



TOGETHER
for a sustainable future

OCCASION

This publication has been made available to the public on the occasion of the 50th anniversary of the United Nations Industrial Development Organisation.



TOGETHER
for a sustainable future

DISCLAIMER

This document has been produced without formal United Nations editing. The designations employed and the presentation of the material in this document do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations Industrial Development Organization (UNIDO) concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries, or its economic system or degree of development. Designations such as “developed”, “industrialized” and “developing” are intended for statistical convenience and do not necessarily express a judgment about the stage reached by a particular country or area in the development process. Mention of firm names or commercial products does not constitute an endorsement by UNIDO.

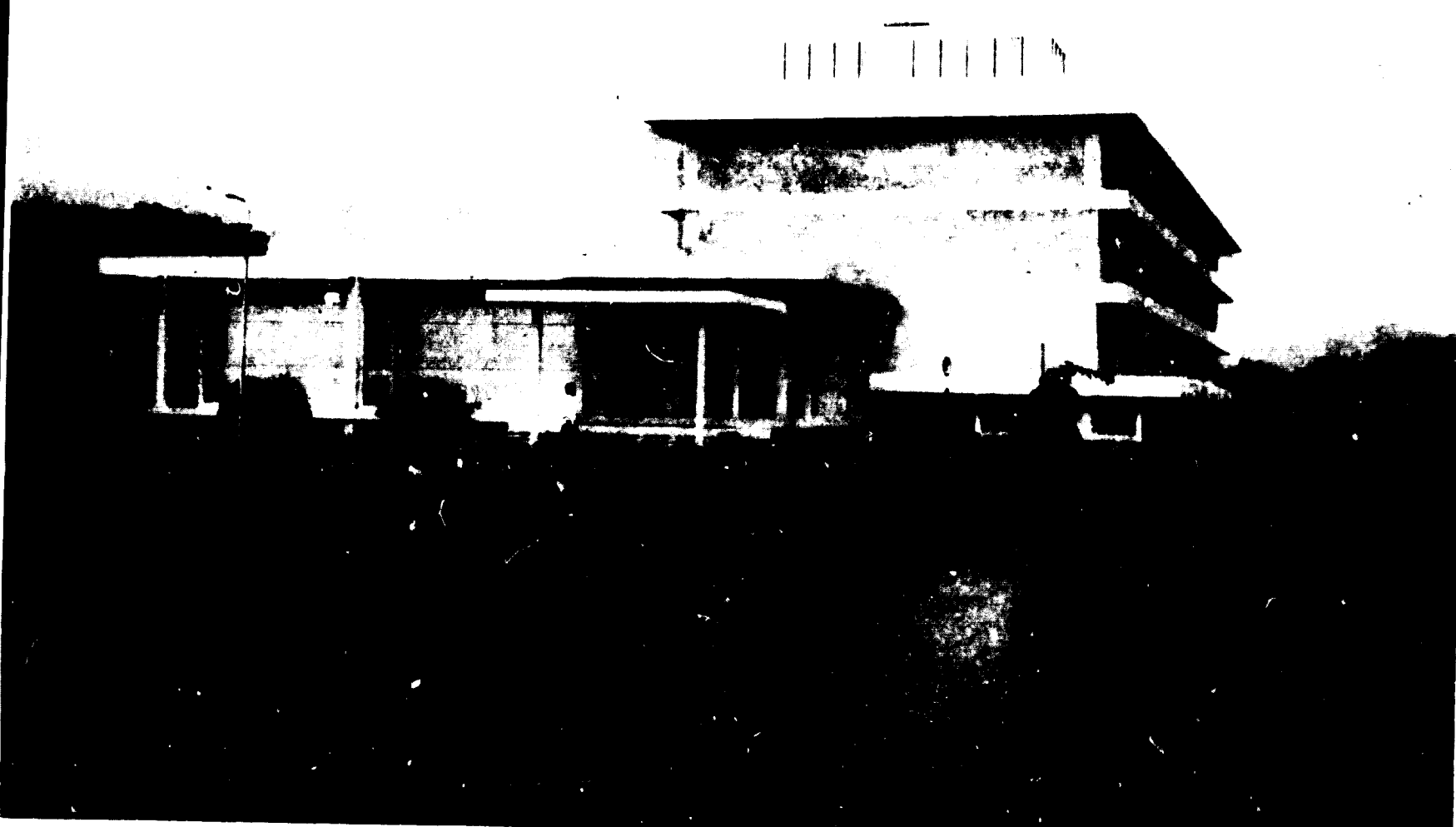
FAIR USE POLICY

Any part of this publication may be quoted and referenced for educational and research purposes without additional permission from UNIDO. However, those who make use of quoting and referencing this publication are requested to follow the Fair Use Policy of giving due credit to UNIDO.

CONTACT

Please contact publications@unido.org for further information concerning UNIDO publications.

For more information about UNIDO, please visit us at www.unido.org



Laboratories for industrial research form part of the ASRCT complex

DO 1718

**ASRCT:
Research Applied to Development
in Thailand**

RECOGNITION OF THE NEED for a many-pronged attack on the problems affecting development impelled the Government of Thailand to create a new agency, the Applied Scientific Research Corporation of Thailand (ASRCT). Established by statute in 1963, ASRCT carries out applied research relating to the natural resources, industries and administrative services of the Kingdom and to the health and welfare of the Thai people. It also promotes the application of research results, trains research workers and provides a variety of scientific services.

In the past five years ASRCT has become a substantial institution, with research laboratories, a library, a workshop, field-station facilities and even a museum. Its headquarters are in Bangkok, on an eight hectare site.

Results

Industry and agriculture are already applying research results from ASRCT programmes. Potential savings of more than US \$50 million a year in imports can stem from their application and capital investment of at least \$20 million is in prospect.

