?
- How to use the electronic mass media (television) to promote an innovative culture and increase awareness about the role of S&T?
- How to achieve a genuine shared vision for technology-led development?

The above listed questions may serve as a guide to formulate specific research projects.

### CONCLUSION

The main purpose of this paper is to present a rational basis and a general framework for S&T policy research in developing countries. Using this framework, first, it is necessary to review past and present activities of institutions engaged in policy research, and then, one can identify further research needs by comparing the activities completed so far with the relevant research questions (some of which are listed in the previous section). Finally, S&T policy research topics have to be selected on the basis of resources available and priorities assigned. 

## Are Women's Organizing Abilities a Forgotten Resource?\*

**D**espite the enormity of financial and technical assistance devoted to community development in Thailand over the past two decades, efforts to eradicate poverty and improve the quality of life of rural people have left a great deal to be desired.

As newer development strategies acknowledge, real change within communities occurs only when people look within themselves and find their own ways to solve problems. Only when all interest groups come together to plan democratically for the future, does true development take place. To facilitate this process, more attention needs to be paid to the role of women. While a "must," this nevertheless raises questions: How, for example, do women organize? Do they approach the tasks of development differently from men? Are their priorities different? Are there feminine ways of accomplishing things that are particularly valuable in assisting community change?

### PROJECT SUMMARY

To help integrate women's talents and organizing abilities in a predominantly masculine problem-solving system, Organizing for Development, An International Institute (ODII) is undertaking a global research and evaluation effort to address this question. The first study—a joint project between ODII and two Thai institutes: the Population and Community Development Association (PDA), a nongovernmental organization undertaking various community development projects throughout the country, and TDRI—was conducted in Northeastern Thailand. The Royal Ministry of Foreign Affairs of Norway provided the funding.<sup>1</sup>

This research and evaluation project examined how rural women in Thailand plan solutions and creatively solve problems to make life more comfortable in their communities. Its overall purpose is to foster understanding by development professionals of women's organizing abilities.

The project's implications, however, go beyond this. This project involves power relationships at the local level, a fresh approach to the whole process of organiz-

ing development both nationally and internationally. This approach moves beyond a centralized, or a funding agency-driven, process to a new holistic model that is at once people-centered, democratic and cost-effective.

In February 1991, sixteen PDA moderators were trained in ODII's new approach.<sup>2</sup> In less than two months, PDA conducted 16 village workshops in which 480 men, women, and young people participated. Each village workshop simulated an ideal Village Committee Meeting where those who represented various village interest groups—men, women, and youth—were all given equal say. Divided into three groups for research purposes—one male, one female, and one mixed—workshop participants prepared clear, logical plans for such activities as better roads, improved water supply, and enhanced silk weaving without outside assistance.

These and many other development priorities were further refined in four regional workshops attended by elected village representatives, headmen, and relevant government officials, such as community development agents, agricultural extension workers, health officers and teachers. The villagers have since taken the approach a step further and used their workshop learning to plan and put into action other activities in their communities.

TDRI studied the villagers' various roles, especially that of women in the planning process. Researchers found that it is both important and very practical to integrate women into the planning process for village development as early as possible. The projects worked out clearly reflected the needs and concerns of rural women—village child-care centers, women's income generation schemes, village health, local education, improvement of existing water resources, and others. All these began during project identification sessions and were negotiated with the men. Project priorities were then accordingly set. Success rates for the women's activities were equal to those of their menfolk.

The workshops, using the "appreciate, influence and control" (A-I-C) approach, proved the strength of grass-roots participation in the development process. While most development agents often think it is difficult

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\* Study conducted by Organizing for Development, An International Institute; the Population and Community Development Association; and the Thailand Development Research Institute.

for villagers to plan their future, villagers themselves are of a different opinion. As one villager remarked to a PDA worker several months after the workshop:

"This is so easy, why didn't you tell us about it before?"

## **OVERVIEW OF FINDINGS AND SUMMARY OF POLICY IMPLICATIONS**

The results of the implementation of this action research project provided many interesting policy implications for both governmental and non-governmental organizations (NGOs). They are as follows:

### **Involving Villagers in Community Development Planning**

A reason often given for the failure of development projects is that villagers are not interested in joining development projects. This has been a major problem for most government agents, who are supposed to motivate local participation. Because development projects are generally planned by central agencies, far removed from village life, villagers do not feel that the projects are beneficial to them or to their community. But if villagers are given the opportunity to think, debate and decide what should be done to improve their own communities, they will usually work hard to see projects succeed, even if it means contributing their own money.

Village and synthesis workshops using the A-I-C approach have motivated villagers—particularly women—to participate in planning and decision-making and have shown the strength of grass-roots participation in the development process. Outcomes from these workshops also confirm that villagers themselves have enormous reserves of energy for developing their own communities.

### **Recognizing Women's Needs in Community Development**

A significant finding of this study was that development projects fared better when women actively participated in equal numbers to the men at all stages of the development process. This was true from project formulation and decision-making on through to implementation. Throughout the workshops, the women's contribution to the decision-making process proved highly helpful. While the men proposed road construction, the establishment of revolving funds, and setting up water resources for agriculture, the women came up with other, just as important aspects—putting more emphasis on health projects, income-generating activities, child welfare, and local education.

From the above findings, the structure of village development committees, presently 95 percent male, should be reconsidered. If the government believes that

rural people should have a say in planning their own community development, then village men and women should be equally included in the village decision-making body, i.e., the Village Development Committee.

### **Organizing Women's Skills**

The women exhibited initiative, the ability to creatively solve problems, and behind-the-scenes coordinating skills. They regularly collected information, anticipating problems and motivating other workshop participants to develop their own concrete community improvement activities.

The women excelled at coordination. Their ability to gain acceptance and cooperation from other villagers will prove most useful in attaining community development objectives. During meetings, the men usually suggested overall plans, but it was the women who were more thorough in planning the details.

Women already play an active role in community development. But they should be integrated into the whole development process. With both male and female participation, rural development will be more efficiently achieved.

