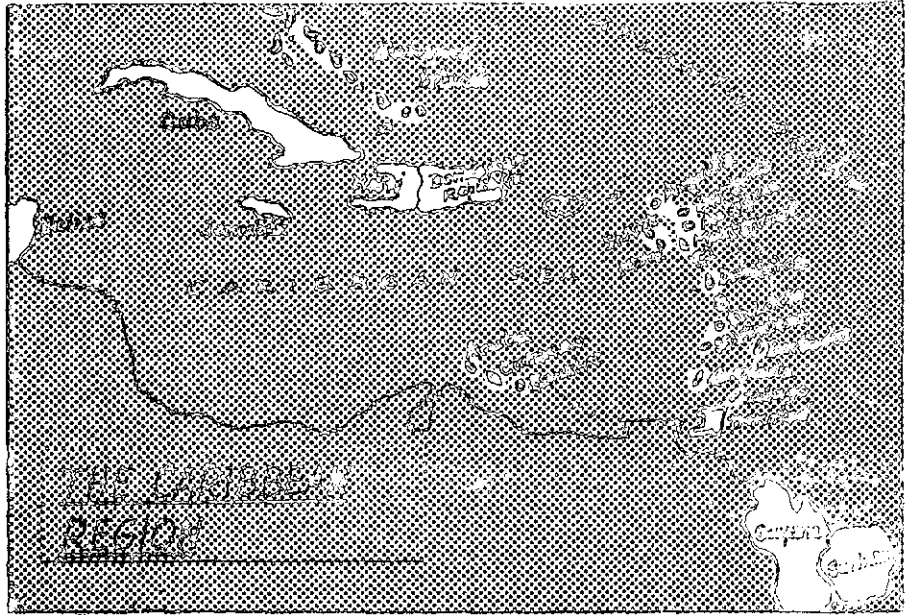


CARIBBEAN  
DEVELOPMENT  
AND  
CO-OPERATION  
COMMITTEE



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SECTION 1: A PROJECT FOR POSSIBILITIES OF SUB-REGIONAL  
CO-OPERATION IN PROJECTS OF APPLIED RESEARCH  
AND TECHNICAL ASSISTANCE TO THE INDUSTRIAL SECTOR

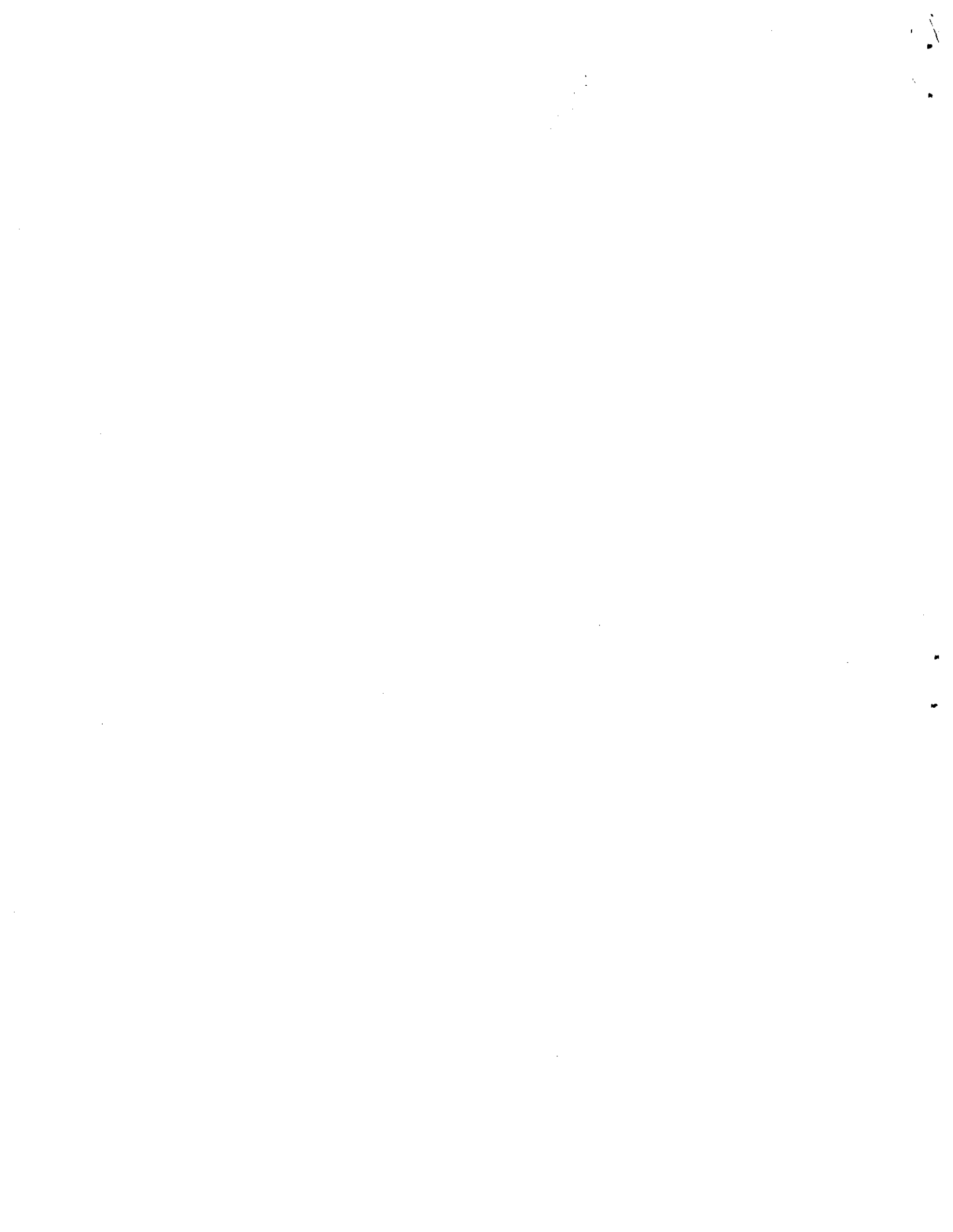
Submitted by the Dominican Republic Delegation  
to the Second Session of the CDCC, Santo Domingo,  
16 - 22 March, 1977