Since it is a key component of the metalworking industries, the foundry industry was an early target for ASRCT research. Current production of ferrous castings is about 60,000 tons *per annum*, with an average value of \$250 a ton. The low quality of local castings has been traced to the use of unsatisfactory moulding and metal-control techniques. Recommendations for the replacement of unsuitable naturally bonded moulding sands by a synthetic variety based on readily available high-silica sands, have already resulted in dramatic improvements in quality and opened the possibility of producing locally 40,000 tons of high-grade castings, now imported at a cost of \$1,250 per ton. These developments have been paralleled with work on metal control, particularly on cupolas for melting.

A process developed by ASRCT for the industrial production of coconut milk is now being applied. This aims at taking the traditional task of preparing coconut milk, a daily chore in most Thai households, into the industrial area. The new method doubles the yield of milk and enables it to be sold at the price now being paid for the raw materials used domestically. A factory with a daily capacity of 20,000 litres of coconut milk is being constructed under the supervision of ASRCT. The capital required is \$500,000, and full utilization of the by-products is planned.

Kenaf, or Thai jute, which is fourth on the list of Thai exports, sprang into prominence during an interruption of jute exports from Pakistan that took place earlier in this decade. Production and marketing surveys have pin-pointed key areas for fibre improvement and higher returns for the farmer. Primitive extraction techniques have been refined through the design of inexpensive retting ponds now being

constructed in the producing area. A stable export of high-quality material worth \$40 million annually is the expected result. Improvement in local gunny sack production, through more efficient working and quality control, should expand exports of finished products substantially. Substitution of waste kenaf for imported wood pulp in local paper factories can lead to savings in imports of more than \$10 million *per annum* and opens the possibility of local newsprint manufacture with an investment of \$25 million.

A simple technique for the stabilization of rice bran, currently under industrial-scale test, should permit the utilization of rice-bran oil-milling capacity of 350 tons a day, now unused because of the unsuitability of the present bran. This would yield products valued at \$5 million *per annum* and pave the way for a further investment of \$3 million to produce oil worth \$10 million *per annum*.