### **Strengthening the Role of NGOs in Facilitating Development**

In conducting this study, PDA was asked to act as facilitator in helping villagers to determine their own development priorities and future plans. The villagers indeed worked out realistic plans that were within the limits of the resources available to them. In this way, PDA was more than merely a provider of services. The Association facilitated the whole organizing process. In addition, the A-I-C process was an effective tool in implementing grass-roots participation. This has important implications for rural development. When NGOs help local communities draw up their own development plans, villagers quickly see how their own contributions accelerate development. It also reduces the cost of preparing and implementing projects.

It is important that NGOs have the trust of villagers and that they understand local cultural, political, and social nuances. NGOs could also usefully serve as mediators between government and the villagers.

### **Involving the Government in Planning Workshops**

For this development approach to work, the government will have to make villagers more aware of government policies and what resources are available to them. One way for the government to participate would be to send representatives to synthesis workshops where several village communities present their own development plans.

Government officers, for example, were invited to attend the synthesis workshops. The opportunity to listen to villagers talk about their problems was a new experience for both government and non-government officials. The officials, perhaps for the first time, were able to learn of development needs directly from the villagers instead of via second-hand information provided by village representatives (village chiefs or *kamnan*), as is the normal practice.

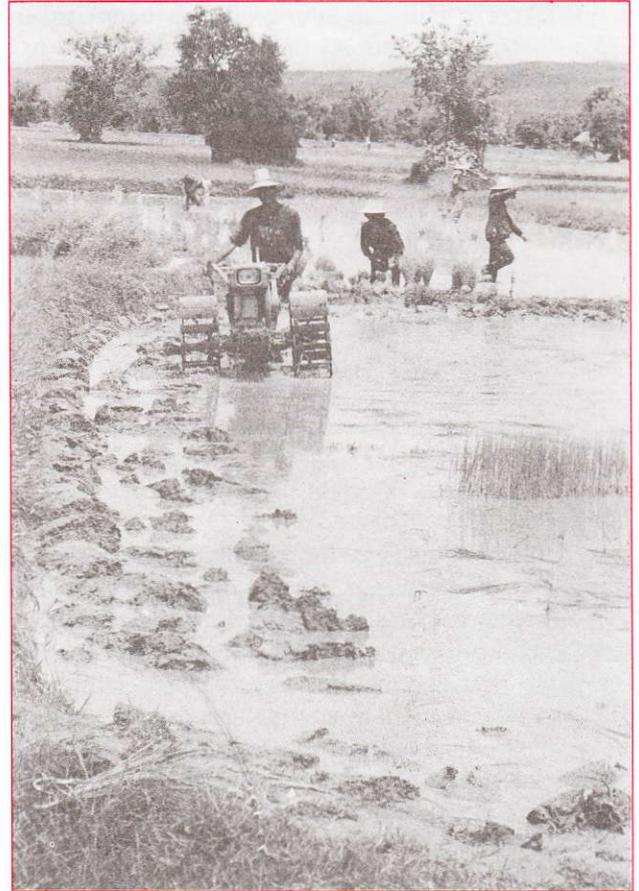
Villagers benefitted from exchanging ideas with neighboring villagers and also from information given by attending government officers. This active participation by the villagers raised their confidence.

This study reached the following conclusions:

- Villagers, when given the opportunity to think, debate, and decide what should be done to improve their own community, will work hard to see their projects achieve success. The A-I-C process provides a way for villagers to participate in community planning that is feasible, simple, and economical.
- When women participate in the community development planning process, they bring to light aspects that are often overlooked by the men, i.e., health, social problems, and the well-being of the community as a whole. They must, therefore, always be included in the planning process.
- Women have important skills for any organizing effort. They are able to come up with practical solutions and have excellent coordinating skills. They also take care of the details to ensure successful implementation of projects. These skills represent an important resource for village development and must not be ignored by government and NGOs.
- If rural development is to succeed, there is a need to move beyond centralized planning or a donor-driven approach to a process which is more people-centered and democratic. A process such as the one used in this study "where men, women, and youth participate as equals" provides a holistic, integrated and sustainable approach to development. The government should consider adopting such an approach throughout the country.

## ENDNOTES

<sup>1</sup> Details of the research findings are in a report entitled "Women's Organizing Abilities: A Case Study



*"If villagers are given the opportunity to think, debate and decide what should be done to improve their own communities, they will usually work hard to see projects succeed, even if it means contributing their own money."*

of the Northeastern Villages in Thailand." TDRI, May 1991. In addition, a documentary film entitled "Threads of Change: Voices of Women in Development" was produced by ODII and the Norwegian Broadcasting Corporation, funded by the Norwegian Government, that shows village and synthesis workshops in operation.

<sup>2</sup> ODII introduced to this project a practical organizing methodology based on social theory to encourage villagers to appreciate, influence, and control (A-I-C) power and to help them balance the social, political, and technical needs. By participating in the workshops, villagers were able to see the relationship between themselves, others and their common environment in a new way. This permitted them to diagnose their own problems, see the need for change within their communities, and work out democratically their own solutions. 

# Financial Innovations and Their Impact upon Economic Policies

## English Executive Summary

*The following is from a recent research monograph, in Thai, by Pakorn Vichyanond.*

Since the mid-1980s governments of various industrial countries have, to a large extent, relaxed their controls on financial institutions. Such liberalization, together with a volatility of exchange and interest rates never before experienced, generated a string of new financial instruments specially designed to handle different kinds of risks. These instruments have been widely accepted in the international financial community, and it is notable that the volume of their transactions in any period of time varies directly with the degree of turbulence in money markets.

In Thailand the Monetary Authorities used to act as a buffer, in most respects, for local markets against fluctuations abroad. This conservative stance was largely due to the desire to achieve economic stability. It is therefore not surprising that the numerous economic measures adopted helped protect domestic units from external disturbance. Fixed exchange rates, restrictive exchange controls, and ceilings and floors on interest rates are examples of these measures. Later on the government realized that such protective ruling also had disadvantages. For instance, fixed exchange rates may contribute to price stability at the expense of a sustainable trade balance on the external account. Similarly, rigid regulations on interest rates may easily impede market competition and the efficiency or professionalism of local financial institutions.

