

C 568

Central Organization
for Applied Scientific Research
in the Netherlands

Bibliothek Hondiusstraat TNO
D-Groningen

25 APR 1977

1972-1977 ed. 1976

TNO

5 Years of Technical Assistance
in Africa, Asia and Latin America

TNO

4570

Bibliotheek Hoofdkantoor TNO
The Hague 25 AUG. 1978

5 YEARS OF TECHNICAL ASSISTANCE
IN AFRICA, ASIA AND LATIN AMERICA

1972 - 1977

21 Koningin Marialaan
The Hague, Netherlands
P.O. Box 778
Tel. 070 - 81 44 81
Telex 31660 rvtno nl

Bureau for International Projects TNO

The Hague, July 1976

INTRODUCTION

Ever since 1966, TNO has been involved in a steadily increasing number of projects in developing countries all over the world.

The present booklet contains a survey of projects initiated and/or carried out within the period 1972 - 1977. It briefly describes the nature and content of each project; all projects have been classified according to the system of the DAC (= Development Assistance Committee), OECD.

Additionally, the TNO institutes, and other institutional or individual consultants, concerned with the very execution of these projects, are specified.

A keyword index and a country-wise index will facilitate data retrieval.

Anyone interested in a survey of all TNO institutes, and a description of their capabilities and equipment, is invited to read "Institutes of the Netherlands Organization for Applied Scientific Research TNO" which booklet will be supplied upon request.

BUREAU FOR INTERNATIONAL PROJECTS TNO

J.C. Gerritsen
(Drs. J.C. Gerritsen)
director

CONTENTS x)

	<u>page</u>
I. ECONOMIC PLANNING, STATISTICS, PRE-INVESTMENT STUDIES	1
II. ENERGY AND WATER SUPPLY, COMMUNICATION, TRANSPORT	3
III. AGRICULTURE, FISHERY, CATTLE BREEDING, IRRIGATION	7
IV. INDUSTRY	11
V. HEALTH	18
VI. EDUCATION, TRAINING	21
VII. BUILDING, SOCIAL INFRASTRUCTURE	25
VIII. CO-OPERATION WITH RESEARCH INSTITUTES WITHIN DEVELOPING COUNTRIES	27
INDEXES	
Keyword index	32
Country-wise index	36

x) according to DAC's classification, except for VIII

I. ECONOMIC PLANNING, STATISTICS, PRE-INVESTMENT STUDIES

1.1 SISAL REINFORCED POLYESTER SHEETS
Tanzania
(1971/1972)

To partially offset the negative effects of weakening outlets for sisal, investigations have been carried out that were based on a Tanzanian idea to process sisal in polyester sheets with emphasis on sisal-reinforced polyester roofing products.

In view of the diversity of the problems presented, a multi-disciplinary approach was deemed necessary. Six TNO institutes participated in the investigations. Recipes for optimal composition were involved, especially taking into account weather resistance requirements. The newly developed sheets were tested and compared with other corrugated sheets. Orientations were carried out on the use of sisal fibres for the manufacturing of board-like materials with other binders. Termite resistance was also investigated.

Economic investigations were carried out, including market research on cost of raw materials, selling prices and cost benefit analysis. The final report contained proposals for the lay-out and set-up for pilot-plant production.

After solving some remaining technical problems, the pilot-plant production seemed economically viable at that time, though not very promising due to rising sisal prices.

- Forest Products Research Institute TNO
- Plastics and Rubber Research Institute TNO
- Central Laboratory TNO
- Institute TNO for Building Materials en Building Structures
- Bureau for International Projects TNO

1.2 SHEET GLASS PRODUCTION
Uganda
(1971/1972)

For the supply of sheet and plate glass for use in houses, offices and shops, the East African Market, including Uganda, has so far been dependent on manufacturers in overseas countries. Imports have shown a dramatic rise since 1963, and substantial foreign exchange savings could be realized by a sheet glass manufacturing industry in one of the EAC member countries.

The TNO field study, carried out at the request of the Uganda Government, comprised: pertinent market research, studies on location and evaluation of raw materials, selection of process, plant size and location, profitability analysis and government trade rules. The final report presents positive recommendations as to the viability of the project. Implementation is delayed due to changed local conditions.

- Bureau for International Projects TNO
- Institute of Applied Physics TNO-TH

1.3 INSTANT COFFEE PLANT

Uganda
(1971/1972)

To obtain more insight in alternative processing and marketing prospects for Uganda's coffee production, a study has been made at the request of the Ungandan Government of the technical and commercial feasibility of instant coffee production; the research team consisted of TNO engineering and economic experts.

Advice was given on the eligible techniques and extensive research was done on potential markets. A prospective investor was indicated.

- Bureau for International Projects TNO

= Central Technical Institute TNO

II. ENERGY AND WATER SUPPLY, COMMUNICATION, TRANSPORT

2.1 WIND ENERGY UTILIZATION

General
(1975/1976)

Research is currently carried out to investigate certain possibilities to apply wind energy within developing countries. Contrary to the situation in industrialized countries, the consumption of energy per head and per square mile in most developing countries seems to be replaceable by wind energy installations; even small ones. Therefore, emphasis has been laid upon local production and management of wind energy installations. The Netherlands contribution aims at an evaluation of wind energy applications (e.g. pumps, generators, etc.) and the development and testing of prototypes.

- Institute TNO for Mechanical Constructions
- University of Technology, Netherlands

2.2 GROUNDWATER RECONNAISSANCE STUDY GUAJIRA

Colombia
(1972-1975)

As part of a plan regarding the development and integration of the Guajira, the Colombian Government requested technical assistance for a groundwater reconnaissance study of that region. In co-operation with Colombia's National Institute for Geology and Mining, TNO-experts carried out geophysical surveys in the (semi-)arid areas of Guajira in order to obtain physical data for groundwater hydrology with prospects of exploitation of water-bearing layers for domestic use and irrigation.

In the course of the two years that the project lasted, an important part of the activities were geared to training of Colombian counterparts in the application of geophysical methods, use, maintenance and repair of geophysical equipment, such with a view to founding a geophysical department for geohydrological surveys.

This groundwater survey forms part of a pre-feasibility study covering the whole development potential of the region. This study includes investigations on volume and quality of existing minerals and derivatives, market surveys, investigations on available water and energy resources, on transport facilities and on the improvement of agriculture.

- Groundwater Survey TNO

2.3 GROUNDWATER APPRAISAL STUDY GUAJIRA

Colombia
(1976-1980)

In the study mentioned in 2.2, the existence of groundwater of excellent quality in an extensive area has been proved. Through the present study, the amount of the available water and the aquifer properties will be established in an area larger than 10,000 sq.km. For this purpose, TNO-experts on hydrology, geohydrology and drilling co-operate with Colombia's National Institute for Geology and Mining in a three years project which also includes the construction of water wells for the Indian communities in the area.

- Groundwater Survey TNO

2.4 GROUNDWATER SURVEY

Colombia
(1974/1975)

Because of the increasing population and a resulting rising need for agricultural produce, there is a growing demand for water suitable for human consumption, and for irrigation purposes, in the plains surrounding Bogotá. The investments needed for an adequate extension of the existing centralized water supply system, or the construction of purification installations, are considerable and would result in high costs.

