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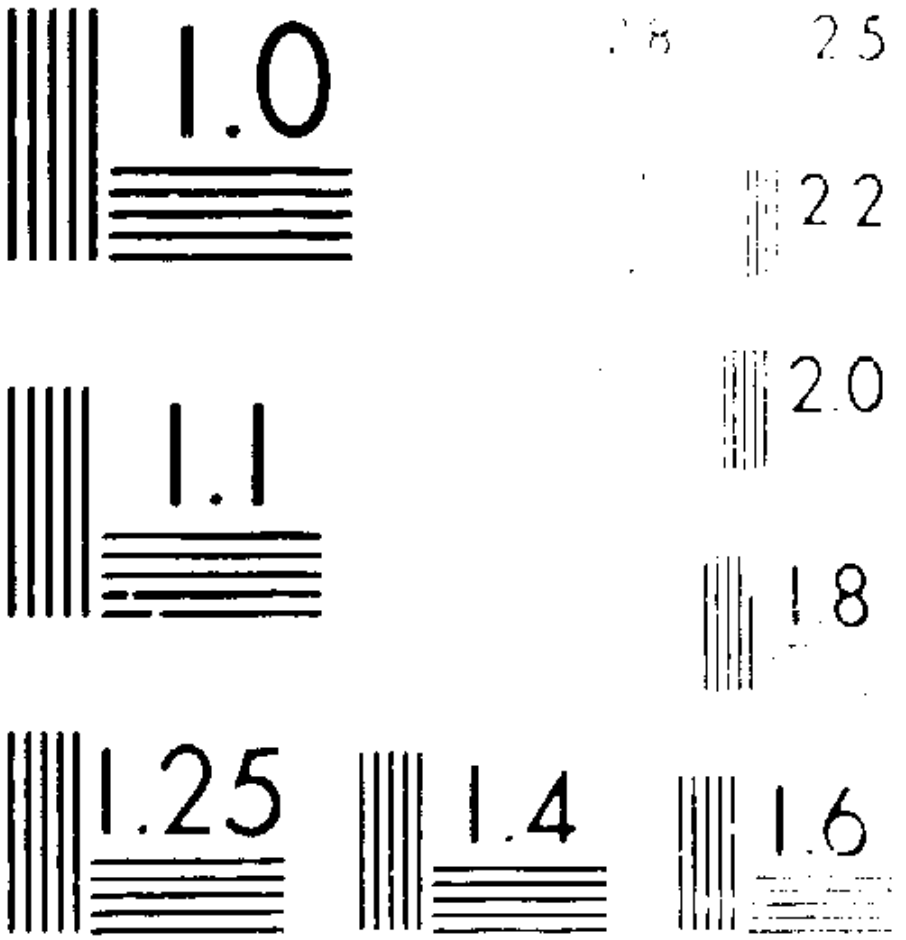
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Thailand.

BOOSTING THE ECONOMIC IMPACT OF INDUSTRIAL R + D

A Contract-oriented Development Programme
for the
Thailand Institute of Scientific and Technological Research (TISTR)*/

by

W.R. Millager

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CON

TENTS

1. INTRODUCTION AND SUMMARY

This report is a follow-up to the previous short background note on the Restructuring of TISTR.[1] It has been prepared at the request of the Governor. The Governor and key staff members have cooperated fully and made major contributions to every section.

The contents include brief material on programme policy and objectives; financing; project management practices; some of the industrial R&D activities; and preliminary ideas for accelerating both R&D results and industrial applications. Section 2 contains descriptive material on TISTR's existing operations and future aspirations. Section 3 outlines a modular action programme for developing programmes, projects, and skills to meet the challenge of the new policy directions.

In summary, the conclusions - although tentative because of the limited nature of the study - are as follows:

1. TISTR has a unique base of talent and experience, with great potential. It must be considered a national resource, and a key instrument of Government policy.

2. TISTR has a tremendous opportunity - through its industrial R&D - to contribute to Thailand's economic and social development in cooperation with related institutions.

3. New directions have been set, which demand a substantial boost in R&D output and a quasi-commercial approach to funding.

4. A modular approach to building an action programme should produce both quick and sustained results, of acceptable magnitude, without excessive risk of counterproductive disruption.

5. The use of a pragmatically structured Technical Review System to inject technical and managerial expertise at the project level is suggested as a necessary key to implementing required operational changes.

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[1] Status Report on Revamping/Restructuring of TISTR, 6/1/83

2. INDUSTRIAL R&D AT TISTR

As indicated in the introduction, this section contains descriptive material on existing R&D operations and TISTR's future aspirations.

2.1 EVOLUTION OF PROGRAMME POLICY

In its early days, ASRCT (TISTR's predecessor) comprised a number of divisions which were, in effect, separate institutes. These included the Technological Research Institute (TRI), which had long-term support from UNIDO/UNDP; the Agriculture Research Institute; the Environmental and Ecological Institute; and a number of Centres dealing with calibration and standards, building research and development, and documentation.

Now, after about 20 years, TISTR has decided to become again primarily an Industrial Research Organization and to adopt a quasi-commercial business approach. TISTR's role includes helping Thai enterprises to "catch up" with practices in other parts of the world. But the institution would also like to play a leading role, i.e. to lead industry in directions which can serve national economic and social development objectives.

