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

Central Organization for Applied Scientific Research in the Netherlands

TNO
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5 YEARS OF TECHNICAL ASSISTANCE
IN AFRICA, ASIA AND LATIN AMERICA
1975 - 1980



Central Organization for Applied Scientific Research In The Netherlands

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The Hague, December 1980

Subject: *INTRODUCTION*

This is the third successive edition of " 5 Years ".

In the last ten years, TNO has initiated 180 projects. Approximately 50 %, thus 90 projects, have been completed. A number of those projects needed extension after an average lifetime of three years. We only consider this type of cooperative arrangements successful, if the achievement in terms of efforts of our counterparts in developing countries, and input of the Netherlands, has been implemented. Fortunately, that has happened quite frequently.

The present booklet serves to illustrate what can be reached through international cooperation, i.e. with the help of careful planning, progress control and dedication to a proper follow-up.

It is hoped that this record of completed work is a stimulus for new tasks in the 1981 - 1990 decade.

BUREAU FOR INTERNATIONAL PROJECTS TNO

J.C. Gerritsen
(Drs. J.C. Gerritsen)
Director

TNO, the NETHERLANDS ORGANIZATION FOR APPLIED SCIENTIFIC RESEARCH is the semi-official, non-profit research organization in fields of manufacturing industry, nutrition, food, defence and health, primarily aiming at solving needs of the Netherlands community.

Due to its long history and its wide variety of research facilities in 40 Institutes and a manpower of 5,000 people, all relevant knowledge and experience is available for small-scale and large-scale operations covering the whole range of simple, appropriate and sophisticated technologies.

The TNO Institutes and other consultants involved in the execution of the projects referred are specified.

A KEYWORD INDEX and a COUNTRY-WISE INDEX are added to facilitate data retrieval.

Anyone, interested in a survey of all TNO Institutes and a description of their capabilities and equipment, is invited to read

"Survey of TNO Research Facilities"

This booklet is available upon request.

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*) according to DAC's classification, except for VIII.
 (DAC = Development Assistance Committee of the OECD, Paris)

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Economic planning, statistics,
pre-investment studies

1.1 FISHERY DEVELOPMENT PROVIDENCIA
Colombia
(1979)

The archipelago of (San Andres and) Providencia lies not far from the coast of Nicaragua, but belongs to Colombia. Its rich fishing grounds and the natural abilities of the highly skilled fishermen of Providencia formed one of the starting points of the programme of the island's development ; it was set up by the pertinent Colombian administrative Department for this region.

A TNO economist and an outside fishery technologist made an appraisal of the developmental aspects and viability of the fishery development plan, which included a fish receiving station. The mission concluded that, though there was sufficient scope for the development of the sector in the archipelago, the actual plans contained major economic and technical imperfections.

Furthermore, the plans envisaged too sudden a change-over from the prevailing fishing methods, based on craftsmanship, to more modern fishing techniques. More important still was the fact that the low degree of organization of the fishermen in Providencia greatly impeded their effective participation in the benefit of the programme.

An alternative approach to the development of the fisheries in the region has been advised ; it could largely be implemented by the local authorities, without considerable initial investments.

- Bureau for International Projects, TNO
- Private Consultant

1.2 SMALL-SCALE AND COTTAGE INDUSTRIES
India
(1979/1984)

Two TNO-experts were sent to India for an appraisal mission of a small-scale industries project, for which a loan proposal was brought forward regarding the development of industrial plots and the construction of sheds for small-scale and cottage industries in Karnataka State. The Government of Karnataka had proposed to utilize external assistance for the development of the hand looms sector, handicrafts, khadi and village industries, leather industries, sericulture and other small-scale industries.

Advice was given concerning the conditions to be met in order that the establishment of industrial plots, and the construction of sheds, would provide an effective instrument for the further development of rural cottage and small-scale industries.

One of the experts has been requested to assist in finalizing the project's preparation at Karnataka and to prepare project documents, aiding the arrangements for monitoring and evaluation of the project, and to join the evaluation team for the scheduled evaluation exercises in the years to come.

- Bureau for International Projects, TNO

1.3 FEASIBILITY STUDIES AGRO-ALLIED SECTORS

Nigeria
(1975-1977)

In the context of an extensive development programme of Nigeria's East Central State, TNO's food technologists provided expert advice as to collaboration aspects of production, processing and storage of various cereals, rootcrops, treecrops and their byproducts 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

1.4 COIR HARDBOARD FACTORY

Sri Lanka
(1979)

In view of the importance attached by the Sri Lanka Government to increased house-building activities in that country, the establishment of a hardboard factory, possibly using coconut fibres (i.e. coir) as a raw material instead of wood, which is getting increasingly scarce, was considered to be highly instrumental in reaching house-building targets on a medium-long term.

A team consisting of experts from both TNO and the Building Centre, Rotterdam, was appointed by the Dutch Government to investigate the prefeasibility of an envisaged hardboard plant. The study team extensively reported on raw materials availability, market size, investments required for a 6,000 tpa hardboard factory and its profitability, aspects of location and environment, and balance of payments and employment effects.