With the assistance of TNO-experts on hydrology and geophysics, the Regional Corporation responsible for the development of the area explored the aquifer potential of the south-western part of the region and installed a number of groundwater wells in various villages. The success of this project has led to an extensive programme of groundwater surveys for the whole region, which could form a basis for an integral development plan.

- Groundwater Survey TNO

2.5 INVENTORY OF GROUNDWATER RESOURCES

Colombia
(1975/1977)

The San Jacinto region in Colombia, with its numerous villages and potential fertility of its land, is characterized by dry summers and almost complete lack of (drinking) water.

Colombia's National Municipal Water Supply Institute has chosen this region, because of its geological characteristics, to undertake a major study; it should establish the groundwater potential in an area of approximately 300,000 ha and determine the optimal sites for ground water abstraction.

Several TNO-experts, including geophysicists, a mathematical physicist and a computer programmer have been assigned to this long-term project and assist the Institute in the execution of the survey and in the training of its staff.

- Groundwater Survey TNO

2.6 GEO-ELECTRICAL SURVEY

India
(1973)

Serious shortage of water because of continuing drought had led to a request made by a Dutch voluntary development agency to pursue a geo-electrical investigation within the Indore area. The study aimed at measuring the thickness and spread of the weathering-zone situated on the tableland basalt. This zone, which is covered by clay, lends itself for the winning of groundwater.

- Groundwater Survey TNO

2.7 GROUNDWATER SURVEY

Iraq
1973/1975

Several experts have been made available to UNESCO for a groundwater survey near Erbil (Kurdistan), for conducting the geophysical research programme and for training of employees of the Institute for Applied Research on National Resources of the Scientific Foundation, Bagdad. Additionally, equipment for physical borehole research, including a landrover for field-work, were supplied.

- Groundwater Survey TNO

2.8 GROUNDWATER SURVEY

Mauretania
(1975)

TNO was requested to assist a French geological consultants firm in this study. TNO's assistance included geo-electrical resistivity research. Three experts, i.e. geophysicist, an operator and a topographer, were made available for a relatively short period.

- Groundwater Survey TNO

2.9 GROUNDWATER INVESTIGATION

Sudan
(1976/1978)

Although the urgency to establish drinking water supplies can be considered high for many areas, two areas have been given priority: the Gedaraf and El Jebelain areas.

Required in both areas is an intensive field investigation including scientific expertise (55 manmonths) and equipment (US\$ 150,000). The project fits in the long-range programme for the development of the Rural Water Corporation (RWC). It should not only provide a strong base for the long-term planning programme in both areas, but should also yield immediate results in the shape of production wells to be drilled. Based on the current knowledge about these regions, the following methods of investigation are scheduled:

- geo-electrical resistivity;
- seismic refraction;
- rotary drilling;
- geophysical well logging of new and existing wells.

Furthermore included are training of RWC professionals in the application, use and maintenance of geophysical equipment, and the interpretation and evaluation of results thus obtained.

- Groundwater Survey TNO

2.10 WATER SUPPLY SURVEY
Tanzania
(1972/1973)

At the request of Tanzania's Ministry of Water Development and Power, TNO participated in the preparation of an integrated masterplan for the Shinyanga region; it involved investigations of the surface and groundwater resources of the area plus an inventorial record of water demand. By application of geo-electrical and magnetic methods and geophysical well logging; a study has been carried out to obtain information regarding the geohydrological conditions of the subsoil.

- Groundwater Survey TNO

2.11 RIVERCRAFT DESIGN AND INSPECTION
Bangladesh
(1973/1974)

Transport on the extensive waterways of Bangladesh is carried out by a variety of passenger and cargo craft with wide ranging specifications, to meet the demand of the changing traffic conditions. However, these craft are generally uneconomic to operate, rather unsafe in operation and not very well suited to the needs.

The main conclusion of a field study, carried out by a TNO-expert on shipbuilding, implied that it is necessary to start studies of the different types of vessels and of the existing traffic and waterways. Next, one would thus be able to design standard types of craft which are easy to build, efficient to operate and optimal for their tasks. To this end, the establishment has been recommended of a local Design and Inspection Office for Inland Waterways Transport and Mechanized Craft.

- Netherlands Ship Research Centre TNO

III AGRICULTURE, FISHERY, CATTLE BREEDING, IRRIGATION

3.1 STORAGE AND PROCESSING OF MEAT

Chile
(1973)

One of the aims of the Chilean Corporation for Agricultural Constructions and Operations (SOCOAGRO) is the improvement and rationalization of the processing and marketing of meat in Chile; for this purpose SOCOAGRO exploits a chain of slaughterhouses and meat factories.

TNO's feasibility study inter alia covered:

- the state of the art regarding SOCOAGRO's current activities and the institutional and structural situation;
- the cattle-breeding situation, i.e. origin of cattle, supply lines, quantities supplied and future developments;
- existing expertise in SOCOAGRO;
- necessary expertise and training.

A TNO meat expert made recommendations regarding organizational problems and technical know-how and equipment. Technical assistance was provided by way of fellowships, equipment and various consultants.

- Central Institute for Nutrition and Food Research TNO

3.2 SLAUGHTERHOUSE

Indonesia
(1971/1972)

A Dutch slaughterhouse expert and a TNO-economist made three studies regarding the feasibility of setting up three slaughterhouses in Jakarta and Yokyakarta, Indonesia. On the basis of the results of these studies, a slaughterhouse for pigs was built in Jakarta.

For the existing slaughterhouse in Yokyakarta some renovations were suggested combined with structural improvements in the supply of cattle.

- Slaughterhouse management expert
- Bureau for International Projects TNO

3.3 FEASIBILITY STUDIES AGRO-ALLIED SECTORS

Nigeria
(1975/1976)

In the context of an extensive development programme of the East Central State of Nigeria, TNO's food technologists provided expert advice, in collaboration aspects of production, processing and storage of various cereals, rootcrops, treecrops and their by-products as part of techno-economic feasibility studies required by the Ministry of Economic Development and Construction.

The products investigated included soya-bean oil, rice bran oil, cashew nuts, cashew wine and brandy, flours from cassave, maize, yam, etc.

- Central Institute for Nutrition and Food Research TNO
- Institute for Cereals, Flour and Bread TNO
- Private consultants firm

3.4 RESEARCH UNIT FOR CEREAL TECHNOLOGY AND COMPOSITE FLOURS
Nigeria
(1975)

The Department of Food Science and Technology (DFST) of the University of Ife has established a research unit for the incorporation of local agricultural products in bread. In close collaboration with DFST, a TNO cereal technologist has drafted a long-term cereal technology and composite flours research programme, containing:

- (a) laboratory-scale research on preparation of cassava, groundnut and sorghum flour, recipes and procedures for breadmaking, both with wheat flour and diluted flours, standardization of laboratory methods standards, etc.;
- (b) research on a pilot-plant scale with regard to the processing of cassava, groundnut, sorghum, etc., the production of bread and other products from composite flours, furthermore acceptability and marketing trials.

