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INSTITUTIONAL ARRANGEMENTS AMONG DEVELOPING COUNTRIES FOR THE ACQUISITION, ADAPTATION AND DEVELOPMENT OF TECHNOLOGIES 1/

by

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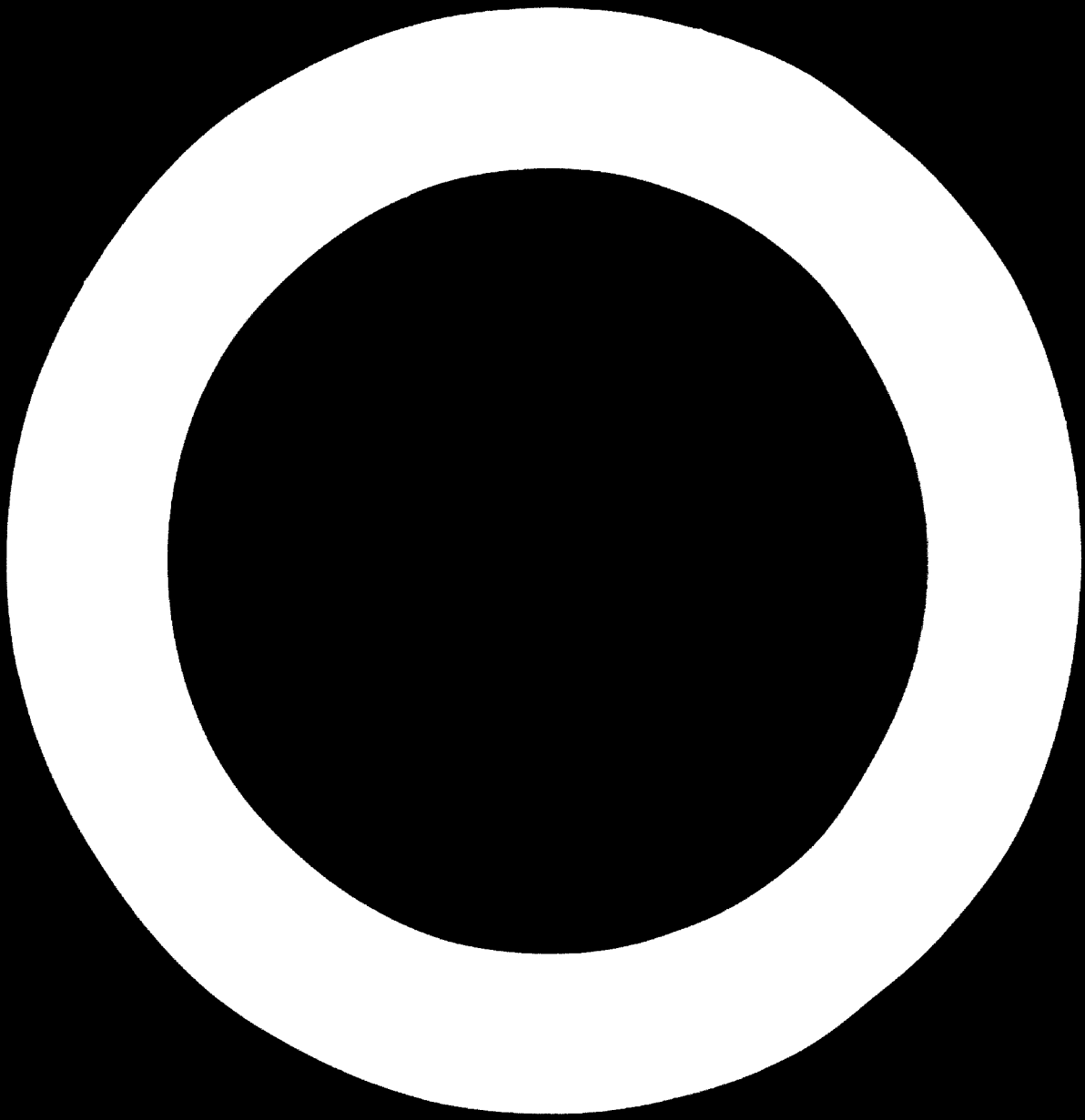


Inputs of technology in developing countries of Asia and the Pacific have to be greatly intensified in coming years if problems of economic and social growth are to be tackled more effectively. The technological base in most countries is presently inadequate, calling for policies, instruments and action at national levels. At the same time, such governmental initiatives need to be reinforced by co-operative efforts among developing countries themselves, including the establishment of institutional arrangements. In this context, an 'institutional arrangement' denotes a body or system organized to undertake specified functions in a continuing manner.

This paper reviews the current technological requirements in Asia with special reference to the five countries of the Association of South-east Asian Nations (Indonesia, Malaysia, Philippines, Singapore and Thailand), in order to identify areas which may be suitable for regional approaches. Existing institutional arrangements for co-operation are indicated and some initiatives to strengthen them and to create new instruments are outlined.