Assistance given to a local tin-plate factory has resulted in the production of tin-plate that meets market specifications and in the consequent possibility of quadrupling output, which at present is only 25 per cent of capacity, because of market rejection of the product.

The introduction of power-system analysis techniques in the government-operated electricity grid has resulted in a new approach to operations. Faults in the system have been reduced through the resetting of overload relays and the adoption of more stable configurations and optimum load flow patterns.

The first of a series of planning atlases for specific provinces has been completed. The atlas presents data on physical and human resources in a series of 30 maps printed on a common base map. Transparent overlays permit the comparison of data on various resources and facilitate national and regional planning.

These examples, chosen mainly from industrially oriented programmes, indicate the scope and alignment of ASRCT research interests. They demonstrate the practical returns to a country that can arise from carefully planned applied research.

Organization

Special attention has been directed towards creating an environment in which research can flourish, where scientists can have careers free from administrative burdens and the pressures of implementing departmental policies while working on the solution of practical problems of immediate importance.

A small Board has authority to determine policy and to control the affairs of ASRCT, including the budget, the employment and dismissal of staff and establishment of salary scales and conditions of employment. The Board reports to the Prime Minister.

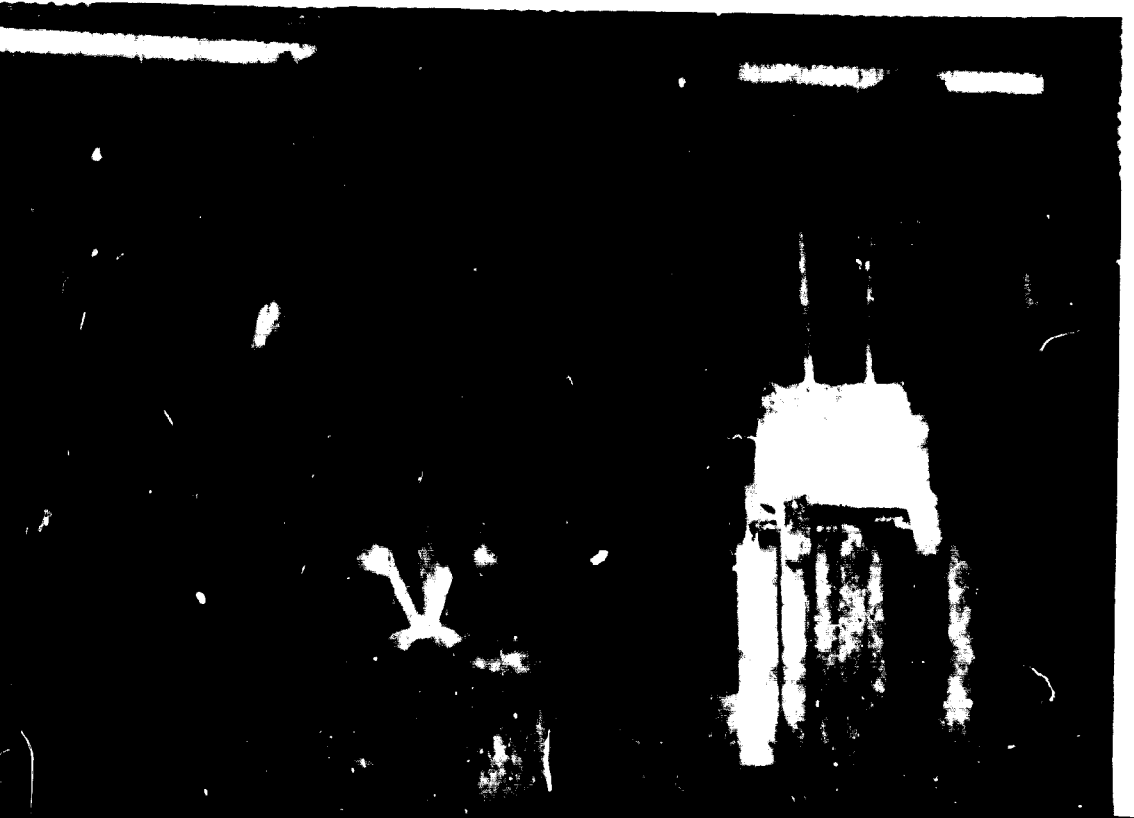
Research is carried out through four operating divisions called research institutes. They are: the Technological Research Institute (TRI), the Agri-