- Institute for Cereals, Flour and Bread TNO

3.5 EXPERIMENTAL FISH PROCESSING
Tanzania
(1966/1976)

The fishing grounds of Lake Victoria offer a vast potential source of protein-rich food for the Tanzanian population. In order to make optimal use of this potential, the Tanzanian Government established in 1966, next to its fisheries training institute, an experimental fish processing station. In collaboration with TNO, investigations and experiments have since been carried out with several methods of fish preservation to adapt these to local conditions. The station's programme of work includes exploration of fishing grounds, investigations on the types of fish considered to be of commercial value, taking into account local climate conditions, permissible costs and, also, marketing studies.

One of the station's most significant activities is that of educating and training Tanzanians to put fishing and processing on a modern basis. The experimental station has meanwhile developed into a research and training centre for all freshwater fisheries in Tanzania. TNO took care of the purchase, adaptation to tropical conditions, overseas and overland transport, as well as continuous management of a fishing boat for the execution of the station's programme. Both for the technical and economic programme, a TNO team has been made available for support of the largely Tanzanian staff, during this period.

- Institute for Fishery Products TNO
- Bureau for International Projects TNO

3.6 FISH PROCESSING PLANT

Uganda
(1971/1972)

The assessment of setting up a freshwater fish processing industry was the object of a techno-economic study undertaken at the request of the Uganda Government.

Following the results of preliminary TNO investigations, special attention has been given to the processing of haplochromis, a small species of fish abundant in Lake Victoria's deep waters. Production and marketing of sun-dried fish seemed feasible. Some aspects of the supply of fish were also covered in the study. The experience and data thus obtained proved to be important elements for the investigations on stream in the Tanzanian Freshwater Fishery Centre.

- Institute for Fishery Products TNO
- Bureau for International Projects TNO

3.7 FISHERIES DEVELOPMENT

Yemen
(1973)

The development of fisheries is of vital importance to the economy of the P.D.R. Yemen. TNO was invited, by a consulting engineering firm with an interest in this matter, to provide assistance in a study of the possible development of fisheries and the financial consequences.

- Institute for Fishery Products TNO
- Private consultants Lebanon

3.8 RAMEH FIBRE RESEARCH

General
(1976)

Rameh is a well-known natural fibre which is grown in a number of developing countries and, up to now, processed mainly in industrialized countries. New developments in especially spinning techniques seem to be of great interest for rameh and its local processing possibilities. The Fibre Research Institute TNO developed a twistless spinning process for flax which seems also applicable to rameh due to comparable properties of the flax and rameh fibres. This is being investigated now; the project aimed e.g. at reduced costs of rameh fabrics by the application of the twistless spinning process. This could open markets like those for curtains, furniture, coverings, machine-washable outerwear and other high quality fabrics; it would also offer rameh growing countries a new industrialization and export opportunity.

- Fibre Research Institute TNO

3.9 FISH PROTEIN CONCENTRATE

General
(1976)

It is generally agreed that a good quality and relatively cheap fish protein concentrate (f.p.c.) can contribute to a diminution of quantitative and qualitative protein calorie malnutrition in developing countries. A private engineering consultants bureau evolved an appropriate technology to produce high quality f.p.c. This production method differs from the presently used methods which are based on extraction by means of highly inflammable organic solvents and which call for highly skilled technicians and advanced equipment and consequently are less suitable for developing countries. The new production method is tested at the Institute for Fishery Products TNO, which will also investigate the applicability of the products obtained.

- Private engineering consultants firm
- Institute for Fishery Products TNO

3.10 SLAUGHTERHOUSE

Indonesia
(1976/1977)

Further to Project 3.2, which had been carried out successfully some years previously, TNO has recently been asked to perform a pre-investment study on a slaughterhouse for ruminants to be built in Jakarta. This will be done by an economist of TNO and a private consultant, probably at the end of 1976, upon finalization of the pertinent agreement.

- Private consultant
- Bureau for International Projects TNO

IV. INDUSTRY

4.1 NODULAR CAST IRON
Bangladesh
(1973/1977)

Technical assistance was required by the Planning Commission of Bangladesh to set up local production of nodular cast iron, using the T-Nock process; this forms a relatively cheap alternative for various types of steel. In the study on the feasibility of this project, two metal experts and an economist of TNO reviewed the state of the art of the country's conventional iron casting techniques, as these should be stepping stones towards specialised techniques like the T-nock process. Problems of available raw materials, investments needed, seat, size, economic effects for the country and other questions were covered.

A request for assistance at the implementation of the project was received in 1976. Implementation will include the training of the local staff, supply of equipment and the manufacture of trial series of ingot moulds, which, for the time being, constitute the main application of nodular cast iron within Bangladesh. A team of three experts is to be sent to Bangladesh early 1977.

- Metal Research Institute TNO
- Bureau for International Projects TNO
- Private consulting firm, India

4.2 INFANT FOOD PILOT PLANT AND NUTRITIONAL LABORATORY

Cuba

(1975/1980)

The existing problems regarding the infant food supply in Cuba can be summarized as follows:

- the seasonal pattern in the harvesting of some important types of fruit calls for preservation and sterilization procedures which, at present, are not fully adequate;
- infant food habits are now rather one-sided;
- at the family level there is generally a lack of knowledge and of practical means to produce infant food according to the requirements;
- in the daytime many children remain in children centres. Food is provided through these centres; standards of nutritional value are being maintained with the aid of dietary manuals. Kitchen facilities, however, are often lacking.

All this calls for a production of ready made infant food, either packed in family size units (small tins, glass jars), or in bulk (frozen food for central kitchens). The existing food industry in Cuba does not possess the necessary facilities to autonomously meet the requirements of an improved and diversified infant food production. Therefore, the establishment has been considered of a department for infant food within the Instituto de Desarrollo de la Industria Alimenticia (IDIA).

Together with a Dutch engineering firm, TNO provides technical assistance regarding the selection of the equipment, and lay-out and engineering for an infant food pilot plant, and a nutritional laboratory, on the one side, and expert advice and training facilities regarding the future research activities on the other.

- Central Institute for Nutrition and Food Research TNO
- Private engineering firm

4.3 CEREAL PILOT PLANT

Cuba
(1975/1980)

Through its five years' plan for the period until 1980, the Cuban Government is aiming at an expansion and reorganization of the cereal production industry in order to achieve better, more efficient and more hygienic production processes. Besides, a greater variety and diversification of the products are deemed to be desirable; efforts would be directed at the improvement of the nutritional value of the products. The production units in the cereals industry are widely dispersed, their capacities limited and their production procedures artisanal; up till now it did not develop sufficient technological know-how, as is essential for the modernization of its equipment and for the education and training of qualified personnel able to handle new production techniques.

The establishment has been considered of a new institute for the development of the cereals industry, which institute will play an important role in the future development of this industry. It will have to investigate new production processes in order to advise on the selection of equipment and on the introduction of new techniques. It will also have to develop new products. Furthermore it will participate in the education and training of technologists for the industry. TNO provided technical assistance regarding selection of equipment and lay-out of the required cereals pilot-plant, and specified the engineering requirements for the various equipment suppliers. Expert advice is given and training facilities are provided regarding the future research and educational activities.

