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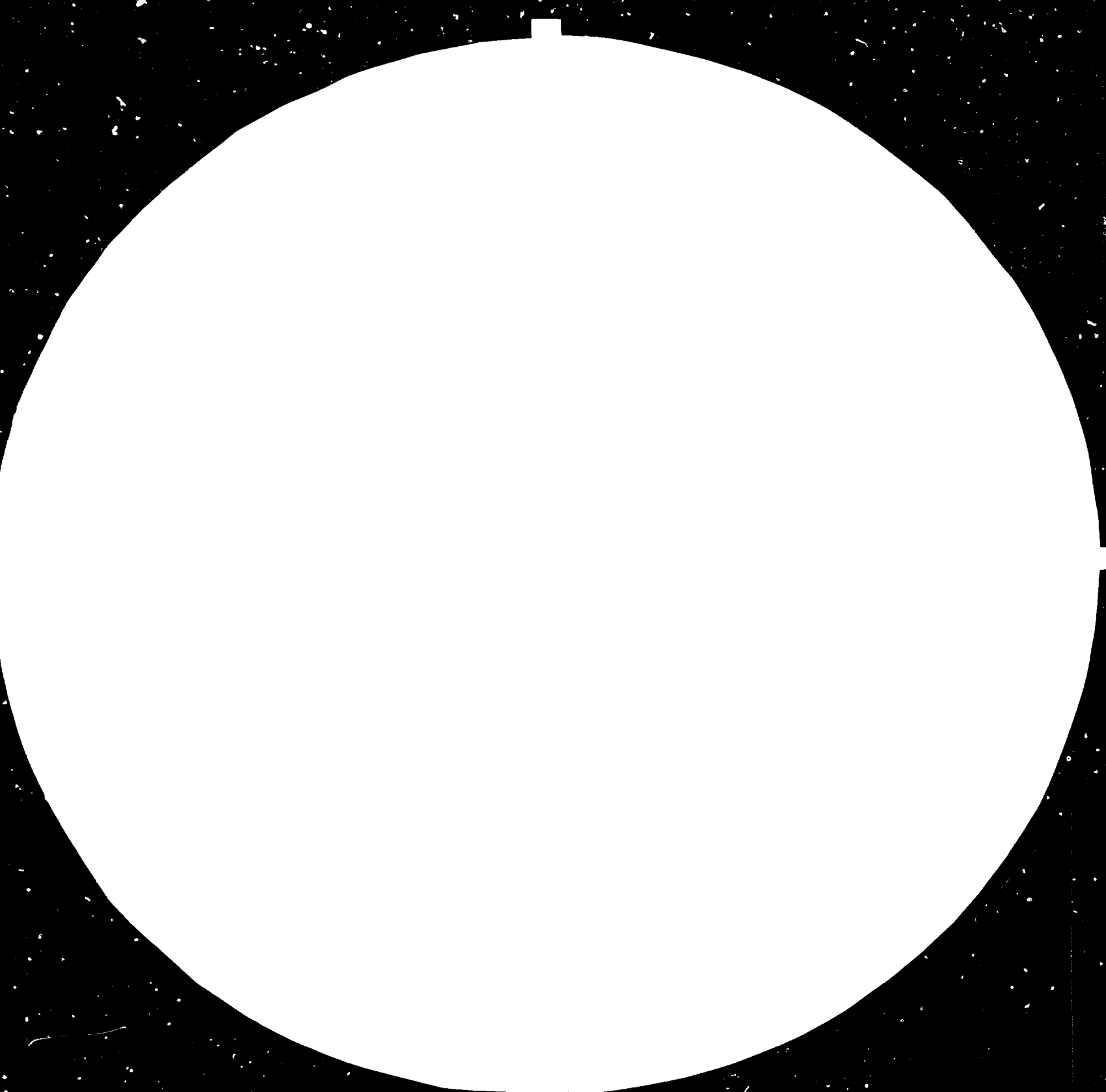

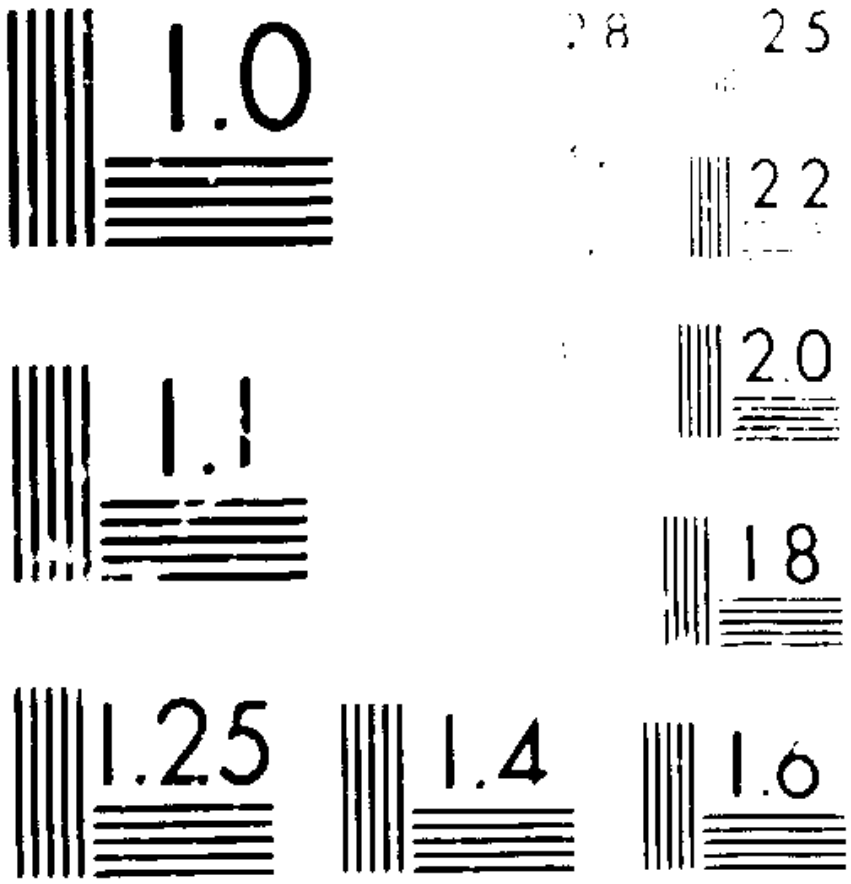
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18 August 1983
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ASSISTANCE TO THE

TANZANIA INDUSTRIAL RESEARCH AND DEVELOPMENT ORGANIZATION
(TIRDO).

DP/URT/78/019
TANZANIA.

Technical report: Evaluation of the project performance and problems of implementation*

Prepared for the Government of the United Republic of Tanzania
by the United Nations Industrial Development Organization,
acting as executing agency for the United Nations Development Programme

Based on the work of James P. Blackledge, UNDP consultant
and Anton Blazej, UNIDO consultant

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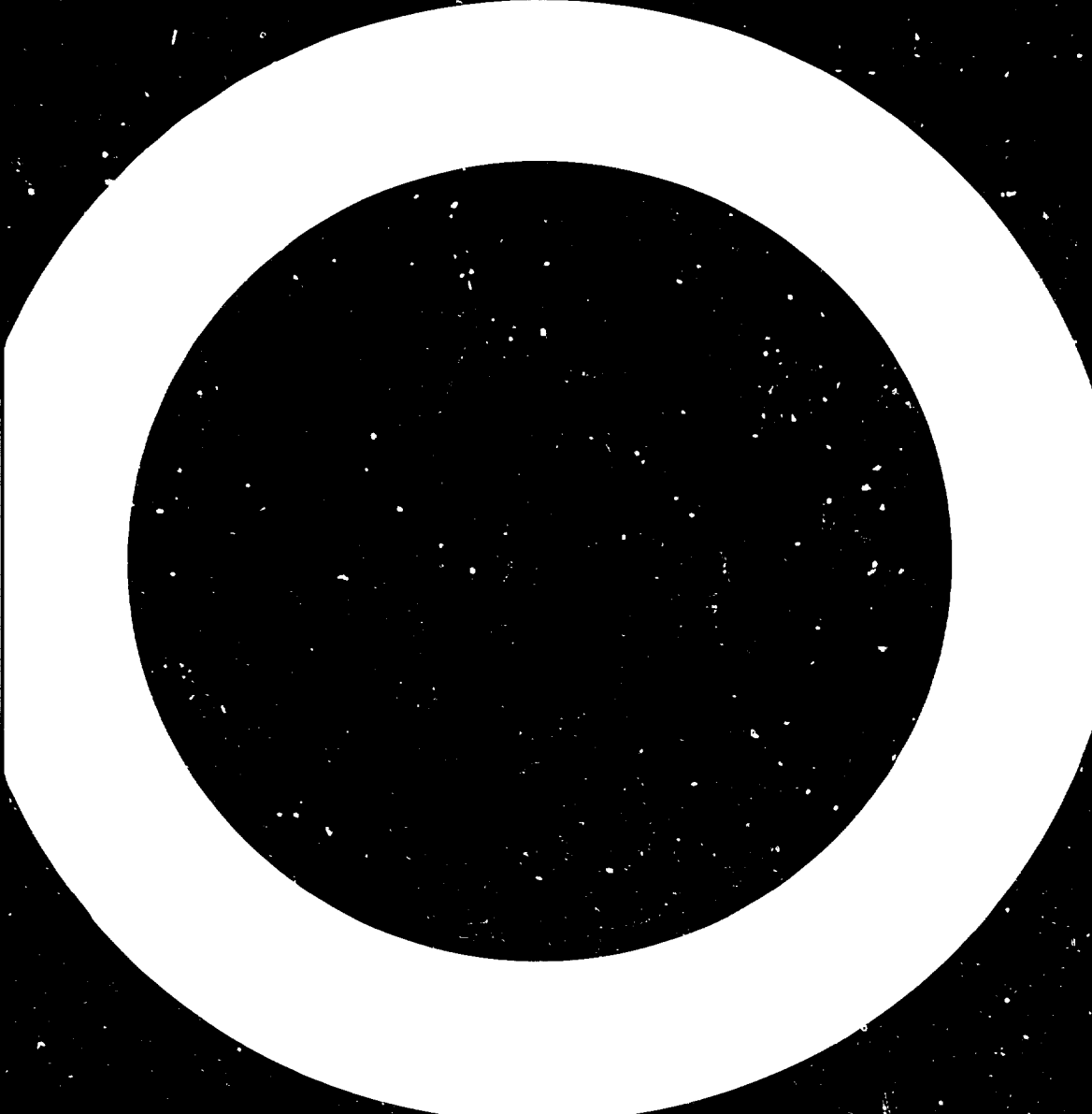

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IX. ANNEXES

ACKNOWLEDGEMENT

The consultants wish to acknowledge, with appreciation, the assistance provided by the UNIDO Chief Technical Advisor, Clinton A. Stone and the TIRDO Director, C.L. Tarimu in explaining, in a brief time, the operational characteristics, the progress which TIRDO has achieved, the contributions of UNDP/UNIDO Project URT/78/019, Phase I, to TIRDO development as well as the problems which have confronted TIRDO and the Project. The consultants wish to thank Mr. Stone and Mr. Tarimu for their efforts to insure that a representative cross-section of TIRDO's sister institutions, potential and current clients, and appropriate Government Agencies were visited in order to discuss TIRDO's role and position in the Government's Structural Programme.