Experiment using vacuum distillation to remove solvent in extraction of flavour from Thai plant

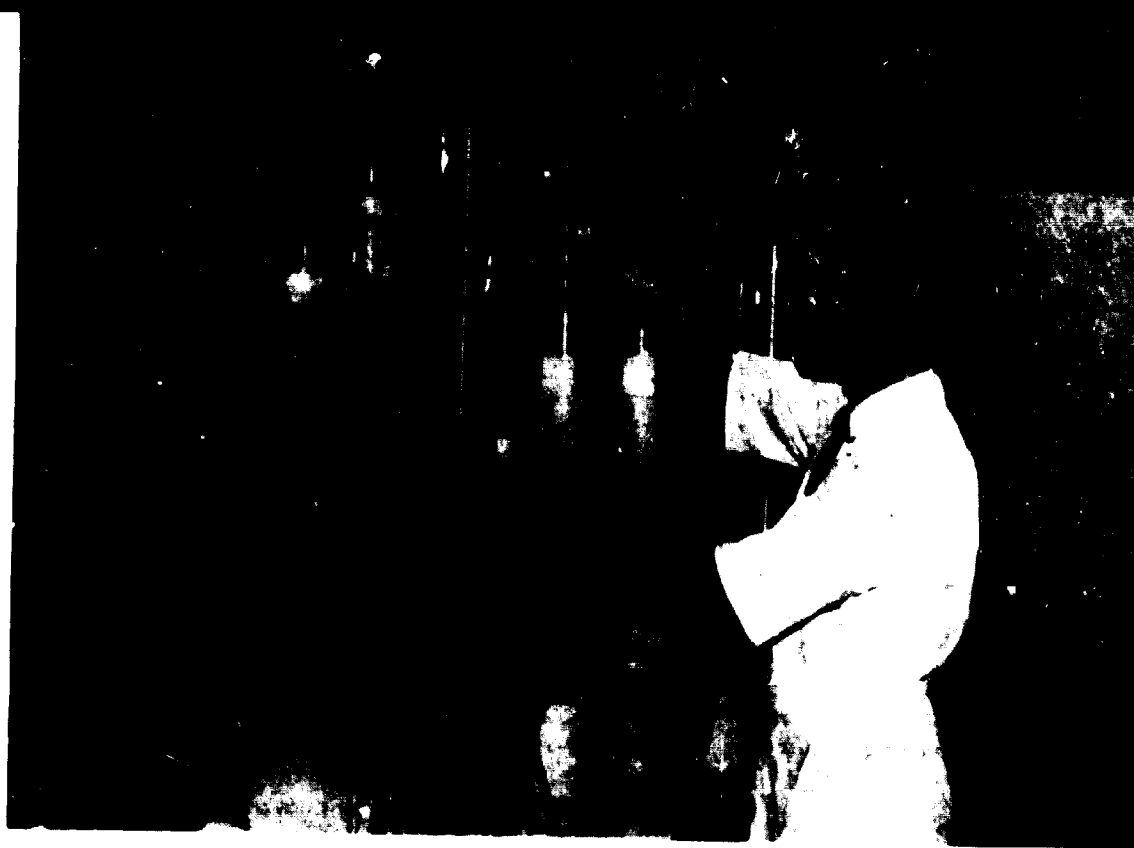


Ballistic strength test provides data