SECTION 2: NOTE BY CDCC SECRETARIAT ON THE PROPOSAL



UNITED NATIONS

ECONOMIC COMMISSION FOR LATIN AMERICA Office for the Caribbean



## SECTION 1

### POSSIBILITIES OF SUB-REGIONAL CO-OPERATION IN PROJECTS OF APPLIED RESEARCH AND TECHNICAL ASSISTANCE TO THE INDUSTRIAL SECTOR

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#### 1. THE DOMINICAN INSTITUTE OF INDUSTRIAL TECHNOLOGY: SERVICES AND PERSPECTIVES.

##### 1.1 Introduction.

Aware of the need of the Dominican Republic to have a scientific and technical tool to serve national industrial development, the Central Bank decided to create, on 26 April 1973, the Dominican Institute of Industrial Technology (INDOTEC), whose fundamental objective is to contribute effectively to the transfer, application, improvement and development of the industrial technology, through research, information services, technical consultation and advice to institutions and enterprises, both in the private and public sector for the better utilization of the productive resources of the country.

The following scientific and technological specialized areas which encompass the field of action of INDOTEC were defined:

- Research and development of Products and Processes
- Industrial Advisory Services
- Technical Assistance in Analysis, Testing and Essays
- Documentation and Information
- Formation and Training

Eventually, as circumstances permit these services would be extended to other countries of the region.

Among the initial steps for the starting of INDOTEC, besides construction of its physical plant, whose inauguration was held on 27 April 1975, the following are worth mentioning - the acquisition of very accurate and efficient modern equipment, the hiring of high calibre professionals as well as the training of national personnel in specialized fields, both in the Central American Institute for Research and Industrial Technology (ICAITI) of Guatemala, and the Chemical Institute of the National Autonomous University of Mexico.

Although INDOTEC commenced operations at the end of April 1975 with incomplete instruments and equipment and a scarcity of adequate personnel in some areas, above all in the field of research and development, the Institute has achieved more than what could have been expected during the 18 months of operation, especially when we compare the results obtained by other institutions in their initial stages.

## 1.2 Activities Developed.

### 1.2.1 Analysis, Testing and Essays.

The Division of Analysis, Testing and Essays has carried out, up to 31 December 1976, a total of 1,616 analytical services in the following laboratories: Spectrophotometry of Atomic Absorption, Nutritional Analysis, Chemical Nutritional Analysis, Microbiology, Chromatography, Physical Tests, Spectroscope and Research.