2.2 PROGRAMME SCOPE AND OBJECTIVES

On a "top-down" basis, four new areas of major programme emphasis have been established. They are, in order of importance, 1) utilization of cassava, 2) engineering industries, 3) utilization of bamboo and 4) rural development. There are also some major continuing programmes; i.e., economical production of fermentation alcohol and development of the Packaging Centre.

Overall objectives include the setting up of model industrial units, especially in the provinces; providing services to small and medium (and also to large) enterprises; promoting rural industries, including cottage industries and building materials production. To these ends, TISTR intends to make appropriate use of technological advances like genetic engineering and

biotechnology, micro-electronics, and solar energy.

The role of the Policy and Planning Section is to propose a broad outline of what should be worked on in a given year and to summarize national policy for the Governor. But there are no detailed reports on these matters.

2.3 PROGRAMME FINANCE

2.3.1 Resources

There are three main sources for R&D funding. One is called "in-house," which refers to government budget finance. The second is contract funding; and the third is grant aid from bilateral or multi-lateral sources. Currently, the government budget provides roughly two-thirds of total funding, but there is a target to increase the importance of contract funding by a major factor within three or four years. This target will require significant changes in operating approaches to allow direct government budget subsidy to be reduced to 25 per cent of the total budget.

2.3.2 BUDGETING

Before 1980 both the National Research Council (NRC) and TISTR, which was at that time ASRCT, were attached to the Prime Minister's Office. The TISTR budget was submitted through and "passed by," NRC. Now, since 1982, the budget is directly submitted to the Bureau of the Budget (BoB). NRC still has a review function.

The 1983 government budget, i.e the funds provided by the Bureau of the Budget, totals 78 million baht. It can be broken down according to the table given in Exhibit 1.

Exhibit 1.

1983 "GOVERNMENT" BUDGET
(M Baht)

	Total	Salaries	No.Empl
Administration	25	14.1	157
Scient & Tech Svcs	12	8.9	80
Research	30)		
	)	23.0	184
Development (NESDB)	10)		
Total	78	46.0	421

The budget supports 421 employees, most of whom have permanent contracts. And their salaries account for more than half of the budget. The proposed 1984 budget is currently being processed and will probably be decided by July. It totals approximately 113 million baht, but will probably be trimmed by at least 10% before final approval. A more detailed breakdown is given in Exhibit 2.

Exhibit 2

1984 Budget Proposal
(M Baht)

	Sal	Wage	Matl	Eqpt	Cons	Oth ¥	Totl
Admin.	14.4	1.0	5.0	4.1	2.6	11.3	38.4
S&T Svcs	9.6	0.4	2.2	3.1	-	1.4	16.6
Research							
Sal&wage	25.9	1.8					27.7
Cont proj		0.5	1.3	3.1	1.3	2.1	8.3
New proj		0.3	1.4	0.8	-	1.7	4.2
Kings proj		0.5	0.6	0.1	0.3	0.9	2.3
Dev NESDB	0.1	0.9	3.3	7.7	0.9	2.0	15.4
Total	50.0	5.4	13.7	18.9	5.1	20.0	113.0

¥ Includes utilities (5.2), benefits (5.0), memberships (0.9) and miscellaneous (8.9)

2.4 PROJECT OPERATIONS

2.4.1 Project Finance

"Project costs" do not usually include salaries, which are implicitly considered to be fixed costs. In the context of a research division, this means that only about one-third of the expenditures are treated as "controllable".

In 1982 there were about 19 projects recognized by the TISTR Board. However, these have been broken by the divisions into nearly 100 subprojects, including about 20 contract research activities. The contracts vary in value from about 0.5 to 2 million baht.

It is important to note that revenues from contract research are retained by TISTR. The excess over and above out-of-pocket costs is available for discretionary use. There have been some initiatives to make part of this fund available for re-use to the division responsible for the contract, as a kind of performance incentive. Apparently there is no effort to monitor the extent to which staff time is applied to contracts or to specific in-house research activities.

2.4.2 Coordination and Reporting

There is a Projects Committee which meets every month. It comprises the directors of all of the research divisions. The Committee considers project proposals, which are usually prepared by researchers and submitted by heads of the respective divisions. For an outside client, a project concept may be prepared by the Business Services Division if the client approaches that office. Otherwise, it may be prepared by the researcher, in consultation with the prospective client. Contracts are also reviewed by the Legal Officer.

Every four months, each project leader completes a one-page progress report, which is approved by the division director and submitted to the Evaluation Section. The report includes the

following items; name of the activity or project; sponsor and amount of the budget; duration; cumulative per cent completion (both for the previous four months report and for the current four months); problems, if any; intended use of results; intended user; explanation of over or under budget; relationship with national development planning objectives. A summary of all such reports is compiled under a blue cover.

This consolidated summary then goes to the Projects Committee where each division director "defends" the reports submitted by his division. The Director of the Governor's Office is Secretary to the Projects Committee; and the head of the Evaluation Unit is Assistant Secretary. This session usually lasts for a single morning, and results only in minor changes. There are usually no critical comments in meetings of the Projects Committee. If there are critical issues, the Governor establishes a working group.