I. TECHNOLOGICAL REQUIREMENTS OF ASIAN COUNTRIES

The major present technological needs in the ESCAP developing countries are in four broad areas:

- Development and application of processes to meet the basic needs of the mass of people, utilizing the available manpower, the agricultural, forestry, marine and mineral resources. This involves innovation as well as the adaptation of imported technologies and the upgrading of traditional techniques;
- Competence in selection, negotiation, purchase and absorption of technologies from external sources;
- Information and extension services to facilitate R and D work (Research and Development), the selection of technologies and technology suppliers;

- National policies and programmes to provide the foundation for self-reliance through development of capabilities in the above three areas.

Research, development and engineering

Developing countries of the region as a whole are estimated to spend less than 1 per cent of the total global research expenditures; in most countries such expenditures represent less than one-quarter per cent of gross national product. Another lacuna is the lack of design and engineering capability to implement laboratory results through pilot and demonstration plants. Better management of R, D and E could improve results from existing facilities.

Technologies developed abroad - and often selected by foreign consultants or foreign-oriented nationals - are often inappropriate to the conditions of scarce capital, inadequate energy resources, small markets and abundant manpower but shortage of skills. The first problem is to make good choice of product and process, and then to adapt, commercialize and absorb these.

At another level, there is good scope for improving traditional methods, for instance, in upgrading simple cupola/smithy operations to produce better human and animal-drawn agricultural implements, better rice milling, paper-making, sugar refining facilities, and so on. Extension services for such improvements are of interest not only in land-locked and island economies but also for rural transformation in relatively more developed countries. The difficulty is reaching the "small guy" - the large enterprise can generally find the technology it needs.

Acquisition of technology from abroad

The poor countries of Asia are now spending around US$1,000 million a year on imported know-how services - an amount many times larger than expenditures on their own R, D and E. If technologies are to be purchased efficiently, increased capabilities have to be created for their search, evaluation, negotiation, approval by the Government, and lastly application.

Technology information

A variety of alternative products and processes are available today but are only in limited use due to lack of information. National technological information centres are needed, which can draw upon regional and global systems.

There is a gap also in information on know-how sources and licensing possibilities. National and inter-national systems could help in strengthening capabilities for negotiation and selection as well as in implementing a code of conduct when it is established.

Technology policies and manpower

Without policies and perspective planning based on clear definition of national aspirations and available resources it is not possible to create a sound technological base or to strengthen local technical talents.

The concept of 'appropriate technology' has been tested at the micro-level in Asia and has gained acceptance. There is need, however, to link policy objectives and instruments with technology choice, so that decision makers can design the inducements and actions necessary to increase employment and develop natural resources through social costing of production factors, alternative product-quality mixes, etc. The complex problems of absorbing technology - appropriate or otherwise - in cultures where it is still incipient call for long-term national plans.

The requirements reviewed above require action by individual countries in their efforts to achieve a measure of technological self-reliance. This action can be supported by various types of institutional arrangements among the countries. UNIDO programmes are helping to create such facilities in the four areas described above, both at the country and inter-country levels.

Endorsement of the institutional approach

In the past, co-operation on technology has taken place mainly through informal programmes such as provision of scholarships, utilization of training facilities and secondment of advisers from one developing country to another.

There have also been a number of informal enterprise-to-enterprise arrangements in recent years and these are increasing, but formal co-operation is still in an early stage. Almost two-thirds of technical assistance among developing countries has been in agriculture, health and education while the 'science and technology sector' has constituted only 3.6 per cent in 1971.[1/] (This low figure for S & T may be partly due to the fact that it excludes technology co-operation in specific sectors.)

These channels continue to be significant but now need to be supplemented by institutional forms of sub-regional and regional co-operation which can retain their vitality and effectiveness over extended periods.

Institution-building in the fields of science and technology has been commended in recent international fora. The Lima Declaration and Plan of Action of the UNIDO Second General Conference call for:

1/ Technical Co-operation Among Developing Countries, Working Group on Technical Co-operation among Developing Countries, Third Session, May 1974 (DP/WGTC/L.2/Add 1)

"Creation of the necessary institutional machinery to enable consultation and co-ordination in order to obtain better terms for the acquisition of technology, expertise, licences, equipment, etc. for the developing countries;

"The sharing of experience in industrialization and technology by those who have already acquired this know-how, together with experience in the application of legislative machinery in the economic field in order that it may be widely known among developing countries. This knowledge may be of greater relevance than that which is acquired from highly developed areas. While a start has been made in co-operative arrangements more intensive and innovative programmes are required for transmitting relevant technology and technical and managerial skills, particularly to the less industrialized countries within the region, through the establishment of region and subregional institutional machinery."

As follow-up on Lima, UNIDO is in process of implementing a comprehensive programme to intensify technology inputs through regional co-operation.