The modern equipment of spectrophotometry of atomic absorption installed in INDOTEC for the detection of metals and personnel specifically trained for its operation, have afforded reliability in the results of analyses carried out within satisfactory limits of allowance. The adaptability of the equipment for serial analysis has also contributed to adequate timing of the results. On the other hand, the continuous use of this equipment for the analyses will offer the opportunity to meet the very important need for better knowledge of the non-renewable natural resources existing in the country.

With regard to the Laboratory for General Chemical Analysis, activities have been concentrated on determination of the nutritional quality of soils and the analysis of water characteristics. Besides, the basic qualities of products such as fertilizers, soft drinks, combustible oils, paints, kaolines, etc. have been identified. The analyses, testing and essays of raw materials, semi and finished products carried out in this laboratory of General Chemical Analysis are an indispensable element for appraisal of their industrial potential and ensuring that the final products are within international standards. For example, we may mention samples studied with a view to establishing the feasibility of installation of a plant for recovery and regeneration of industrial waste products.

Among the activities of the Laboratory for Nutritional Analysis assistance has been given to eight private sector enterprises which are involved in preparing balanced food for animals, through the analysis of samples of proteins, grease, raw fibre, carbohydrates, ashes and humidity. The techniques used in this Laboratory, as well as the equipment installed have been selected in accordance with the appropriate methodology for animal foods. In this way, producers and consumers are in a position to evaluate the results of the analyses which are normally carried out with a view to establishing the specifications of these foods.

The Laboratory for Microbiology has carried out analytical services to various enterprises in the private sector, with the aim of advising them on the microbiological control of products destined for human consumption, such as canned foods, milk products, bottled water, as well as the control of balanced food for poultry and in the manufacture of pharmaceutical products.

As the services of these Laboratories are widened, enterprises will have a fundamental tool for the quality control indispensable to the industries of the country. In some cases the results of analyses carried out by our laboratories have served as a basis for the exercise of a better quality of imported raw materials.

The Laboratory for Physical Testing has analyzed samples necessary for determining the quality of barbed wire, pharmaceutical products, textile fibres, plastics, rubber and others.

The Laboratories for Chromatography and Spectrophotometry have received different samples sent by private sector enterprises and universities of the country. The analyses have been carried out principally to determine the quality of edible oils, the purity and yield of Patchuli roots (essential oil of Vetiver) and to know the characteristics of certain imported raw materials.

The Laboratories for chromatography and spectrophotometry, very recently introduced in the country, will offer very valuable tools of analysis in the research of new products obtained from raw agricultural materials and national flora.

On the other hand, a considerable group of enterprises have contracted the Division of Analysis, Testing and Essays of INDOTEC for services of quality control along the following lines:

- Pharmaceutical products
- Production of pure water
- Food products
- Metal products
- Balanced poultry food
- Milk products
- Electric articles for lighting use
- Edible vegetable oils

It is also possible that very soon this Division will grant export Quality Certificates for gas containers for domestic use and for ceramic products.

In addition, steps have been initiated, on the basis of annual contracts, to undertake the following studies:

Systematic nutritional analysis of some basic grains;  
Analytical detection in the manufacture of Kraft paper;  
Mineral plan of analysis, under the auspices of the United Nations;  
Technical assistance to two laboratories.

#### 1.2.2 Technical Services to Industry

The Division of Technical Services contracted the execution of pre-feasibility studies related with the following industrial activities: electrolitical process industry, container plant, rehabilitation and regeneration plant for industrial waste, abrasive articles industry, production of electrodes, protein for human consumption, soya-based food for human consumption, poly-vinyl acetate.

This Division also undertook feasibility, rationalization and productivity studies on behalf of some enterprises of the country. As an example, it is worth mentioning that on the basis of the recommendations made, increases in one of these enterprises reached 50%. As a result this enterprise has again requested the assistance of the Institute to study other production aspects as well as to carry out a restructure of the organization in the area of production.