The summary report is next discussed by TISTR's Board, which makes brief recommendations, probably totalling no more than a single page for the whole volume. The summary report is then submitted to the Ministry of Science, Technology and Energy and the National Research Council. An annual report is also sent to the Ministry.

The reporting form used during 1982 is a revised format which includes considerably more information than previous versions. The current format represents a considerable compromise. Previously, somewhat different formats were required by the National Research Countil, the Ministry of Science, Technology and Energy, and NESDB. Now these all accept the current format, while the Bureau of the Budget has created a new format, which requires separate preparation.

There is at least one additional coordination body internal to TISTR. This is the Cassava Committee, chaired by the Governor, which coordinates planning and implementation for work of various divisions, especially Agriculture Products Research Division and the Industrial Research Division.

It is understood that the Accounting Section

can provide information on unspent funds remaining under a given project, but is not able to provide a detailed consolidated report. It is requesting several additional staff members to bring it up to full strength for this purpose. Further, as mentioned earlier, there is no accounting of staff time in connection with individual projects.

2.4.3 Contracting and Pricing

Contracts are usually prepared by the Business Services Division, with the assistance of a lawyer, although of course the technical divisions must participate in some of the substantive aspects. There is apparently an unwritten policy that the results of any research performed under a contract will become exclusive property of the client. Thus an instant birdsnest soup formulation developed some time ago could not be the subject of industrial extension service or contract research for any other client. These rights are apparently granted in perpetuity, and without stipulation for licensing, or any other means of making the knowledge more broadly available.

The contract price depends partly upon the client's "ability to pay." Ideally, it is calculated to include wages and salaries plus 250% overhead, in addition to other out-of-pocket costs such as materials and purchased services. TISTR's "marketing" function is shared by the Business Services Division and by the research divisions.

2.4.4 Project Approval Routine

As indicated earlier, the Projects Committee approves individual projects. This can take place within constraints of the Government budget which is negotiated with the Bureau of the Budget. However, in addition, there is a group of Government-funded projects over which NESDB has special oversight. This is shown in outline form in Exhibit 2. Such projects are intended to support special NESDB development concerns, such as rural development. There are also various committees, one of which is the Committee to Promote Implementation of Projects Under the Science and Technology Chapter of the Fifth Plan.

This is headed by a prominent Professor of Chulalongkorn University and has the Head of NESDB's Technology Unit as secretary. For example, this committee is considering TISTR's proposal for a project to implement the Packaging Centre.

When a project is proposed to be funded through multi-lateral or bilateral grant aid, DTEC must also be involved, and uses its own technical assistance subcommittee to consider project proposals. For example, in the case of the Packaging Centre, it is likely that the DTEC sub-committee will also have a role to play.

2.5 AGRICULTURAL PRODUCTS RESEARCH DIVISION

2.5.1 Post Harvest Technology Laboratory

This laboratory is largely concerned with loss-reduction technology and its implementation. There is currently a four-year project on Handling, Transportation and Storage, mainly funded by the Government budget, but also by the International Foundation for Science. There are also services provided to industry on an inquiry basis as well as a public awareness programme.

On the implementation side, considerable work has been done on low-cost machinery, both in TISTR machine shop facilities and also using outside workshops. Examples are wash tanks for bananas and a hot water tank for pre-processing mangoes and papayas. A current machinery development project is for a storage cooler. One problem is that there seems to be a near total lack of engineering ability in Thailand for post-harvest handling machinery.

2.5.2 Food Technology Laboratory

There are a number of interesting projects as below:

1. Orange juice concentrate - some laboratory work has been done on the in-house budget and it is hoped to do pilot plant work during 1983. Other juices (tangerine, mango and so on) may also be future subjects for this project. So far, only

basic formulation work has been done, since no detailed product specifications have been established. However, the project was partly stimulated by the special interest of a company which sells insecticide and fertilizer to farmers. The company wishes to assist its customers to strengthen their marketing results and thus increase demand for its products. The idea was to supply bottling companies which are now importing artificial essences and flavours with concentrated juice products for use as beverage base. Two problems were noted in this regard:

First, there tends to be a sedimentation problem. This proved to be a marketing roadblock for one company which tried to produce such products in the past. Second, some years ago the Seven-up bottler wanted to market a tamarind-flavoured beverage.The company found out that according to its contract it could only use imported concentrate. This is thought to be a general problem for import substitution in the beverage field.

The tangerine growers cooperative visited TISTR at one time, saying that there were many potential clients overseas, interested in obtaining concentrated tangerine juice from Thailand. They especially mentioned Sweden. So far, no specifications have been received for such a product. One company which produces beverages based partly on natural fruit juices sells its product at 5 baht per packet, using the Tetrapak method, while the same size bottled beverages sell for only 2.25 baht. This higher price is necessary because the package itself costs approximately 2 baht.

2. Dehydrated Fruits - there are currently five contracts for fruit processing (this includes one for storage of fresh longan). One contract is for dehydrating mango, rambutan, jackfruit, and guava. The client company is building a factory mainly for export and wishes to have process information and assistance in packaging. Another contract is for dehydration of pickled mango. Both of these are for small companies.

The division is in touch with the Export

Service Centre which has benefited from the services of a consultant named Harvey Niese of Food Systems International, financed by USAID. It is thought that there are many small producers in the North which could prepare pickled or dehydrated fruits of acceptable quality for export.