The Working Group on Technical Co-operation among Developing Countries, set up by General Assembly resolution 2974 (XXVII), recommends 'support for the establishment and operation of institutional arrangements which groups of developing countries may decide to make for promoting technical co-operation among themselves'.

UNDP document (CB 19/2 DP/FM6/52) on New Dimensions in Technical Co-operation has proposed radical new approaches:

"Since assistance for the development of new technology and the adaptation of existing technologies to the requirements of the country is as important as that for the transfer of technology, UNDP should undertake certain high risk projects ... In order to achieve technological breakthroughs in a relatively short period, it may be necessary to provide all the inputs that are needed for as long a period as necessary, and fully utilize available national expertise and other resources."

Problems of institutional co-operation in technology

The difficulties in building viable regional institutions are compounded when it comes to technology development and transfer. While science is international, technology is situation-specific and it is generally preferable to transfer the scientific knowledge and adapt the technology locally. The absence of a 'technology culture' in many developing countries inhibits the absorption process.

Due to rapid technological progress in the advanced countries during this century a developing country tends to look to the west for its requirements, even though comparable competence may exist with its neighbour. Moreover, even among developing countries technological levels are different, with varying potentials for participation in a co-operative effort. There may also be the feeling that a regional institution is likely to be of more benefit to the country of its location than to the others.

But the factors favouring institutional arrangements among developing countries generally out-weigh these difficulties. Firstly, inspite of differences, there are many similarities in problems and in factor proportions which justify a co-operative search for technological solutions. Secondly, these efforts require a certain 'critical mass' to be effective and this could be easier attained by aggregating the inputs needed. Thirdly, experiences - good and bad - of nations which are in the process of tackling development problems are more pertinent to others in similar predicaments and need to be shared; institutional arrangements can facilitate such exchanges.

Technological co-operation among developing countries provides concrete benefits and also the psychological satisfactions deriving from team-work and from recognition by one's peers.

The types of institutional structures

Regional institutions can be effective mechanisms provided that they have (i) a selective scope of work to satisfy the insistent needs of participating countries; (ii) the flexibility to meet changing situations and respond promptly; (iii) the autonomy to engage very competent staff and to operate without undue bureaucratic procedures; and (iv) the technical leadership to provide a high level of expertise against payment of fees where possible.

Four alternative modalities may be considered:

Regional institution located in a host country and with its own physical facilities;

Multi-disciplinary task force with mobility to provide services on request;

Co-ordinating centre of a regional network of existing institutes in a specific field of activity;

Poly-centred network built around institutes of excellence in various fields of activity.

There may well be other variants. In connexion with the proposed institution for development of agricultural machinery in ESCAP countries, a UN preparatory mission (December 1974) had the opportunity of getting reactions of governments to the alternative arrangements mentioned above. Of the 11 countries visited, six were in favour of a regional network concept while four favoured a full-fledged regional centre - located in their own country!

The network idea, wherein nodal points in participating countries are strengthened and co-ordinated by a nucleus, has merit in the light of national aspirations of self-reliance and also because activities such as technology adaptation are best done close to the point of use. It must be pointed out, however, that the strength of a net, like that of a chain, is in its weakest link and therefore the primary function of such an institutional form may well be to initiate, support and strengthen technology activities at national levels.

II. REVIEW OF INSTITUTIONAL ARRANGEMENTS IN THE TECHNOLOGY FIELD

Existing institutional machinery for co-operation on the acquisition, adaptation and development of technology is considered to be inadequate in Asia and the Pacific. These arrangements are reviewed below.

Metals and engineering

In the minerals sector, the Committee for Co-ordination of Offshore Prospecting (CCOP) for east Asia has been active since 1972, and a project for the South Pacific is underway. A Regional Mineral Resources Development Centre is being set up in Bandung, Indonesia, and a South-east Asia Tin Research and Development Centre in Ipoh, Malaysia. These are primarily concerned with co-ordination of joint prospecting, research and information as well as prompt technical advisory services to participating countries.

The South-east Asia Iron and Steel Institute at Singapore is providing a useful forum for the exchange of technology through its publications, symposia and technical committees on selected topics. This Institute was started by ESCAP in 1971 and has recently been assisted by UNIDO in the preparation of a framework for steel standardization among ASEAN countries.

A chain of Metals Industry Research and Development Centres has been established with UNIDO assistance in Singapore, Indonesia, Philippines, Malaysia (in progress) and Thailand (as an Industrial Services Institute). Following upon the comprehensive work of the Asian Industrial Survey for Regional Co-operation, a Steel Action Group and a Fertilizer Action Group have been formed recently to help harmonize sectoral expansion plans in the ASEAN countries.

On the subject of metals and engineering, mention may also be made of recent UNIDO workshops in India on 'Animal/hand Operated Agricultural Machines and Simple Power Equipment' (October 1974), 'Exchange of Experiences

in the Foundry Industry' (December 1974) and 'Machine Tools and Allied Engineering Industries' (November 1975), which have stimulated co-operation among countries and are leading to the formation of institutional arrangements.