As a result, the Thai Monetary Authorities recently opened up the local scenario to a considerable degree. Floating exchange rates, dismantlement of some exchange controls, and the abolition of some interest rate constraints are examples of such deregulation. In the presence of growing volatility in local as well as foreign money markets, a large number of private entrepreneurs or organizations are beginning to recognize the benefits financial innovations bring in handling their assets and

liabilities. Seven new financial instruments—currency options, interest rate options, forward rate agreements, currency swaps, interest rate swaps, floating rate notes, and note issuance facilities—are described below.

### CURRENCY OPTIONS

Currency options are rights to buy or sell foreign exchange at a price neither above nor below the one agreed upon in the contract within a specific period of time or on a given date. These rights are useful in curbing exchange risks for customers or units expecting to have foreign exchange dealings in the future, for example, importers, exporters, borrowers, and contractors. Typically, financial institutions offering currency options demand that their clients present supporting evidence of possible or expected foreign exchange flows so as to minimize speculation. Ordinary maturities of currency options stay within six months. Longer maturities bring about complications to both sellers and buyers, especially with regard to appropriate fees.

Among various foreign exchange tools, currency options have the following outstanding features. They are only rights, not obligations, which can be exercised or left unused at the will of the holder. Whenever holders decide to exercise these rights, they are not bound to carry out the desired transactions with the same financial institutions which sold the currency options in the first place. Customers only need verify actual transactions, wherever they are done, before receiving or paying the difference in accordance with the option contracts. Furthermore, as long as options are not yet exercised and the contracts still remain valid, option holders can trade their rights to any party should they so desire. This allowance adds a valuable element of liquidity to currency options. Because of the flexibility mentioned above, fees charged in currency options are somewhat higher than those typically charged in outright forward contracts. Despite their higher prices, currency options have

**For a copy of the research monograph from which this executive summary is taken, please contact the Publications Office at TDRI. It costs 250 Baht (US\$10.00, plus US\$6.00 postage).**

become fairly attractive, especially among those customers wishing to curtail exchange risks in possible future projects. Clear-cut examples are companies tendering to contracts which involve foreign exchange expenses. Even though there are other ways to hedge exchange risks, such as currency swaps and currency futures, they do not yield as much flexibility and customization as currency options.

Currency options are equally attractive to the financial institutions selling them, since these options are only rights and need not be reported on the sellers' balance sheets. These "off-balance-sheet" activities yield income to sellers, without necessitating the presence of adequate back-up capital funds or other conditions as in the case of typical lending activities of commercial banks.

In Thailand the first currency option, offered in 1985, was between the U.S. dollar and the local Thai baht. A year afterwards commercial banks started to market currency options between prominent Western currencies. It is notable that even though Thai commercial banks dominated the forward exchange market in Thailand, the parties which were more eager to offer currency options were foreign banks. This may be attributed to the constraint these foreign banks have in establishing branches in Thailand as well as their close connection with their headquarters abroad which provide familiarity with crucial aspects of extending services on currency options, such as risk appraisal, pricing, coverage, and trading in secondary markets. As regards pricing, empirical tests suggest that fees were based on the degree of exchange rate fluctuations in the past. And the option premium charged was, on average, more than enough to compensate for possible losses. That may be because commercial banks do not want to encounter crises similar to the one experienced in currency option markets overseas in 1984-85 arising from both underpricing and rapid fluctuations of exchange rates.

## INTEREST RATE OPTIONS

The types of interest rate (IR) options studied here include "cap," "floor," "collar," and "swap options." Cap is the ceiling on interest rates and can be bought by any floating-rate debtor for a certain amount of principal, thereby restricting his interest expenses. Floor, on the other hand, represents the minimum interest rate a floating-rate depositor can purchase to attain satisfactory returns on his deposit. These services are rendered because the interest rates, which serve as a basis in floating-rate commitments, can fluctuate wildly and unpredictably, causing too much burden or too little return in money markets. Cap and floor are thus favored by some borrowers and depositors as less risky. The interest rates referred to in cap and floor are ordinarily required to be standard rates, reflecting the true liquidity status of the money markets concerned. For instance, either LIBOR or SIBOR is often selected as a reference rate

for IR option contracts in U.S. dollars, while the rate on CITINOTE or CHASENOTE serves contracts in Thai baht.

Collar combines cap and floor and creates a definite boundary for customers. Whenever the reference rate exceeds the ceiling of the collar, option sellers compensate the excess to customers. On the other hand, if the reference rate falls below the floor of the collar, customers have to pay the difference. Neither party loses if the reference rate stays between ceiling and floor. Collar also helps customers restrict their interest obligations within certain ranges.

Swap options specify the maximum or minimum interest rate differential between two currencies. This service can accommodate both units that count on foreign borrowing and units that receive income from abroad. In the former case, for instance, prudent swapping of foreign funds for local cost financing has to be matched up with appropriate cover in the forward exchange market. Otherwise, gains from tapping cheaper funds abroad may disappear because of exchange rate appreciation. Usually prices of forward covers vary directly with interest rate differentials. Therefore, swap options can assure local companies of certain total cost of swapping foreign loans for local currency.

Before employing any of the aforementioned IR options, customers have to declare the desired amounts of principal concerned, the maturities of the contracts, the relevant currencies, and the interest payment periods. These factors are taken into account when upfront fees are negotiated. Since their innovation, IR options have attracted strong and continuing attention from various money markets worldwide. The primary reason for this popularity is the following advantages to both buyers and sellers. For buyers, IR options provide protection as well as flexibility. For instance, even though cap assists borrowers by restraining interest liabilities within a certain level, no matter how tight the money market has become, it also allows borrowers to enjoy a lighter burden when relevant interest rates drop. Compared to other ways to cope with interest rate volatility, such as swaps or futures, IR options allow more leeway to fit in with the differing needs of individuals. They are also tradable as long as contract maturities have not expired, so buyers are furnished with an element of liquidity.

For sellers, IR options are rights of buyers, and do not have to be reported on financial balance sheets. Consequently, financial institutions offering IR options are not bound to support these activities by putting up further capital funds, nor do they have other obligations. Moreover, sellers of IR options are exposed to only market risks or interest rate fluctuations, and not to credit risks or creditworthiness of customers. Thus, IR options yield fees to financial institutions with less risk than typical credit extension. In short, IR options repre-

sent an income-earning channel at cheaper overall costs.