Within the field of advice on quality control, the Division mentioned has initiated the design and introduction of systems in enterprises involved in the following areas:

- Pipes
- Bulbs
- Metal products

The Division of Technical Services likewise has prepared and continues to prepare technical-economic reports on safety measures, which have been presented by some enterprises and sent to INDOTEC by the Monetary Board for purposes of study and opinion.

On its own initiative and within the programmes for improving knowledge of the actual situation of different industrial areas of the country, this Division is preparing diagnoses on:

- Plastic industry
- Pharmaceutical industry
- Fermentation industry

The following agro-industrial profiles have also been prepared which will be presented as part of the promotional programme which the Investment Fund for Economic Development (FIDE) intends to carry out:

- Production of garlic and onion dehydrates
- Production of starch or starch and glucose
- Industrialization of the cashew
- Production of chocolate pills
- Production of leguminosae
- Production of Roquefort type cheese
- Production of processed type cheese
- Production of mayonnaise

Likewise, pre-feasibility studies for the research and development of the production of food for cattle based on agricultural waste were prepared.

### 1.2.3 Standardization and Quality Control

This Division has elaborated more than 400 standards for the following areas: petroleum and by-products, chemical products, soaps and detergents, fertilizers, pesticides, starches, cartons and paper, drinks, food and milk products in general, etc.

The elaboration of these standards, which have been selected in accordance with the national priorities, represents one of the first steps whereby national products can be turned out with the guarantee of due analysis in line with the highest level of quality. Likewise, a guide for the use of the national system of units, with definitions and tables of equivalence.

### 1.2.4 Applied Research

With a view to assisting several industrial sectors in the development of their research programmes, INDOTEC has identified five projects related with the following activities:

- Marine Resources of the Dominican Republic. This project will evaluate the economic-nutritional potential of a natural resource which is unexploited even in the country with suitable emphasis.
- Conservation and Processing of Tropical Fruits.
- Production of Ethyl Alcohol and Protein from molasses.
- Effect of the Use of Chemical Products on the Agro-eco system of the Dominican Republic. This project seeks, through the control in the use of pesticides and nutrients, to foster the productivity of the agricultural sector, to reduce their cost of production and control the incidence of those products in the environment and in animal and human health.
- Research on various native plants, to obtain hexanic and chloroformic extracts from them, for their further use.

### 1.2.5 Formation and Training

The Department of Formation and Training of INDOTEC, which was originally designed by the Central Bank as a Centre for Research and Advanced Studies, has held a total of 56 courses and seminars of short duration and five conferences, in which more than 3,000 technicians and professionals of the



related fields of specialization have participated. Among the assistants to the activities of this Department, more than half belong to persons from the Government sector.

Taking into account the need to train Dominican professionals in the techniques required by the crop and livestock sector and the development of agro-industrial activities of the country, among the courses and seminars of short duration priority has been given to matters related to these sectors.

Moreover, in the conviction that the future industrial development of the country lies with the exploitation of natural resources, conferences and courses of short duration have been selected to train professionals in the field of the chemical industry.

In the same way, since the productive sector of the country needs professionals trained in the modern techniques of quality control and application of standards which guarantee good quality products, INDOTEC prepared seminars and courses of short duration on the following topics:

- Quality Control
- Standardization

Because actual analytical techniques constitute the indispensable instrument to carry out quickly and accurately any necessary determinations, both in chemical research and in the routine inspection and control of quality in the enterprises, the Institute organized courses on:

- Chromatography
- Spectroscopy
- Infra-Red Spectroscopy of Organic Components

Moreover, with the view of discussing the origin, types and stages of projects and analyzing the content of pre-investment studies, as well as the quantitative, entrepreneurial, economic and social criteria of the economic evaluation and to discuss the sectoral priorities and the regional impact of the projects and to extend the sectoral and regional evaluation to the national field, courses were presented on high administration, evaluation of projects and administrative techniques.

In view of the necessity for exchange of ideas and experiences among countries and pursuing more effective development through the practice of advanced technologies, INDOTEC, in collaboration with the Department of Scientific Affairs of the Organization of American States, presented two seminars attended by personnel from recognized institutions, both national and foreign. The matters dealt with were the following:

- Economic and Marketing Problems of Scientific and Technical Centres of Information.
- Administration of Research and Development.