It was recommended to proceed with the pertinent plans and to elaborate the establishment of a hardboard factory, using wood as a raw material, gradually replacing it by coir fibre after the introduction stage of the plant's operation in order to enable simultaneous extension of the necessary processing capacity of coconut fibre.

- Bureau for International Projects, TNO
- Netherlands Foundation "Bouwcentrum" (= Building Centre)

1.5 CASHEW APPLE JUICE PLANT

Tanzania
(1977/)

Vast reserves of hardly used cashew apples, and a new production process for carbonated cashew juice developed by TNO, induced the Tanzanian Government to make application for a technical assistance project aiming at the production of cashew juice. For that purpose, a laboratory-scale production unit was established in the cashew growing region in the South of Tanzania. Some 25,000 bottles of cashew juice were produced during the harvest season (Oct/Nov) of 1977, and distributed in six different cities at 41 distribution points. The test-marketing programme thus performed lasted about four months ; it comprised, next to taste panel tests, a consumer survey with a sample size of 545 consumers, and a price-perception analysis. On the basis of the results of this study, indicating a readily available market for cashew juice, it was recommended to perform a techno-economic feasibility study to determine the optimum capacity, investments required and make social cost-benefit analysis of a commercial production unit. The feasibility study has correspondingly been made in co-operation with the Netherlands Economic Institute ; it reveals that such a factory can be operated profitably if its capacity is used for the production of certain soft-drinks during the off-season of cashew-apples.

- Central Institute for Nutrition and Food Research, TNO
- Bureau for International Projects, TNO
- Netherlands Economic Institute
- Private engineering consultants firm

II

Energy and water supply, communication, transport

2.1 WIND ENERGY UTILIZATION

General
(1975/1977)

Research was carried out to investigate certain opportunities for the application of 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 aimed at an evaluation of wind energy applications (e.g. pumps, generators, etc) and the development and testing of prototypes.

- Institute for Mechanical Constructions, TNO
- University of Technology, Netherlands
- Private consultants firm

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 the training of Colombian counterparts in the application of geophysical methods, use, maintenance and repair of geophysical equipment, such with a view to found 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 covers 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 STUDIES INGEOMINAS
Colombia
(1976-1981)

In some of the neighbourhoods of the border town of Cúcuta (pop. 300,000), water is only available one hour a week. In view of the extremely high costs of treating and supplying water from a far-away river, it was decided to investigate the groundwater potential in the pertinent district. Activities also included a detailed evaluation of the optimal use of the currently tapped river. Complex geological conditions call for a solution in order to improve drilling performance. Some hundred kilometers to the north of Bogotá, many villages on the mountainous border of the cattle grazing valley of Ubaté and Chiquinquirá have no adequate drinking water supply. Operating costs and technical skills, necessary to use water from the intermittent streams, led to this groundwater investigation. While studying the regional aquifer potential, some 15 wells have been drilled for drinking water purposes. The study under 2.2 demonstrated the existence of fresh water at larger depth in the Guajira peninsula. Within this project about 30 wells were drilled to make the resources available to the area's Indian population and to evaluate local quantity, quality and aquifer properties. In these studies TNO-experts on hydrogeology, geophysics, hydrology, drilling and electronics co-operated with Colombia's National Institute for Geology and Mining (INGEOMINAS). The aim was to reinforce the hydrogeology section through practical experience in these projects, short courses in Colombia and fellowships in Europe.

- Groundwater Survey, TNO

2.4 GROUNDWATER SURVEY
Colombia
(1974/1975)

The population growth and a consequential rising need for agricultural produce make for a growing demand for water that is 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 integrated 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 an almost complete lack of (drinking) water. Colombia's National Municipal Water Supply Institute chose 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 were assigned to this project to assist the Institute in the execution of the survey and in the training of its staff.

- Groundwater Survey, TNO

2.6 GROUNDWATER STUDY CALL

Colombia
(1980-1982)

In close collaboration between Colombia's National Municipal Water Supply Institute (INSFOPAL) and TNO, a programme has been formulated for technical co-operation during 1980 - 1982. Its objectives are:

- strenghtening the capabilities of the Geohydrology Division in practical groundwater exploration;
- evaluation of the groundwater potential;
- construction of wells.

This regions of investigations are situated in the Cesar Valley, the Atlantico District and the Llanos Orientales.

Several TNO-experts (60 manmonths), including a geohydrologist, a geophysicist, a drilling superintendant and an electronic engineer have been assigned to this project to assit the Institute in the execution of the survey and in the training of its staff.

- Groundwater Survey, TNO

2.7 GROUNDWATER

Guinee-Bissau
(1979)

TNO assisted in a rural water supply project in Guinee-Bissau through the execution of a geophysical survey on the alluvial valley fill near Bafata, in order to investigate the application of new water sources for that city. The same was done on the eastern part of the isle of Bolama, including quality aspects related to the intrusion of salt water in the aquifers, as well as in the regions Buba and Tombali. The measurements in the Tombali region were also carried out to evaluate possibilities for application of the geo-electrical method in these regions.