The consultants also wish to thank the TIRDO staff and UNIDO experts who took time away from their other activities to explain their projects, the services that TIRDO is providing to the productive sector, cooperation with similar parastatal organizations, and their ideas and hopes for the future.

The consultants particularly wish to express appreciation to Mrs. Shoo for her patience in deciphering their handwritten copy and typing of the Evaluation Report.

ACRONYMS

CTA	-	Chief Technical Adviser
DEVPLAN	-	Ministry of planning & Economic Affairs
DSM	-	Dar es Salaam
EEC	-	European Economic Community
IRSI	-	Industrial Research and Services Institute
IPI	-	Institute of Productive Innovation
NESP	-	National Economic Survival Programme
SAP	-	Structural Adjustment Programme
SIDO	-	Small Industries Development Organisation
TBS	-	Tanzania Bureau of Standards
TFNC	-	Tanzania Food and Nutrition Centre
TEMDO	-	Tanzania Engineering & Machinery Design Organization
TISCO	-	Tanzania Industrial Studies and Consulting Organisation
TNSRC	-	Tanzania National Scientific Research Council
TEXCO	-	National Textile Corporation
TLAI	-	Tanzania Leather Associated Industries
TIRDO	-	Tanzania Industrial Research & Development Organization

SUMMARY OF EVALUATION

A severe economic crisis persists in Tanzania and is expected to continue for several years. This has resulted, in part, from declining agricultural production, decreased exports, soaring energy costs, necessity for using scarce foreign exchange to purchase imported processed and semi-processed raw materials for use by the productive sector, seriously underutilized plant production capacity, shortage of equipment repair and maintenance services and spare parts, which have rendered a considerable amount of such process equipment unuseable.

As a result of this economic crisis, the Government has been unable to provide construction funds to complete all of the TIRDO laboratory complex of 21 buildings, although two laboratory buildings and a plant facilities building will be completed before the end of 1983. Equipment for these buildings will not be available unless multi-lateral assistance provides a grant for purchase of such equipment. The grant request is under consideration.

The Government has requested assistance from TIRDO, to the extent possible, in impacting on the problems of the productive sector as related to the constraints of the Structural Adjustment Programme, and has increased TIRDO's recurring budget for the fiscal year 1982/83 by 50 percent, which has enabled TIRDO to employ additional staff and pay for added support services. The current recurring budget for TIRDO is T.Sh. 3.5 million.*

In spite of the lack of its own laboratories, TIRDO Chemistry and Food Technology Department staff have been innovative in establishing ad hoc arrangements to use laboratories and equipment in other parastatal institutions to undertake some limited internally sponsored research in areas such as: pyrolysis of agricultural wastes for production of charcoal; coffee processing for export production; direct reduction of local iron ore, using indigenous coal; extraction of textile dyes from native plants and shrubs; extraction of essential oils from lemon grass and orange peel wastes; and use of cassava as a partial substitute for maize in poultry feeds.

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The Department has used the same external laboratories to: analyze impurities in local glass sands which color the glass and reduce export potential. Analyses could be undertaken of foundry sands, with a view to substituting local sands, and of imported raw materials for cement manufacture to determine if local raw materials can be substituted.

This internal applied research and analysis has led to TIRDO proposals to the KIOO Glass Company for beneficiation of local glass sands to remove iron and clay impurities, and to the Tanzania Textile Corporation for process development and testing of locally-produced natural dyes, as a substitute for imported synthetic dyes. Other proposals are being considered for essential oils production, clarification of edible oils, and recovery of solvents in the edible oil solvent extraction process which is planned to be operational in Tanzania in 1984.

The TIRDO Industrial Information/Industrial Extension Department began operations in September 1981. Industrial information is provided to industries in the areas of engineering, textiles, foods, fibres, chemical processes, mining and metallurgical processing, ceramics, energy and instrumentation. Sixty-one information requests were received in 1983. Five industries (glass, edible oils, soap, salt, and farm implements) are using the TIRDO Information Service on a recurring trial basis with the possibility of future subscription service.

The TIRDO Industrial Extension Service, during the period 31 September 1981 to 15 March 1983, has contacted 160 industries, technical institutions and industry associations. These visits identified 115 technical problems confronting the productive sector. Twenty four industries have indicated problems of production, process design or modification, or analysis and testing, which TIRDO may be able to solve.

The TIRDO Instrumentation Repair and Maintenance Service initiated operations in November 1982. To date, instruments and equipment valued at T.Sh. 400,000 have been repaired at the request of eight industries, six non-medical institutions, and three medical institutions, who have paid for these repairs. Requests for additional repairs are pending, awaiting the arrival of spare parts.

...../..

The TIRDO Engineering Energy Audit/Conservation Unit began to function in December 1982, upon completion of training of two TIRDO staff members and acquisition of necessary equipment. The Ministry of Industry and the Ministry of Water and Energy specifically requested that TIRDO undertake energy audits and make recommendations to the industries audited relative to corrective conservation measures which can be provided either by the industry or by TIRDO. The priority target has been the 23 industries who consume 90 percent of the total annual fuel consumption of the 99 large energy users in Tanzania. Ten energy audits have been completed to date. Annual energy savings in the amount of T.Sh. 30.8 million are possible for nine of the ten industries audited, if suitable conservation measures are implemented. It is estimated that, with appropriate conservation measures, industries could reduce annual consumption by nearly 18 percent. The Tanzania Investment Bank will contract with TIRDO to undertake energy audits and prepare detailed specifications for retrofitting (using foreign consultants) for approximately ten industries.

TIRDO is making a small but definite impact on the problems confronting the productive sector in accordance with the constraints and the requirements of the Structural Adjustment Programme.

Despite the constraints imposed on the UNDP/UNIDO Technical Assistance Project (URT/78/019, Phase I) to TIRDO by the economic crisis and sometime non-availability of UNIDO expertise, it appears that the Project has been effective in assisting TIRDO to initiate operations. Revisions in the original PRODOC objectives, inputs, and activities have been necessary, and predicated on adaptation to meet realistic needs within the framework of available human resources, facilities, equipment, and opportunities for other funding. It seems clear that the original Project design was: (a) too optimistic; (b) did not contemplate the current economic crisis, even though signals of impending crisis were becoming apparent during the time frame of the Preparatory Mission; and (c) continued to stress R&D for industry instead of technological services. It is important to note, however, that the Preparatory Mission and the PRODOC both recognized the requirement for up to 20 years for the establishment of a viable and effective ISI in a developing country.

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The PRODOC for URT/81/037, Phase II, was prepared on the basis of realistic assessment of the technical assistance required by TIRDO to extend and expand to capabilities to provide immediate and urgent technological services to the productive sector. The approximately 50 percent cut in the Phase II budget for 1983/86, which has been provisionally finalized, will severely impede the ability of TIRDO to respond to productive sector needs.

A suggested plan has been prepared to conform to this greatly reduced Phase II budget. In the opinion of the consultants, however, and unless external funds become available, TIRDO will remain essentially in a holding pattern for the next three years.

I. STATEMENT OF MISSION PURPOSE

1. With the concurrence of the Government of the United Republic of Tanzania, a joint UNDP/UNIDO Evaluation Team visited Tanzania during the period 20 March - 8 April, 1983, to assess past, current and future UNDP/UNIDO assistance provided to the Tanzanian Industrial Research and Development Organization (TIRDO). The terms of reference for the mission were:

- evaluate the project performance and problems of implementation (URT/78/019, Phase I);
- reassess the role and place of TIRDO in relation to the industrialization process of Tanzania, in light of the Government's new economic development policies and priorities;
- assess the soundness of the project design of URT/81/037;
- suggest realistic and achievable objectives, modalities of actions to be entrusted to the UNDP/UNIDO technical assistance project (URT/81/037, Phase II).

2. During the course of the Evaluation mission, interviews were conducted with TIRDO staff, UNDP and UNIDO, Government officials, and representatives of a number of parastatal and private organizations (see Annex A). The report which follows is based on these interviews as well as observations of the consultants.

II. BACKGROUND

Tanzania economic development policy

3. A long-term economic and social development policy was adopted by the Government of Tanzania in 1975. The Development Plan identified main national goals, e.g., increased agricultural production, industrial growth, structural change in the national economy, with the objective of increasing self-reliance.

4. Included in the framework of the policy was the Basic Industry Strategy (BIS) with a 20 year perspective. The industrial plan targets for the Five Year Development Plan 1981/82 - 1985/86 included the following:

a. To increase efficiency and capacity of existing industries;

b. To establish a system which would promote and harmonize the development of small and large scale industries to make them inter-dependent;

..../..

c. To prepare the industries to start utilizing locally available raw materials, inputs, and spare parts;

d. To strengthen and expand production capacity for the export market.

5. The BIS identified certain industries which require strengthening to meet the basic needs of the people - food processing, textiles, leather products, and building materials. The BIS further identified industries which should be encouraged to use locally available raw materials as a substitute for imported processed or semi-processed raw materials. These included: metal fabrication, machinery and equipment, glass and ceramics, cement, paper, industrial chemicals, fertilizers, and the petroleum industry.

6. The industry sector in Tanzania contributes approximately 10-12 percent of the GDP. There are approximately 900 parastatal and private small, medium, and large industries in Tanzania. Productive capacity has been declining since 1975, as a result of decreased exports, increased costs of energy and process materials, shortage of equipment repair and maintenance services, spare parts, and shortage of convertible foreign exchange. Private industry is unwilling to reveal information on utilized capacity, although it seems clear that such capacity is declining, since imported process materials and machinery requires foreign currency that is available only on a priority basis. The decline in utilized capacity in parastatal industries is shown in the following table for the years 1975 to 1980.

INSTALLED & UTILISED CAPACITY IN PARASTATAL MFG. ENTERPRISES

		INSTALLED CAPACITY		UTILISED CAPACITY %
PRODUCTS	UNITS	1980	1975	1980
FOOD PROCESSING	TONNES	N.A.	45-70	30-65
BEER	MILL. CASE	7.6	89.7	76.2
TEXTILES	MILL. SQ M	149	55.6	49.4
LEATHER	MILL. SQ FT	29	53	49
FOOTWEAR	MILL. PAIR	4 050	66	62
WOOD PRODUCTS	QU. M.	105 000	36	34
PLASTIC PRODUCTS	TONNES	7 000	36	22
METAL FABRICATION	MILL. T.SH.	N.A.	23-50	15-49

N.A. = Not Available

..../..

MANUFACTURING & HANDICRAFT GROSS DOMESTIC PRODUCT 1974 - 1980
T.SH. MILLION - 1966 CONSTANT PRICES

1974	1975	1976	1977	1978	1979	1980
900	903	961	1 002	1 036	982	893

Data for the period 1980 - 1982 are not available, but indications are that overall utilized capacity in parastatals is less than 50 percent. In some industries, utilized capacity is 15 percent or less.