In regard to agriculture and agricultural mechanization, institutions are well developed. Of the group of eight international agricultural research organizations, two are located in Asia, namely, International Rice Research Institute, Philippines, and International Crop Research Institute for Semi-Arid Tropics, India.

As noted earlier, a Regional Centre for Development of Agricultural Machinery is in the process of being set up in the Philippines with the primary objective of assisting national institutes in developing and commercializing the manufacture of appropriate agricultural implements and equipment. The application of this 'planetary' concept in the Asian context will be watched with interest.

Producer institutions

In efforts to institutionalize technological co-operation, the commodity-community approach has been useful in ESCAP countries. The Asian Coconut Community has been set up at Jakarta, in view of the importance of the primary and secondary processing of coconuts in providing increased livelihood and foreign exchange earnings. It includes four ASEAN countries, India, Sri Lanka and Western Samoa. The objectives of this inter-governmental body are to stimulate technical co-operation. It has received substantial UNIDO assistance on technical and economic problems confronting the coconut industry.

The Association of Natural Rubber Producing Countries, with Indonesia, Malaysia, Singapore, Thailand and Sri Lanka as members, is playing a significant role in co-ordinating the development of technology and markets for natural rubber.

The Pepper Community, established 1972 with India, Indonesia and Malaysia as members has basically the functions of improving the pepper economy at the production, processing and marketing levels. An inter-regional project proposed by UNIDO will set up a 'Pepper Processing and Product Development Centre' at one of the existing research institutes to serve all participating countries.

Agro- and allied industries

The importance of agro-industries has been well recognized in the ESCAP region as they provide substantial employment, foreign exchange earnings through exports of processed products, reduce imports of consumer goods and indirectly assist in rural transformation.

Most of the agro-processing technologies needed already exist in some of the Asian countries and their transfer could be facilitated by institutional arrangements which include information systems backed by consultative and training services. An ESCAP expert group meeting, October 1974, discussed specific agro-industries for which expertise was available in certain countries which could be shared with others. Table 1 is only indicative of possibilities. Other countries may well be in a position to provide know-how.

An FAO proposal for an inter-country technology network on agricultural product processing industries based at the Central Food Technology Research Institute, Mysore, is under discussion between UNDP, ESCAP, FAO and UNIDO.

In addition to the work of ESCAP, UNIDO and FAO in this field, a comprehensive 3-year training programme on Agro-based Industrial Development, centred in Malaysia and supported by the Netherlands Government, is now underway.

Table 1: Co-operation possibilities in agro-processing

Industry	Countries with special capabilities	Countries which might share expertise	
1. Rice milling	Thailand Philippines	Sri Lanka Indonesia	Malaysia
2. Coconut	Sri Lanka Philippines	Malaysia Thailand	Indonesia India
3. Oil palm	Malaysia Indonesia	India Thailand	Sri Lanka Philippines
4. Maize processing	Philippines India	Thailand Indonesia	
5. Cassava	Thailand India	Malaysia Indonesia	Sri Lanka
6. Cashewnut processing	India	Indonesia Thailand	Malaysia Sri Lanka
7. Canning fruits/ vegetables	Philippines	Indonesia Sri Lanka	Thailand India
8. Sugar	Philippines India	Thailand Malaysia	Indonesia Sri Lanka
9. Dairy industry	India	Sri Lanka Malaysia Indonesia	Philippines Thailand
10. Enrichment of cereal food	India	Philippines Malaysia	Indonesia Sri Lanka
11. Animal feed	Sri Lanka	Malaysia Indonesia Thailand	Philippines India
12. Silk processing	Thailand India	Sri Lanka Malaysia	Indonesia Philippines
13. Essential oils	Sri Lanka India	Indonesia Malaysia	Thailand
14. Tobacco	Philippines	Indonesia Malaysia	Thailand
15. Rubber	Malaysia Sri Lanka	Indonesia Thailand	India
16. Leather and leather products	India Indonesia	Philippines Thailand	Sri Lanka Malaysia

Research and development

There is at present no proper institutional base for co-operation on research, development and engineering in the ESCAP countries. Cases of informal institute-to-institute interchange are, however, on the increase; for instance, the Applied Scientific Research Corporation of Thailand has developed the processing of Thai kenaf to pulp, and a 50-ton sample was pilot-tested recently at an Indian paper mill in order to establish the design parameters for a 30,000 tons/year joint-venture project at Khon Kaen.

Major impediments to co-operative research arrangements are the disparities in technological levels among the countries and the differences in priorities. Consequently also there are difficulties in identifying appropriate projects for joint efforts as well as in the sharing of inputs and benefits. The lack of technical leadership and of finances are other constraints.