- Institute for Cereals, Flour and Bread TNO
- Bureau for International Projects TNO

4.4 TWISTLESS JUTE SPINNING

India
(1976/1981)

Processing of jute fibre is of great importance to India. And to its neighbour, Bangladesh. The competition of synthetics, however, is very strong in certain fields of application. Applied research is needed to overcome, regarding price and quality, disadvantages of jute applications. Studies carried out by TNO resulted in the development of a new twistless spinning system, which leads to savings in raw materials and improvement in quality.

Close co-operation between TNO and an Indian jute research association is being considered; the aim is to investigate the application of the twistless spinning process on jute. The project concerned would relate to long and short-term experts, fellowships and laboratory testing assistance. The ultimate aim would be to retain or even improve the position of jute on the world market.

- Fibre Research Institute TNO
- Bureau for International Projects TNO

4.5 SHOE LASTS PRODUCTION

India
(1976)

A TNO-expert will study the present performance of a precision shoe lasts factory and suggest measures for its modernization, and for increasing the production of shoe lasts of suitable quality to meet export requirements as well as criteria for quality control. The requirements will be assessed for the appropriate seasoning of wooden blocks used in the manufacture of shoe lasts. The duration of the assignment will be three months.

- Institute for Leather and Shoe Research TNO

4.6 RESEARCH AND DEVELOPMENT FOR FOOD PROCESSING

Indonesia
(1976)

With the increasing production of processed and packaged foods in Indonesia, the availability of a food processing laboratory is considered an absolute necessity. It should carry out the required development work for this growing industry.

As a (potential) nucleus for the establishment of such a facility, the Chemical Research Institute in Bogor has been visited by a TNO food-chemist to review and analyze the status of the institute in the light of the country's and region's need in terms of food-processing research and technology development.

Equipment and specialist requirements to get the institute up to the desired level of technological competence were defined, and a plan for future "institutional pairing" has been drafted.

- Central Institute for Nutrition and Food Research TNO

4.7 PAINT AND VARNISH INSTITUTE
Indonesia
(1976)

Testing of paints and varnishes is compulsory in Indonesia for all materials used for Government projects and in Government enterprises. Nevertheless, the Government, and also the private sector industries and individual consumers, are often victims of intensive sales promotions for poor quality merchandise and have thus far obtained little protection.

Paints and varnishes are among frequently used materials where quality problems exist because products of various and variable qualities are marketed and sold.

In order to draft a programme to upgrade the present testing facilities of the Materials Testing Institute at Jakarta, a TNO paint-expert reviewed and analyzed the present situation at the Institute and pinpointed its need in terms of equipment, facilities and skilled personnel.

- Paint Research Institute TNO

4.8 LEATHER SUBSTITUTES
Romania
(1973)

Because of the reduced stock of live cattle, the tanning industry in Romania cannot meet the leather requirements of the footwear industry. The production of substitutes has to be developed, the raw material being locally available. In 1972, a factory started to produce synthetic leather but some problems arose for which solution of which further expertise was needed.

TNO has assisted the factory at the request of Unido.

- Plastics and Rubber Research Institute TNO
- Institute for Leather and Shoe Research TNO

4.9 PACKAGING INDUSTRY
South East Asia
(1975)

A team of two TNO-experts was invited to participate in a regional seminar on packaging design for developing countries, aiming at improved export packaging and relevant institutional measures. Included in the programme was a number of visits to factories showing that advanced technologies were almost invariably adapted to the local conditions.

-Institute TNO for Packaging Research.

4.10 PROMOTION OF SMALL AND MEDIUM SCALE ENTERPRISES

Togo
(1974)

A Dutch consulting firm provided technical assistance regarding improvement of the organization and management of the National Centre for the Promotion of Small and Medium Scale Enterprises. TNO-institutes supplied expert advice about the set-up of an installation for drying wood, together with product and process descriptions of several hand-operated and animal-drawn agricultural equipment to be produced in the experimental workshop of the Centre.

- Forest Products Research Institute TNO
- Metal Research Institute TNO

4.11 CLAY-PRODUCTS MANUFACTURING UNIT

Curaçao, West Indies
(1974/1975)

When TNO was asked for advice on a tentative project proposal concerning a light-weight aggregate manufacturing unit at Curaçao, it was concluded that further research in the field of shale layers and quality of the local shale had to be done.

Accordingly, a geologist and two ceramic experts of the Central Technical Institute TNO visited Curaçao in order to study all the relevant aspects. They next prepared a report which contains a reasoned proposal for a clay-products manufacturing plant.

- Central Technical Institute TNO
- Private consultants firm

4.12 OPEN-END SPINNING OF COTTON
General
(1976/1978)

In collaboration with the International Institute for Cotton (IIC), the Fibre Research Institute TNO will carry out investigations and evaluations of possibilities for utilizing a wider range of cottons and improving typical fibre properties for open-end spinning. Competing fibre producers are intensively investigating the possibilities of the open-end system for their products, and unless comparable information on fibre and processing requirements is made available to cotton growers and users, cotton could lose a major share of its present markets.

- International Institute for Cotton (IIC)
- Fibre Research Institute TNO

4.13 EASY-CARE FINISHING OF COTTON
General
(1976/1978)

Numerous surveys have concluded that cotton's major disadvantage in its battle with synthetics is its lack of that level of easy-care performance which is expected by today's consumer. A thorough examination will be done on the influences of a number of preparatory treatments.

An important contribution toward the solution of these problems seems to be the application of recently developed processes, at the same time promising significant savings of energy and chemicals.

- International Institute for Cotton (IIC)
- Fibre Research Institute TNO

V. HEALTH

5.1 NUTRITION RESEARCH
Indonesia
(1975/1976)

In Surabaya, Indonesia, the Royal Tropical Institute of Amsterdam assisted in establishing a nutritional department of the Airlangga University. The biochemical part of this programme was delegated to TNO. Vitamin analyses were carried out. Moreover, TNO-experts on blood, human milk, urine and foodstuffs advised on the spot.

- Central Institute for Nutrition and Food research TNO
- Royal Tropical Institute, Amsterdam

5.2 NUTRITION SURVEY
Kenya
(1975/1976)

In the Machakos district, Kenya, a nutrition survey was carried out by the Medical research Centre, Nairobi. Part of the survey, especially the vitamin analyses for blood, human milk, urine and foods, was carried out by TNO.

- Central Institute for Nutrition and Food research TNO
- Royal Tropical Institute, Amsterdam

5.3 LACTOSE INTOLERANCE
Kenya
(1970/1974)

The Netherlands Medical Research Centre in Nairobi co-sponsored a project of TNO which comprised investigations on measures aiming at control of kwashiorkor through supply of fish protein and milk protein and, in this context, R&D on lactose malabsorption (hypolactasia). Results suggested that children in the age-group of 1 to 3 years, recovering from malnutrition, grew better with lactose-poor milk than with ordinary milk. The absorption of protein from milk was not impaired in children with hypolactasia. Research on the implications of poor absorption of lactose is continued; (see 5.5).