The economic crisis in Tanzania

7. The economic crisis began in 1980, but wide-spread recognition of this crisis only occured in 1981. Action to cope with the crisis was initiated in 1982, however the Government, is still attempting to develop suitable mechanisms to resolve the crisis. Actions have included establishment of the National Economic Survival Programme (NESP) in 1981, which led to the Structural Adjustment Programme (SAP) in June 1982. The SAP has been activated for a three year period, 1982/83 - 1984/85, based on the assumption that funding for at least that duration is necessary both to prevent a premature relapse in the economy and to allow a realistic interval for the recovery in world economic conditions.

8. The SAP has outlined strategies, guidelines, and requirements for a number of major sectors in Tanzania. Of significance to this report are the innovation and incentives scheme under which additional financial and technical support will be provided to investigate and undertake potentially highly productive innovations in such areas as energy economy, the substitution of local for imported inputs, recycling of wastes, manufacture or refurbishing of spare parts, the maintenance of equipment, etc.

9. In the area of energy, for example, Twenty-three industries consume 90 percent of the total fuel oil consumed by a group of 99 industries (121,180,000 litres per year of fuel oil and 53,391,000 litres per year of industrial diesel oil, 1981 data). The need for energy conservation in these industries is a priority concern of the Government. Considerable savings in fuel oil consumption can be obtained through improved combustion efficiency, insulation, recovery of lost steam, etc., which are relatively simple to correct.

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10. Similarly, instrument and equipment repair and maintenance is urgently needed to assist industry in increasing utilized capacity and productivity. Information is needed by industry on machinery specifications, process design specifications, more efficient process and production techniques.

11. Tanzania possesses a very large renewable and non-renewable resource base. The SAP recognizes this and is encouraging the exploitation of such resources as a substitute for imported materials.

III. EVALUATION OF PROJECT PERFORMANCE AND PROBLEMS OF IMPLEMENTATION, URT/78/019, PHASE I

Project performance

12. The Phase I Project Evaluation Report (PER) prepared by the CTA on 23 August 1982, reflected several changes in the original PRODOC Immediate Objectives and Outputs. These changes resulted from recommendations of the Tripartite Review Meetings of 22 July 1981 and 6 August 1982, and the requirement to modify the Project so as to assure that TIRDO's objectives and priorities were brought into line with the Structural Adjustment Programme (SAP) and the National Economic Survival Programme (NESP).

13. The Project Immediate Objectives were amended in September 1981 (Revision G) and extended the LOP from two years and ten months to three years and ten months, as follows:

1. Establish the framework for the capabilities of the Analysis Department and lay down the foundations of the Food and Engineering Departments, based on the needs of industry;
2. Setting up of an Industrial Information system covering information retrieval, enquiry services and an R&D Registry;
3. Organize, equip and initiate operation of an electronic repair and maintenance function to serve TIRDO, other institutions and industry;
4. Identification of foreign sources of assistance which could provide expertise, equipment and training facilities.

14. The Project Outputs were also amended to reflect changes in the Immediate Objectives, as follows:

1. Preliminary organisational and institutional framework defining the main directives of research and development for the Tanzanian industry and allocation of staff, facilities and funds among TIRDO itself, other government organizations and foreign resources.

..../..

2. Preliminary plan and work programme of the Chemical/Analysis Department.

3. First draft of the TIRDO Management Manual. This includes policies, procedures, organization and financial data.

4. Consolidated medium-term training programme.

5. A computer aided information system. Specification and purchase/lease of equipment and organisation of services.

6. Registration system for Tanzanian research and development activities.

7. Detailed instrument and equipment specifications for the Analysis Division.

8. Preliminary work plan for the Engineering Division based on a detailed and in-depth survey of the present and future requirements of the engineering industry.

9. Detailed specification of instruments and equipment for the Engineering Division including workshops.

10. Trained local personnel in electronic equipment maintenance, calibration and repair.

11. Ten trained junior and senior staff members by the end of 1982.

12. Assistance to the Director-General of TIRDO in the preparation of agreements and project documents for the co-operation with sister institutes, inter-governmental and non-governmental organizations and governments.

13. Specification and procurements of equipment and supplies for the electronics activity.

14. Preliminary work plan and specification of instruments and equipment for the Food Technology Department.

15. The following additional activities to the original PRODOC activities were included in Revision G:

15. Assist in the preparation and negotiation of technical assistance from both bilateral and multilateral sources. Prepare a project document for UNDP/UNIDO assistance during the 3rd UNDP Country Programme.

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16. Survey existing instrument repair and maintenance services in Tanzania and quantify future needs in the sector.

17. Develop equipment and staff plans for an electronic service function.

18. Survey the food industry and food technology institutions and assess priority testing and research needs in the food technology sector.

16. The Project Immediate Objectives, Outputs and Activities were further amended in September 1982 (Revision M) by addition of:

Immediate Objectives

5. Establish an energy audit service at TIRDO with trained staff capable of conducting energy audits and assisting individual companies in implementing energy conservation programmes.

Outputs

15. An energy audit service unit within TIRDO, equipped to undertake energy audits and conservation implementation.

16. Two people trained in the conduct of energy audits and energy conservation techniques.

17. Quantifiable reduction in industrial energy consumption.

Activities

19. Conduct energy audits of at least fifteen major consumers of industrial energy.

20. Assist individual companies in implementing energy conservation programmes.

21. Organize an energy audit service.

17. The Project revisions recognized the need to increase the expert component for the instrument maintenance and repair unit and the information/industrial extension Department, add an expert in industrial energy conservation, training of two TIRDO staff in industrial energy conservation and instrumentation for energy audits. The revisions decreased the expert components for the Engineering and Analysis Departments. Some slight changes were made in the total TIRDO staff training component.

...../..

18. Revisions G and M to the PRODOC do not directly reference (except for budgets) continued management assistance and guidance to the TIRDO Director-General and senior staff. However, this is explicit as a UNIDO activity. The draft of the TIRDO management manual has been given a lower priority in order to dedicate maximum effort to assisting TIRDO in conforming to the SAP.

19. It must be remembered that the critical assumption for Project implementation was based on the premises that the economy in Tanzania would remain stable, that industrial production would increase, and that the Government would be able to provide funds necessary for completion of buildings and laboratory facilities, and to obtain foreign assistance for provision of equipment.

20. The events which have taken place since the Project began operations have clearly voided this assumption. The land for the TIRDO compound has been acquired. Fortunately, the staff housing (67 units) has been completed, some of which are being used at the present time as offices and services units. The construction of TIRDO office buildings, laboratories and other facilities (a total of 21 buildings) exist mainly as foundations, although basic shells for three buildings are expected to be ready by July/August of 1983. There is no provision for approved funding for water, electricity, etc., or technical equipment in these buildings at the present time.

21. As a result of the economic crisis and SAP, the Government has been unable to provide funds to further the construction of the remaining buildings in the 12 months period ending June 1983. The Government has, however, increased TIRDO's recurring budget for fiscal year 1982/83 by 50 percent, which has enabled TIRDO to obtain additional staff, and to have additional funds for support services.

22. Thus, the original Phase I Project design has been modified appropriately and correctly to accomodate to the above unanticipated events and to direct TIRDO's immediate activities to providing technological services to the productive sector. However, the revised PRODOCs do not always reflect these changes. The functions of TIRDO, as assisted by the Project, are directly in response to the requirements of the SAP and the wishes of the Government.

23. In the opinion of the Consultants, Project implementation has been effective in assisting TIRDO. Forty six man months of training for nine TIRDO staff members in topics appropriate to the SAP as well as to the long-range development plans of TIRDO have been completed. Equipment for information services, instrument repair and maintenance, and energy conservation audits have been provided, and are in use. The CTA and other experts, in the absence of a Chief Research Officer, have assisted TIRDO staff

in identifying productive sector problems, and in preparing proposals to solve such problems. While the Project is slightly behind schedule in a few areas, overall progress is seen to be better than might have been expected under existing in-country conditions.

24. In retrospect, the Development Objective for TIRDO should have stressed establishment of a Technological Services Unit as the first phase instead of creating a multi-branch IRSI. In effect, the events of the past two years have resulted in change of direction so that TIRDO is, in reality, performing as a Technological Services Unit. TIRDO is also much more able, in this mode, to provide assistance to the productive sector and to conform to the requirements of the SAP.

25. Summary of Project URT/78/019, Phase I, to date

November 1979	Preparatory Mission
September 1980	Project Implementation Began
August 1981	Project Phase I Extended to December 1982
September 1981	Second Long Term Expert Arrives
December 1982	Project Phase I Extended to June 1983
March 1983	Project Evaluation Team Arrives
December 1983	2 Laboratory Bldgs. and Plant Facilities Bldg. to be occupied

OUTPUTS

Seven Mission Reports -TIRDO Sectoral Plans:
- Industrial Information Services
- Chemical Analysis & Testing
- Food Technology
- Engineering
- Instrument Maintenance & Repair
- Small-scale Industrial Processes
- Industrial Energy Conservation

Training Fellowships - Nine Staff Members (46 M/M)

Operating Industrial Information/Extension Service:

66 Technical Enquiries

102 Industries Visited

Instruments and Equipment Valued at T.Sh. 400,000 Repaired

Multilateral Assistance Proposal $1.65 million (pending)

Ten Industrial Energy Audits - T.Sh. 30.8 million Annual Savings Possible

TIRDO Project Income July 1982 to date - T.Sh. 44,000

Industrial Project Proposals Outstanding - T.Sh. 470.000

UNDP/UNIDO Project Expenditure 1979 to June 30, 1983 $1,244,000

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Problems of implementation

26. Some of the problems of implementation of Phase I have been mentioned above. These can be summarized as follows:

1. Building/laboratory construction schedules began to fall behind in February/March 1981;

2. The economic crisis began in 1980 but wide-spread recognition of this crisis only occured in 1981. Action to cope with the crisis was initiated with the SAP in 1982. The Government is still attempting to develop suitable mechanisms to control the crisis;

3. It has been difficult to obtain basic infrastructure requirements (electricity, water, telephones) for the revised housing/office units. Such services became completely available only in March 1982;

4. TIRDO staffing has fallen behind even revised schedules for staff additions. It has not been possible to hire a Chief Research Officer. TIRDO is aggressively seeking employees with experience, but faces competition from industry and other Government entities. TIRDO is able to obtain a limited number of new University graduates, allocated by the Board for Manpower. Four new graduates are anticipated in July 1983. All of these require additional training and experience;

5. Seconding of TIRDO staff to industry for periods of 3-6 months to gain industrial experience is continuing. Industry is willing to accept TIRDO staff for industrial practice in its facilities, but not in responsible positions;

6. The usual start-up problems which do not appear in Project reports, such as purchase of materials, supplies, etc., has consumed Project time, and is often not recognized as a problem by outsiders;

7. There is a very confused infrastructure in Tanzania. It is difficult to find the person or organization who can provide reliable answers to problems. The Government is planning the establishment of Tanzania Engineering and Metal Design Organization (TEMDO) which could compete with TIRDO, at the same time that it cannot provide sufficient funds for TIRDO's development. The priorities seem to be confused;

...../..