The Association for Science Co-operation in Asia meets annually in different countries to discuss issues of research co-operation. An Advisory Council for Industrial Research had been set up in 1967 by the Asian Industrial Development Council at ESCAP and had identified projects to be entrusted to a regional co-ordinator assisted by a number of country co-ordinators. But with the recent re-structuring of ESCAP, both AIDC and ACIR have ceased to function.

In the absence of a supportive structure, industrial research institutes have used "twinning" arrangements with counter-parts outside the region. Thus, PCSIR Pakistan has co-operative linkages with Denver Research Institute, the textile and ceramic institutes in Indonesia with TNO Holland, and Korean Institute of Science and Technology with Batelle, USA.

In order to strengthen country capabilities, as a pre-requisite to inter-country co-operation, UNIDO has carried out projects on industrial research and standardization in Thailand, Malaysia, Republic of Korea and Iran, on quality control in Singapore and Hong Kong, and on metallurgical research in India.

At the global level, UNIDO has helped form the World Association of Industrial and Technological Research Organizations (WAITRO) in 1970 to stimulate co-operation by linkages on specific research projects and through practical training of research workers.

Technological information

Systems to compile, retrieve and disseminate available information form the corner-stone of any programme to transfer technology and lend themselves to an institutional approach. In this field, UNIDO has been providing valuable services through its Industrial Information System, Inquiry Service, SDI and ACE services. These have recently been extended to technologies evolved or adapted in developing countries themselves to suit their own conditions.

An operational programme embodying the network concept is Technonet-Asia, located in Singapore and assisted by the International Development Research Centre, Canada. Technonet seeks to provide technical information, training and extension services to selected organizations in ASEAN and other Asian countries. The programme covers the interchange of experiences between members, supported from Ottawa, and the compilation of inventories of alternative processes in various sectors. Joint UNIDO-Technonet workshops on industrial information systems in Singapore-Bandung, October 1974, have helped in identification of country requirements and inter-country possibilities.

[illegible] in 1977, it was offering technical programmes for [illegible] participants from all countries of Africa, Latin America and Asia. [illegible] of technology [illegible].

[illegible] development [illegible].

Science and technology development

Without the existence of [illegible] marketing, public administration and related high-level skills, technology cannot be effectively applied and started. A number of regional institutions are engaged in training and research in these fields. Mention may be made of the following:

- Asian Development Institute, Bangkok
- Asian Centre for Development Administration, Kuala Lumpur
- Asian Productivity Organization, Tokyo
- Asian Institute of Technology, Bangkok
- Technology and Development Institute of the East-West Centre, Honolulu.

An ESCAP regional project is now preparing guidelines for technology development and transfer with the object of assisting national governments in formulating policies on technology-related issues.

Inter-governmental co-operation

Some programmes for technology development are underway on a government-to-government basis and their effectiveness provides endorsement of the TCDC approach. Notable is the ITEC programme of the Government of India.

Table 2 : Technology and development information systems

Sponsor	System	Subject	Geographical coverage	Regional activity status
UNIDO	TECHNONET	Industry	ASEAN countries	Operational
ASPAC	Registry of Scientific and Technical Services	Science	ASPAC countries	Project terminated
AIT		Geology, engineering	Asia	Evolving
University of Hawaii, College of Tropical Agriculture	Computerised Service	Biological, food science, engineering, chemical	Tropical and sub-tropical Asia	Operational
MIT, Mynd ra- id	SCIDOC	Small industry development	National	Being extended to region
US Department of Commerce	NTIS	Technical information	Korea Philippines Thailand	Experimental
Friedrich-Ebert-Stiftung		Economic and social development		Files being developed
UNIDO		Industrial information	Global	Operational
ILO	ISIS	Economic and social	Global	Not envisaged
FAO	AGRIS level one	Agriculture	Global	South East Asia Pilot Study at Los Banos, Philippines
IAEA	INIS	Nuclear	National	Without regional implications
UNCTAD/ITC		Trade information	ESCAP region	Files being developed
ESCAP	Bibliographic Information System	Economic and social information	Secretariat in-house only	Experimental
UN Regional Centre for Development, Nagoya	ALPHA	Economic development	ESCAP region	Project terminated
UNU/INRE	RAINS study	Development information	ESCAP region	Survey in progress
FAO/ESCAP	Regional Information [illegible] Agricultural Development	Agricultural development	ESCAP region	Proposing Expert Group to design system
UNESCO	Regional Information Network for Science and Technology	Science and technology information	South-east Asia	Proposed

about a dozen technology protocols have been signed to facilitate transfers of know-how between India and other developing countries. At a different level, the India-ITC agreement has resulted in visits to India by teams of technologists from developing countries (including four from Asia: Indonesia, South Korea, Philippines and Fiji) to help identify areas of joint work for mutual benefit.

The Colombo Committee has done excellent work in the development of the participating countries, through sub-regional multi-disciplinary investigations. UNIDO has provided assistance through feasibility studies [illegible] iron and steel, ferro-alloys and phosphoric acid plants.