Finally, considering the importance of the crop and livestock sector to the country, the Institute presented jointly with the National Academy of Sciences of the United States, a seminar on Agro-industrial Development in which ten specialists selected by the National Academy of Sciences participated, seven were from INDOTEC and sixteen from the public and private sectors of the country. This important seminar covered the following subjects:

- Integrated Aspects of Food and Quality Technology
- Problems of Local and International Markets
- Technical Assistance, Information and Training
- New Opportunities for Development of Agro-industry in the Dominican Republic.

#### 1.2.6 Documentation and Information

Besides specialized books and reviews of recognized national fame received by INDOTEC, this Institute possesses a wide collection of technical information related with equipment, processes, technologies, markets and, in general, dealing with technical/economic aspects of the industrial sector. This information comes directly from all international organizations, enterprises possessing technologies, factories manufacturing machinery and equipment, embassies, etc.

INDOTEC issues informative bulletins which contain article extracts, selected by specialists of the Institute, for their particular interest in the productive sector of the country. These bulletins are sent to entrepreneurs and other public and private organizations interested in the development of the agricultural and industrial sector, as well as to financiers and bankers in the country.

INDOTEC also participates actively in an Information and Technical Assistance Programme geared to the Central American and Caribbean Industry, under the aegis of the Organization of American States. With this in mind, the Department of Documentation and Information has acquired the necessary equipment and has trained technical personnel, with the aim of offering the following services:

- Service of industrial liaison
- Service of technical questions and answers
- Holding of courses and conferences on information
- Service of information consultation

#### 1.2.7 Promotion and Development of Projects

The Unit for Promotion and Development of Projects has carried out more than three hundred contracts with enterprises interested in the services of INDOTEC.

As a result of this work 17 proposals of technical assistance and 1,629 analytical services have been carried out. Concurrently, a follow-up system has been established both from the proposals delivered to those interested and from those not yet contracted. Among others, the following were presented to:

- Investment Group interested in installing a pineapple processing plant.
- Investment Group interested in installing a flour producing plant.

This Unit initiated a new cycle of visits to a number of industrial establishments with the aim of directly informing on the possibilities of services which INDOTEC can offer and the determination of the problems encountered in these industries and the fields most in need of assistance.

## 2. POSSIBILITIES FOR REGIONAL CO-OPERATION

Considering the physical and human resources now available in INDOTEC, the Institute could immediately participate in regional co-operation programmes in several fields of Science and Technology, with the aim of expediting economic and industrial development of the area.

With this in mind, it would be feasible to identify specific projects which could be of common interest and which would incorporate efforts of the Caribbean countries. Therefore, we submit to the consideration of the member delegates attending, some projects and activities which, in our opinion, may soon initiate co-operation programmes.

### 2.1 Research and Development of Products and Processes.

- Storage of Tropical Fruits. The project would determine the costs and desirable conditions of temperature, humidity, etc. for the storage of tropical fruits such as avocado, mango, pawpaw, tamarind, banana, guava and others, through the study of their physical characteristics, of the right time of picking, the respiratory pattern and evaluation of ethylene as a sign of maturity, completing all of this with the corresponding essays.
- Product development based on Tropical Fruits. In view of the development of products based on tropical fruits which could be processed (as already mentioned), of the development of manufacturing processes and estimates of production costs, their dimensions, weight, yields, acidity, colour, etc. will be measured and experimentation of new products will be made, such as juices and nectars, jellies and marmalades, preserves, concentrates and others.
- Development of Products Derived from Sugar-cane. Alternative processes for the industrial utilization of sugar-cane, starting from juice or molasses, will be studied to transform the fermentable sugars into ethylic and butylic alcohol, acetic acid, citric acid and others through microbial process, or into unicellular proteins. For the production of ethylic alcohol or by-products, juice or molasses will be used through discontinued cultivation and through

continued fermentation and varying the different parameters of the process. For the production of unicellular protein the juice or molasses would also be used through different types of micro-organisms related with their use and characteristics of propagation, both in continuous and discontinuous culture.

- Effects of the Use of Chemical Products on the Agro-eco system of the Country and of the Region. It is proposed to study the result of the use of chemical products in the agro-industrial sector and to evaluate the effects on the agro-eco system, through calculation of the consumption of chemical products in the agricultural sector, inspection of the agricultural regions of greater importance from the point of view of product consumption, design of adequate samples, chemical analyses of the samples and evaluation of the effects observed.