8. UNIDO expert and associate expert recruitment has been too slow. After two years, a computer expert has still not been provided. An electronics associate expert and a computer associate expert have not been provided. The expert inputs in the area of analysis and testing were unsatisfactory;

9. UN volunteer requests produced no useful results;

10. The CTA has been required to establish the TIRDO management system by working with individual staff members, since department heads have not been apointed.

11. The CTA has also assumed the responsibilities of Chief Research Officer, such as industry visits, preparation of proposals, guiding TIRDO technical activities, in addition to his overall responsibility for Project implementation, assistance to the TIRDO Director-General, and other related activities;

12. An additional operation problem, probably unavoidable is that the Project appears to be planned in accordance with the UNDP budgeting cycle and not in accordance with Project needs.

IV. ASSESSMENT OF TIRDO

27. Tanzania Industrial Research and Development Organization (TIRDO) was established in Dar es Salaam by the Government of Tanzania and became operational in April 1979, as an autonomous parastatal entity. See Annex B for current organization chart. The Parliamentary Act which created TIRDO as a multi-branch industrial research and services institute (IRSI), specified the usual functional activities, which can be summarized as follows:

a. conduct applied research designed to facilitate the evaluation, development and use of local materials in industrial processes;

b. evaluate various aspects of local and foreign industrial technologies, and their suitability for adaptation and alternative use in local industrial production;

c. provide to the Government and firms or organizations engaged in industrial production, technical and advisory services, and advice and guidance on technical matters relating to industrial productivity;

d. establish and operate a system of documentation and dissemination of technological information to Government and to the productive sector;

...../..

e. conduct applied research and investigation into the causes, and the ways of abating and preventing industrial pollution;

f. provide to industrial enterprises technical services connected with the repair and maintenance of instrumentation, machinery and equipment.

28. In view of the low level of industrial development in Tanzania, the economic situation and the needs and problems of the productive sector, the main functional activities of TIRDO have been largely limited to providing technical services of a problem-solving nature. Even with use of other laboratory facilities, TIRDO is unable to undertake other than limited applied research. TIRDO is providing the kind of assistance (information, energy audits, instrument repair, chemical analysis, etc.) which the productive sector requires.

Cooperation with other technical organizations

29. TIRDO is one of a number of technological organizations in Tanzania (See Annex C). While the broad functional descriptions of these organizations would indicate that TIRDO may be duplicating the functions of the others, interviews have shown that, for the most part, TIRDO's activities are complementary to, and extend the functions of the other organizations.

30. As an example, the library and information centers, which exist in Tanzania, tend to be general, academic or highly scientific. These centers are passive, do not disseminate industrial information, and do not maintain contacts with the productive sector. These centers refer industrial/technological inquiries to TIRDO, whose information service is focused on technological information and which maintains direct and continuous contact with industry via newsletters, distribution of abstracts, titles of information available, and visits to industry by TIRDO's Industrial Extension Officer.

31. TIRDO/TISCO/SIDO/TANRIS have jointly published a "Directory of Technical Information Services in Tanzania." The Directory will be updated annually.

32. The Tanzania Bureau of Standards (TBS) is responsible for calibrating industrial instruments but does not provide repair and maintenance services, other than for its own equipment. TBS refers industry with repair and maintenance problems to TIRDO.

33. Tanzania Industrial Studies and Consulting Organization (TISCO) cooperates with TIRDO in the following ways:

a. TISCO and TIRDO share technological information;

b. TISCO refers clients with instrument repair and maintenance problems to TIRDO;

c. TISCO requests TIRDO assistance in chemical analysis for minerals exploitation, e.g. analysis of sands for a foundry development project.

34. Institute of Productive Innovation (IPI) uses TIRDO information services industrial extension services, and instrumentation repair and maintenance service. IPI and TIRDO are cooperating in the design and development of a combustion unit for production of charcoal from agricultural wastes.

35. The Tanzania Food and Nutrition Center (TFNC) uses TIRDO instrument repair and maintenance services to keep its own laboratory equipment in operation, while TIRDO is planning to train TFNC technicians in maintenance and calibration. TIRDO uses TFNC laboratory facilities for chemical analysis.

36. The Director-General of TIRDO is a member of the Governing Councils of TBS and TISCO, and the heads of these institutions are on TIRDO's Council. TIRDO has organized and is coordinator of a "Professional Club on Information For and Within Industry", in which approximately 35 representatives of the productive sector and parastatal organizations (TBS, TISCO, IPI, TIRDO) meet quarterly to discuss common problems, opportunities for use of equipment, sharing of faciltieis, and related topics. This forum provides an opportunity for TIRDO to learn of problems in the productive sector and to suggest possible solutions.

TIRDO use of laboratories in other organizations

37. Since TIRDO has no laboratories at the present time to conduct chemical analyses and testing, the staff have made arrangements to use laboratory facilities and equipment in a number of other organizations on an ad hoc basis. These are:

a. University of Dar es Salaam;

b. Central Veterinary Laboratory;

c. Government Chemist;

d. Tanzania Food and Nutrition Center;

e. State Mining Corporation (STAMICO).

38. TIRDO's initiative in seeking use of these laboratories is commendable and represents an awareness by TIRDO staff of the need to provide some services to the productive sector. The ad hoc arrangement, however, makes it difficult to schedule use of the laboratories or to conduct analyses and

testing except during certain periods of short duration when the laboratories and equipment are not otherwise in use.

TIRDO staff

39. At the present time, the TIRDO staff is comprised of 20 Tanzanian professionals, 3 UNIDO experts, and 14 support staff. (See Annex D). Predominately, the staff is young, with little or no research experience and with practically no prior industrial experience. Staff members are seconded to industry for periods of 3-6 months. Training such as that which has been provided by UNDP/UNIDO is crucial to the development of these staff members.

40. An urgent need exists for appointment of a Chief Research Officer, who will receive training from the UNIDO staff, and who can provide guidance in project development, management and control, preparation of proposals, and liason with the productive sector. To date, it has not been possible to obtain the services of such an individual.

41. The TIRDO long range staffing plan contemplates, at full strength, 50 professionals, 100 technicians and 100 support staff. TIRDO is hopeful, but not assured, that 4 new graduates will be available in July 1983. For example, 58 engineers will be graduated from the University of Dar es Salaam in 1983. Thus, the projection of TIRDO staff growth appears to be unrealistic.

TIRDO facilities

42. The total investment in TIRDO facilities and equipment is expected to be approximately US$30 million*. The investment to date has been in the order of US$11 million for land and buildings. In 1983, the Government has been unable to provide funds for continued construction, so that by the end of 1983, only 3 of the projected 21 laboratory and services buildings will be completed as empty shells. Equipment acquisition requires foreign currency, not now available, so that external assistance is required.

43. As a consequence of the above, TIRDO is currently using unoccupied staff housing for offices, information, energy audit, and instrumentation maintenance services, plus the external laboratories listed in paragraph 37.

* T.Sh. 9.56 = US$1.00

TIRDO projects and current proposals

44. Since June 1982 TIRDO has undertaken several technological services and technical assistance projects. Amongst these have been 10 energy audits of heavy energy consumers which collectively have been shown how to save energy costs in the potential amount of US$3.1 million annually. These audits have been performed at the specific requests of the Ministry of Industry and the Ministry of Water and Energy (See Annex E).

45. Instruments and equipment valued at US$40,000 have been repaired at the request of eight industries, six technological institutions and three medical institutions. Additional requests for repair and maintenance are in hand; some of these cannot be completed pending receipt of spare parts and electronic components.

46. TIRDO Industrial Information/Extension Service has received and responded to 66 technical inquiries since it started operation in September 1981. Five industries (glass, edible oils, soap, salt, farm implements) are using the TIRDO information service on a continuous basis. The Industrial Extension Service has contacted 105 industries, 35 technical institutions, and one industry association. These industry visits identified 115 technical problems confronting the productive sector, many of which are beyond TIRDO's capability to solve at the present time. However, 24 industries have problems of production, process design or modification, or analysis and testing, to which TIRDO may be able to provide solutions. See Annex F.

47. TIRDO has conducted internally sponsored research which is intended to provide background data for submission of proposals to industry to provide background data for submission of proposals to industry in the areas of: removal of iron and clay impurities from glass sands; textile dyes extracted from local trees and shrubs; clarification of edible oils; extraction of essential oils; recovery of solvents in the non-edible oil extraction process; direct reduction of local iron ore; coffee processing for exports; cassava as a substitute for maize in poultry feeds; production of sodium silicate from rice husks.

48. Based on these internal projects, TIRDO has submitted a proposal in the amount of US$47,000 to the National Textiles Corporation (TEXCO) for process development and testing of dyes from local shrubs. KIOO Glass Company is considering a contract to TIRDO for US$2,000 to develop a beneficiation process to remove iron impurities from its locally used glass sands.

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49. The TANGOLD Company is interested in contracting for an essential oil distillation plant to use available citrus wastes and excess steam. SIDO is interested in the design of a portable still for essential oils in rural areas.

50. The National Research Council has made a grant to TIRDO in the amount of US$3,900 to conduct a survey on agricultural and industrial wastes in terms of types of wastes, quantity produced and locality in country. The survey is being conducted in three regions of Tanzania. To date, 22 enterprises have been visited. The survey provides TIRDO an opportunity to prepare specific proposals to the industries on the utilization of these wastes.

51. The Tanzania Investment Bank, in cooperation with the World Bank, has just recently agreed to engage TIRDO's services as a prime contractor, to conduct energy audits and make detailed specifications for retrofitting approximately 10 industries. TIRDO will receive foreign exchange for retaining foreign experts, foreign travel, and a small amount of equipment, plus salaries of three TIRDO staff, plus local costs of TIRDO and the experts. The industries who receive this service are obligated to pay 20 percent of the local costs.

TIRDO's role in light of the Government's new economic development policies and priorities

52. Discussions with representatives of the Ministry of Industry and the Ministry of Economic Affairs and Planning indicate that TIRDO must be involved in the SAP and NESP in the following manner:

a. exploitation of natural resources to reduce imports of processed and semi-processed materials;

b. identify imported processed and semi-processed materials in use in the productive sector (e.g., kaolin clays for ceramics) and recommend substitution of local raw materials and the appropriate process to treat these;

c. assistance in reduction of energy consumption in Tanzanian industries through energy conservation audits and recommendations for process or plant modifications which would reduce energy consumption;

...../..

d. development of appropriate processes to produce essential oils, edible oils, soap, and other agro-industrial products under Tanzanian conditions;

e. serve as a nucleus to identify production/process problems in industry and recommend solutions to these;

f. assistance to industry in repair and maintenance of instruments and equipment which could increase industrial productivity and decrease demand for foreign exchange.

g. provide technological information to industry and modify the industrial extension activities to include on-the-spot problem-solving (this requires considerably more experience in TIRDO staff than is now available);

h. training of industry technicians in aspects of plant operations, such as analysis and testing, quality control, instrument maintenance, and process controls.