- Central Institute for Nutrition and Food Research TNO
- Royal Tropical Institute, Netherlands

5.4 FOOD QUALITY CONTROL

Saudi Arabia
(1976/1973)

Invited by FAO, TNO executed from 1967 to 1973 a food quality control project whose main objectives were:

- establishing of two food control laboratories;
- training of Saudi-Arabian personnel;
- assistance in drafting food standards.

In Jeddah and Dammam food control stations were set up by a multi-disciplinary team of TNO-experts whose work also included the drafting of standards methods of analysis, and the training of local staff in daily routine matters. The laboratories have been operational since 1968/1969; analyses are made at a rate of about 1000 a month. Fellowships have been granted to a total of 12 students, with satisfactory results.

TNO's assistance in the drafting of food standards consisted in sending high level experts to meetings of the two Ministries of Food Legislation and Consumer Protection.

The technical assistance project was completed after implementation of the successive steps in 1973, i.e. after a period of 6 years of intensive co-operation.

- Central Institute for Nutrition and Food Research TNO.

5.5 LACTOSE INTOLERANCE

Surinam
(1974/1975)

The problem of poor absorption of lactose from milk (lactose intolerance, hypolactasia) occurs in many tropical regions. Hypolactasia was investigated in Surinam Bushnegro boarding-school children. In this study 95 % of the children showed hypolactasia, according to current definitions. Thirty-two of the children were supplied during one school year with skinned milk. The incidence of hypolactasia did not decrease during that year. It was concluded that production of lactase was not induced in that period. A second group of 24 children consumed lactase-treated skinned milk. Height and muscle mass increased less in these children than in children consuming "normal" milk. Consequently, a favourable effect of this batch of lactase-treated milk could not be demonstrated.

- Central Institute for Nutrition and Food Research TNO
- Netherlands Foundation for the Advancement of Tropical Research (WOTRO)

5.6 NUTRITION AND PUBLIC HEALTH

Thailand
(1975/1976)

The TROPMED National Centre of Thailand participates in various nutrition-related projects in the lower Mekong Basin areas. One of these projects comprises the establishment of a food and nutrition monitoring system; it should study the food and nutrition status of mothers and children. A TNO-biochemist assisted in strengthening the biochemical laboratory of the Centre involved and participated in the training of laboratory staff and students of the Faculty of Tropical Medicine of the Mahidol University, Bangkok.

Another TNO nutrition expert assisted in developing a systematic approach to the problems regarding nutrition and public health in the lower Mekong Basin. His work included the identification of needs and problems by undertaking surveys in the area, planning of operations and evaluation of the results.

- Central Institute for Nutrition and Food Research TNO

5.7 TUBERCULOSIS SURVEILLANCE

General
(since 1962)

In co-operation with the World Health Organization (WHO) and the International Union against Tuberculosis, TNO co-ordinates the activities of a world-wide tuberculosis surveillance programme. The programme aims at assistance to countries all over the world, developing countries as well as industrialized ones, to measure their tuberculosis problem by means of tuberculosis infection rates in samples of the population.

Research teams visit participating countries to implement tuberculosis programmes, which include the training of local personnel. During return visits, test samples are taken; the information obtained is centrally processed at TNO.

Consultatory work is carried out regarding methods of vaccination, and on the tracing of tuberculosis sources.

- International Tuberculosis Surveillance Centre
- Organization for Health Research TNO
- Institute TNO for Mathematics, Information Processing and Statistics.

VI EDUCATION, TRAINING

6.1 CONSULTATION WORKSHOP ON PRODUCT ADAPTATION AND DEVELOPMENT
Lebanon
1975

Under the auspices of Unido, and in co-operation with the Research Institute for Management Sciences, Delft, and the Centre for the Promotion of Imports from Developing Countries (CBI), Rotterdam, TNO selected and tested productsamples of Lebanese industrialists for the Consultation Workshop on Product Adaptation and Development scheduled to be held in October 1975, Delft.

The Consultation Workshop would enable manufacturers from Lebanese industries to identify the market requirements and the technical specifications of the Dutch market, in order to adapt and/or develop exportable products from the Lebanon.

The workshop could not yet be implemented.

TNO's comments on test results have been reported to Unido.

- Fibre Research Institute TNO
- Institute for Leather and Shoe Research TNO
- Institute for Packaging Research TNO
- Bureau for International Projects TNO
- RVB, Research Institute for Management Sciences
- CBI, Centre for Promotion of Import from Developing Countries

6.2 TRAINING COURSE ON INDUSTRIAL AUTOMATION
Mexico
1976

The Information Centre for Industrial Automation TNO will arrange a special English-language training course of 3 weeks for 6 or 8 participants from CONACYT (Consejo Nacional de Ciencia y Tecnologia). The programme includes: production automation, logic control systems, basic principles of measurement and control, fundamentals of mini-computers. The course will start September 1976 and be followed by a stage of 2 months with the Netherlands industry by the participants, thus putting their theoretical knowledge to practice.

- Information Centre for Industrial Automation TNO
- Bureau for International Projects TNO

6.3 LOW COST AUTOMATION
Philippines
(1966/1972)

Under an extensive programme of levelling-up, a section for low cost automation has been established in the Institute for Small-Scale Industries at Manila as part of the University of the Philippines; it is a training institute at post graduate level for experts who specialize in assisting and promoting small and medium scale industrial enterprises.

So far automation has been applied solely in the bigger industries. This type of automation, however, is generally not suitable for the smaller industries, because of its high capital outlay and negative employment effects. Application of low cost automation in the small/medium sized enterprise should indeed allow interestees to arrive at making the best use of existing production techniques rather than aiming at eliminating labour.

An LCA-expert of TNO was appointed project manager. By mid 1970 the section had successfully carried out the following tasks:

- dissemination of knowledge to industry;
- practical training of managers and engineers in the automation laboratory;
- direct assistance to industry through on-the-spot consulting;
- demonstration projects;
- advice on equipment;
- co-operation with educational students.

- Industrial Liaison Department TNO

6.4 INTERNATIONAL RESEARCH MANAGEMENT COURSE
General
(1973/1975)

Under the auspices of Unido, and in co-operation with a Dutch research institute for management sciences, TNO prepared a programme of courses for the "In-service training of managers and senior executives of industrial research institutes in developing countries". In the courses, which lasted three months each, a variety of specific management problems inherent to research institutes were covered in a series of lectures and practical work. Such as: programming of research, financial and personnel management, marketing research, etc. Some 15 TNO-institutes participated in the project; this reflects the diversity of the subjects concerned.

- Industrial Liaison Department TNO
- RVB, Research Institute for Management Sciences.

6.5 FOOD INSPECTION COURSE

General
(1974/..)