The first cap and floor were offered in Thailand during 1985 for only U.S. dollar interest rates. Later on, these services were developed for Thai baht interest rates. Branches of foreign banks in Thailand took a leading role in this context. As regards terms and fees, sellers of IR options in Thailand were fairly accurate in their interest rate projections, e.g., collars offered in the past were correct, in spite of lengthy maturities, and fees were more than enough to compensate for the interest rate exposure that IR option sellers took on behalf of buyers.

### **FORWARD RATE AGREEMENTS**

The forward rate agreement (FRA) is a financial instrument which helps manage interest rate exposure of customers. A buyer selects a certain level of reference interest rate at any particular point in the future for one notional principal amount (which is not exchanged). The situation is similar to purchasing insurance so that the effective interest rate in the future will be at a pre-specified level. If the actual interest rate on the due date is higher (lower) than that agreed, the difference will be refunded to (by) FRA buyers. Examples of typical FRA buyers are private corporations about to borrow or invest but afraid that interest rates may rise in the future. Conversely, depositors expecting certain returns in the future worry that interest rates may decline. They therefore sell FRAs ahead of time to eliminate uncertainty.

Though FRA transactions do not require margins or collateral as in futures markets, FRAs do not leave as much room or flexibility to purchasers as do interest rate options. Once committed in an FRA contract, a buyer has to either win or lose. Nevertheless, what he gains is to know in advance the exact amount of forthcoming interest obligations. The reference rates ordinarily used in FRA contracts are the standard rates, such as LIBOR or SIBOR, which reflect true market liquidity.

The two salient features of FRAs engendering widespread popularity are as follows. FRAs allow customers to adjust their interest rate exposure without having to immediately shift the liquidity profile of their current assets and liabilities. Because of their off-balance-sheet nature, FRAs appeal to financial institutions, as the institutions can sell them without having to raise additional capital or satisfy certain obligations. Moreover, the FRA attracts a large number of customers, especially at times of substantial interest rate volatility, since the terms of FRAs are so customer-oriented that the agreed interest rate, maturity, and beginning date of interest calculation can be tailored to fit individual needs. This aspect of flexibility enables customers to easily adjust their profiles as desired or offset any existing interest rate mismatch.

Yet, FRAs also have drawbacks. First, there is no secondary market trading for FRAs before maturity. Nonetheless, either partner of an FRA can enter a reverse FRA contract with another party to dissolve the original obligation. Second, in contrast with interest rate options, FRAs give rise to both market and credit risks. This can have a strong impact on financial institutions rendering FRAs to earn income or to adjust interest rate exposure.

In Thailand few banks offered FRAs and initially FRAs were only for U.S. dollar interest rates. This may have been due to the limited capability of FRA sellers to safely cover their positions via reverse FRAs. With regard to terms and pricing, FRA sellers were largely accurate in their expectations of interest rate movements and fees were adequately high, yielding profits to some extent.

### **CURRENCY SWAPS**

A currency swap is an exchange of newly-committed or current debts denominated in different currencies between two parties according to a specific rule. After the principals have been exchanged, each party must service the corresponding interest payments attached to the received principals. On maturity dates, each party has to return the original amount of principal to its counterpart. In some cases an agreement is reached so that there is no initial exchange of principals, and in others not at maturity either.

The outstanding benefits of currency swaps are plentiful. For instance, a company can execute an arbitrage via currency swap that generates a desired currency at a cheaper all-in cost than borrowing the currency directly. Currency swap can help eliminate currency exposure by matching assets and liabilities, both in terms of currencies and maturities, or help cover long-term commitments in foreign currencies. Moreover, currency swap is utilized to gain access to both convertible and blocked currencies with respect to either party. As regards current debts, it can lock in exchange gains or mitigate exchange losses.

Development of currency swaps stemmed from several underlying factors. Greater volatility of exchange rates, particularly in the late 1970s and the early 1980s, together with market imperfection and different perceptions among participants, created abundant opportunities. New instruments or methods were sought to hedge against exchange rate risks, to reduce financing costs, to gain access to virtually most currencies, and to help circumvent foreign exchange regulations. Nowadays, a main driving force is the capability of market participants to find the best solutions to suit their needs and the market environment at any point in time.

A sizable portion of currency swap markets is dominated by consideration of accessibility to desired currencies. Compared to interest rate swap markets,

there is a wide diversity of types of participants in currency swap markets, with financial institutions, especially banks, playing a smaller role than sovereigns, supranationals, or corporates. Secondary markets of currency swaps are relatively active, giving chances to both parties to speculate on both interest and exchange rates. For the most part, secondary trading is driven by profit motives, changes in market environment, and the differing perceptions of market participants.

In Thailand, genuine currency swap is yet to be developed since its so-called "swap" involves only the exchange of principals without the associated interest burden. In other words, such a swap resembles ordinary forward contracts. The major obstacles to currency swaps in Thailand have been foreign exchange regulations and the lack of benchmark interest rates, especially the long-term ones. Nevertheless, given the recent rounds of foreign exchange liberalization and the attempts of the authorities to develop market-oriented financial papers, the prospects for currency swap are better than before.

### INTEREST RATE SWAPS

An interest rate swap is a transaction in which two parties agree to make to each other periodic interest payments, calculated on the basis of specified interest rates, and a notional principal amount denominated in one currency. Typically, the payment made by one party is based on a floating rate of interest, e.g., LIBOR, while the payment made by the other is determined by a fixed rate of interest or a different floating rate.

Borrowers in international money markets are attracted to interest rate swaps' distinctive features. For instance, an interest rate swap enables a participant to tailor his interest obligations to meet his needs in a given rate environment, to reduce his cost of borrowing, to hedge against future changes of interest rates, or, in some circumstances, to lock in certain profit margins. Furthermore, interest rate swaps, particularly basis swaps, can be used to rectify maturity mismatch, to diversify interest rate risks, and to unwind existing swap obligations.

Many factors accounted for the development of interest rate swaps. Imperfect information and markets, coupled with the different credit risks of the same participant as perceived by different markets and differential risk premiums as demanded in fixed versus floating rate markets in the same currency, have created a comparative advantage between the two parties and the corresponding arbitrage opportunity to be exploited. Another major factor was the growing volatility of interest rates in the 1970s and the 1980s that prompted market participants to find ways to hedge. The combined features of risk and cost reduction render interest rate swaps a positive sum game, i.e., no losers at no cost to the system.