53. While these Ministries stated that TIRDO should be conducting industrial R&D as a long-term development process for benefit of the Tanzanian economy in the future, they also recognized that such activities were not feasible under present economic conditions.

54. Apparently, early in development of the SAP, consideration was given by the Government to suspension of TIRDO construction programme for the duration of the economic crisis. With realization, however, that TIRDO is performing tasks in line with the SAP, and needed by the productive sector, the Government reversed its opinion, and may provide funds in fiscal year 1983/84 to continue the construction of TIRDO's laboratories.

External funding other than UNDP/UNIDO

55. TIRDO has received some external funding assistance, which have included the following:

a. Yugoslavia - US$100,000 for chemical equipment and supplies;

b. Holland - 100 Technical books, value US$1500;

c. Ireland - US$35,000, hand tools and engineering equipment.

The multi-lateral donor, if the grant is approved, would provide: US$200,000 for machine shop equipment; US$300,000 for chemical equipment and instrumentation for analysis and testing; five man years expertise in chemical/engineering industries plus some training. However, this is not assured.

V. ASSESSMENT OF PROJECT DESIGN, URT/81/037, PHASE II

56. The design of Project URT/81/037, Phase II, is based on the realities of the Tanzania National Economic Survival Programme and the Structural Adjustment Programme. The design scheduled outputs relate to vital areas of the economy such as energy conservation, recycling and reduction of wastes, reduction in processed and semi-processed materials imports, refurbishing of parts and equipment maintenance. The plan recognized that funding of TIRDO by the Government probably would be limited mainly to annual recurring expenses.

57. At the same time, the plan recognized TIRDO's perceived role of providing appropriate services and technical assistance to the productive sector in accordance with the SAP and requests from the Government. The function of institution-building for TIRDO's long-term development was retained. However, Phase II proposed provision of experts and staff training in those functional activities (information/extension, instrument repair, energy audits) now being performed by TIRDO.

58. The Phase II plan further anticipated acquisition of experts for equipment design and fabrication, and identification of at least two industrial projects per year in the engineering and chemical sectors. Training of TIRDO staff was programmed to relate to the areas of expertise to be provided.

59. It was also anticipated that the information/extension service could become operational essentially with TIRDO staff in 1983, although expert short-term missions were programmed for follow-up in 1985 and 1986. Similarly, the plan anticipated management and operations of the instrument repair service by TIRDO staff beginning in 1984, but with provision for additional expert assistance to further strengthen the capabilities of the unit in the area of mechanical equipment repair. While no additional expert assistance in energy conservation audits was programmed beyond Phase I, there was recognition that additional TIRDO staff training was required to increase the capabilities of the energy audit unit.

60. In view of the importance of instrument repair and maintenance in industry and the necessity of energy conservation in Tanzania, the expert in instrumentation and mechanical equipment is vital for Phase II. It is also essential to obtain additional expertise in the energy area, not for audits, but for recommendations for implementation of the results of the audit analyses.

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61. The scheduling of follow-up experts in information/extension two years after this function has become institutionalized is not necessary, unless TIRDO experiences turn-over in its information/extension personnel.

62. TIRDO staff training was however, and continues to be, a priority activity of the Project. Inasmuch as experienced scientists and engineers are in short supply, the funding figures for training are entirely reasonable.

63. In December 1982, as a result of meetings between the SIDFA and the CTA, and in recognition of impending cuts in the country IPF, a revised budget for Phase II was developed (See Annex G). It is not known whether the revised budget was forwarded to UNDP/New York for consideration. In any event, the PRODOC for Phase II was not revised at that time, as it should have been.

64. The December 1982 revised budget retained expert assistance in information/extension services, instrument repair and maintenance, and energy audits and conservation implementation, and excluded services of experts in engineering, analysis and testing, and chemical industries. UN personnel costs were reduced from US$938,597 to US$822,200. Training fellowships were reduced from 107 m/m to 77 m/m. The equipment component was reduced from US$249,000 to US$123,000. The total budget was reduced from US$1,504,880 to US$ 1,207,779.

65. The revised budget is believed to be the minimum necessary to continue to provide effective technical assistance to TIRDO in its efforts to respond to the NESP and the SAP. This is particularly so since while information/extension services were initiated in September 1981, energy audits and instrumentation services did not begin to impact on productive sector problems until near the end of 1982.

66. The Phase II PRODOC referenced the possibility of funding support from a multi-lateral donor for equipment, expertise, and staff training in the chemical and Food Technology Department and the Engineering department. The PRODOC pointed out that such support was encouraging but, by no means, assured. It should be noted that, as of March, 1983, there is still no formal response.

67. In the opinion of the Evaluation Consultants, the Phase II design appropriately recognized the constraints imposed on TIRDO's development and institutionalization by the economic crisis. The plan logically was focused

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on strengthening those areas where TIRDO was capable of immediately providing needed services to industry. The plan further included much needed assistance in identification and recommendation for provision of technical services in the engineering and chemical industries. As has been mentioned earlier, this is an urgent need if industry is to increase productivity and reduce reliance on imported process materials.

68. The plan recognized that, even in the absence of laboratory equipment in the TIRDO complex, it was possible to undertake some applied research directed to specific industry problems (e.g., impurities in glass sands, textile dyes from natural plants and shrubs by using laboratory facilities in other organizations.

69. Shortly after the Evaluation Team arrived in Dar es Salaam, it was learned that, based on decisions by the Government and UNDP, the Phase II budget has been further reduced from US$1,207,779 to US$771,900 for the period January 1983 - December 1986.

70. It has not been possible to learn the extent of cuts in other UNDP funded Ministry of Industry projects. If priorities exist for development of technological institutes such as TIRDO and TEMDO, the information about these priorities is currently not available.

71. This drastic cut back in expenditures for Phase II is disastrous for the continued development of TIRDO. It will be necessary to seriously cut expert assistance and training functions. Only very limited expansion of TIRDO's capabilities to provide industrial services will be possible, unless external assistance becomes available from other sources, such as multi-lateral or bilateral assistance, support for specific projects from UNDP, UNIDO, etc.

72. Frankly speaking these reductions, in experts, training and equipment, severly constrain the Project Development Objective which was to create a capability to undertake industrial research and development activities in support of the country's long term development plan through establishing TIRDO.

73. It is possible that the multi-lateral donor will elect not to provide support. It may well be that the Government will delay, for an indefinite period, building construction funds, based on the promise that TIRDO does not have sufficient capabilities and trained staff to justify such expenditures.

VI. SUGGESTIONS FOR REALISTIC AND ACHIEVABLE OBJECTIVES AND MODALITIES OF ACTIONS FOR URT/81/037, PHASE II.

74. In view of the Project funding cutbacks reported in paragraph 69 above, it is clear that major revisions will be required in Phase II Outputs and activities. A revised budget has been prepared by the CTA and the TIRDO

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Director-General, based on the recommendations of the Evaluation Consultants (See Annex H). The new budget differs from the budget revision of December 1982, as follows:

- Schedule completion of the Phase II Project in December 1985, and transfer funds for the proposed six months in 1986 back into 1984 and 1985;
- Reduce the total personnel costs from US$822,200 to US$611,200 and experts from 97 man months to 80.5 man months;
- Reduce the TIRDO staff training component from 77 man months to 47 man months;
- Reduce the equipment component from US$123,000 to US$20,000;
- Reduce the total budget for 1983/85 from US$1,207,799 to US$771,900.

75. These reductions emphasize the necessity for shifting from institutional development to incremental growth through specific project implementation, which emphasize industrial rehabilitation, use of local raw materials, and conservation of energy as, specified by Government policy.

76. The Phase II PRODOC will be revised to undertake, in addition to strengthening activities in information/extension, instrumentation repair and maintenance, and energy conservation, development of one or more specific industrial projects which will involve operation of a demonstration plant to: (a) test process feasibility for commercial operations; (b) train TIRDO staff in solving industrial process industry problems; and (c) provide a source of income to TIRDO through sales of demonstration plant products.

77. Examples of such specific industrial projects are:

a. production of charcoal from agricultural and forest wastes, with recovery of tars and volatiles. Design of the pyrolisis unit is completed. The demonstration plant phase is ready for initiation. A considerable domestic market exists for charcoal. Tars can be used for wood preservation;

b. extraction of essential oils. Preliminary pilot plant design and laboratory experiments have been completed. It is possible to enter the demonstration plant phase in the near future. A market exists for essential oils in the soap and related industries. Purified essential oils are needed by the cosmetics and pharmaceutical industry;

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c. beneficiation of foundry sands and kaolin clays. A techno-economic feasibility study is required to assess the potential for the processes, before a demonstration plant phase is initiated. The extent of the market is unkrown, however this project would impact on import substitution;

d. production of insulation from locally available gypsum, mica, and asbestos. Some techno-economic analysis is required. The design for a demonstration plant is required. The market, particularly in industry retrofitting as an energy conservation measure, is believed to be very large;

e. production of alcohol and furfural. A techno-economic feasibility study is necessary. No demonstration plant design is available, but small-scale plant designs for production of alcohol and furfural are well known. The extent of the market is not known.

78. In order to undertake one or more of the above specific industry projects (or identify others), at least 12 man months of an expert in pilot plant technologies will be required. An expert in techno-economic feasibility studies is required, but is not provided for in the proposed Phase II budget.

79. No attempt is made here to write the entire revised Phase II PRODOC. The background information and descriptions are covered adequately in earlier sections of this report. Suggestions are made regarding development and immediate objectives, inputs, outputs, and activities which are achievable within the constraints of the new Phase II budget.

80. Development Objective. The development objective of the project is to continue to create a capability in TIRDO to adapt to and take an active part in the Country NESP and SAP, and to intensify industrial research and technological services activities which support Tanzania's short-term needs as well as the long term strategy for industrial development.

81. Immediate Objectives. Phase II of the Project covers a period of two years and six months, beginning in July 1983, and will assist in the achievement of the above development objective. The immediate objectives of this project are to:

1. Identify and undertake specific demonstration plant projects which will respond to the Structural Adjustment Programme, and which may be a source of TIRDO income;

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2. Increase the capability to conduct energy conservation audits, to recommend cost-effective energy conservation measures, and to provide technical assistance in retrofitting to large energy users.

3. Institutionalize the management and operation of instrument repair and maintenance services;

4. Institutionalize the management and operation of industrial extension and technical information services;

5. Identification of foreign and domestic sources of assistance which will contribute to support of facilities and technical equipment, experts, and training to the continuing development of TIRDO.