3. As a part of the overall cassava products programme, this Division has a contract with the Tapioca Association concerning cassava products for human consumption. One aspect is a study of gari preparation or starter chips for export to Africa. A broad programme proposal has been submitted to EEC.

A contract has been signed with KAIST (Korea) whereby a prototype of the low-cost extrusion machine (for expanded vegetable protein) has been shipped and is expected to arrive during February. An additional prototype will be built at low cost, with various parts obtained from different machine shops to avoid copying the whole machine. The prototype will be installed on the premises of an interested company which will test-market products using different flavours and shapes.

If successful, the company will pay a one-time fee which will go into a revolving fund for further cooperation with KAIST. (The next project with KAIST is expected to be rice bran stabilization, using a Korean machine.)

The extrusion machine would mainly be used to produce snack foods which may incorporate some soya and/mung bean for added protein. There are delays on this project because the current year's budget does not include special funding, mainly because the budgeting process works roughly 18 months ahead. (UNIDO "bridging" help was invited, but has not materialized.)

4. There is a major project using IDRC funds for process improvement in the small food industry. The current phase will be working on noodles for three years. There is a project team involving not only the Agriculture Products Research Division but also engineers, economists, and technologists from other divisions. The plan is to study the problems faced by the small noodle manufacturers. Solutions will be tested in a pilot plant

evironment and then the technology will be given to the enterprises to help them increase their profits and improve product quality.

This project started a year ago and the team has worked with three factories. They will also do diagnostic work in two more factories. These are located both in Bangkok and up-country. Then the team will give a seminar as one means of the disseminating the information gained. Later on, they would hope for continuing support from IDRC to work with fruit processing enterprises in a similar manner.

A comment was made on the opportunity for further discussion of the respective roles of TISTR and the Department of Agriculture in similar subjects.

2.5.3 Packaging Technology Laboratory

The Cabinet agreed last year that TISTR should establish a Packaging Centre. This was an agreement in principal, based on a study by a leading Belgian institution which found that there was a need for additional equipment and a modest amount of specialized expertise. There is also an ASEAN cooperative project on packaging of fruits and vegetables which is coordinated by Kasetsart University; and TISTR is contributing to this programme.

A project proposal was prepared by TISTR during 1982 for expanding the current capacities and upgrading the laboratory to the status of a true packaging centre. The proposal is currently being considered by NESDB and has been referrd to the Committee for the Promotion of Projects Covered by the Science and Technology Chapter of the Fifth Plan. The proposal includes a number of equipment items, among which are a universal testing instrument and a walk-in cold-heat testing chamber. These two items which will cost approximately 250,000 baht would make a siginificant favourable impact on the testing facilities of the laboratory.

Commercial utilization of the Packaging Centre would be a focus of attention by its

Steering Committee which is intended to comprise, among others, representatives of the Department of Industrial Promotion, the Export Service Centre, the Thai Packaging Association, the Association of Thai Industries, and the Thailand Industrial Standards Institute. Additional building space is currently under construction for the laboratory.

2.6 INDUSTRIAL RESEARCH DIVISION

2.6.1 FERMENTATION TECHNOLOGY LABORATORY

As can be expected because of the importance of the subject, this laboratory has a number of interesting projects:

1. One very large project is currently in progress. This is the alcohol pilot plant which is largely financed by the Japanese and is intended to demonstrate low-energy production of fermentation alcohol. Khun Poonsuk is project leader and Dr. Nara is designated as plant manager. The plant building is currently under construction and many items of equipment have already been delivered.

2. Another key project began about three months ago. This is the use of cassava and agricultural by-products as ingredients in animal feed for low cost village or farm-level formulation. A field survey has been made and the first project report issued. The project will use rice straw, cassava and chicken manure to formulate cattle feed. Four locations, three in Khon Kaen and one in Cha Chengsao in the East have been chosen. One is a very small farm which will require no equipment, while another is somewhat bigger and will require chopping and mixing equipment. The remainder of the first year will involve laboratory work on formulation and chemical analysis.

The second year programme will be carried out jointly with agricultural people at Kam Pangsaen, where there will be animal feeding experiments. The third year will involve on-farm demonstrations and then subsequently the results will be distributed for use by DOAE extension people.

The feed project will require testing about

400 samples for cellulose content. Manual methods require a considerable time and produce only about six samples per week. There is a machine called Fibretext which can do the sample tests almost immediately. No such machine is available even at Kasetsart; but it is understood that the Department of Livestock has just bought one. It is hoped that some method of sharing this machine, possibly on weekends or at night, may be worked out. Otherwise there will be an urgent need to purchase another machine.

KAIST of Korea will provide either a design or a design and prototype equipment to produce the animal feed. The process involves anaerobic fermentation and will use a ferro-cement vessel. The laboratory work is now using 5-kg plastic containers. When the prototypes are made in Thailand, it is expected that they will be obtained in the Chinatown area of Bangkok, where many workshops can produce such items very cheaply. In fact they are already making fermentation equipment for alcohol production. The client for this project is the Department of Industrial Promotion. DIP is interested in local production of the equipment.

3. There will be another contract for the Association of Cassava Trade for mixed cassava feed for chickens, ducks, and other small animals. The Association has set aside 3 million baht for research on animal and human feed based on cassava. The project uses a Korean process which involves pre-treatment of rice straw using alkali. An important element is the animal "taste test," which will largely determine whether the product can be sold. The small-animal feed will not use straw, since their digestive systems are unable to handle the lignocellulose material.