- Groundwater Survey, TNO

2.8 GROUNDWATER SURVEY
Iraq
(1973/1975)

Several experts were 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

2.9 GROUNDWATER
Jamaica
(1979/1980)

Within the framework of an artificial recharge pilot project with an estimated capacity of 25 million liters of water per day, the effect of recharge on groundwater storage and quality is studied by means of geophysical techniques, e.g. geophysical well logging and use of special instruments for groundwater salinity inspection and surface measurements.

For three months, a TNO-geophysicist trained Jamaican hydrologists in geophysical well logging and in the evaluation of the logs. A TNO geophysical engineer trained Jamaican technicians in the use and maintenance of geophysical well logging instruments, previously acquired by the Jamaican Water Resources Division. During this period, a series of geo-electrical measurements were carried out in order to assess the applicability of the geo-electrical method under the given circumstances. Approximately one year after the training period, a short visit of two weeks to Jamaica is envisaged to ensure a proper continuation.

- Groundwater Survey, TNO

2.10 WATER RESOURCES IN ARID AND SEMI-ARID LANDS
Kenya
(1980/1985)

Kenya's basic development goal for the water sector is "Bringing to the entire population the benefits of safe water supply to their requirements for domestic and livestock consumption", with particular emphasis on the arid and semi-arid lands. Three pilot areas have been selected, viz Ndeiya/Karai, Elgeyo Marakwet and West Pokot. The Kenyan counterpart, i.e. the Water Resources Department, is assigned with extensive inventory/data processing and preliminary evaluations. The Dutch contribution includes training in the geo-electrical method, expert services for field work (including drilling), processing, analysis and evaluation and the procurement of equipment.

- Groundwater Survey, TNO

2.11 GROUNDWATER SURVEY

Pakistan
(1980/1982)

The groundwater investigations in the North West Frontier Province of Pakistan cover: an inventory of existing tubewells and hand dug wells, waterlevel observations in a network of selected wells, water quality surveys, geological studies including the determination of general geology of the project areas with particular reference to groundwater resources conditions. Geophysical reconnaissance surveys will be made to provide data regarding the lithostratigraphy and the total salt content of the groundwater down to depths of 600 - 1200 ft. The total number of geo-electrical soundings to be performed is approximately 1,400. Some 50 test holes will be drilled; geophysical logs will be run in all test holes drilled. Promising holes will be converted to production wells, the others to observation wells. Furthermore will be performed a topographic survey, the collection of hydrometeorological data, and pumping tests. Total duration of the project will be approximately 3 years. The TNO team consists of two geohydrologists, two geophysicists and a drilling supervisor.

- Groundwater Survey, TNO

2.12 GROUNDWATER INVESTIGATION

Sudan
(1976/1978)

Although the urgency to establish drinking water supplies can be considered high for many of the country's areas, two have been given priority : the Gedaref and El Jebelein areas. In each, an intensive field investigation including training (55 manmonths) and equipment (US \$ 150,000) is required. 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 through the drilling of production wells. Based on the current knowledge about these regions, the following methods of investigations are planned:

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

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

- Groundwater Survey, TNO

2.13 WATER RESOURCES ASSESSMENT OF ALLUVIAL BASINS

Sudan

(1979-1984)

In August 1979, a second cooperation programme started with the National Administration for Water aiming at the following objectives:

- assessment of water resources in the Gash Basin (pilot area) and other alluvial basins ;
- strengthening the National Administration for Water by training its professionals in assessment studies ;
- the promotion of the institution of regional water authorities in alluvial basins.

The TNO team (126 manmonths) comprises a geohydrologist, a hydrologist, a drilling supervisor and a technician.

These linkage programmes are carried out within the framework of the Netherlands bilateral aid programme. The total budget involved amounts to US \$ 10,000,000. The input of TNO's Groundwater Survey for these projects is about 45 manyears.

- Groundwater Survey, TNO

2.14 SOLAR ENERGY UTILIZATION

Sudan

(1978/1983)

Former investigations into the application of solar energy, especially in LDCs, revealed that a project aiming at the development of a solar driven refrigerating system could be very useful ; especially if solar radiation is relatively high, which is the case in Sudan. Solar radiation needs no infrastructure for energy transport and is "available" in large quantities in the arid zones. Within the framework of the project, a sunpowered cold store is being designed with a useful space of 50 m³ and a storage capacity of 15 to 30 tons at a temperature of 4° to 8° C. The store is designed in such a way that it is possible for local people to operate and maintain it. Key figures about climate and radiation, kind of materials to be stored, duration of storage and optimum use of storage capacity are being collected under the project. Total duration of the project will be five years, 16.5 man-years for Dutch experts and 21.5 man-years for Sudanese experts being involved.