on the quality of kenaf fibre

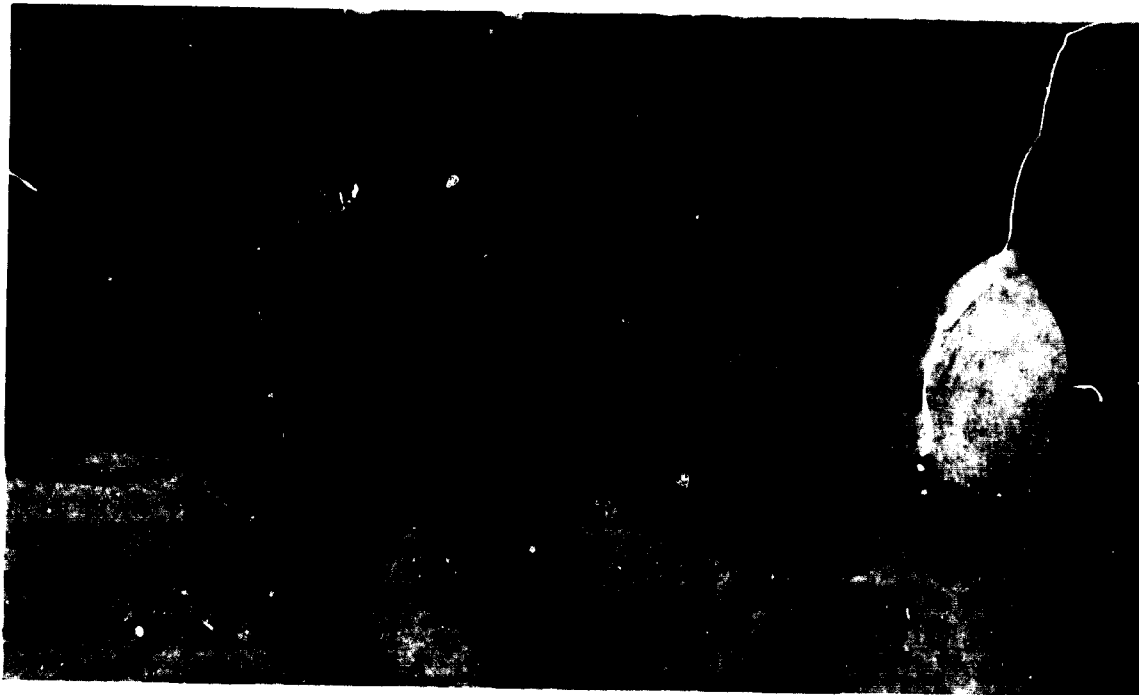


Checking the temperature of molten metal immediately before casting in the ASRCT experimental foundry