4. The Micro-biological Research Centre (MIRCEN) for Southeast Asia has been based at TISTR for six or seven years. There are nine such centres, worldwide. The Bangkok Centre has been aided somewhat by UNESCO, in the amount of $10,000 or $20,000 per year. Its purpose is to promote the use of beneficial microbes. A training course is conducted every two years on culture and collection technology. Trainees have come from China, Philippines, and many other countries.

It was noted that a gene bank of plants (not microscopic) is maintained at the Agriculture Research Division of TISTR and can be considered an important resource for the biotechnology programme. But there is no similar facility for animal tissue materials.

5. Another project of considerable interest is the Shiitake mushroom which has been actively promoted over a number of years. This is carried out in conjunction with the King's project and has been assisted by the United States Department of Agriculture as well as by Taiwan and the Thai Government. A related project involves promotion of the button mushroom, or champignon.

6. A cooperation project with Japan, the JSPS (Japanese Society for the Promotion of Science) and the Fermentation Resarch Institute of Japan has the aim of producing hydrogen through bacteriological ac

7. Cassava leaves have a protein content over 20%, but they are poisonous unless the hydrocyanic acid is removed. Fortunately, fermentation removes the toxin. But the leaves are bulky, so a company which now collects the leaves and dries them for shipment to Japan (located in Chonburi) is having a problem. The price being low, farmers don't like to take their time to collect the leaves and deliver them.

2.6.2 Metallurgical and Ceramic Engineering Laboratory (4 Professionals)

A current project involves vacuum casting of iron in cooperation with Japan. This project is about ready for demonstration to interested companies. The demonstration will be carried out at a cooperating company with other firms invited to observe.

The laboratory has been working on a survey of dolomite resources in the South in conjunction with a UK university. The laboratory has given a very favourable evaluation of the quality of the raw material for use in producing fire bricks. The report will be finished in three or four months

and will be submitted to ASEAN in connection with a proposed joint project on refractory materials which is now in the planning stage.

2.6.3 Fibre Technology Laboratory

The main project is on paper-making fibre. In Thailand, paper is now being made from baggase and kenaf. This project is considering alternative raw materials based on fast-growing trees. In consultation with the Forestry Department, 14 trees have been identified. Laboratory analysis is being carried out to test the resulting pulp. The results will be transmitted to the Forestry Department to help them decide which trees to promote.

Fast-growing trees are defined as those which can be ready for harvesting in less than ten years. One of the fast-growing species which seems to be favoured is called Lusina or Epu-epu and some samples can be seen growing at the TISTR premises. Results from this project should be completed by the end of next year.

On the same subject, there is a contract for the Kraft paper company concerning raw material alternatives: which would be the most favourable, how to grow them, and so forth. This company is located in Bang Mon; and they have land in other areas.

2.6.4 Chemical and Process Engineering Laboratory (5 Professionals)

This group comprises mostly chemical engineers and provides a service function for other laboratories, especially to set up pilot-scale production.

2.6.5 Oils and Fats Laboratory

The lab works on products for use as edible oils, for industrial purposes, and for fuel. Under the industrial category, current work involves rubberseed oil and cashew nut shell oil which has

value as a drying oil in varnish and paint. In this case, a local paint company is testing the market with apparent success. The only limitation seems to be that there is a yellowish colour which cannot be removed; so it is not suitable for use with white paints.

A manual oil expeller promoted by TISTR is expected to be useful for producing a substitute diesel fuel from oilseeds grown by farmers. The idea was introduced to farmers for their own small diesel engines. This would theoretically allow a considerable saving because there would be no tax to pay. The expeller works very well with peanut oil but unfortunately the value of the peanut is so high that the product is currently not competitive for use as a fuel.

2.7 OTHER RESEARCH DIVISIONS

Most of the other research divisions also have projects which are highly relevant to industrial development. However, since this report is not intended as a comprehensive study, it was not felt essential to consider their work at this stage.

3. BOOSTING TISTR'S CAPACITIES

This section contains suggestions for developing a modular action programme to translate TISTR's new R&D policies into operational reality. Briefly, it is understood that this requires increasing R&D productivity and output, applying project selection criteria, greatly expanding contract revenues, multiplying commercial application of TISTR's results, and enhancing internal consultancy and decision-making tools.

These notes reflect a limited amount of consultation with key officials. They are presented as "ideas" for discussion, modification, and refinement.

3.1 CRITERIA FOR ACTION

It has been widely assumed that boosting TISTR's capacity will require radical restructuring of its programme, and perhaps of its institutional framework. This may well be true, but radical changes do carry risks. It is suggested that the action programme be designed with the following criteria in mind. (This list is based on an intuitive assessment of the opportunities and possibilities of instituting change at TISTR.)

1) To be credible, the action programme must be seen to cut to the heart of TISTR's problems. As a basis for discussion, it is assumed that this means it must have a major effect on the results and impact of TISTR's work; it must ensure that the incentives for TISTR - i.e. for its staff - to become more productive are clearly positive, rather than negative; and it must include built-in upgrading of TISTR's capacities: it must be forward-looking.