- Institute of Applied Physics, TNO-TH
- Firm of Private Consulting Engineers
- University of Technology, Delft

2.15 BIOGAS PRODUCTION

Guinee Bissau

(1980/)

At the request of the Government of Guinee Bissau, a TNO expert carried out a feasibility study on the production of biogas in Bissau and on the island of Boloma. As a result, detailed plans for the installation of two experimental biogas units were submitted to and currently evaluated by the authorities in Guinee Bissau.

The two biogas units should produce gas for cooking and lighting; they should also be used for the instruction of the working group "New energy sources" of the "Instituto Nacional de Energia".

- Central Institute for Nutrition and Food Research, TNO

III

Agriculture, fishery, cattle breeding, irrigation

3.1 FISHERIES DEVELOPMENT
Cape Verde
(1978)

Experts of TNO and the Netherlands Institute for Fishery Research were assigned to investigate the pre-feasibility of a fishery project on the isle of Santo Antão . The mission thoroughly studied the present situation of small-scale fishery activities by the local population ; also in view of the stock of fish which could be endangered, should fishing intensity be increased too extensively. Data were collected on the total capacity of the fishery sector at the isle in terms of manpower, fishing boats, types and quantities of fish landed, etc. It was found that an increase of fishing activity is feasible only if outlets for fish in the processing industries, especially for export, can be traced. Advice has been given about a set of measures and incentives to enable both the artisan fisherman and fish processing industry to increase their production and, consequently, the income resulting from these activities. The feasibility of the project is found to be highly dependent on the implementability of the said measures and incentives for increased cooperation.

- Institute for Fishery Products, TNO
- Netherlands Institute for Fishery Research

3.2 FISH PROCESSING
Kenya
(1978)

A TNO-expert in handling and processing of fish was made available during two months for a technical assistance project related to the operation of a new fishing vessel.

After a four-months training period of the Kenyan counterparts at TNO's Institute for Fishery Products, the fishery expert assisted on the spot in the transfer of know how and the development of other appropriate methods for the processing, packing and freezing of different kinds of fish.

- Institute for Fishery Products, TNO

3.3 FISHERY DEVELOPMENT

Laos

(1977/1978)

In order to obtain data on the local situation, present stocks of fish, potential catches, organization of fish catching and its commercialization and the relationships between production and consumption within the socio-economic structure of the country, the Dutch Government invited some experts, among which one of TNO's fisheries experts, to study a project proposal for the development of fishery in the Nam Ngum Lake, Southern Laos. During a three-weeks mission, most of the information could be collected and advice was given about the desirability of Dutch technical and financial aid to this project.

In 1980 an evaluation mission visited the Nam Ngum Lake project in order to inform the Netherlands Government on the progress made, and as to the desirability of further financial support.

- Institute of Fishery Products, TNO
- International Agricultural Centre
- University of Leuven, Belgium

3.4 COLD STORAGE UNITS

Mozambique

(1977,1979)

The fishery sector in Mozambique derives its significance from the ability to earn foreign exchange through export of shrimps, and from the provision of protein-rich food for the population.

Taking both aspects into account, the Mozambique Government set up a project including four large and eight minor cold storage units.

The large cold storage units in the major cities create facilities for an increased and more efficient handling and for better processing of the shrimps. The small cold stores will improve the handling and distribution of fish, following an envisaged increased input of the industrial and traditional marine fisheries.

TNO investigated the project in its relation to the national plan and to the integral physical distribution chain. Technical, economic and organizational aspects were considered, as well as problems related to the training of personnel. The progress of the project was reviewed two years after its start, and recommendations were made as to the technical completion of the project and the organizational measures required for the adequate functioning of the installations within the context of the Mozambican fishery activities.

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

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

The Department of Food Science and Technology (DFST) of the University of Ife established a research unit for the incorporation of local agricultural products in bread. In close collaboration with DFST, a TNO cereal technologist 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, 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

3.6 INSULATION OF COLD STORE
Peru
(1979)

During the construction of a cold store for a large fish storage and handling centre at Las Puntillas, problems arose regarding the quality of locally produced insulation materials. TNO fielded a troubleshooting mission which advised on alternative specifications of the insulation materials, and on related problems such as adhesives, mechanical fixing components, interior finish and the installation of the insulation works.

- Institute for Fishery Products, TNO

3.7 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 were next carried out with several methods of fish preservation to adapt these to local situations. The station's programme of work include exploration of fishing grounds, investigations on the types of fish considered to be of commercial value, taking into account local climatic 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, adaption 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 was available for support of the largely Tanzanian staff, during this period.

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

3.8 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 currently used methods ; they are based on extraction by means of highly inflammable organic solvents. They call for highly skilled technicians and advanced equipment and, consequently, are less suitable for developing countries. The new production method was tested at TNO's Institute for Fishery Products, which also investigated the applicability of the products obtained.