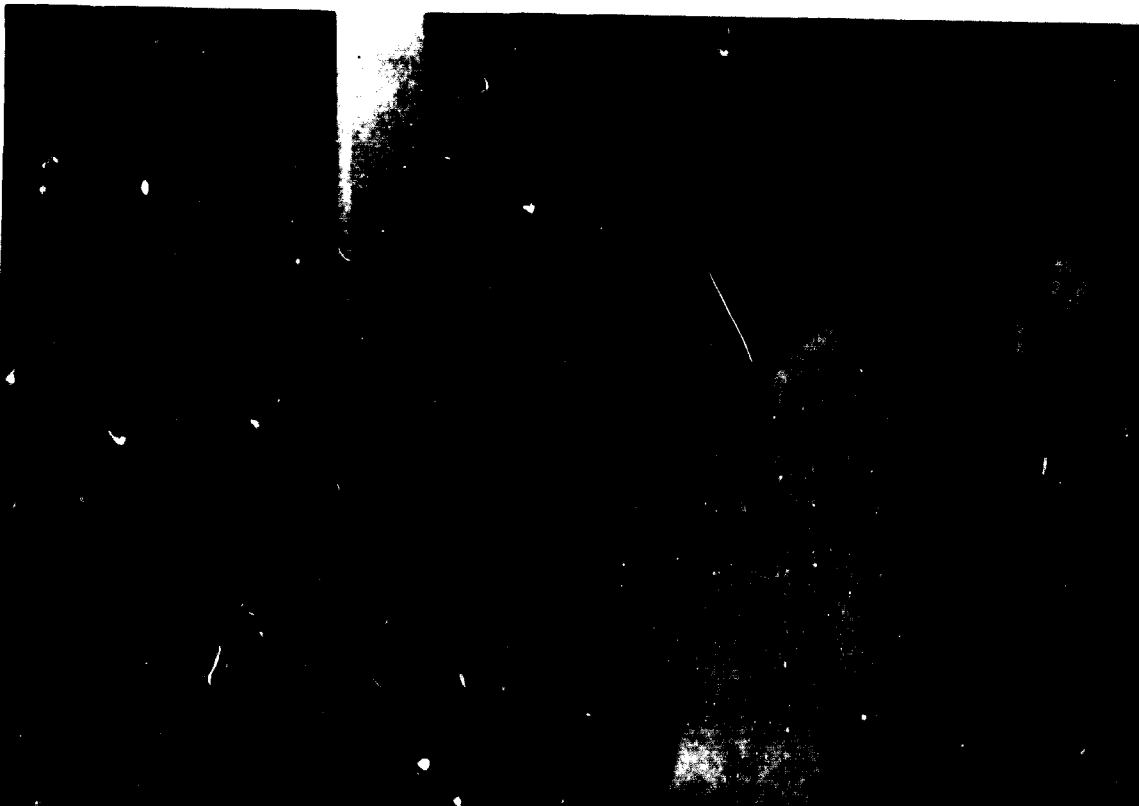
**Extracting active ingredients from
Thai medicinal plants**



**Examining china clay samples in a
survey of ceramic raw materials**



**Preparing a depolarizer mix for dry
batteries based on Thai Manganese
ore**



cultural Research Institute (ARI), the Environmental Ecological Research Institute (EERI), the Behavioural and Sciences Research Institute (BSRI). These institutes are subdivided into groups and sometimes further into units. The research units are organized according to scientific disciplines and provide staff and facilities for work in these disciplines.

The Technological Research Institute was established first and has laboratories concerned with chemical technology, industrial processes, organic chemistry, pharmacy and pharmacology, food technology, metallurgy, applied mineralogy, cement and concrete technology, fibres, physics, electrical engineering, structural engineering and microbiology. Facilities for materials testing and analytical chemistry serve all groups in ASRCT. A close association exists with the Economic Evaluation Group of the BSRI in industrial surveys and feasibility studies.

A central service organization takes care of administrative matters, such as accounting, personnel and procurement; technical operations, such as the construction of equipment; laboratory services; transport; and general housekeeping. This organization leaves the heads of research groups free to devote their time to research and research management with a minimum of involvement in administrative routine.

ASRCT operates several scientific services at the national level to provide assistance to all agencies. These include the Thai National Documentation Centre, the Instrument Repair and Calibration Centre, the Centre for Thai National Standard Specifications, the National Science Press and the National Building Centre.

Research is directed towards specific programmes which are subdivided into projects. Flexible multi-discipline teams drawn from the appropriate research units work together on each programme. Project leaders are designated, and their efforts are co-ordinated by one of their number acting under the general direction of a programme steering committee. Composition of the research teams can be varied according to the exigencies of the work. This method of functioning, which is a feature of ASRCT work, lends itself to the incorporation of research workers from other agencies. User groups are represented on steering committees to ensure the alignment of programmes to practical ends and to facilitate the application of research results.

Finance and staff

Funds for the operation of ASRCT are provided primarily by an annual grant from the Government of about \$750,000. Other grants and research contracts raise the annual operating budget to about \$1 million a year. The value of land, buildings, and equipment available to ASRCT is close to \$2 million.

Staff members are mostly Thai nationals, although a few foreigners with special qualifications have also been employed. The staff of 370 includes 170 pro-

fessionals, about 35 of whom have higher degrees. Operating costs, including overheads, per research team (research scientist, graduate assistant and two auxiliaries), are \$20,000 *per annum*.