Under the auspices of FAO, and in co-operation with the Netherlands Food Inspection Services and the Royal Netherlands Tropical Institute, TNO has prepared a programme for a Food Inspection Course. The aim of the course is to transfer appropriate knowledge to participants who, in their respective countries, will be in charge of food inspection services. Within the following scope: protecting the consumer by checking the absence of harmful contamination of food, and checking the absence of deterioration of foods, e.g. with regard to flavour, protecting honesty in trade by checking the conformity of quality with labelling, using available standards and regulations. The programme includes theoretical and practical training, plus several excursions.

- Organization for Nutrition and Food Research TNO
- Food Control Services in the Netherlands
- Royal Netherlands Tropical Institute

6.6 COURSE ON FISH PRESERVATION

General
(1974/..)

In co-operation with the Fishery Industries Division of the FAO, and the Royal Netherlands Tropical Institute, TNO has prepared a programme for a well integrated short-term course (3 - 5 months) on fish preservation, at an international level.

The aim is to provide the participants with a better understanding of the processes, machinery and other tools that are to be used in the fish processing industry, to offer them opportunity to study processing plants in operation, and to introduce them to several sources of information, e.g. other institutes and engineering industries. Beside visits to these industries, it is planned to make a trip aboard a fish pilot ship (the "Tridens").

- Institute for Fishery Products TNO
- Bureau for International Projects TNO
- Royal Netherlands Tropical Institute

6.7 INTERNATIONAL WORKSHOPS ON PACKAGING DEVELOPMENT AND PACKAGING TECHNOLOGY

General
(1976)

The Centre for the Promotion of Imports from Developing Countries (CBI) organizes, in co-operation with TNO, a programme of international workshops on packaging development and packaging technology. The workshops will last three weeks each and programmes will centre around various aspects of export packaging; they will include technical training, practical training, marketing items, excursions and field work.

The first two workshops will be held in the autumn of 1976; the main subjects then being wet-processed food (max. 30 participants) and dry-processed foods (30 participants), for which CIPE (Centro Americano de Promoción de Exportaciones) acts as a promotional organization.

- CBI, Centre for Promotion of Imports from Developing Countries
- Institute TNO for Packaging Research
- Bureau for International Projects TNO

6.8 FELLOWSHIPS TRAINING

General
(1966/..)

Over the last five years about 95 fellows from 40 developing countries have visited TNO for a training period: ranging from a few months to a year and even longer.

Most requests for fellowships came to BIP-TNO from Unido, the Dutch Ministry of Foreign Affairs, FAO,OECD,UNESCO. Twelve TNO institutes have assisted these fellows, in the following research fields: fishery, food and nutrition, cereals and flour, groundwater survey and geohydrology, plastics and rubber, applied physics, building materials and construction, forest products, packaging,metallurgical research and welding techniques, leather and shoe research, fibre research.

VII BUILDING, SOCIAL INFRASTRUCTURE

7.1 BUILDING MATERIALS

Kenya
(1971/1976)

In 1971 a project for the development of the building materials production in developing countries was started, which is carried out jointly by the Netherlands Foundation "Bouwcentrum" and TNO.

The execution of the project was envisaged to take place in three stages:

Stage I, which was reported on in February 1974, included an inventory of problems and opportunities for building materials production in developing countries with special reference to Kenya. A brief survey was made on the available raw materials resources in that country.

Stage II focuses on the synthesis of the various aspects into a plan for the local production of building materials.

Stage III is envisaged to include advice on the implementation of plans for the local production of building materials.

- Netherlands Foundation "Bouwcentrum" (= Building Centre)
- Institute TNO for Building Materials and Building Structures

7.2 HOUSING PROJECT

Kenya
(1971/1975)

In 1971 an agreement was settled between the Kenyan and Netherlands Governments regarding a project in the field of housing, building and physical planning in Kenya. The project was planned to last approx. 5 years; its purpose was threefold:

- to assist in the implementation of Kenya's housing policy;
- to increase the efficiency of the existing units in the field of research and standardization;
- to expand and improve the activities of the Kenyan Building Centre and to promote, in that way, the transmission of knowledge.

TNO was mainly in charge of the research and standardization part of the project. Increase of efficiency is sought to be realized by further strengthening of the units, improving the co-ordination of the units and creating a better link between their activities and the Kenya Government policy. A Netherlands mission visited Kenya to review the follow-up of the project and to advise on successive steps to be taken.

- Institute TNO for Building Materials and Building Structures
- Netherlands Foundation "Bouwcentrum" (= Building Centre)
- Netherlands Ministry of Housing.

7.3 LOCATION, OPERATION, SIZE OF FISHING HARBOURS

Ghana

(1971/1972)

Following the recommendations of a 1957 FAO/IBRD identification mission, a Dutch engineering firm, together with TNO experts on processing, economics and finance, made a study on the need for new fishing ports development and expansion works along the Ghanian coast.

On the basis of technical surveys, cost estimates and evaluation of economic consequences, detailed recommendations were made on port and marketing organization, shore facilities, new ports required and extension of an existing port (Phase A). The next step in the project was the preparation of the engineering designs of relevant harbour works, additional field surveys, hydraulic model studies, etc. (Phase B). A study of operational aspects in relation to the financial consequences and feasibility analyses also formed part of the follow-up.

- Institute for Fishery Products TNO
- Bureau for International Projects TNO
- Engineering firm

VIII CO-OPERATION WITH RESEARCH INSTITUTES WITHIN DEVELOPING
COUNTRIES

8.1 DEVELOPMENT OF BAKERY PRODUCTS FROM COMPOSITE FLOURS
Colombia
(1970/1972)

Studies on the use of non-wheat flours for the production of bread and other bakery products have shown that starchy flours from root crops and various cereals combined with high-protein flours from defatted oilseeds constitute a good basis for composite flours to be used as such, or as a diluent of wheat flour. The quality of such composite flours, especially when soya-flour is used as the protein component, may exceed that of common white wheat flour in terms of nutritional protein characteristics.

In 1971, a pilot-plant bakery with a capacity for a daily production of 500 kg bread was established in the Instituto de Investigaciones Tecnológicas (IIT) in Bogotá; it supplied composite-flour bread for a one-year feasibility study, carried out by a TNO-IIT-FAO team of bakery and marketing experts. It was shown that local wheat flour diluted up to a level of 30 % with non-wheat components (rice, maize, soya) could quite well be used for the production of various bread types, as it calls for no more than slight adaptations in the local breadmaking procedures. Market surveys moreover indicated that the diluted-wheat bread was readily accepted by the consumer.

Economic studies were made to explore the implications for Colombia of a large-scale composite flour programme with regard to future availability of suitable raw materials and the costs of supply and processing local raw materials.

- Institute for Cereals, Flour and Bread TNO
- Bureau for International Projects TNO

8.2 PROMOTION OF COMPOSITE FLOURS UTILIZATION

Colombia
(1975/1977)

In the past few years, Colombia has experienced considerable improvements in the industrial development of a food grade, defatted soya-flour product that appears to be suitable for breadmaking. This (see 8.1) development and the waiving of the internal subsidy on wheat, which eliminates the relative price advantage of wheat over other grains, make for a receptive climate that benefits the actual implementation of composite flours in bakery products.