- Private engineering consultants firm
- Institute for Fishery Products, TNO

3.9 RAMEH FIBRE RESEARCH

General
(1976)

Rameh is a well-known natural fibre grown in a number of developing countries and, up to now, processed mainly in industrialized countries. New developments in spinning techniques especially seem to be of great interest for rameh and its local processing possibilities. TNO's Fibre Research Institute developed a twistless spinning process for flax which seems also applicable to rameh due to comparable properties of the flax and rameh fibres. This has been investigated ; 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

IV
Industry

4.1 PACKAGING TECHNOLOGY

Argentina
(1976)

At the request of UNIDO, a packaging expert of TNO's Institute for Packaging Research was sent to Argentina for a six weeks mission. Advice was given concerning the creation of a packaging laboratory within Argentina's National Institute of Industrial Technology (INTI).

A training programme was started in situ by the presentation of a one-week course for local engineers about production and design of fibreboard packaging for fruits and vegetables.

- Institute for Packaging Research, TNO

4.2 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 of TNO's metal experts and a TNO-economist 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 the 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 included the training of local staff, the 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 was sent to Bangladesh early 1977.

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

4.3 PROGRAMME FOR THE DEVELOPMENT OF AGRO-INDUSTRY

Costa Rica
(1977)

The share of agro-industries in Costa Rica in total industrial production and total value added in industry amounts to approx. 65%. Major bottlenecks for its further expansion lie in a lack of regular supply of primary products, ineffective marketing systems, a skewed regional distribution of agro-industrial activities and overorganized bureaucratic intervention by (semi)governmental institutions.

TNO participated in the design of the programme for the further development of the country's agro-industry. This programme was set up as a combination of sector-oriented projects (starting in the fields of fruits, vegetables and potatoes) together with a functional problem-solving approach (including cooperative problems, marketing, technological aspects, financial and economic analyses).

- Bureau for International Projects, TNO

4.4 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 the 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 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 such improved and diversified infant food production. Therefore, the establishment has been considered of a department for infant food within the Instituto de Investigaciones para la Industria Alimenticia (IIIA).

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, as well as expert advice and training facilities regarding the future research activities.

- Central Institute for Nutrition and Food Research, TNO

4.5 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 improvement of the nutritional value of products. The production units in the cereals industry are widely dispersed, their capacities limited and their production procedures traditional. Thusfar sufficient technological know how has not been developed, though this is essential for the modernization of equipment and for the education and training of qualified personnel ; they should be able to handle new production techniques.

The establishment is considered of a new institute for development of the cereals industry ; this institute is to 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

4.6 WHEAT FLOURS PROCESSING

Guatemala
(1977)

At the request of the Instituto Centro Americano de Investigacion y Tecnologia Industrial (ICAITI), a TNO expert was asked to provide advice on possibilities to establish a section for wheat research at ICAITI, including a task description of such a section and an estimate of its requirements in terms of manpower and equipment.

The request was made in view of the increasing consumption of bread in Central America. The wheat thus additionally required may be imported or obtained by means of an increased local production. The latter means, however, requires the local wheat to meet certain minimum quality requirements. The envisaged section for wheat research at ICAITI should assist in determining and improving the quality of local wheat through the provision of know how, both to wheat farmers and processing industries. It could furthermore assist in the development and application of composite flours. The advisory report offered clear-cut answers to the aspects just mentioned.

- Institute for Cereals, Flour and Bread, TNO

4.7 FRUIT JUICES PLANT
Guinee-Bissau
(1978/)

A few years ago, TNO was asked to redesign the production processes for fruit juices and jams of a fruit processing plant in Guinee-Bissau, because of both production and marketing problems with the products made so far.

A new process for the production of carbonated cashew juice was set on stream, while acceptability and marketing tests were performed with both the cashew juice thus produced and various types of jams. Export marketing possibilities were identified in four West-African countries.

TNO has been requested to extend its technical and managerial assistance over the years to come, especially during harvesting season. In the next few years, production will be gradually increased to cover both domestic and foreign market needs.

The revitalization of the fruit juices and jams plant has greatly enhanced the cultivation and profitable use of fruits in the pertinent region of Guinee-Bissau, thus leading to increased employment and income in the rural areas concerned.

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

4.8 PACKAGING DESIGN
Hong Kong
(1975)

ESCAP and UNCTAD were the main sponsors of a two-week seminar on "Packaging Design for International Markets", organized in Hong Kong with the aim to provide contributions to the promotion of exports from ESCAP Member countries.

TNO experts acted as consultants and provided a large part of the information needed on such subjects : importance of improved export packaging for international markets ; basic principles of packaging design, from technical and promotional points of view ; adaption of export packaging to target market needs ; in-depth analysis of promotional package design at present used for selected commodity ; institutional and other measures for better export packaging design.

Exchange of experience among the seminar participants was stimulated in various other fields.