There is a shortage of scientific manpower in Thailand, and relatively few people have been trained for research. ASRCT is providing additional training for its staff both on the job and through formal training overseas. An estimated quarter of the full-time research manpower in Thailand is now concentrated in the Corporation.

Shortages of experienced research leaders have initially been overcome through various technical-assistance channels. For example, eight senior scientists from the Food and Agriculture Organization (FAO), the United Nations Educational, Scientific and Cultural Organization (UNESCO), and UNIDO are assisting. Two others are assigned under bilateral programmes.

ASRCT staff members are not part of the civil service. Their salaries are generally comparable with those in commerce and industry. Promotion is on merit. These policies permit the building of stable research groups, in contrast to local civil service conditions under which senior personnel, if they are to take advantage of opportunities for promotion are sometimes forced to abandon their original assignments. This situation often results in a drain from laboratory benches to office desks.

Programme selection

Subjects for ASRCT programmes originate in many ways, mostly from government requests but also through surveys, contact with industry and approaches from sponsors.

After an initial screening by the management, a staff member is assigned to appraise a promising research proposal and to prepare an outline for a programme to implement it. The outline must include economic justification in addition to data on projected lines of work and the staff and facilities needed.

The decision to proceed involves an assessment of available manpower and facilities, including the effect on existing programmes. The programme is then reappraised by its steering committee. Programmes are also subject to periodic cost-benefit reviews that aim at eliminating unproductive projects.

Application of results

One of the most important steps is to choose programmes the results of which can be applied, and the careful steering of such programmes has been the concern of ASRCT management.

A small committee reviews potential industrial applications arising from research, and a process-development unit assists in the scale-up of operations. A few case studies will illustrate the diversity of routes that are involved. For instance, research on

foundry sands yielded new synthetic moulding sands that necessitated careful mixing, moisture control and a modification of traditional practice. Leaflets were prepared describing the new technique in simple language. These were distributed to foundry operators and were supplemented by demonstrations. The new methods were also transmitted to the teaching staff of the several technical schools engaged in training technicians for this industry. The improvement in quality provided sufficient incentive for foundries to adopt the innovation.

A number of difficulties experienced by foundries in achieving surface finish and in preparing moulds for intricate castings were solved by investigation. Simple demonstration insured that the results were applied.

When a new process was devised for the production of coconut milk, it was realized that further development at the industrial stage would be involved, in addition to sales promotion. A feasibility study provided data on market potential and on the capital investment required. It was decided to work initially with a single manufacturer and to give him exclusive rights. Television publicity for the new product resulted in many inquiries from interested entrepreneurs. Finally an agreement was signed with the manufacturer, providing him with know-how and consulting and quality-control services in return for fees and a royalty on sales.

New techniques for kenaf retting and fibre preparation have been passed to extension services in other agencies for transmission to farmers. ASRCT participated in the preparation of extension leaflets and a demonstration film.

In many cases a considerable gap exists between the laboratory process and a feasible industrial operation. Care is taken to pass laboratory scale processes to the industrial processes unit for assessment by staff more appropriately qualified for this phase. These operations are becoming increasingly important as additional programmes reach the application stage.

Special equipment for pilot projects is often required. Thus, to test a process for the stabilization of rice bran, a steam chest was built for installation at a small rice mill, and a vat of one cubic metre capacity, with heating coils, was constructed to provide data for the industrial operation of a new process for the manufacture of fish sauce.

Information services

The Thai National Documentation Centre (TNDC), provides scientific library services to all inquirers. It has compiled a loose-leaf catalogue of the scientific periodicals in Thai libraries. It provides photocopies of technical papers on demand, using overseas libraries to supplement local resources. TNDC also arranges for the translation of articles into English and answers to requests for technical information.