2) The action programme must promise - and be capable of producing - some fast, visible results in order to convince skeptics that TISTR can in fact be reformed.

3) The action programme must be viable as part of TISTR's long term evolution as a strong, highly-regarded contract R&D institute. The tolerance for false starts is quite narrow.

4) The actions should be simple and easily understandable, or at least presented in easily understandable modules. The programme should be seen as "fundamental and determined", as opposed to cosmetic.

5) The changes required should be "socially acceptable," in the broad sense, and in the Thai cultural framework. The actions taken should be seen by the staff as at least probably useful for achieving TISTR's institutional objectives. Equally important, the staff should be able to view the actions as likely to be beneficial to them as individuals and as a group.

6) The programme should contain built-in provisions for easy monitoring; and its design approach should be essentially heueristic, rather than deterministic.

7) The action programme must be dramatic enough to attract attention and win support from outside TISTR.

3.2 CURRENT INITIATIVES

Discussion of a possible action programme will take into account the many recent and current initiatives which bear on TISTR's economic impact. The following is a partial listing, as an aide memoire:

- Internal procedural changes being instituted under the leadership of the Governor's Office, in consultation with the Reform Committee. This involves establishment of so-called "Planning Corps" for different activity areas and will benefit from advice of outside Thai resource people.

- The recent exposure of the head of TISTR's Policy and Planning Division to the R&D programming and management system of the Denver Research Institute.

- The Sunderman study, Battelle/USAID.

- The regional (and eventually global) activity organized by FIT under IDRC/CIDA sponsorship, to prepare an R&D management manual. TISTR is

hosting a regional meeting in Pattaya later this month to review a draft of the manual.

- Efforts to obtain consultancy inputs from UNIDO on programming of work related to technological advances, in order to help TISTR assume a leading posture (see Section 2.1).

- Design efforts vis a vis the Technology Transfer Centre, whose establishment on a more operational basis has been approved in principle by the Cabinet. MSTE officials are concentrating on this activity, perhaps partly at the expense of TISTR.

- International consultancy inputs on "Promotion and Regulation of Flows of Technology and Investment" financed by UNIDO. An interim report is about to be distributed.

- TISTR's proposal to obtain an in-house mini-computer, which is currently being considered by the National Committee.

- The studies of TISTR's programme commissioned by the Reform Committee.

3.3 STRENGTHENING R&D PROGRAMMING

3.3.1 The Need for Precision

The newly stated programme policies (please see Section 2.1) are clear and precise in concept, if not fully comprehensive. Yet these policy statements and the existing R&D programme, and/or the budget proposals for fiscal 1984, may not yet be fully compatible with each other. At a more general level, it is evident that DTEC has imposed an informal embargo on supporting further technical cooperation projects requested by TISTR. DTEC will probably maintain this posture until a description of its R&D programme in at least summary form, with numbers, and containing relative priorities, has been presented and discussed.

3.3.2 Programming Flexibility

TISTR needs to retain a degree of programming flexibility which is somewhat beyond the constraints of the BoB funding process, because of the length of the budgeting cycle. And some flexibility already exists through the practice of redeploying revenues obtained from contract R&D. This mechanism can be further developed. Its usefulness may be increased through further refinement. And expansion of the contract R&D business approach is in itself another avenue toward the desired flexibility.

The "subscription" programme now being promoted by TISTR also generates discretionary funds. It can be further developed and expanded. Possibly the offering can be "sweetened" by including a few diagnostic consultancy sessions as a part of the subscribers' entitlement.

3.3.3 National Perspectives

Allocation of functional roles among institutions - in the broad field of technology - is being considered by several groups, up to and including RESCOM and the Economic Ministers. But there are still uncertainties which contribute to apprehension about TISTR's place in the national R&D programme. This uncertainty is not likely to be greatly reduced until the concept of the Technology Transfer Centre is clarified and defined in some depth.

There is reason to be optimistic, however, that complementary roles will emerge. This should have, among others, the desireable effect of allowing MSTE officials to support TISTR more strongly than in the recent past, and encouraging TISTR to contribute to implementation of the TTC programme.

3.3.4 Organization

There may still be room for more clearly defining, and possibly adjusting, the respective roles of some elements of the Office of the

Governor, especially the Policy and Planning Section and the Evaluation Section. This will have to be analyzed and considered after further consultations.

3.4 STRENGTHENING PROJECT OPERATIONS

3.4.1 Project Design, Evaluation, and Approval

There is strong internal interest in upgrading these processes. The "Planning Corps" concept is apparently being instituted, and will include regular inputs from outside resource people. Further attention to project design will be appropriate during discussion of the modular action programme (Section 3.5).

3.4.2 Project Implementation and Monitoring

Productivity and output of TISTR's R&D staff are evidently an issue, according to the terms of reference of the Reform Committee. My contacts with TISTR indicate that key staff members are motivated people, that they are highly qualified, and that they have a number of years of experience - often more that a decade - at TISTR. Consequently, they are very familiar with developments in their respective fields. They also have rather wide acquaintanceship outside TISTR among their professional colleagues. Those whom I have met readily express interest in sharing in efforts to build up TISTR's contribution to Thailand's development.

Thus it is an interim conclusion that key staff members will be glad to participate in well-conceived efforts to achieve that objective. They will accept management innovations as long as these are consistent with the social criteria listed in Section 3.1.