Participants in the primary market for interest rate swaps are normally large corporations and financial institutions. Commercial and investment banks may enter the market as both end-users and intermediaries. In a secondary market, existing swap positions are traded to match or square up the profile or speculate in expectation of interest rate movements. Before trading is carried out, a consent is often requested from the original counterparties unless the deal was arranged through intermediaries from the very beginning.

Interest rate swaps are rarely adopted in Thailand due to the absence of market clearing interest rates and sluggish domestic interest rates. But they may become popular, in light of present liberalization, especially after truly benchmark rates such as market-oriented government bond rates are established.

### FLOATING RATE NOTES

A floating rate note (FRN) is a medium- to long-term bearer note which is liberally traded. Interest from FRNs is paid periodically and pegged to a standard interest rate that constantly reflects actual market liquidity, such as LIBOR in London or SIBOR in Singapore. Normally, an FRN holder receives interest income equal to the sum of a standard rate and a certain spread. Besides, minimum interest rates are often stipulated, so as to assure investors of minimum returns. Most FRNs are listed in securities markets, thus compensating for their long maturities with some liquidity. In addition, prices of FRNs as quoted in secondary market trading are more stable than those of fixed rate securities, since interest rates are periodically adjusted in accordance with prevailing reference rates.

An FRN is often resorted to as a source of long-term funding by financial institutions, especially by commercial banks. Its maturity and floating rate nature fit well with commercial banks' syndication lending, whose interest rates are periodically reset. Furthermore, under the general terms of FRN, timing of debt commitment is viewed by borrowers as flexible, unlike fixed rate bonds where borrowers may hesitate depending upon how interest rate movements are predicted. For investors or lenders, FRNs give higher yields than short-term notes and yet have some degree of liquidity. Also, these yields are continually updated.

A number of Thai commercial banks issued FRNs in overseas markets so as to tap funds from abroad and adjust their maturity profiles. Within the local market itself, however, both borrowers and savers were still unaccustomed to the mechanisms of FRNs. That FRNs did not exist in Thailand before 1988 is therefore not surprising. Later on, some businesses did make efforts to borrow via FRNs. However, the market remained so immature that bank guarantees were needed and notes could only be sold to a restricted group of investors. The lack of secondary markets necessitated possible

redemption of funds before maturity by concerned finance companies at prices artificially below par.

Obstacles to the further development of FRN markets in Thailand are the absence of a reliable rating agency and a truly market clearing interest rate. The former is indispensable as the concerned parties only care about the note-issuers' creditworthiness. The latter is required so that returns from FRNs can be arranged to reflect the actual status of prevailing market liquidity.

### NOTE ISSUANCE FACILITIES

A note issuance facility (NIF) is a medium-term agreement between financial institutions and a borrower which allows the borrower to issue short-term paper in his own name, but underwriting banks are committed to purchase any notes which the borrower is unable to sell – or, in effect, to provide standby credit. An NIF commitment typically lasts five to seven years, while the paper is issued on a revolving basis, each round for maturities of three to six months. Most papers, often called Euronotes, are in U.S. dollars and issued with high face values at competitive bidding rates. They are intended for use by professional or institutional investors, rather than private individuals. The majority of NIFs settled in the past had a ceiling on borrowing costs in relation to market rates.

The NIF has been widely adopted in international markets because it has several attractive characteristics to all parties concerned. From a borrower's viewpoint, the NIF represents direct access to surplus units, while banks only function as managers or arrangers. Therefore, the overall costs of borrowing tend to be lower than other channels, even after various management fees are taken into account. In addition, NIF customers are provided with rights regarding the timing of note issuance and whether or not they are to be rolled over. Due to the underwriting commitment, borrowers are also assured of the availability of funds whenever needed. Borrowers are also able to immediately transform the maturity profiles of their portfolios or undertake investment at will.

For banks, unless called upon, underwriting commitments remain off-balance-sheet, entailing no obligations but with various types of fees. Acting as arrangers of the NIF, banks are not subject to ordinary costs of credit extension, e.g., interest on deposits and reserve requirements. For investors, returns on NIF are usually higher than short-term deposit rates, owing to the periodical adjustment of NIF rates, while variations of deposit rates tend to be more sluggish. And most note issuers are large creditworthy corporations, thus entailing little risk to investors.

In Thailand large companies in the oil business made use of this facility, even though commercial banks were not yet permitted to legally underwrite notes. Instead, participating banks themselves bought unsold

papers first and then later resold these papers at discounted prices.

### IMPACT

Under normal circumstances, economic policy-makers have two primary objectives: stability and the ability to influence the pace of economic activities. The impact of the financial instruments under study here are examined in this regard.

The distinct roles of financial instruments are to segregate, disperse, and transfer financial risks so that individual units can cope well with uncertainty and attain better asset or liability management. A clear-cut example, demonstrating numerous possible benefits from financial innovations, is the case whereby a private corporation hinges upon floating-rate foreign debt. In such a case, the company, frustrated by possible interest rate rise and exchange rate appreciation, could resort to swaps, options or FRAs by remitting the relevant fees and thus lessening risk exposure to a manageable degree. However, although financial innovations can enable each separate organization to handle its position comfortably, stability of the financial system as a whole may be endangered in three aspects.

1. The risks, after being segregated and transferred, may be clustered among few banks, few exchange rates or interest rates, and few maturity dates. Such bunching could arise due to the availability of very few banks with enough expertise or widespread networks, turbulent fluctuations of exchange or interest rates during particular intervals of time, and underpricing of financial services.
2. Most financial innovations (except FRNs) are off-balance-sheet items which may not be backed up by adequate capital funds of service suppliers.
3. Caps and swaps could bring too many low-ranking debtors into credit markets, thus depressing the asset quality of the markets. Similarly, direct modes of financing such as NIF and FRN, if popular, will not only take away high-quality borrowers from, but also weaken the deposit base of, financial institutions.