82. Project Outputs. The specific outputs of the project, as related to the immediate objectives, are as follows:

1. Expert assistance in selection of specific demonstration plant projects in the chemical and engineering industries, which stress utilization of locally available raw materials;

2. Implementation of at least two such projects per year.

3. Eighteen man months of training for selected chemical and engineering staff in industrial process engineering;

4. An additional engineer trained in energy audits and conservation implementation measures leading to a TIRDO capacity for the conduct of at least ten industrial audit/analysis activities per year by 1984;

5. A fully equipped and functioning instrumentation repair and maintenance service, with two trained electronic engineers, one trained mechanical instruments engineer, two trained senior level instrument technicians, and one trained workshop assistant;

6. Management and operation of the instrument repair and maintenance service by TIRDO officers beginning in 1985 and providing instrument repair and maintenance services for TIRDO and, on a fee basis, to industry and other institutions;

7. Training of two instrument engineers and two instrument technicians by 1984;

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8. A fully equipped Information Department with two fully trained documentation officers, two trained industrial extension officers, a documentation assistant, a reprographic assistant, and a full time secretary;

9. Eight man months of training in information documentation services and industrial extension services:

10. Management and operation of the Information Department by TIRDO officers beginning in 1984.

11. Management training for four incumbent or prospective department heads by 1986;

12. Assistance to TIRDO Director General and Senior staff in preparation of a TIRDO Management, Administration and Operational Procedures Manual;

13. Inputs to documentation for cooperative agreements and foreign assistance projects with other institutions, organizations and governments.

83. Project Activities. The following activities will be carried out during the project outputs:

1. Recruit a pilot plant technologies expert;

2. Survey the feasibility and appropriateness of the demonstration plant projects selected;

3. Review and evaluate fellowship candidates for process industry training;

4. Review and evaluate fellowship candidates for training in energy audits and conservation implementation;

5. Assist in management training courses for the Instrumentation maintenance and repair services;

6. Provide on-the-job training and fellowships in testing equipment use, identification of problems, and repair;

7. Evaluate the demand for and response to TIRDO maintenance and repair services and obtain additional necessary equipment and supplies;

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8. Review the appropriateness of instrument maintenance and institutions on a fee basis;

9. Organize fellowships and conduct on-the-job training for Information Department staff;

10. Develop brochures and publications including the TIRDO Newsletter, in order to increase TIRDO visibility to government and industry;

11. Up-date the TIRDO/TISCO/TANRIS/SIDO Directory of Technical Information Resources in Tanzania;

12. Establish linkages with regional and international technical information groups, thus extending TIRDO sources for industrial services;

13. Provide evaluations of management candidates for the Information Department and assist with management training courses;

14. Evaluate effectiveness of industrial extension services and develop improved methods for increased interaction with industry.

15. Seek additional sources for document acquisitions;

16. Participate in candidate selection and provide management training fellowships as well as on-the-job training for incumbent and prospective department heads;

17. Provide guidance to the TIRDO Director General and senior staff in preparation of the TIRDO Management, Administration and Operational Procedures Manual;

18. Compile and periodically up-date a file of foreign government and agency assistance priorities;

19. Assist in design, costing and proposal preparation of cooperative and technical assistance agreements;

20. Prepare for TIRDO management summary recommendations of project opportunities;

21. Discuss specific problems and suggest remedial actions/problems with TIRDO clients and potential clients;

22. Conduct a continuing survey of industry needs which can be assisted by TIRDO;

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23. Conduct a quarterly review of TIRDO's activities to assure that these are responding to the requirements of the Structural Adjustment Programme.

84. Inputs and Training Provisions. No attempt is made here relative to Government inputs, UNDP inputs, and training provisions, since these are difficult to project until such time as the Phase II budget is finalizedd. It is probable that most of these inputs have been outlined in the original Phase II PRODOC.

Phase II additional inputs subject to available funds

85. If additional funds become available for Phase II, either through the Country IPF or for specific project support from UNDP or UNIDO, the following additional Project inputs need to be considered:

1. Provision of a UNIDO expert Chief Research Officer for 12-18 months, but only if the TIRDO Chief Research Officer has been employed;
2. An additional UNIDO instrument expert is needed for 6-12 months to strengthen capabilities and to offset loss of these skills in TIRDO to industry jobs;
3. Additional energy conservation training to provide capabilities for industrial electricity and plant experience in design of energy conservation devices, (6-9 man months overseas training for two people plus on-the-job training from the expert);
4. Training of a techno-economist (9-12 man-months in techno-economic feasibility studies under practical conditions);
5. Additional equipment is needed in the range of US$25,000 - 50,000 for pilot plant projects;
6. There is no provision for information, instrument repair and energy audit follow-ups at the end of the project. This is needed for an assessment of the capability of TIRDO to sustain such operations.

VII. RECOMMENDATIONS

86. TIRDO should exert a strong effort to employ a Chief Research Officer at the earliest possible date in order to continue staff development, develop a rational and coherent research and technological services programme, and to develop strong working relationships with the productive sector.

87. TIRDO and the Government should increase their efforts to obtain funding from external bilateral sources in order to complete TIRDO buildings and facilities as soon as possible and so that appropriate R&D projects of importance to the Government and the productive sector can be initiated.

88. The Ministry of Industry should intensify its efforts to obtain necessary funds, during 1983/84, to provide the basic infrastructural requirements (water, electricity, etc.) so that the three buildings soon to be ready for occupancy will be functional.

89. TIRDO should be assisted by the Ministry of Industry in advising industry about capabilities of TIRDO, and in encouraging industry to pay for such services.

90. TIRDO should intensify its actities to generate income through operation of demonstration plants, which will provide opportunities for applied research training and process development, but which may also produce products for sale.

91. The TIRDO charter provides a mechanism for the Ministry of Industry to establish a cess or tax against the productive sector for the financial support of TIRDO in providing essential R&D and services. The Ministry of Industry should initiate this mechanism at the earliest possible date, and provide interim funding to TIRDO, perhaps through a draw-down account, which will enable TIRDO to complete its facilities and expand its services to the productive sector.

92. The Ministry of Industry should approach foreign governments, particularly where bi-lateral cooperation agreements exist, to seek grants, either in foreign currency, or in the form of gifts of supplies, pilot plant and other technical equipment, training etc.

93. The TIRDO Instrument Repair and Maintenance Service should be strengthened and expanded into the areas of mechanical instrument repair and maintenance, which is severely constraining the ability of the productive sector to increase production capacity. If TIRDO does not soon obtain machine shop capabilities, then TIRDO should made arrangements with local machine shops to make parts and equipment components with TIRDO guidance.

94. Energy conservation audits are seen as an important function in view of the high expenditures for energy in the productive sector. TIRDO should continue to emphasize this service and to further technical assistance to industry through specific proposals for operational modifications, use of alternative energies, insulation, improved energy utilization, and other related factors.

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95. TIRDO use of laboratory facilities of other Tanzanian entities is commendable, however, the use of such facilties is ad hoc, which does not enable TIRDO to program its use of these facilities in order to meet the needs of TIRDO clients. The Ministry of Industry should assure use by TIRDO of such facilities through agreements with appropriate Ministries.

96. The tremendous natural renewable and non-renewable resource base of Tanzania is not being exploited at the same time that the productive sector, heretofore dependant on imported raw or semi-processed materials, is now constrained in the purchase of such commodities due to serious shortages in convertible foreign currencies. TIRDO and the Ministry of Industry should urgently take the initiative to seek funding support from other ministries and parastatal organizations in order to develop and exploit the use of such natural resources by the productive sector.

97. In view of the financial constraints being imposed on TIRDO, and the 50 percent reduction in UNDP/UNIDO funds to be made available to Tanzania during the period 1983-1986, the Government and UNDP should seriously consider deferring the development of TEMDO until such time as increased funding is available, and re-direct these funds to strengthening TIRDO's capacity to provide increased technological services to the productive sector.

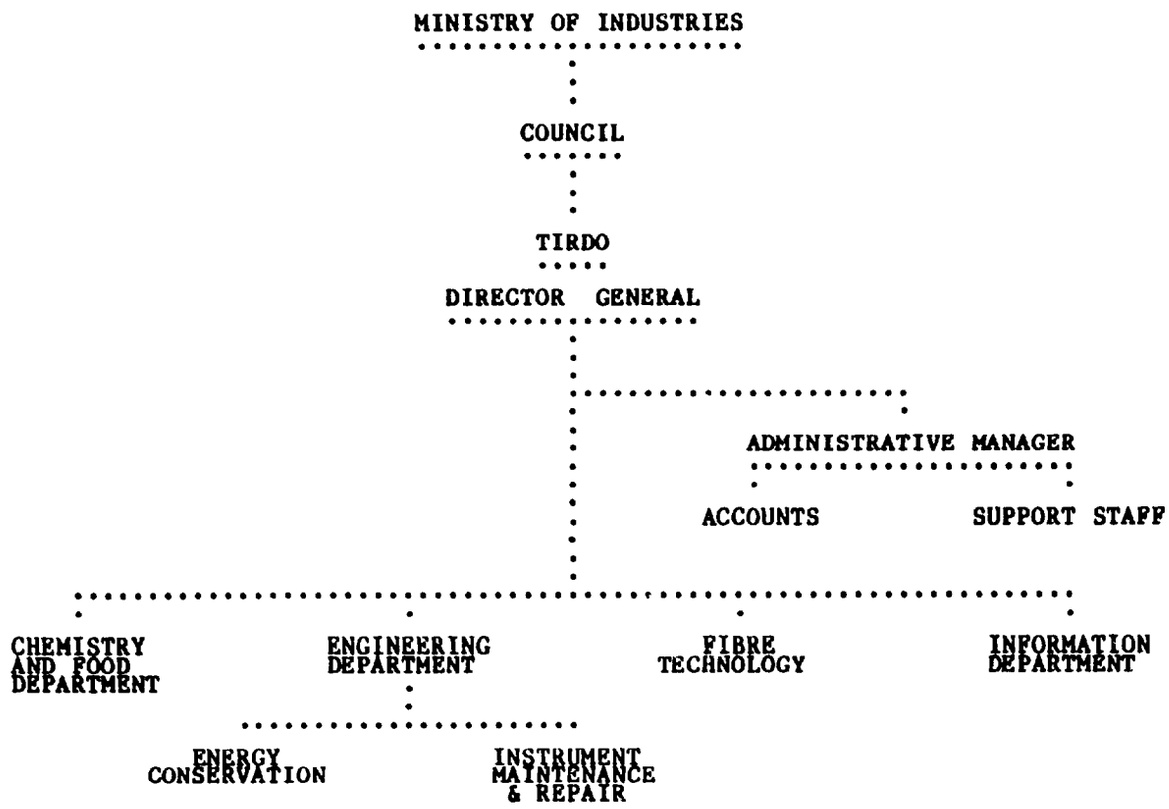
98. It is important for the Government of Tanzania and UNDP to re-assess the funding situation related to URT/81/037, Phase II, and re-adjust the funding to be available to a level much closer to that defined in the Phase II Project budget, as amended on 30 December 1982.

99. If budget constraints imposed by Government and UNDP decision are to stand for URT/81/037, Phase II, then Project inputs and activities should be drastically curtailed in accordance with the attached schedule of expenditures for Phase II (Annex H).