- Packaging Research Institute, TNO

4.9 TWISTLESS SPINNING OF JUTE
India and Bangladesh
(1976/1983)

Processing of jute fibre is of great importance to India and to its neighbour, Bangladesh. The competition from synthetics, however, is very keen in certain fields of application. Applied research is needed to overcome disadvantages of jute applications, as regards price and quality. 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. Cooperation is established with an Indian and a Bangladesh Research Institute. The aim is to investigate the application of twistless spinning process. Because of differences in requirements, applications and established operational practices, however, the methods to be used will differ for the two inherent situations. The ultimate aim is to retain, or even improve, the position of jute and its applications on the world market vis-a-vis synthetics.

- Fibre Research Institute, TNO
- Bureau for International Projects, TNO

4.10 SHOE LAST PRODUCTION
India
(1976)

A TNO expert studied the performance of a precision shoe lasts factory and suggested 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 were assessed for the appropriate seasoning of wooden blocks used in the manufacture of shoe lasts. The duration of the assignment was three months.

- Institute for Leather and Shoe Research, TNO

4.11 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 was 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" was drafted.

- Central Institute for Nutrition and Food Research, TNO

4.12 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, 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

4.13 NODULAR CAST IRON
Philippines
(1978/1981)

Under a tripartite cooperation programme between Yugoslavia, the Netherlands and Philippines, a project is executed that aims at the production of nodular cast iron through application of the T-Nock and Vortex process. The project started with a techno-economic feasibility study in order to assess the suitability of local foundries for these processes and the demand for nodular castings. After the positive results of this study, and an analysis of the suitability of the locally available raw materials, the project continued with the training of three stagiaires of the Philippines and the implementation of these processes in the Metals Industry Research and Development Center (MIRDC), Manila, which is assigned with transfer of these technologies to local foundry industries. Next, a second training period in the Netherlands and Yugoslavia is to be held in the second half of 1980.

The know how and technology transferred under this project greatly contributes to the state of the art in local Philippines foundries, while reducing import needs for both traditional and steel castings.

- Metal Research Institute, TNO
- Bureau for International Products, TNO
- Yugoslavian foundry experts

4.14 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. The programme comprised a number of visits to factories, showing that advanced technologies were almost invariably adapted to local conditions.

- Institute for Packaging Research, TNO

4.15 PACKAGING INDUSTRY

Sri Lanka
(1977/1978)

A TNO expert studied and recommended measures to ensure that the packaging sector in Sri Lanka receives the attention and services vitally necessary for its rapid development ; e.g. promotion of packaging knowledge, proper co-ordination, provision of adequate design and testing facilities, etc.

These recommendations were based upon the identification of the problems faced direct by users (especially exporters) of packaging materials, containers and ancillary materials and the problems faced by the existing local manufacturers of packaging materials, containers and the like. Inherently, much attention was paid to the tea-packaging problem in Sri Lanka.

It was ultimately recommended to make better use of the readily available results of research carried out elsewhere through the formation of a small packaging department in the Central Institute of Scientific and Industrial Research (CISIR), Colombo, rather than establish a specialized Packaging Centre equipped to carry out testing and development work and, also, packaging research, for the time being.

- Institute TNO for Packaging Research

4.16 PRESERVATION OF WOOD AND BAMBOO

Vietnam
(1977/)

In the reconstruction activities of the Socialist Republic of Vietnam, wood and bamboo play an important role for the construction of houses and utility buildings and also, for example, as railway-sleepers and in marine structures.

To obtain a longer service life of such building materials, preservation is indispensable along with an improvement of timber construction methods.

A TNO identification mission recommended to set up a project with the following components:

- (1) a laboratory for research on wood preservation and wood destroying organisms ;
- (2) a multi-purpose wood preservation plant ;
- (3) training of Vietnamese specialists, and
- (4) technical assistance during construction, setting up and commissioning of laboratory and plant equipment.

A positive decision was taken regarding the execution of the project, but the pertinent start has not yet been agreed upon.

- Forest Products Research Institute, TNO

4.17 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 TNO's Central Technical Institute 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

V
Health

5.1 NUTRITION RESEARCH
Indonesia
(1975/1976)

In Surabaya, Indonesia, the Royal Netherlands 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 Netherlands 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 analysis for blood, human milk, urine and foods, was carried out by TNO.

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

5.3 LACTOSE INTOLERANCE
Surinam
(1974/1975)

The problem of poor absorption of lactose milk (lactose intolerance, hypolactasia) occurs in many tropical regions.

Hypolactasia was investigated in Surinam Bushnegro boarding-school children. According to current definitions, 95 % of the children in this study showed hypolactasia. Thirty-two of the children were supplied with skimmed milk for one schoolyear. 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 twenty-four children consumed lactase-treated skim 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)

5.4 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 the 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 problems regarding nutrition and public health in the lower Mekong Basin. His work covered the identification of needs and problems by undertaking surveys in the area, planning of operations and evaluations of the results.