Because of the possible adverse effects on overall financial stability, it is recommended that financial companies and banks be required to report these activities more often and in more detail. Customers' motives should be included in these reports and details on whether or how much offering companies or banks hedge. In addition, the Monetary Authorities should demand that risks from the financial innovations in use be backed up by sufficient capital funds despite the fact that such activities are off-balance-sheet. The volume of

these activities ought to be given some weights, though less than those given to ordinary credits, reflecting the actual degree of associated risks.

As regards the government's ability to guide momentum and direction of economic activities, new financial instruments generate repercussions via four channels:

1. Credit flows are stimulated. For instance, with interest rate options and FRAs, customers are more likely to request and commit debts. The NIFs and FRNs, which are direct financing, help reinforce the purchasing power of borrowers.
2. Financial innovations raise the extent and speed of capital mobility into and out of the country. Currency swaps, currency options, and swap options, for example, facilitate foreign borrowing. Net inflows of funds from abroad directly affect the amount of local money supply, thus the effectiveness of implemented monetary policies.
3. The popularity of the new instruments may give rise to some constraints on local banks regarding their capacity to finance fiscal deficits. Because of these constraints, fiscal policies could be hindered and inflationary sources of financ-

ing, such as central banks or external loans, may be resorted to.

4. In another possible scenario, public agencies themselves utilize new financial instruments. This enables government agencies to cover all costs of investment or maintenance projects. Hence, the direction and degree of desirable fiscal policies could vary.

Although most of the macroeconomic effects of financial innovations, as mentioned above, tend to be negative, the favorable aspects should not be overlooked. Examples of benefits are as follows:

- Once borrowers and savers have more alternatives to choose from in attempts to find credit, avert risk, or invest, banks and other financial institutions are pressured to improve their services. Financial innovations, in other words, encourage efficiency in and further development of money markets.
- These financial innovations function as automatic stabilizers within the financial system. This stability is crucial, otherwise private enterprises could experience a greater frequency of business failures because of wild fluctuations of interest rates, exchange rates, and money market liquidity. ㉑

## NEWSBRIEF

### Seminar on “The Development of the Rural Credit Market in Thailand: Myth or Reality”

To further disseminate research findings and discuss policy recommendations to improve the credit market in rural Thailand, TDRI's Sectoral Economics Program and its Publications Office co-organized a seminar on “The Development of the Rural Credit Market in Thailand: Myth or Reality” held at the Hilton International Hotel, Bangkok, 2 August. Participants in panel discussions shown from left to right are: Dr. Ammar Siamwalla, Dr. Chirmsak Pinthong, Dr. Nipon Poapongsakorn, Dr. Prayong Netayarak, and Dr. Bandid Nijathaworn. Some sixty participants from commercial and government banks, the Ministry of Agriculture and Cooperatives, private companies, universities, the mass media, among others, attended the seminar.



The seminar also launched *The Rural Credit Market in Thailand* edited by Ammar Siamwalla. This research monograph, in Thai, is a collective study by researchers from TDRI and from Thammasat University, and with close cooperation from the Bank for Agriculture and Agricultural Cooperatives, on formal and informal credit markets in rural Thailand. The study analyzes the rural credit market system from the perspective of both borrowers and lenders. It also assesses the relationships between them, the competition between lenders, and the impact on interest rates in rural credit markets as well as on the economy as a whole.

### Dr. Twatchai Yongkittikul Appointed Member of CAP



Dr. Twatchai Yongkittikul has been appointed member of Canada-Asia Partnership's (CAP) International Advisory Board. The first Board meeting was held 22-24 July 1991 in Calgary, Canada. CAP is a program to promote collaboration among member countries in training and implementing development programs focussing on “Quality of Life Improvement” activities.

Canada, the Philippines and Thailand are now the three participating countries in the Partnership. The three

partners hope to encourage others to participate in the future, thus bringing together more and more doctors, teachers, researchers, and others engaged in education and training in public health matters.

CAP, now one year old, actively encourages “networking” between countries of Southeast Asia, and hopes to bring together more and more people with extensive experience in research and “willing to get their hands dirty.”

Dr. Twatchai, selected by CAP because of his impressive record in rural development and management research, holds a Ph.D. in Economics from the University of Illinois, a Master's Degree in Development Economics from Williams College of the U.S.A., and a Bachelor's degree in Economics from Thammasat University here in Bangkok.

He joined TDRI in 1985 as Director of Planning and Development, the post he still holds. Before coming to TDRI, he served for 19 years with the National Institute of Development Administration (NIDA), beginning as a Lecturer and finishing as Vice-Rector for Academic Affairs.

## The Fourth Annual "Thailand in Transition" Photo Contest "People: Thailand's Greatest Resource"

If Thailand is to continue its progress as a rapidly industrializing nation, then it will have to invest more in training and educating its people. This year's TDRI photo contest, co-sponsored by Kodak (Thailand) Limited and the Photographic Science and Printing Technology Department of Chulalongkorn University, hopes to heighten public awareness of Thailand's present and future educational needs.

Participants are asked to capture on film what is being done to upgrade the skills of the Thai people. Examples abound: school children studying modern subjects such as science, in obviously rural settings; training classes in the use of power saws in tree plantations; how to operate sonar equipment for "fish finding" aboard a modern Thai trawler; or young Thai men and women mastering computers in factories or auto assembly plants, or other work place.

All photo enthusiasts, foreign or Thai, amateur or professional, residing in Thailand are eligible to take part.

Entry forms for the contest are available at the TDRI offices on Soi 21, at Kodak outlets throughout the country, and at Chulalongkorn University.

Each photographer participating in the contest is allowed five entries, all to be taken on Kodak transparency, or "slide" film. Closing date for contest entries is September 30.

The top three winners will receive cash prizes of 15,000, 10,000 and 5,000 baht respectively, plus a Kodak camera each. Winning photographs will be published in TDRI's annual report, with photo credits, and will also be displayed in special TDRI exhibitions. The Awards Ceremony for this year's winning photographs will be held in October.

## News About TDRI Publications in English

**Research Monograph No. 5** *The Structure, Conduct and Performance of the Seed Industry in Thailand* by Suthad Setboonsarng, Saran Wattanuchariya, and Banlu Phutigorn, 250 baht (US\$10.00 plus US\$5.00 postage).