Elements still to be considered are the establishment of quality control regulations plus inspection procedures, and a massive training programme for local bakers. In the first phase of this programme, TNO and the Colombian Institute for Technological research will assist the National Professional Training Service through teacher training, and trouble-shooting activities at bakery level.

- Institute for Cereals, Flour and Bread TNO

8.3 SOYA-BEAN PROTEINS FOR HUMAN CONSUMPTION

Colombia
(1976/1978)

Recognizing the extent and complexity of the problems of nutritional calorie-protein deficiencies in the population, the Colombian authorities have made preparations for a country-wide attack on malnutrition. The new National Food and Nutrition Plan inter alia aims at the industrial production of low-cost food products with high nutritional value, which partly have been developed by the Institute for Technological Research, Bogotá. In collaboration with this Institute, a TNO food technologist and a mechanical engineer will assist in the further development of a great variety of processes and products, based on soya-bean, using relatively simple technologies with a low investment outlay, thus enabling small-scale and decentralized production. Investigations will relate to soy-milk products, including fermentation products, full fat,soy-flour, roasted or cooked soya-beans and soy-enriched maize-cakes.

Important aspects of the investigations will be determination of acceptability of the products on the Colombian market, and an analysis in terms of their economic feasibility.

The project will start with training of the Colombian counterparts in the TNO-units concerned.

- Organization for Nutrition and Food Research TNO
- Central Technical Institute TNO
- Bureau for International Projects TNO

8.4 APPROPRIATE TECHNOLOGY
Colombia
(1973)

A four-man multidisciplinary TNO-team studied the feasibility of a programme for evaluation, selection, adaptation and development of technologies in terms of their suitability. The programme had been submitted by the Institute for Technological Research, Bogotá. During the investigations, selections of specified research projects were made according to criteria regarding the prospects of applying the research to activities of direct socio-economic significance, the local institute's scope of research and the prospects for short-term implementation of the adapted technologies.

The project submitted for further consideration aimed at:

- introduction of new soya-bean-based food with high protein content for human consumption;
- exploitation of Colombia's natural resources, i.e. phosphates and/or fine chemicals;
- production of hydraulic lime for the building industry;
- promotion of transfer of know-how to the country's industry.

- Bureau for International Projects TNO
- Central Technical Institute TNO
- Organization for Nutrition and Food Research TNO
- Institute TNO for Building Materials and Building Structures

8.5 GLASS RESEARCH
Indonesia
(1973/1976)

The glass industry in Indonesia has grown rapidly in recent years; production of container glass, sheet glass and other glass types has increased considerably. Traditional, existing and modern, new industries all need technological support for low-cost production and adequate quality. It appeared feasible to establish a glass research and development department in the Institute of Ceramics, Bandung, because of its environment in terms of technological facilities. The glass section should be able to serve the whole glass industry and the users of this product with R&D and affiliated activities, i.e. technical information, routine tests, analyses and trouble shooting.

A project of technical co-operation and training between the said institute and TNO has been initiated. Short-term visits and supervisory trips, a long-term assignment of a glass expert, fellowships and supply of equipment are currently performed.

- Institute of Applied Physics TNO

8.6 TEXTILE TECHNOLOGY
Indonesia
(1969/1977)

Within the framework of bilateral co-operation between the Indonesian and Netherlands Governments and in view of the need for technological support of the rapidly growing Indonesian textile industry, intensive contacts have been established in recent years between the Institute for Textile Technology (ITT), Bandung, and TNO. Technical assistance has been given through mutual visits, exchange of experts, including supply of equipment, scientific literature and training.

Further upgrading of ITT to an adequate level for proper consultation of textile mills will be of the utmost importance to promote efficiency of processing, reduce production costs and improve product quality. A more intensive co-operation between the two institutes will now be implemented through fellowships, and supervising assistance in R&D, and testing services by a TNO-expert during the next few years.

- Fibre Research Institute TNO

8.7 ORGANIZATION OF RESEARCH UNIT
Turkey
(1973)

With reference to problems in their materials research unit, a Turkish industrial research institute requested TNO to send a trouble-shooting expert. Upon arrival he soon found that, apart from the unit's installation problems and growing pains, management and organizational factors threatened to become considerable drawbacks in the smooth running of the institute.

Advice has meanwhile been given regarding project management, accounting systems, cost price calculation programming and budgeting. Follow-up was planned to be met through traineeships, special consultancies, managerial topics and organization of information processing.

- Industrial Liaison Department TNO

8.8 TRANSFER OF TECHNOLOGY
Yugoslavia
(1976/..)

Within the framework of the bilateral co-operation between Yugoslavia and the Netherlands, discussions took place regarding possible assistance concerning the mandate given to Yugoslavia at the conference of non-aligned countries held in Algiers, 1974, as a co-ordinator, together with Algeria, for mutual co-operation in the field of science and technology between the non-aligned countries. As a result, a TNO-expert visited a metallurgical institute in Yugoslavia in order to investigate the possibilities of establishing a tripartite co-operation on the transfer of foundry technology among , at first instance, Yugoslavia, the Philippines and the Netherlands. Formulation of a plan of activities, with regard to specific aspects of the Yugoslavian mandate, is currently undertaken.

- Metal Research Institute TNO
- Bureau for International Projects TNO

8.9 TECHNICAL INFORMATION SERVICES
Netherlands
(since 1971)

UNIDO's Special Industries Service, operated to the benefit of developing countries, involves the furnishing of pertinent factual information with regard to industrial questions and problems. Within this framework, TNO acts as an information network correspondent and provides economic technical information on manufacturing industries in all sectors.

- Bureau for International Projects TNO

INDEXES

KEYWORD INDEX

<u>project no.</u>		<u>country</u>	<u>page</u>	
3.3	agriculture	agro-industry	Nigeria	7
3.4		agro-industry	Nigeria	8
3.8		rameh	general	9
4.10		equipment	Togo	16
6.2	automation (low cost)		Mexico	21
6.3			Philippines	22
8.1	bread		Colombia	27
8.2			Colombia	28
1.1	building materials		Tanzania	1
1.2			Uganda	1
6.8			general	24
7.1			Kenya	25
7.2			Kenya	25
4.11	ceramics		Curaçao	16
8.5			Indonesia	29
4.3	cereals		Cuba	13
6.8			general	24
4.11	clay products		Curaçao	16
1.3	coffee		Uganda	2
3.4	composite flours		Nigeria	8
8.1			Colombia	27
8.2			Colombia	28
4.12/13	cotton		general	17
2.1	energy		general	3
6.8	fellowships		general	24
1.1	fibres	sisal	Tanzania	1
3.8		rameh	general	9
4.4		jute	India	13
4.12/13		cotton	general	17
3.5	fish	processing	Tanzania	8
3.6		processing	Uganda	9
3.7		development	Yemen	9
3.9		protein concentrate	general	10
6.6		preservation course	general	23
6.8		fellowships	general	24
7.3		harbours	Ghana	26
1.3	food	coffee	Uganda	2
3.1		meat	Chile	7
3.2		meat	Indonesia	7
3.3		oils	Nigeria	7
3.4		composite flours	Nigeria	8