The Commonwealth has over the years made valuable contributions to technology development. More recently, the Government of Japan has established the Institute for Transfer of Industrial Technology (ITIT) which has undertaken over a dozen joint research projects in which Japanese institutes have worked with an institute from an Asian country.

The above enumeration may not cover all institutional arrangements but it does include the main ones. Some initiatives now underway to meet the deficiencies in the institutional structure are indicated in the section below.

III. PROPOSALS FOR NEW INSTITUTIONAL SYSTEMS

The climate for co-operation among developing countries in the technology field is excellent; what is needed are initiatives and innovative thinking to develop additional institutional machinery. The new regional or sub-regional arrangements should, as noted earlier, have the primary function of reinforcing national skills and be built around the actual

technology demands of developing countries, not the supply capabilities of advanced countries. The main demands are co-operation on development, dissemination and application of appropriate technologies, particularly in the least developed countries, and evaluating and negotiating the import of know-how. Above all, the design of a new institution should enable business-like operation over a long period.

Regional Centre of Technology Transfer

A major initiative is now underway at ESCAP to establish a regional centre of technology transfer (RCTT), in pursuance of deliberations since 1971 and resolution 159 (XXXI) of the Commission at New Delhi, March, 1975. The group of experts preparing a feasibility study are in agreement on the need for the proposed centre to undertake functions which are supportive of country efforts. It is expected that this RCTT will establish linkages with technology establishments and with national centres for technology transfer (NCTT) when they are established in the ESCAP countries.

The experts have expressed the view that significant work is being done currently and planned by various UN agencies and other bodies, and there is obvious need to prevent over-lap. The RCTT would be required to provide strong national and regional orientation, and also the feed-back and the channel for international agencies to intensify their inputs into the region. The centre would serve to stimulate and facilitate regional and global trade in technology.

The functions of the regional centre would be demand oriented and taken up in a selective, phased manner. It would comprise (a) technological information, (b) evaluation and adaptation, and (c) purchase of know-how. These activities would be undertaken through consultative

work, training programmes, and sub-contracting of research projects in existing institutes. The above functions and activities are inter-linked for the purpose of providing effective integrated assistance.

Further, it is proposed that RCTT efforts should be directed towards promoting technology to meet basic needs of the mass of people, utilizing the available manpower, mineral, agricultural, forestry, marine and other resources. Sectors deserving priority attention would be mechanical, metallurgical and chemical processes for agro-industries, transport, manufacturing and energy development; and such other products and processes suitable for promotion as small and medium industries, particularly for integrated rural development.

The centre would have a core staff of experienced professionals, with emphasis on proven technical skills and primarily from regional member countries. Provision would also be made for engagement of consultants on a world-wide basis for specific assignments.

In view of the great importance of this TCDC project, funding for an initial five-year period from UNDP, regional member countries, bilateral and multi-lateral sources has been suggested. After initial operations, the RCTT should be able to provide at least 20-25 per cent of its annual budget out of earnings and the balance from participating member countries. From the outset, the centre would attempt to establish a reputation as a non-profit but business-like organization providing professional services of an innovative type against payment of fees.

Organizations like UNIDO and UNCTAD can be expected to make significant contributions to the RCTT in view of their specializations in the various functions that are to be undertaken.

Co-operation in research, development and engineering

There is a felt need to institutionalize the arrangements for co-operation on research as well as standardization in Asia, with the primary objectives of adapting and applying technologies appropriate to current requirements and local endowments. This may start with only two or three countries and evolve to wider coverage, both with regard to countries and mechanisms of partnership. First, the specific needs of the countries have to be established and the structure designed to meet these by partners acting in concert.

An approach would be to identify R, D and E institutes of excellence, sector by sector, and inter-link them into sub-regional and regional groupings. To illustrate, one could conceive of the following inter-linkages between R and D institutes, although again other possibilities undoubtedly exist:

	Linked to
1. Leather Research Institute, Jogjakarta	Corresponding institutes in ASEAN countries
2. Pulp and Paper Research Institute, Bandung	
3. Instrumentation Centre, Singapore	
4. National Institute of Foundry and Forge Technology, Ranchi	Foundry/forge centres in ESCAP countries
5. Electronics activities at Korea Institute of Science and Technology	Electronics centres in ESCAP countries

Possibilities in agro-industries have been indicated in table 1.

There is now an opportunity to form an association of metal industry development centres (MIDC's). By inter-linking them through a co-ordinating centre, possibly in the Philippines, R and D results, trainers and experiences in the metals sector could be exchanged more readily.

Further, steps could now be taken to bring together the Asian countries of the South-east Asia Iron and Steel Institute and other steel-producing countries (such as Iran, South Korea, India and Pakistan) in an enlarged professional steel organization.