Accordingly, it is suggested that the existing "percent completion" performance indicator be replaced - for internal use - by a system based on scheduled milestones. This may use a variation of the Critical Path Method, which is currently being promoted by the Thailand Management Association - perhaps a highly simplified version, initially.

The milestone indicators for accomplishment will need to be accompanied by a somewhat sharper project budgeting and accounting technique than now in use. The key changes will be: (1) applying the time of professional staff to specific projects, rather than considering it as a fixed cost; and (2) refining the inter-divisional transaction procedures so that project expenditures require prior agreement of the project leader.

These changes, while they require only long-established techniques which are widely accepted in some countries, will need to be applied with considerable sensitivity at TISTR, because they represent a big change from current practice. Therefore, strong top management support and involvement will be needed. Organizational and procedural approaches are discussed below under Section 3.6, Implementation and Monitoring.

3.5 MODULAR ACTION PROGRAMME

TISTR's present initiatives toward beefing up its internal programming and management capabilities are well founded on demonstrated needs. They deserve both strong support and accelerated action. But the social and cultural implications are great, and it would be easy to cause counterproductive disruption rather than the productive rationalization desired.

Thus the following paragraphs concentrate on modules rather than on an overall system, even though the intended result is a fully integrated operation. And the focus is on pilot installations and evolutionary change, rather than on installing a full blown, radically modified R&D management system all at once .

The modules presented for immediate attention deal with:

- Designation of "Spotlight Projects";
- Marketing and Public Information
- Economic / Financial Analysis and

- Application of Technological Advances.

3.5.1 Module #1: Spotlight Projects (Pilot Activity)

Discussions with directors of the Agricultural Products Research Division and the Industrial Research Division - and with key officials of the Governor's Office - have led to two findings:

1) It is possible to identify projects which have capacity for accelerated early payout and long term continuous impact.

2) Key staff members would be delighted to participate in a pilot activity along the lines described in Section 3.4 on Strengthening Project Operations.

It was agreed that this could lead to early positive project results. This is also the way to identify and adapt some tested R&D management techniques for use at TISTR.

Accordingly, a small number of projects have been tentatively identified for treatment as spotlight projects:

- Spinoff from fruit dehydration work (R&D marketing);

- Export of (pickled) Northern fruits in cooperation with ESC, including post harvest and packaging;

- Animal feed from cassava (part of the "top down" programme);

- Paint drying oil from rubberseed and cashew nut shell;

- Promotion of the Packaging Centre;

- The four new "top down" programmes;

- The modular irrigation channel project (Mekong/NEA/KMIT).

3.5.2 Module #2: Marketing and Public Information

Under this module suggestions are given on contracting practices, market studies, and stepped up public information effort. Additional project level work will be proposed under the Technical Review System (Section 3.6.1). Please see also the first item listed under Future Action Modules (Section 3.6.3).

Experience with the instant birdsnest soup contract, and with a few others which have been notably successful, demonstrates that TISTR's contract R&D work can have commercial impact. But full, sustained impact on economic development frequently requires that such successes be applied by a number of enterprises. This "multiplier" is severely limited when process R&D on natural products is conducted for a client and the results become his exclusive property in perpetuity.

In the spirit of TISTR's promotional role, it would be desireable that TISTR be able to make such information available to a number of enterprises. There are also important business implications for TISTR itself, since it could earn additional revenue from further services.

Several means of overcoming this severe limitation were identified in discussion. These could be implemented by including appropriate clauses in an R&D contract. For example:

- Results not to be exclusive property, but the contract price to be only a fraction of the full cost;

- Exclusive rights only in a given Province or Region;

- Exclusive rights to be limited in duration to two or three years;

- Rights to be exclusive, but licenses must be granted under "reasonable" terms;

- Rights to be exclusive for a limited time, after which licenses must be granted to other firms under

reasonable terms; residual rights to expire after a specified additional time.

This line of reasoning suggests that TISTR may wish to change its contracting procedures to preserve its future markets and to enhance its promotional role.

Another possible innovation in marketing techniques, can be derived from the above analysis. This is the offering of multi-client R&D, and multi-client studies. Clients would share the cost according to a predetermined formula taking into account the size and financial capacity of each client. This method is practiced by, among others, the Battelle Institute, and is currently being used in various fields by Battelle. One example is a study on technological advances, referred to in UNIDO's Microelectronics Monitor.

In addition, it may be helpful for TISTR to consider preparing market analyses and marketing plans for key programme areas. These would include in-depth analysis of the needs - and ability or willingness to pay - of prospective clients. Perhaps this task could be a responsibility of the Economic Research Section, jointly with the responsible technological division(s).

It is suggested that a communications programme be developed to help make key target groups aware of TISTR's positive past contributions; of its key role in achievement of the targets of the Fifth Plan; and of its current and emerging programmes. A project can be set up to create and disseminate information selectively in various formats. The details need to be based on a "matching" of the interests and needs of the respective target groups with the achievements and prospects of TISTR's R&D activities.

3.5.3 Module #3: Economic/Financial Analysis

The technological divisions exhibit considerable interest in the economic implications of their work. But they must rely on other divisions - especially the Techno-economic Research Division - to supply them with this kind of expertise when required. However, availability is

not assured, since the providing sections lack incentives to give high priority to "service" work.