- Central Institute for Nutrition and Food Research, TNO

5.5 PUBLIC HEALTH
Thailand
(1978/)

The Medical Faculty of the Khon Kaen University, in the North of Thailand, is supported by TNO's Central Institute for Nutrition and Food Research for the development of public health programmes in the region. The project includes the training of staff members in the Netherlands, as well as in Khon Kaen, concerning the appropriate techniques used in biochemical, clinical and chemical analysis. A clinical-chemical laboratory was established. The TNO experts and their Thai counterparts had selected suitable equipment during the training period in the Netherlands, and next had it installed and made operational. Research programmes on nutrition and public health are initiated and implemented in the region. A research project was started that aims at improvement of the diagnostics and treatment of the most common diseases of the said region's rural population.

- Central Institute for Nutrition and Food Research, TNO

5.6 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 problems by means of tuberculosis infection rates in samples of the population.

Research teams visit participating countries to implement tuberculosis programmes, which includes 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 for Mathematics, Information Processing and Statistics, TNO

VI
Education, training

6.1 TRAINING COURSE ON MAINTENANCE OF MACHINE TOOLS
Curaçao
(1978)

Two training courses on maintenance of machine tools were organized by TNO on behalf of a group of teachers of several Antilles Technical Colleges, at the request of the Ministry of Education of the Netherlands Antilles. The aim of the project was to train "maintenance promoters" to enable them to maintain the technical level of their machine shops in an efficient way. Apart from theoretical training much attention was given to practice in terms of the application of measuring equipment, measurement techniques in machine inspection and through performing machine inspection in various local machine shops.

- Metal Research Institute, TNO

6.2 FOOD INSPECTORS TRAINING PROJECT
Kenya
(1979-1983)

Under the auspices of the FAO, the Kenyan Ministry of Health, and the Ministry of Public Health and Environmental Hygiene in the Netherlands have set up courses for Health Inspectors from English-speaking East and Central African countries, to be trained as Food Inspectors. TNO's Organization for Nutrition and Food Research is the executing unit.

Two courses of six months were held in the Netherlands for, respectively, 13 and 12 participants from Kenya, Sudan, Tanzania and Zambia. They all obtained a Nuffic diploma in General Food Science and Food Inspection. From 1981 onwards, courses of a full academic year will be organized in Kenya; the University of Nairobi will award their diplomas. For the first two courses, 2 x 10 fellowships for non-Kenians are available and a Dutch Project Manager will be attached to the Staff of the Medical Training Centre in Nairobi, where the courses are to be held, to assist in their organization.

- Organization for Nutrition and Food Research, TNO
- Food Control Services in the Netherlands
- Royal Netherlands Tropical Institute, Amsterdam
- State University of Utrecht , and Agricultural University at Wageningen

6.3 CONSULTATION WORKSHOP ON PRODUCT ADAPTATION AND DEVELOPMENT
Lebanon
(1975)

Under the auspices of UNIDO, and in cooperation with the Research Institute of Management Sciences, Delft, and the Centre for Promotion of Imports from Developing Countries (CBI), Rotterdam, TNO selected and tested product samples from Lebanese industrialists for the Consultation Workshop on Product Adaptation and Development, held in October 1975, Delft.

The Consultation Workshop enabled 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.

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 Imports from Developing Countries

6.4 TRAINING COURSE ON INDUSTRIAL AUTOMATION
Mexico
(1976)

TNO's Information Centre for Industrial Automation arranged a special English-language training course of three weeks for five participants from CONACYT (Consejo Nacional de Ciencia y Tecnologia). The Programme covered : production automation, logic control systems, basic principles of measurement and control, fundamentals of mini-computers. The course started in September 1976 and was followed by two months' work with the Netherlands industries, thus putting theoretical knowledge to practice.

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

6.5 TRAINING IN LOW COST AUTOMATION
South East Asia
(1974 -)

The Asian Productivity Organization sets up multi-country training courses in low cost automation with the objective of promoting the application of LCA-techniques in member countries.

So far automation has been applied solely in the bigger type of industries. Their automation approach, 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 aim at eliminating labour.

In the training courses, particular emphasis is laid on the training of trainers and consultants from the national productivity organizations and similar institutions ; they should be able to develop and conduct training courses in LCA for small and medium sized industries in their respective countries.

An LCA expert of TNO acted as chief trainer and consultant in the courses thus given. In 1978, the same expert assisted in the Industrial Service Institute (ISI), Bangkok, in the setting-up of an LCA Centre there. In 1980, training has been provided to the engineers from ISI and industry.

- Central Organization, TNO

6.6 INTERNATIONAL WORKSHOPS ON PACKAGING DEVELOPMENT AND PACKAGING TECHNOLOGY
General
(1976)

The Centre for the Promotion of Imports from Developing Countries (CBI) organized, in cooperation with TNO, a programme of international workshops in packaging development and packaging technology. The workshops lasted three weeks each, and programmes covered various aspects of expert packaging ; they focused on technical training, practical training, marketing items, excursions and fieldwork. The first workshop was held in the autumn of 1976 ; the main subjects then being wet-processed and dry-processed foods (50 participants), for which CIPE (Centro Interamericano de Promoción de Exportaciones) acted as a promotional organization.

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

6.7 FELLOWSHIPS TRAINING
General
(1966/)

Over the last five years, some 95 fellows from 40 developing countries have visited TNO for a training period from a few months to a year or even longer.