Other areas and projects perhaps could be offered as a result of the exchange of ideas between the members of the respective delegations. In any event, INDOTEC is prepared, as far as possible, to offer its installations and services both for the development of projects already mentioned and others which could be added. Our understanding is that this willingness for concrete regional co-operation could be implemented with the support of the countries of the area and also of international organizations.

## 2.2 Formation and Training

The Department of Formation and Training is in excellent conditions to offer within a regional programme for the specialization of technicians and professionals, courses in agricultural planning, zootechnic and veterinary sciences and chemistry as well as instrumental and analytical techniques.

### 2.2.1 Agricultural Planning

This programme, for which specialized trainers are available consists of a basic course in Agricultural Planning and six others which offer participants an overall view of the techniques necessary to execute

efficient agricultural planning based on rational and modern criteria.

- High Level Course in Agricultural Planning.  
An analysis of the macro and micro planning for crop and livestock, with case studies and detailed discussion on the methodology tools for planning of relevant enterprises, consisting of inter alia market research, production lines, designs of soil maps, economic administrative and financial evaluation of agricultural plans as well as a study of specific techniques for the planning of stock raising enterprises.
- Lineal Programme Applied to Agricultural Planning.  
A thorough review of common problems encountered in crop and livestock enterprises and an exhaustive treatment of the background and applications of lineal programming in the field of agricultural planning.
- Critical Path Method Applied to Agricultural Planning.  
A study of the use and methodology of the network of activities and successive activities and movements in the planning and programming of agricultural projects, with a discussion of the matrix of elasticity, Pert charts and procedure for evaluation, placing emphasis on practical applications.
- Agricultural Statistical Sampling.  
A systematic treatment both of the sampling for proportions and percentages and aleatory calculations, as well as systems of ratios and regression and their uses in agricultural planning.
- Agricultural Markets.  
An analysis of the descriptive aspects of markets, demand programmes, localization and market research, with a discussion on analysis methods of prices as well as problems in the determination of empirical cost functions, again with a view to the agricultural sector.
- Planning and Control of Agricultural Cultivations.  
A concrete application, through a specific instrument, of precise techniques for the programming of different activities to be performed in individual cultivations and a presentation of the

problems which may be solved with this assistance.

- Statistical Methodology in Agricultural Planning.

A study of the fundamental concepts of statistical and regression theory, with reference to agricultural planning.

2.2.2 Zootechnic and Veterinary Sciences.

- Hygiene and Prophylaxis of the Main Diseases of Milk Producing Cattle.

An analysis of the influence of stabling with regard to hygiene of the milk producing Bovine cattle in tropical countries with recommendations on prophylactic measures to be taken with regard to the stable and complementary installations, cattle tenders and cows to be milked with adequate treatment of pathological infections of mammary glands, parasites and metabolism diseases and deficiencies of the respiratory and digestive organs.

- Food Planning for Bovine Cattle.

A study of the nutritive needs of the cattle and of the different types of food, especially fodder, concentrates, molasses and urea, their digestibility and absorption of rations and food planning for the herd.

- Pig Rearing and Exploitation.

A discussion of efficient systems of production for pig rearing, with an introduction to the general nutritional aspects and an analysis of the complete process of production, namely, sow gestation and nursing, care of the boar from birth to weaning, from weaning to the market and reproduction.

- Hygiene and Prophylaxis of the Main Diseases of the Pig.

An analysis of the influence of stabling on the hygiene of the pig in tropical countries, with recommendations on prophylactic measures to be taken during pig rearing.

- Rabbit Rearing.

A study of the races and construction and equipment best suited for the production of rabbits, with emphasis on their care, food, reproduction and economy of the rearing and exploitation of rabbits.

- Apiculture.

An analysis of the biology and care of bees, types of beehives and honey production, with a discussion on the keeping of queen-bees and the retention and use of wax and pollen, as well as the production of beehives, pollenization and economy as applied to apiculture.

2.2.3 Chemistry, Analytical and Instrumental Techniques.

- Chromatography in Gaseous Phase.
- Spectroscopy of Atomic Absorption.
- Electronic Maintenance of Analytical Equipment.
- Steroids.
- Organic Synthesis.
- Chromatography.
- Spectroscope.