ANNEX A - INTERVIEWS

Aquino, Mrs. L.	UNIDO Expert - TIRDO
Ganyara, Mr. M. A.	Research Officer - TIRDO Chemistry & Food Technology
Haule, Dr. P. K.	Principal Res. Off.- TIRDO Chemistry & Food Technology
Henein, Mr. S. K.	SIDFA - UNDP/DSM
Kayumbo, Prof. H.	Director General - TNSRC
Malata, Mr. F.	UNIDO Expert - Bora Shoe Co.
Mawenya, Prof.	Chairman - TIRDO Council
Mbaga, Mr. F. D.	Principal Secretary - Ministry of Industries
Mbuya, Mr. E. N.	DEVPLAN
Mramba, Hon. B.	Minister of Industries
Mujuni, Dr. F.	Principal Secretary - DEVPLAN
Nindie, Mr. R.	Research Officer - TIRDO Engineering
Nyonyi, Mrs. W.	Research Officer - TIRDO Documentation
Ouattara, Mr. D.	Resident Representative - UNDP/DSM
Reynolds, MR. P. S.	Deputy Resident Representative - UNDP/DSM
Rupin, Mr.	Rajani Industries
Rwegoshora, Mr.	Director General a.g. - TBS
Ryder, Mr. R.	UNIDO CTA - TEXCO
Sadicot, Mr. S. T.	Chief Glass Technologist - KIOO Ltd.
Saxena, Mr. H. B.	General Manager - KIOO Ltd.
Shirima, Mr. D.	Research Officer - TIRDO Instrumentation
Siegbahn, Mr. Ch.	Chief Consultant - TISCO
Stone, Mr. C. A.	UNIDO CTA - TIRDO
Suri, Mr. S. K.	UNIDO Expert - TIRDO
Svensson, Mr. B.	UNIDO CTA - TLAI
Tarimu, Mr. C. L.	Director General - TIRDO
Tingo, Mr. A. J.	Research Officer - TIRDO Industrial Extension
Victus, Mr. P.	Research Officer - TIRDO Engineering

ANNEX B - ORGANIZATION CHART : TANZANIA INDUSTRIAL RESEARCH AND DEVELOPMENT ORGANIZATION



ANNEX C - RELATED TECHNICAL ORGANIZATIONS

Tanzania Bureau of Standards (TBS) - The standards organization was created by law in 1975 and began operations in 1978. Its principal objective is to prepare and establish standards for quality specifications and codes of practice on a national and international basis. The Bureau also certifies goods as being in conformity with national standards through a certification marking procedure. TBS works through industry standards committees, sub-committees and working groups to carry out the research, drafting and publication of national standards. Recently commissioned laboratories include metrology, textiles, food testing and analytical chemistry.

Tanzania Industrial Studies and Consulting Organization (TISCO) - TISCO is a multidisciplinary parastatal under the Ministry of Industries. They perform feasibility studies, sectoral studies, management consulting and project design studies. The staff is composed of expatriate and local economists, engineers and documentation specialists.

Tanzania Food and Nutrition Centre (TFNC) - The main objectives of TFNC are to plan and initiate food and nutrition programmes, review existing programmes, carry out nutrition research, advise the Government on food and food distribution matters, provide training facilities and to disseminate nutrition research results. The Centre is empowered to analyse and otherwise check any aspect of food products at any time. TFNC is establishing testing laboratories and facilities for small-scale food preparation with Swedish and FAO assistance.

Government Chemist - The Government maintains an analytical laboratory for forensic work and for the analysis of materials and products submitted to the laboratory. In general, they do not provide interpretive service.

Metal Engineering Industries Development Association (MEIDA) - This industrial association (of which TIRDO is a member) has as its objectives to: a) exchange information on production and management problems, b) seek solutions to the development of technical manpower, c) exchange information on existing facilities of the metals engineering companies, d) discuss the problems of acquiring materials, equipment and spares, and e) exchange information on industrial data collection and dissemination. MEIDA has also provided industry training on preventive maintenance systems.

Institute for Production Innovation (IPI) - The Institute is an autonomous activity under the authority of the University of Dar es Salaam. IPI is primarily a mechanical engineering activity established in 1979 with the assistance of the German Agency for International Cooperation. The charter includes consulting to local industries and villages, applied research and prototype construction of appropriate machinery, setting up a literature archive on feasible technology and curriculum development at the Faculty of Engineering.

Tanzanian Engineering and Manufacturing Design Organization (TEMDO) - TEMDO is to be located in Arusha and has just begun its establishment. The stated objectives are to create a centre for engineering design, development, training and liason programme with respect to products, tools, dies, jigs, fixtures and special spare parts.

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ANNEX C - RELATED TECHNICAL ORGANIZATIONS

Leather Research and Training Institute - The Tanzania Leather Associat[illegible] Industries is establishing an institute for leather product and process research and training at Mwanza. The Institute is scheduled to become operational in 1983.

Small Industries Development Organization (SIDO) - Small-scale industries are a major segment of Tanzanian industry. SIDO was formed to assist the sector through the creation of industrial estates and a programme of regional offices to provide technical assistance to local firms.

The National Scientific Research Council (UTAFITI) - The Council provides science policy guidance to the Government, awards research grants, stimulates scientific interchange through meetings and publications and maintains a science information service, TANRIS.

Tanzania Industrial Research and Development Organization (TIRDO) - TIRDO is a multidisciplinary organization created in 1979 specifically to provide technical services to industry. The staff of 23 engineers, chemists, information specialists and managers engage in industrial extension visits, process development, improvement and substitution of manufacturing materials, industrial energy conservation and instrument repair and maintenance for industrial clients and the Government. The Organization is engaged in collaborative projects or activities with IPI, TISCO, SIDO and TANRIS and is purusing collaborations with the State Mining Corporation, the National Development Corporation and the National Textile Corporation.

ANNEX D - TIRDO TECHNICAL STAFF

NAME	POST & SPECIALITY	DEGREE & DATE	SPECIAL TRAINING	CURRENT RESPONSIBILITY
HAULE, P.K.	PRINCIPAL R.O. CHEMISTRY	PH.D.CHEM. 1972		CHEMICAL AND FOOD PROJECTS
MWINGIRA, B.A.	SENIOR R.O. CHEMISTRY	M.S. CHEM. 1969		COFFEE PROCESSING IMPROVEMENT
MNDEWA, B.S.	R.O. I CHEMISTRY	M.S. CHEM. 1977	CHEMICALS FROM PLANTS	COFFEE PROCESSING IMPROVEMENT
MAKINGE, F.K.	R.O. I CHEMISTRY	M.S. CHEM. 1974	MINERAL PROCESSING	ESSENTIAL OIL PRODUCTION
NJAU, G.J	R.O. II CHEMICAL ENGINEER	M.S. CH.ENG. 1983	IRON ORE REDUCTION	SPONGE IRON FROM TANZANIAN ORES
CHANDO, R.A.	R.O. II CIVIL ENGINEER	B. ENG. 1979	FACILITY MAINT. & REPAIR	TRAINING FELLOWSHIP
TARIMO, J	R.O. II TEXTILE TECHNOLOGIST	B.S EDUC. 1978	TEXTILE MACHINERY	INVENTORY OF AGRO-INDUSTRIAL WASTE
SHIGAVALLE, M.A.N.	R.O. II TEXTILE TECHNOLOGIST	B.SC. 1979	TEXTILE MACHINERY	" " "
VICTUS, P	R.O. II MECHANICAL ENGINEER	B.S. ENG. 1980	PROD.ENG & ENERGY CONSERV	INDUSTRIAL ENERGY CONSERVATION
GANYARA, M.A.L.L.	R.O. II ANALYTICAL CHEMIST	M.S. CHEM 1980		EXTRACTION OF NATURAL DYES
MAGASHI, A.N.	R.O. II TEXTILE CHEMIST	B.S.CH EM 1980	FABRIC DYEING & FINISHING	PERFORMANCE OF NATURAL DYES
KAHATANO, J.	R.O. II ANALYTICAL CHEMIST	M.S. CHEM 1980	PH.D. ANALYTIC CHEMISTRY	TRAINING FELLOWSHIP
NYONYI, J.L.M.	R.O. II FOOD TECHNOLOGIST	M.S. BIOL. 1982	FLOUR & FEED FORMULATION	GRAIN SUBSTITUTES IN POULTRY FEED
NINDIE, R.M.	R.O. II MECHANICAL ENGINEER	B.S. EN 1981	ENERGY CONSERVATION	PYROLYSIS OF WASTES & ENERGY CONS.
KASHAIJA, A.	R.O. II FOOD TECHNOLOGIST	B.S. AGRIC. 1981		REFINING OF EDIBLE OILS
SHIRIMA, D.M.D.	R.O. II ELECTRONIC ENGINEER	B. ENG 1979		ELECTRONIC MAINTENANCE & REPAIR
NYONYI, W.N.	R.O. I DOCUMENTATION OFFICER	M.A. EDUC. 1980	INFO CLASSIFYING/RETR'VAL	INDUSTRIAL DOCUMENTATION & ENQUIRY
TINGO, A.J.	R.O. II EXTENSION OFFICER	B.SC. 1976	EXTENSION METHODS	INDUSTRIAL EXTENS./PROBLEM INDENT.
KIDUNDA, G.S.	SR. TECH. ELECTRONIC TECHNICIAN	FORM IV 1969	LAB TECH & ELECT. CERTIF.	ELECTRONIC MAINTENANCE & REPAIR

ANNEX E - TANZANIAN COMPANIES AUDITED and POTENTIAL ANNUAL ENERGY SAVINGS

COMPANY	ANNUAL SAVINGS (T.Sh.)	PERCENT OF ENERGY COST
BLANKET MANUFACTURERS LTD.	140,000	14
TANGANYIKA DYEING & WEAVING	972,000	9
KIOO LIMITED	5,419,600	16
TANZANAIA BREWERIES LTD.	2,261,100	16
ALUMINUM AFRICA (ALUCO DIV.)	962,000	38**
TANZANIA PORTLAND CEMENT	12,540,000	14
KIBO PAPER INDUSTRIES	305,250	8
TIPER (REFINERY)	7,518,950*	10
TANZANIA DISTILLERIES LTD.	652,200	35
TANITA CO. LTD.	NC	NC
TOTAL SAVINGS	30,771,100	AVERAGE 17.7%

* Calculated on the baris of delivered fuel oil price in Tanzania
**Percentage of fuel oil costs - electricity cost not available
NC - Not completed