<u>project no.</u>		<u>country</u>	<u>page</u>	
3.5	food	fish	Tanzania	8
3.6		fish	Uganda	9
3.7		fish	Yemen	9
3.9		f.p.c.(fish protein concentrate)	general	10
4.2		infant food	Cuba	12
4.3		cereals	Cuba	13
4.6		processing	Indonesia	14
5.3		nutrition	Kenya	18
5.4		quality control	Saudi Arabia	19
5.6		nutrition	Thailand	20
6.5		inspection course	general	23
6.6		fish	general	23
6.8		fellowships	general	24
7.3		fish	Ghana	26
8.1		composite flours	Colombia	27
8.3		soya-bean proteins	Colombia	28
4.1	foundry technology		Bangladesh	11
8.8			Yugoslavia	31
2.2	geophysical/-hydrological surveys		Colombia	3
2.3			Colombia	3
2.4			Colombia	4
2.5			Colombia	4
2.6			India	4
2.7			Irak	5
2.8			Mauretania	5
2.9			Sudan	5
2.10			Tanzania	6
6.8			general	24
1.2	glass		Uganda	1
8.5			Indonesia	29
5.1	health		Indonesia	18
5.2			Kenya	18
5.3			Kenya	18
5.5			Surinam	19
5.6			Thailand	20
5.7			general	20
7.2	housing		Kenya	25
8.9	information services		general	31
4.4	jute		India	13
4.8	leather substitute		Romania	15
6.8			general	24
6.4	management		general	22
3.1	meat		Chile	7
3.2			Indonesia	7

<u>project no.</u>		<u>country</u>	<u>page</u>
4.1	metals	Bangladesh	11
6.8		general	24
4.1	nodular cast iron	Bangladesh	11
6.8		general	24
3.4	nutrition	Nigeria	8
4.2		Cuba	12
5.1		Indonesia	18
5.2		Kenya	18
5.3		Kenya	18
5.6		Thailand	20
6.8		general	24
8.3		Colombia	28
4.9	packaging	South East Asia	15
6.7		general	24
6.8		general	24
4.7	paint and varnish	Indonesia	15
1.1	plastics	Tanzania	1
4.8		Romania	15
6.8		general	24
6.1	product adaptation	Lebanon	21
4.7	quality control	Indonesia	15
5.4		Saudi Arabia	19
3.8	rameh	general	9
2.2	research co-operation	Colombia	3
3.4		Nigeria	8
4.4		India	13
8.1		Colombia	27
8.2		Colombia	28
8.3		Colombia	28
8.5		Indonesia	29
8.6		Indonesia	30
8.8		Yugoslavia	31
2.11	rivercraft	Bangladesh	6
4.5	shoe lasts	India	14
1.1	sisal	Tanzania	1
3.1	slaughterhouse	Chile	7
3.2		Indonesia	7
3.10		Indonesia	10
4.10	small-scale industry	Togo	16
6.3		Philippines	22
3.3	soya-bean products	Nigeria	7
8.3		Colombia	28

<u>project no.</u>		<u>country</u>	<u>date</u>
1.1	synthetics	Tanzania	1
4.8		Romania	15
6.4	technology transfer	general	22
6.5		general	23
6.6		general	23
8.7		Turkey	30
8.8		Yugoslavia	31
8.6	textiles	Indonesia	30
4.12/13		general	17
6.1	training	Lebanon	21
6.2		Mexico	21
6.4		general	22
6.5		general	23
6.6		general	23
6.7		general	24
6.8		general	24
8.2		Colombia	28
8.3		Colombia	28
5.7	tuberculosis	general	20
3.8	twistless spinning technology	general	9
4.4		India	13
2.2	water	Colombia	3
2.3		Colombia	3
2.4		Colombia	4
2.5		Colombia	4
2.6		India	4
2.7		Irak	5
2.8		Mauretania	5
2.9		Sudan	5
2.10		Tanzania	6
2.1	wind energy	general	3
4.10	wood	Togo	16

COUNTRY-WISE INDEX

<u>project no.</u>	<u>country</u>	<u>project title</u>	<u>page</u>
2.11	Bangladesh	Rivercraft design and inspection	16
4.1		Ductile nodular cast iron	11
3.1	Chile	Storage and processing of meat	7
2.2	Colombia	Groundwater reconnaissance study Guajira	3
2.3		Groundwater appraisal study Guajira	3
2.4		Groundwater survey	4
2.5		Inventory of groundwater resources	4
8.1		Development bakery products from composite flours	27
8.2		Promotion of composite flours utilization	28
8.3		Soya-bean proteins for human consumption	28
4.2	Cuba	Infant food pilot plant and nutritional laboratory	12
4.3		Cereal pilot plant	13
4.11	Curaçao	Clay products manufacturing unit	16
7.3	Ghana	Location, operation, size of fishing harbours	26
2.6	India	Geo-electrical survey	4
4.4		Twistless jute spinning	13
4.5		Shoe lasts	14
3.2	Indonesia	Slaughterhouse	7
3.10		Slaughterhouse	10
4.6		Food processing research and development	14
4.7		Paint and Varnish Institute	15
5.1		Nutrition research	18
8.5		Glass research	29
8.6		Textile technology	30
2.7	Irak	Groundwater survey	5
5.2	Kenya	Nutrition survey	18
5.3		Lactose intolerance	18
7.1		Building materials	25
7.2		Housing project	25
6.1	Lebanon	Consultation workshop on product adaptation and development	21
2.8	Mauretania	Groundwater survey	5

<u>project no.</u>	<u>country</u>	<u>project title</u>	<u>page</u>
6.2	Mexico	Training course on industrial automation	21
3.3	Nigeria	Feasibility studies agro-allied sectors	7
3.4		Research unit for cereal technology and composite flours	8
6.3	Philippines	Low-cost automation	22
8.8		Transfer of technology	31
4.8	Romania	Leather substitutes	15
5.4	Saudi Arabia	Food-quality control	19
4.9	South East Asia	Packaging Industry	15
2.9	Sudan	Groundwater investigation	5
5.5	Surinam	Lactose intolerance	19
1.1	Tanzania	Sisal-reinforced polyester sheets	1
2.10		Water supply survey	6
3.5		Experimental fish processing	8
5.6	Thailand	Nutrition and public health	20
4.10	Togo	Promotion of small and medium-scale enterprises	15
8.7	Turkey	Organization of research unit	30
1.2	Uganda	Sheet glass production	1
1.3		Instant coffee plant	2
3.6		Fish processing plant	9
3.7	Yemen	Fisheries development	9
8.8	Yugoslavia	Transfer of technology	31
2.1	General	Wind energy utilization	3
3.8		Rameh fibre research	9
3.9		Fish protein concentrate	10
4.12		Open-end spinning of cotton	17
4.13		Easy-care finishing of cotton	17
5.7		Tuberculosis surveillance	20
6.4		International research management course	22
6.5		Food inspection course	23
6.6		Course on fish preservation	23
6.7		International workshops on packaging development and packaging technology	24
6.8		Fellowships, training	24
8.9		Technical information services	31