While Asia does not have a regional co-operative agency covering multi-disciplinary R and D, other developing regions have formed such arrangements. The East African Industrial Research Organization (EAIRO) was established as a permanent institution in 1955 to assist development of industries in Kenya, Tanzania and Uganda. The Central American Research Institute for Industry (ICAITI), formed in 1956 with UNDP assistance, covers Costa Rica, El Salvador, Guatemala, Honduras and Nicaragua. The Andean Group is also attempting to co-ordinate industrial research among its constituents.

A new field in which regional co-operation would be useful is technology forecasting. Resources in Asian countries are limited and it is therefore essential to identify the imperatives for R and D work by systematic studies utilizing the new forecasting methodologies. The Technology Forecasting Group at the Indian Institute of Science, Bangalore, has done pioneering work which could be shared with other countries through appropriate institutional arrangements.

In the task of implementing laboratory results for commercial operations as well as scaling-down advanced technologies to suit small markets, the engineering consultant has a key role. Institutional arrangements are needed to help strengthen such consultancy activities in Asian countries. It would also be very useful to have a regional directory of consultancy organizations as well as a roster of free-lance experts who could be engaged for specific assignments.

The UNIDO manufacturing clinic on agricultural implements, New Delhi, October 1974, which was attended by 80 participants from 18 countries, recommended the setting up of a comprehensive training system for technology transfer in the field of agricultural machinery and implements. The programme would comprise design, development, testing, manufacturing, marketing, rural financing, and agro-industrial extension services.

Institutional arrangements for the least developed countries

Many capital-stretching, labour-utilizing, energy-conserving processes and products are already available in developing countries. What remains is to make adaptations to suit local situations and disseminate them widely.

The least developed and land-locked countries can be major beneficiaries of such efforts. Similarities in their problems would indicate a concerted approach. Many of them have the basic capability to set up Adaptive Technology Centres, and one leading centre could co-ordinate efforts among many countries. A similar network could be formed in the Pacific island countries, to adapt and diffuse technologies and products appropriate to their endowments.

Co-operation in regional industrial projects

The setting up of multi-national enterprises (as against trans-national) in sectors amenable to scale economies can itself become a strong instrument for technology development. The Asian Industrial Survey, completed in 1973, evaluated various combinations or 'packages' of industries in different countries which could allow an equitable sharing of markets and benefits.

There is wide recognition of the need for Asian countries to come together, starting perhaps with one or two industries and a few selected countries. But the institutional machinery to promote industrial co-operation is lacking. The formation of an association of development banks or boards of investment has been proposed for this purpose.

The current work of the ASEAN Steel Action Group could help in realizing the objective of a major regional steel mill. The Action Group could also in time develop into an Asian Iron and Steel Community and play a dynamic role in stimulating the expansion of the steel industry in the region.

At another level, co-operation mechanisms would be useful in enabling the better utilization of technologies already available at existing industrial plants. By identifying such under-utilized capacities and matching them with demands elsewhere, production costs could be lowered and intra-regional trade increased.

Co-operation in selection of an negotiation for technology

A major function of the proposed RCTT will be to assist in the evaluation and procurement of imported technologies. Mention may be made here of a proposed UNIDO project in Indonesia to assist national officials and entrepreneurs in devising methodologies for selection of technologies appropriate to local conditions through comprehensive training workshops, demonstration plants and supporting information services. Once such programmes are also underway in other countries, they could mutually support each other.

Participants at UNIDO workshops on know-how licensing in Manila (June 1974) and Mexico City (October 1974) have proposed the establishment of a Centre for Technology Licensing to serve as a focal point for collecting and disseminating information regarding technology contracts in developing countries. Such a centre could be responsible for (i) collection and processing of information regarding technology contracts in developing countries; (ii) disseminating salient features of such contracts, including the names of licensors and licensees and the principal terms and conditions, but excluding any confidential technical data (which are not, in any case, included in most such contracts); and (iii) assisting in the negotiation of specific technology contracts.

The objectives of such co-operation are primarily to strengthen bargaining positions and improve access to technologies at fair terms. It could, in fact, result in stimulating the in-flow of technology as well as of investment, as accelerated technological development can be expected to create demands for more sophisticated know-how.

The Seventh Special Session of the General Assembly has proposed work on a global technology bank, which could conceivably acquire the needed know-how and provide it to developing countries at special terms. Concurrently, the concept of technology preferences could be pursued, wherein developing countries would be given more favourable terms in direct arrangements for (i) use of patents and (ii) purchase of know-how services.

While new machinery for intra-regional co-operation is being developed, attention is also required on the possibilities of increased inter-regional contacts. Technologies available in Mexico, Brazil, Egypt or Yugoslavia could be of value to Asian countries. The Lima declaration points out that "the experience shared should include experience in dealing with foreign investment and transnational corporations, with a view to harmonizing and co-ordinating policies in this respect".