ANNEX F - INDUSTRIAL EXTENSION VISITS

NAME	LOCATION	SECTOR	PROBLEMS
ARUSHA METAL INDUSTRIES LTD.	ARUSHA	:METAL PROD. MFG.	:LOCAL SUPPLY QUALITY FOUNDRY SAND, METAL ANAL.& PRODUCT REDESIGN
CHEMICAL & ALLIED INDUSTRIES	ARUSHA	:CHEMICAL MFG.	:CHEMICAL ANALYSIS & TECHNOLOGY FOR ETHANOL PRODUCTION
BOBBY SOAP FACTORY (T) LTD.	DAR ES SALAAM	:CHEMICAL MFG.	:LOCAL SUPPLY QUALITY CAUSTIC SODA & ESSENTIAL OILS
DAR LIME LTD.	DAR ES SALAAM	:CHEMICAL MFG.	:TECHNOL. SMALL-SCALE PROD. CALCIUM CARBIDE, CAUSTIC SODA, ETC.
DAWA YA MBUU LTD.	DAR ES SALAAM	:CHEM PROD. MFG.	:BETTER STARCH EXTRACT PROC., PERFUMING PROC. & MACHINERY REPAIR
EMCO INDUSTRIES LTD.	ARUSHA	:FOOD & CHEM. MFG.	:TECHNOL. SMALL-SCALE PROD. GLUCOSE, ESSENTIAL OILS & FLAVOURS
GLORIA BAKERIES LTD.	DAR ES SALAAM	:FOOD PRODUCTS	:SUPPLY OF FLOUR WITH LOCAL GRAINS/TUBERS SUBSTITUTE FOR WHEAT
H. J. STANLEY & SONS LTD.	DAR ES SALAAM	:MINERAL PROD'TN	:TECHNOLOGY POTASSIUM FERTILISER & ROPE FROM COCONUT SHELL
JANDU PLUMBER LTD.	ARUSHA	:METAL PROD. MFG.	:METALLURGICAL ANALYSIS & INSTRUMENT CALIBRATION
KILIMANJARO METAL SHAPERS LTD.	ARUSHA	:METAL PROD. MFG.	:METALLURGICAL ANALYSIS, ANODIZING TECHNOLOGY & MACHINERY INFO.
KIOO LIMITED	DAR ES SALAAM	:GLASS PROD. MFG.	:SAND ANALYSIS, PROCESS FOR IMPURITY REMOVAL & DESIGN SAND DRYER
POLISHES MANUFACTURERS LTD.	TANGA	:CHEM PROD. MFG.	:LOCAL SUPPLY OF WAX, DYES & ESSENTIAL OILS; FLOW METER CALIBRAT.
RAJANI INDUSTRIES LTD.	DAR ES SALAAM	:FOOD PRODUCTS	:MACHINERY SPECS. & PROCESS FOR EDIBLE OIL CLARIFICAION
SADOLIN PAINTS LTD.	DAR ES SALAAM	:CHEM PROD. MFG.	:RECOVERY OF USED SOLVENT
STEEL ROLLING MILLS LTD.	TANGA	:METAL PROD. MFG.	:METALLURGICAL TESTS
TANGANYIKA INDUSTRIAL CORPORATION LTD.	TANGA	:TEXTILE MFG.	:LOCAL BLEACHES, PRODUCTS FOR IDLE MACHINES (HYDR. PRESS,CUTTER)
TANGANYIKA PLANTING COMPANY LTD.	KILIMANJARO	:LEATHER PRODUCTS	:SPARE PART DESIGN & FABRICATION
TANGOLD PRODUCTS COMPANY	DAR ES SALAAM	:FOOD PRODUCTS	:PRODUCTION OF ESSENTIAL OILS FROM WASTE & FRUIT CONC'TRATE TECH.
TANZANIA BREWERIES LTD.	DAR ES SALAAM	:BEVERAGE MFG.	:IMPROVED BOTTLE WASHING PROCEDURES
TANZANIA FOOD CORPORATION LTD.	ARUSHA	:FOOD PRODUCTS	:TECHNOLOGY FOR PROD. SODIUM CARBONATES & SULPHATES; FOOD COLOURS
TANZANIA TANNERIES COMPANY LTD.	KILIMANJARO	:LEATHER MFG.	:LOCAL DYES & SOLAR DRYER FOR HIDES AND SKINS
TANZANIA CIGARETTE COMPANY LTD.	DAR ES SALAAM	:TOBACCO PRODUCTS	:TECHNOLOGY FOR LOCAL FILTER MANUFACTURE
TEXCO	DAR ES SALAAM	:TEXTILE MFG.	:LOCAL PRODUCTION OF DYESTUFFS, CHEMICALS & SHUTTLES
UBUNGO FARM IMPLEMENTS LTD.	DAR ES SALAAM	:FARM MACHINERY	:CONVEYOR REDESIGN, DESIGN OF JIGS & FIXT'S, UTILISE STEEL SLIPER

ANNEX G - REVISED PHASE II BUDGET

COUNTRY	PROJ NUMBER & AMENDMENT	SPECIFIC ACTIVITY
TANZANIA	DP/URT/78/019/0	01/037

PROJECT TITLE

ASSISTANCE TO THE TANZANIA INDUSTRIAL RESEARCH AND DEVELOPMENT ORGANIZATION (TIRDO)

	PROJECT PERSONNEL EXPERTS/POST TITLE	TOTAL M/M	TOTAL $	1979 M/M	1979 $	1980 M/M	1980 $	1981 M/M	1981 $	1982 M/M	1982 $	1983 M/M	1983 $
11-01	PREP ASSISTANCE CONS	3.2	17303	3.20	18281		-978						
11-02	SENIOR TECH ADVISER	37.3	236338	2.70	8896	4.60	26432	12.00	77582	12.00	80428	6.00	43000
11-03	ENGINEERING	2.50	19937					1.00	14769	1.50	5168		
11-04	ELECTRONIC INSTRUM'T	14.00	90883					2.00	11783	6.00	38100	6.00	41000
11-05	ANALYSIS & TESTING	2.00	14035					2.00	14035				
11-06	INFORMATION RETR'VAL	19.20	122091					1.20	7691	12.00	76400	6.00	38000
11-07	INFORMATION EXTENS'N	12.00	88122					3.80	27266	8.20	60856		
11-08	FOOD TECHNOLOGY	1.50	10644					1.50	10644				
11-09	ENERGY CONSERVATION	4.10	31400							1.10	8400	3.00	23000
11-10													
11-11	ASSOC EXPERT ADMIN	(24.00)						(1.00)		(12.00)		(11.00)	
11-12													
11-13	ASSOC EXPERT COMP'TR	0.00											
11-50	CONS R&D PROJ IDENT	1.00	6392							1.00	6350		
11-99	SUBTOTAL:	96.8	637145	5.90	27177	4.60	25454	23.5	163770	41.8	275702	21.00	145000

ANNEX G - REVISED PHASE II BUDGET

PROJECT NUMBER

DP/URT/78/019/0

		TOTAL		1979		1980	1981		1982		1983
		M/M	$	M/M	$	$	M/M	$	M/M	$	$
13-00	SUPPORT PERSONNEL		18511					7011		11500	5500
14-00	VOLUNTEERS										
15-00	EXPERTS TRAVEL		3413		102	84		227		2000	1000
16-00	OTHER PERSONNEL COST		11056		2304	3463		2289		3000	
19-00	TOTAL PERSONNEL	96.8	675583		29583	29001		173297		292202	151500
28-00	SUBCONTRACTS TOTAL SUBCONTRACTS										
31-00	TRAINING FELLOWSHIPS		146121					37404		77217	31500
32-00	STUDY TOURS & NON-UNDP		10711			10016		695			
33-00	IN-SERVICE TRAINING										
34-00	GROUP TRAINING										
35-00	MEETINGS NON-UNDP										
39-00	TOTAL TRAINING COMP'T		156832			10016		38099		77217	31500
40-01	EQUIPMENT NON-EXPENDABLE										5000
40-01	EXPENDABLE										
49-00	TOTAL EQUIPMENT COMP'T		365019			8726		251493		99800	5000
51-00	MISCELLANEOUS OPERATIONS-MAINTENANCE		15935			506		2679		7750	5000
52-00	REPORTS										
53-00	SUNDRIES		14921		513	1118		4933		7357	1000
59-00	TOTAL MISCELLANEOUS		30856		513	1624		7612		15107	6000
99	GRAND TOTAL:	96.8	1,228,290		30096	49367		470501		484326	194000

ANNEX H - RECOMMENDED BUDGET BASED ON PROVISIONAL PHASE II FUNDING

COUNTRY	PROJ NUMBER & AMENDMENT	SPECIFIC ACTIVITY
TANZANIA	DP/URT/81/037/A	01/37

PROJECT TITLE

ASSISTANCE TO THE TANZANIA INDUSTRIAL RESEARCH AND DEVELOPMENT ORGANIZATION (TIRDO)

11	PROJECT PERSONNEL EXPERTS/POST TITLE	TOTAL M/M	TOTAL $	1983 M/M	1983 $	1984 M/M	1984 $	1985 M/M	1985 $	1986 M/M	1986 $
11-01											
11-02	SENIOR TECH ADVISER	36.00	263500	12.00	86000	12.00	87500	12.00	90000		
11-03											
11-04	ELECTRONIC INSTR. SPEC.	18.50	129900	12.00	82500	6.50	47400				
11-05											
11-06	INFORMATION RETRIEVAL	11.00	69300	11.00	69300						
11-07											
11-08											
11-09	ENERGY CONSERVATION	3.00	23000	3.00	23000						
11-10	PILOT PLANT PROJECT SPEC.	12.00	87500			5.50	40100	6.50	47400		
11-11	ASSOC. EXPERT ADMIN.	(10.00)		(10.00)							
11-12											
11-13	ASSOC. EXPERT COMPUTER	(24.00)		(2.00)		(12.00)		(10.00)			
11-14											
11-99	SUBTOTAL:	80.50	573200	38.00	260800	24.00	175000	18.50	137400	0.00	0

ANNEX H - RECOMMENDED BUDGET BASED ON PROVISIONAL PHASE II FUNDING

PROJECT NUMBER		TOTAL		1983		1984		1985		1986	
DP/URT/81/037/A/01/37		M/M	$	M/M	$	M/M	$	M/M	$	M/M	$
13-00	SUPPORT PERSONNEL		24000		10500		7500		6000		
14-00	VOLUNTEERS										
15-00	EXPERTS TRAVEL		6000		2500		2000		1500		
16-00	OTHER PERSONNEL COSTS		8000		4000				4000		
19-00	TOTAL PERSONNEL	80.50	611200	38.00	277800	24.00	184500	18.50	148900	0.00	0
	SUBCONTRACTS										
28-00	TOTAL SUBCONTRACTS										
	TRAINING										
31-00	FELLOWSHIPS	47.00	101400	20.00	42000	9.00	19800	18.00	39600		
32-00	STUDY TOURS & NON-UNIDF MTGS.		8000		3000				5000		
33-00	IN-SERVICE TRAINING										
34-00	GROUP TRAINING										
35-00	MEETINGS NON-UNDP										
39-00	TOTAL TRAINING COMPONENT	47.00	109400	20.00	45000	9.00	19800	18.00	44600	0.00	0
	EQUIPMENT										
40-01	NON-EXPENDABLE		15000		4000		6000		5000		
40-02	EXPENDABLE		5000		1000		2000		2000		
49-00	TOTAL EQUIPMENT COMPONENT		20000		5000		8000		7000		0
	MISCELLANEOUS										
51-00	OPERATIONS-MAINTENANCE		24300		9300		8300		6700		
52-00	REPORTS		0								
53-00	SUNDRIES		7000		3000		2000		2000		
59-00	TOTAL MISCELLANEOUS COMPONENT		31300		12300		10300		8700		0
99	GRAND TOTAL	79.00	771900	37.00	340100	24.00	222600	12.00	209200		0