Experimental retting of kenaf stalks is carried out by a technician of the Technological Research Institute

ASRCT has published the *Thai National Scientific Papers* in several series. Papers are accepted from authors, subject to approval by international referees. ASRCT research results are issued initially as internal reports and synopses are prepared later for wider circulation.

The National Building Centre was set up as a mechanism for introducing new building technology to Thailand. It is collaborating with other agencies through study groups and has arranged meetings to consider items such as standardization. In association with the Bouwcentrum in the Netherlands, it is co-operating with the Department of Public Welfare in the co-ordinated construction of 4,000 dwelling units in a new housing project.

as the Board of Investment and the Industrial Finance Corporation, carries out feasibility studies as a basis for new investment. These range from appraising proposals for an integrated iron and steel industry, comprising a blast furnace and rolling mills, to assessing the prospects for import substitution and the processing of local raw materials. These studies have involved the accumulation of data not readily available in Thailand.

Further industrial contacts are made through inquiries received from firms that need information or assistance. Under its charter, ASRCT can undertake work on a confidential basis and can charge clients for research carried out.

Two large overseas companies have sponsored research by ASRCT in food technology. A local firm



In a laboratory of the Technological Research Institute, a technician strains fish sauce in a new filtration system which greatly speeds the process

Industrial contacts

Information on the structure of, and conditions in, industry is required for the proper selection of research programmes and for ensuring that results are correctly assessed. ASRCT has assembled a description of the Thai industrial sector as a preliminary guide. This is being revised through detailed industrial surveys covering the building industry, the kenaf mills, the food industry and the chemical industry.

Surveys of this kind are valuable in aligning further investigations of specific problems. They also provide general economic information required for studies on new industrial processes.

As part of its aim of introducing new technology to Thailand, ASRCT, in collaboration with such agencies

with overseas connexions has sponsored work on kenaf utilization, and the Government power authority has paid for investigations on power-system stability.

Overseas links

ASRCT has benefited from United Nations Technical Assistance programmes. The principal channel has been the UNIDO-administered Special Fund project, concerned mainly with building competence for industrial research. Other help has been received from the Expanded Programme of Technical Assistance; through UNIDO in industrial economic studies; through UNESCO in scientific documentation and instrument repair and calibration; and through FAO in agricultural research. Australia has helped

with expert services in administration and fibre technology.

Training fellowships for ASRCT staff have been available from the United Nations and, under the Colombo Plan, from Australia, Canada, India and the United Kingdom.

Co-operative working arrangements have been established with sister organizations abroad, principally with the Commonwealth Scientific and Industrial Research Organization (CSIRO) in Australia, the National Research Council in Canada, the Applied Scientific Research Organization (TNO) in the Netherlands and the Tropical Products Institute in the United Kingdom. These links have facilitated the transfer of information and have resulted in co-operative research projects and an exchange of staff.

An unusual technical assistance programme has been worked out with Israel whereby Israeli funds go to the Hebrew University in Jerusalem to cover the cost of a nutritional evaluation of vegetable-protein foodstuffs developed by ASRCT food technologists.

Resource-inventory studies, a complex ecology study of a tropical forest, geophysical research and social science research projects are being funded from United States Government contracts. These arrangements have enabled local competence to be built up

and have considerably extended ASRCT arrangements for catalyzing research in the universities and in other agencies.

By offering research facilities to overseas scientists, ASRCT has been able to develop useful programmes, notably in biological research and in transport studies. This latter field now covers work on the extensive inland water-transport system, coastal shipping, railways and road transport and involves experts from the University of Michigan, the Australian National University and the University of Hawaii.

Co-operative research

The establishment of links with national and international agencies has been a feature of ASRCT policy.

Special attention has been given to the development of research within the universities. ASRCT has many co-operative programmes involving university partners and has channelled research funds to these groups, including the granting of scholarships for higher degrees.

ASRCT is increasingly involved with planning groups to provide the data and expertise required to deal with problems at the national level and is providing major benefits through its broad perspective and flexible cross-linkages.





10 . 6 . 71