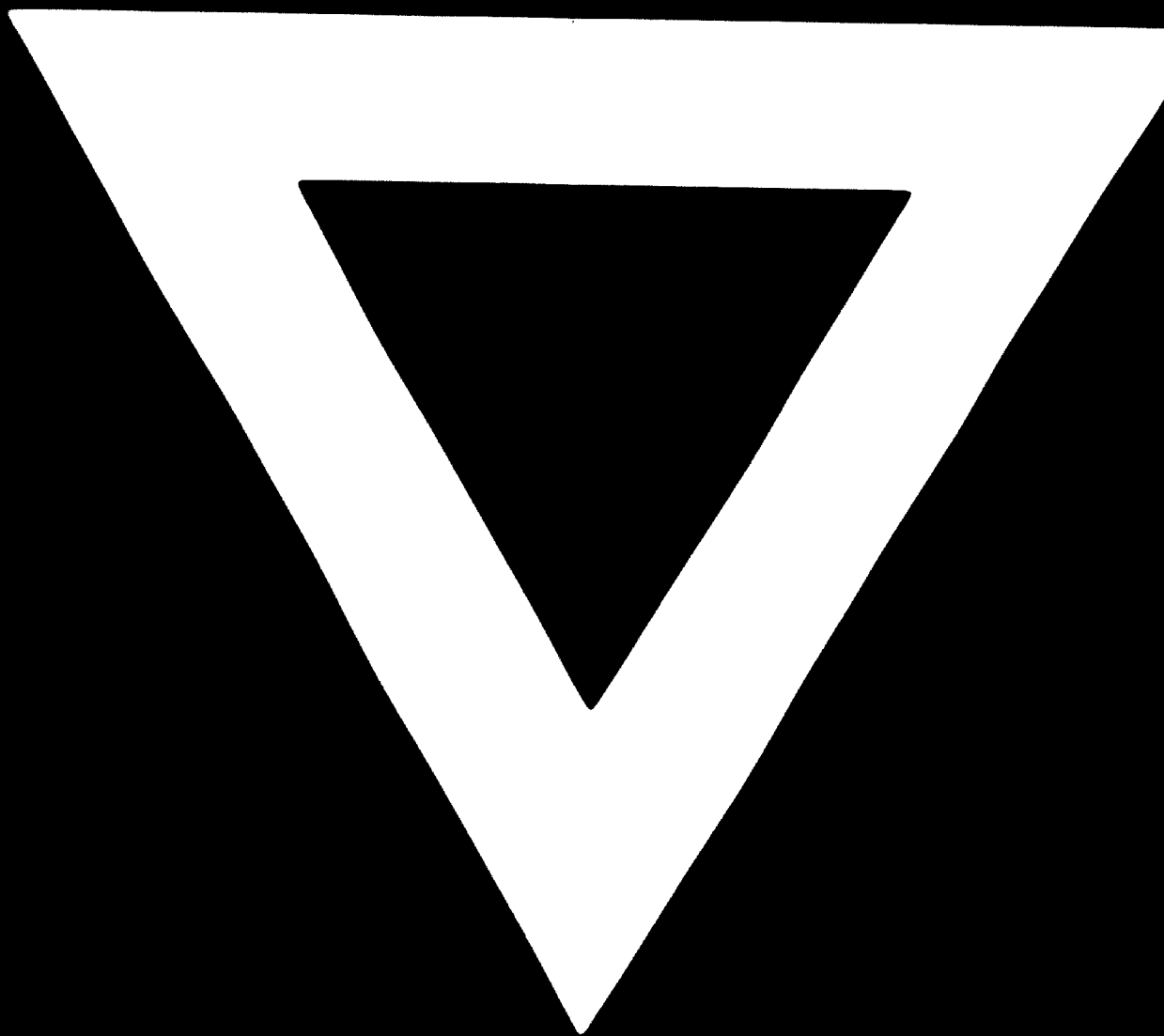
Conclusion

Co-operation among developing countries is an integral component of the new international economic order. Such partnership has added significance in the complex field of technology. Of the various forms of co-operation, the development of a stronger institutional base must now receive greater attention as this would facilitate the process of technology acquisition and transfer.

Presently such institutional arrangements are weak, considering the vast problems and potentials of the Asia and Pacific countries. In fields where regional institutions exist, they have to be properly utilized and strengthened. Where not available, they have to be created. New institutions have long gestation periods, and even after establishment they take many years to reach a stage of self-sustaining growth.

Technology development and transfer institutions are required at national, regional and inter-regional levels. They are needed for specific sectors and for accross-the-board functions. They may take the form of fully-equipped institutions, or of mobile task forces, or of focal points co-ordinating and supporting a network of national centres. The forms and functions may vary depending on market needs.

This paper suggests a variety of possibilities for new regional institutions to meet existing deficiencies and to intensify the infusion of technologies in the future. These could be taken up for further study and implementation, in a phased manner, through UNDP inter-country programming, bilateral, multilateral and other arrangements.



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