Ways and means must be found to ensure easy access to economic analysis skills by projects. And work elements in this field should regularly be built into most of the R&D projects and programmes.

It seems inevitable that when discussing the development of new markets, or substitution of natural products for imported sythetics, or in various other situations, there is a need for early comparative analysis of the alternatives which will be available to a client or potential user. This work need not always be done in series, but may be more useful if done first (on an order-of-magnitude basis) during an early stage of project definition.

3.5.4 Module #4: Application of Technological Advances

TISTR's interest in genetic engineering and biotechnology, and in micro-electronics, inter alia, is well established, and has been mentioned in the section on programme policy. The suggested Spotlight Projects contain significant elements of both of these two technologies. Additional involvement already exists, and will be examined - together with future prospects - during the mission of Professor Nayudamma, later this month.

3.6 IMPLEMENTATION AND MONITORING OF THE ACTION PROGRAMME

The suggested action programme is modular, as described in the previous sections. It is suggested that implementation of the action modules be organized within the Office of the Director. Some of the details remain to be worked out, but much of the work required to be done to complete the first four modules will "automatically" be addressed while developing the Technical Review System described below.

3.6.1 The Technical Review System (TISTR/TRS)

A small team of capable people should be given the responsibility to inaugurate a pragmatic, but structured, "Technical Review System." The TRS will be used to guide project operations and to ensure that the best available talent is relied on for increasing R&D success. (For example, some of the outside resource persons identified for the Planning Corps may participate in selected reviews, by invitation.) Initially, the TRS will work only with the Spotlight Projects.

The TISTR/TRS will be built up in stages, in order to meet the needs of TISTR. It will employ written materials which are prepared in the form of presentation charts, but which can be copied for use in later follow up. The "client" will be the Governor. His direct participation in both design and operation of the TRS is vital.

TRS reviews will be orally presented by the repective project leaders at periodic sessions. They will contain information on normal project elements such as objectives, technical approach, workplan and schedule, performance against plan, costs, marketing, and economic/financial analysis. The review will be used as an opportunity for the project leader to obtain guidance and help in solving problems, and to communicate information which will be of use to colleagues and others.

Additional details will be worked out after agreement is reached on broad principles of the system. Preparation of the review charts will be the responsibility of the Project Leader, but with technical assistance of the TRS team, who will act as consultants to the Project Leader and to the Governor.

3.6.2 Providing Incentives

It is a basic premise of the action programme that internal changes are intended to help TISTR reach its institutional objectives. At the same

time, adequate attention must be devoted to helping the staff meet their needs for personal fulfillment through their professional work. These two objectives are essentially harmonious and synergistic. And neither will be fully achieved unless both are satisfied.

It has sometimes been suggested that public institutions cannot stimulate excellent performance on the part of staff members. Recent experience, and research, however, has challenged this assumption. Application of the results is suggested as one of the "future action modules." (See next section.)

3.6.3 Future Action Modules

This report only begins to address the vast opportunities available to TISTR. In any case, it would be counterproductive to propose too many actions at one time. But for the future, it is suggested that further attention be given to selecting, defining and implementing additional action modules. Consideration may begin with the following prospective list:

- Marketing R&D to Multiply the Value of Contract Awards: Analysis and Planning, Target-allocation (Divisional Prospects), Incentives, and Monitoring;

- Development and Application of Incentive Measures to Boost R&D Output;

- Matrix Organization Accounting As A Project Planning and Management Tool;

- Programming and Organizing Multi-disciplinary, Multi-institutional Projects;

- Linkages With DTEC, NESDB, NRC, MoI, and MSTE;

- Divisional and Inter-divisional R&D Programming;

- Subcontracting to Accelerate TISTR's R&D Output;

- TISTR's Role in the National R&D Programme;

- Use of the Computer in TISTR's R&D and Management;

- Application of Microprocessor Technology in TISTR's R&D Work;

- Technical and Economic Expertise At TISTR: Supply, Demand, and Remedies;

- Programme Priorities for Facility and Skill Investments and External Cooperation Inputs.

- Design and Implementation of an Enhanced Internal Evaluation System

None of the above topics is new to TISTR, at least not in principle. But some updating and reinforcement of concepts, and additional implementation effort are in order for many of them. If the Technical Review System is successfully implemented, there will be a cumulative development of skills relevant to many of the above by key TISTR staff. This will be "automatic," as skills are sharpened through systematic use at the project level.

But a strong case can be made for selectively undertaking two or three of these activities at the "macro" level as well. And it is suggested that this be done as soon as possible, subject to availability of resources. The results will help strengthen programming decisions as well as project operations.

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ABBREVIATIONS

TISTR Thailand Institute of Scientific and Technological Research

NRC National Research Council

DTEC Department of Technical and Economic Cooperation

NESDB National Economic and Social Development Board

MSTE Ministry of Science, Technology, and Energy

UNIDO United Nations Industrial Development Organization

UNDP United Nations Development Programme

AIT Asian Institute of Technology

KAIST Korean Advanced Institute of Science and Technology

ESC Export Service Centre

CIDA Canadian International Development Agency

IDRC International Development Research Centre

USAID United States Agency for International Development

TRS Technical Review System