Most requests for fellowships reached TNO's Bureau for International Projects from UNIDO, the Dutch Ministry of Foreign Affairs, FAO, OECD and UNESCO.

Twelve of TNO's various 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 WIND TURBULENCE RESEARCH
Aruba (Neth. Antilles)
(1978)

In the windtunnels of the Department for Fluid Flow Technology of TNO's Central Technical Institute were tested three models of eight existing and planned hotels for Aruba's Palm Beach. Advice was given as to how to restrict more or less serious wind effects in the surroundings of these hotels, and at the beach, in connection with extensions or buildings to be erected. In order to study the windproblems, and the plans for extensions and for hotels to be newly built, a TNO mission visited Aruba at the request of the Netherlands Ministry for the Antilles.

- Central Technical Institute, TNO

7.2 BUILDING MATERIALS
Kenya
(1971/1976)

In 1971, a project for the development of building materials production in developing countries was started ; it was 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, covered 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 raw materials resources available in that country.

Stage II, focused on the synthesis of the various aspects in terms of an overall plan for the local production of building materials.

Stage III, envisaged advice on the implementation of plans for the local production of building materials.

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

7.3 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 approximately five 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 project's research and standardization parts. Increase of efficiency is sought to be realized by further strenghtening of the units, improving the cooperation of the units, and creating a better link between their activities and Kenyan Government policy. A Netherlands mission visited Kenya to review the project's follow-up and to advise on successive steps to be taken.

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

7.4 PILE MEASUREMENTS

Saudi Arabia, Sudan, Venezuela
(1977 -)

The durability and structural behaviour of structures that have to be built on an unfavourable subsoil is mainly determined by the integrity and bearing capacity on the foundation piles. TNO's Institute for Building Materials and Building Structures developed two methods for testing foundation piles ; both have found wide application.

The one method measures the reflex of a hammer blow on the pile head. From this reflex can be detected cracks and discontinuities in the cross section of the pile. The method only needs lightweight apparatus and works fast enough to check more than 100 piles in one single day. The other methods uses somewhat heavier apparatus and a small computer. With this apparatus, a blow is dealt on the pile head. The movements of the pile head are compared with the forces exerted by the blow. As a result, a report is produced by the computer, stating the bearing capacity, the load-displacement diagram and data on the relative importance of point resistance and mantle friction. Two or three piles can be subjected to this "dynamic load test" in a day. Both methods have been used extensively for important building projects not only in European countries but also in the Middle East, South East Asia and South America.

- Institute TNO for Building Materials and Building Structures

VIII

Co-operation with research institutes
within developing countries

8.1 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 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 considered were the establishment of quality control regulations plus inspection procedures, and a massive training programme for local bakers. In this programme, TNO and the Colombian Institute for Technological Research assisted the National Professional Training Service through teacher training, and trouble-shooting activities at bakery level.

- Institute for Cereals, Flour and Bread, TNO

8.2 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 have partly been developed by the Institute for Technological Research, Bogotá.

In collaboration with this Institute, a TNO food technologist and a mechanical engineer assisted in the further development of a great variety of processes and products, based on soya-beans, using relatively simple technologies with a low investment outlay, thus enabling small-scale and decentralized production. Investigations related to soy-milk products, including fermentation products, full fat soy-flour, roasted and cooked soya-beans and soy-enriched maize-cakes.

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

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

8.3 GLASS RESEARCH
Indonesia
(1973/1977)

The glass industry in Indonesia has rapidly grown in recent years; production of container glass, sheet glass and other glass types has increased considerably. Traditional, existing and modern, new industries all need technical 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 cooperation and training has been executed between the said institute and TNO. Short-term visits and supervisory trips, a long-term assignment of a glass expert, fellowships and supply of equipment were performed.

- Institute of Applied Physics, TNO

8.4 TEXTILE TECHNOLOGY
Indonesia
(1969/1977)

Within a framework of bilateral cooperation between the Indonesian and Netherlands Government, and in view of the need for technological support of the rapidly growing Indonesian textile industry, intensive contacts were established in recent years between the Institute for Textile Technology (ITT), Bandung, and TNO.

Technical assistance was thus 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 cooperation between the said institutes and TNO is currently being implemented through fellowships, supervising assistance in R & D, and testing services.

- Fibre Research Institute, TNO

8.5 OPEN-END SPINNING OF COTTON

General

(1976/1983)

In collaboration with the International Institute for Cotton (IIC), TNO's Fibre Research Institute is carrying out investigations and evaluations of opportunities for utilizing a wider range of cottons and improving typical fibre properties for open-end spinning. Competing fibre producers are intensively investigating 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 well lose a major share of its present markets.

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

8.6 EASY-CARE FINISHING OF COTTON

General

(1976/1983)

Numerous surveys have revealed that cotton's major disadvantage in its battle with synthetics is its lack of that level of easy-care performance which is habitually 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 in energy and chemicals.

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

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