Prior to 1980, bringing more land under the plow was the major source of expansion for the Thai agricultural sector. With fewer possibilities of opening up even more agricultural land, new technology—particularly improved seed—has gained importance over the past decade as a new and major source of increasing yields. As Thailand, like most of Asia, has now all but exhausted its cultivable lands, most, if not all, increases in food production must come through higher yields per hectare from farmlands already under cultivation. Hence the extreme importance of the use of newer and higher quality seeds.

**Policy Study No. 3** *Thailand's Export-Led Growth: Retrospect and Prospects* by Narongchai Akrasanee, David Dapice, and Frank Flatters, 100 baht (US\$4.00 plus US\$3.50 postage).

Thailand is currently one of the world's fastest growing economies. This study reviews the background to this performance and examines the more immediate sources of the export-led boom that lies behind the recent success. It analyzes the economic effects of this boom and discusses some of the most important barriers—both international and domestic—that may stand in the way

of a continuation of this remarkable performance. It concludes that continued emphasis on outward-looking development offers the best prospects for Thailand. The primary goal of economic policy should be to anticipate and prevent internal bottlenecks and barriers to economic growth.

**Research Monograph** *Population and Economic Development in Thailand: Some Critical Household Behavioral Relations* by Chalongsob Sussangkarn, Jere R. Behrman, Yongyuth Chalamwong, Mathana Phananimamai, and Prapon Pattamakitsakul (to be printed soon).

This study attempts to contribute to the empirical foundations for the analysis of population-development interactions in Thailand. The Thai experience is of interest not only in itself, but much more broadly because of the combination in recent decades of relatively high rates of economic growth and transformation and of declining rates of growth of population.

This study explores some critical household behavioral relations pertaining to the number of surviving children, post-compulsory schooling demand, household savings, and hours worked by women, based on the 1981 Thai Socioeconomic Survey (SES).

*These publications can be purchased directly from the TDRI Publications Office.*

## NEW CONTRACTS

### **IER to Conduct Policy Study on Intermediate Goods**

TDRI's International Economic Relations Program has signed a contract with the Federation of Thai Industries to conduct a study on developing intermediate goods industries. An IER team will analyze government policies, measures, rules and regulations related to the production of the intermediate goods used as inputs by exporting industries.

### **TDRI to Study Benefits of Information Technology**

"The Role of Information Technology in the Information Society in the Year 2010" is a subproject of TDRI's Thailand Toward the Year 2010 Project. A TDRI team will study strategies and directions for the development of information technology in Thailand and some selected nations. The study should provide evidence to demonstrate the potential benefits of information technology to a number of important sectors of the economy and various strata of society. It will define the requirements for institutions and networking necessary for a smooth transition into an information society in the year 2010.

### **SEP to Study Impact of Pesticide Use on Farmers' Health**

A multi-disciplinary two-year project on "Impact on the Local Environment and Farmers' Health from Pesticide Use on Rice in Selected Villages in Central Thailand" under TDRI's Sectoral Economics Program

is now under way. The research team consists of medical doctors, agricultural toxicologists, and social scientists. Major research activities include intensive and extensive monitoring and analyses of pesticide residues, for two consecutive rice seasons, in human blood as well as in the rice paddy environment, e.g., soil, water, fauna, and flora. Farmer behavior and other socioeconomic factors relevant to pesticide use decisions will also be recorded during the two rice seasons. Funding for the project has been provided by the Rockefeller Foundation.

### **SEP to Project Options for Cassava Use over the Next 10 Years**

This project, financed jointly by the Thai Tapioca Trade Association and the Department of Export Promotion, will investigate trends in cassava cultivation, crop substitution, varietal improvement and supply response. A TDRI Sectoral Economics Program team will examine the increase in local and export demand for starch. The possibility of using cassava in the production of high fructose syrup and alcohol will also be investigated.

### **SEP to Forecast Food Situation in Thailand**

TDRI has signed a contract with the International Food Policy Research Institute (IFPRI) to examine trends and make projections of supply, demand and food balances to the year 2000 for basic food crops. Based on these analyses, a research team from TDRI's Sectoral Economics Program will review government production and consumption policies. The policy options for sustainable growth to meet the growing demand for food will be assigned priorities and investment strategies will be worked out.

## **1991 TDRI Year-End Conference Date and Location Finalized**

**TDRI's Year-End Conference, "Educational Options for the Future of Thailand" will be held on December 14-15 at the Ambassador City Jomtien, Chon Buri. Between 400-500 participants from both the Thai and foreign governments, private industry, and the media are expected to attend. As with last year, the Chai Pattana Foundation, under Royal Patronage, has graciously agreed to co-sponsor this year's conference.**

## NRE Co-hosts International Conference on “Global Warming and Sustainable Development”



TDRI's Natural Resources and Environment Program (NRE), the Woods Hole Research Center, USA, and the Institute for Research on Public Policy (IRPP) co-organized an international conference on “Global Warming and Sustainable Development” held at Bangkok's Ambassador Hotel, June 10-12. Shown at the Ceremonial Session, from left to right, are Dr. Dhira Phantumvanit, Director of TDRI's

NRE Program; Dr. Saburo Kawai, Chairman of the International Development Center, Japan; Dr. Sanga Sabhasri, Thailand's Minister of Science, Technology, and Energy; Dr. Joseph C. Wheeler, Director, Program Integration, United Nations Conference on Environment and Development (to be held in Geneva next year); Dr. George M. Woodwell, Director, the Woods Hole Research Center; Dr. Ammar Siamwalla, President of TDRI; and Dr. Kilaparti Ramakrishna, Senior Associate, the Woods Hole Research Center.

More than 150 researchers, policy-makers, scientists and technical experts from international and non-governmental organizations attended the conference. Keynote speakers included Dr. Sanga Sabhasri, Dr. Saburo Kawai, and Dr. Joseph C. Wheeler.

The conference successfully produced a substantive statement to be presented at UNCED in 1992, brought together a group of regional policy researchers to discuss future collaborative efforts, and furthered the general debate on this timely topic.

## ASEAN Regional Forum on Business and Environment

The Natural Resources and Environment Program, TDRI, in collaboration with the Federation of Thai Industries and the Business Council for Sustainable Development, Geneva, Switzerland, organized an ASEAN regional forum on “Business and Environment” held at Bangkok's Royal Orchid Sheraton Hotel, July 22-23.

Discussions focussed on the concept of sustainable development, the importance of balancing environmental protection and business development, and ways of improving the role played by ASEAN business in protecting the environment. The forum was attended by approximately 80 local and ASEAN business leaders. Dr. Sippanondah Ketudat, Thai Minister of Industry, gave the keynote speech.

The forum recommended the formation of a working group on the environment in the ASEAN Chamber of Commerce and Industry. This recommendation was later adopted at the ASEAN Chamber of Commerce and Industry's Meeting in Manila. The outcome of this forum will also form part of the business perspective on sustainable development to be presented at the United Nation's Conference on Environment and Development (UNCED) to be held in Rio de Janeiro, June 1991.

## TDRI and MOSTE Co-organize Seminar on “Geographic Information Systems in Thailand”

The Ministry of Science, Technology, and Energy (MOSTE) and USAID co-organized a seminar with TDRI on “Geographic Information Systems in Thailand: Strengthening User Networks” on June 24, at the Hilton Hotel, Bangkok. MOSTE's Minister Sanga Sabhasri presided over the opening ceremony. The keynote speech, presented by Dr. Jack Dangermond — one of the real pioneers of Geographic Information System (GIS) technology and among the world's foremost experts was entitled “GIS Technology: Where Do We Go From Here?” and addressed some critical problems now facing Thailand. The conference was attended by over 250 people in the government, private sector and international organizations using GIS.

As part of the seminar, TDRI presented its Master Plan for MOSTE's National Geographic Information System Center, plus a summary of the present status of GIS technology in Thailand. In addition, real end-users of GIS technology in Thailand gave their experiences and recommendations. These users came from the private sector, rural development, regional planning, and urban infrastructure management.

## Seminars/Conferences Attended and Papers Presented

Dr. Ammar Siamwalla, President of TDRI, welcomed a group of Mexican trade representatives to the TDRI offices. Visiting Thailand at the request of the Thai Ministry of Foreign Affairs, the group attended a lecture on Thai economic and trade development given by TDRI executives on 12 July.

Dr Ammar Siamwalla attended a conference on "Deposit Insurance Institutes in Thailand" held at TDRI on 23 July. Dr. Pakorn Vichyanond, Research Fellow of the Macroeconomic Policy Program, presented a paper at this conference entitled "Deposit Insurance Institutes in Thailand and Methods of Handling Crises in Banking and Finance."

Dr. Ammar Siamwalla attended the Search Committee Meeting of the International Food Policy Research Institute, Washington, D.C., 11-15 August.

Dr. Ammar Siamwalla attended the XXI International Association of Agricultural Economists Conference in Tokyo, 22-29 August.

### Science and Technology Development Program

Dr. Chatri Sripaipan, head of TDRI's Science and Technology Development Program (STD), served as coordinator in the session on "Science and Technology Development: The Role of Indigenous and New Technologies" at the East-West Center 1991 International Conference on "Asian-Pacific Cooperation and Constraints in the Year 2000: Challenging Issues" held at the Asia Hotel, Bangkok, 17-20 July.

Dr. Chatri Sripaipan chaired the session on "The Roles of the Ministries of Commerce; Industry; and Science, Technology and Energy in Metrology" at a seminar on "International Trade: Metrology and the ISO 9000 Series," organized by the Office of the Science and Technology Development Board held in Chon Buri, 9-11 August. The Minister of Industry, the Minister of Science, Technology, and Energy and the Inspector General of the Ministry of Commerce presented papers at the seminar.

Dr. Chatri Sripaipan presented a paper on "Facilitators of Research and Development" at a training workshop on "Research in Natural Science," organized by the National Research Council of Thailand, 13 August.

Dr. Chatri Sripaipan participated in a workshop on "Industrial Linkages Development in Chiang Mai and Nearby Provinces," organized by the Office of the Board

of Investment and held at the Empress Hotel, Chiang Mai, Thailand, 14 August.

Dr. Chatri Sripaipan served as chairman at a seminar on "Cooperation between the USA and Thai Scientists," organized by Damrong Lathapipat Foundation and held at Chulalongkorn University, 19-20 August.

The Science and Technology Development Program (STD) coordinated the visit to Thailand of Dr. Wu Tianyou, Deputy Director of the International Technology and Economy Institute, Research Center for Economic, Technological and Social Development, the State Council of the People's Republic of China, 24-30 August.

### Sectoral Economics Program

Dr. Mingsarn Kaosa-ard, Director of TDRI's Sectoral Economics Program (SEP), attended the "Intellectual Property Rights" seminar hosted by the Department of Internal Trade and held at the Imperial Hotel, Bangkok, 31 May.

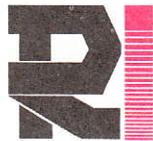
Dr. Mingsarn Kaosa-ard gave a speech on "Technology Licensing in Thailand" at the "Patents and Licensing in the Changing World" seminar co-organized by Chulalongkorn University and the Science and Technology Development Board and held at Chulalongkorn University, Bangkok, 6 June.

Dr. Mingsarn Kaosa-ard attended the "Study of Extending the Meat and Pork Exports" seminar hosted by the Department of Business Economics and held at the Imperial Hotel, Bangkok, July 10.

### International Economic Relations Program

Dr. Wisarn Pupphavesa, Director of TDRI's Thailand and Economic Cooperation in the Asia-Pacific Region Project, presented a paper entitled "The Current Situation of Direct Foreign Investment in Thailand" at the Taiwan-Thailand Investment Seminar, co-organized by the Taiwan Institute of Economic Research (TIER) and TDRI. The seminar was held at TIER in Taipei from 26-27 August.

Dr. Paitoon Wiboonchutikula, research fellow of TDRI's International Economic Relations Program (IER), took part in discussions on a paper entitled "Taiwan's Policy on Direct Investment Abroad" at the Taiwan-Thailand Investment, co-organized by the Taiwan Institute of Economic Research (TIER) and TDRI and held at TIER in Taipei, from 26-27 August. 



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