Each of the above mentioned courses would be for a duration of 30 hours and could be carried out in one week.

2.3 Documentation and Information.

The Department of Documentation and Information of INDOTEC could participate in technical assistance programmes in the following areas:

- Preparation of specialized bibliographies
- Reproduction of documents
- Linkage services with other documentation centres
- Specialized indices
  - Chemical Abstracts
  - Current Contents
  - Food Service and Technology Abstracts
  - Current Abstracts of Chemistry
  - Index Chemicus
- Active information service
  - Complete articles
  - Science and technology extracts
- Microfilms
- Classification of documents



- Technical standards collections
- Machinery and equipment catalogues
- Technical question and answer Bank
- Search and retrieval of information

#### 2.4 Analysis, Testing and Essays

The Division of Analytical Services of INDOTEC is able to offer assistance in:

- Standardization of bee honey for export, in conformity with the norms of Codex Alimentarius or other norms.
- Chemical analysis of minerals, including gold and silver. Traditional methods, spectrophotometry of atomic absorption and fire essay (gold).
- Analysis of mineral carbons to determine calorific value, the quantity of sulphur and ashes. ASTM Method.
- Analysis of oils and fats in conformity with the AOAC and AOCS methods of chromatography in gassy phase.
- Microbiological analysis of pharmaceutical, cosmetic and food products.
- Analysis of fertilizers to detect nitrogen, phosphorous, potassium and magnesium. AOAC Methods.

#### 2.5 Industrial Consultation

The field of Industrial Consultation also offers wide possibilities for exchange and co-operation, of particular interest for development of the industrial sector. In this respect, INDOTEC is efficiently prepared to participate in Consultory and Advisory programmes which could be established at regional level, in the following areas:

- Preparation and evaluation of industrial projects, at pre-feasibility and feasibility level.
- Planning and execution of the different phases of industrial projects.
- Selection of manufacturing processes and equipment and machinery.
- Design of production programmes and preventive maintenance.

- Design of control programmes and optimum levels of inventories.
- Analysis of situation of enterprises and re-organization programmes.
- Planning of short, medium and long term enterprise.
- Preparation of standards for industrial products.
- Quality control programmes.

Another field of interest for advisory programmes would be product design. The training and specialization of industrial design technicians could be instrumental in the development of new markets and in the saving of foreign currency through the substitution of imported products and raw materials.

Finally, we have exhaustively enumerated the areas which in our views and in accordance with our available resources, offer good prospects for promotion of an exchange of knowledge and technical co-operation between Caribbean countries. Each of them offers concrete possibilities of rapprochement in a not-too-distant future. Consequently, INDOTEC reiterates its willingness to participate together with the countries of the region in common activities aimed at strengthening the control and independent management of our natural resources. We are aware of limitations to this clear will of co-operation; among them might be mentioned the scarcity of highly qualified human resources in a number of science areas and the high costs involved in the research and development of products and processes, which at times are beyond the financial capacity of the relevant organizations. Nevertheless, we are convinced that such limitations can be successfully coped with as far as we may rely on the firm desire to overcome obstacles. For these reasons, we exhort the delegations of the countries gathered here to define, together with the Dominican delegation, the sectors in which co-operation will be implemented, and to proceed with the discussion of the machinery which would facilitate its realization. Moreover, in view of the volume of resources which would have to be utilized in the event that our proposal is accepted, and in view also of the convenience to guarantee continuity of these programmes, we request CEPAL to identify international organizations capable of supporting this initiative with proper resources and to inform us about the nature and content of this support.

## SECTION 2

### NOTE BY CDCC SECRETARIAT

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The "Instituto Dominicano de Tecnología Industrial" (INDOTEC) appears to be well equipped and reasonably well staffed. As explained in the brochure it tackles quite a number of tasks in very diversified fields of activity such as:

- Analysis, testing and essays;
- Extension services to Industry and pre-feasibility studies, productivity boost, industrial diagnosis, preparation of agro-industrial profiles;
- Standards and Quality control;
- Applied research;
- Formation and Training;
- Documentation and Information Services;
- Industrial promotion and technical assistance to infant industries.

INDOTEC offers for regional co-operation encompass a spectrum of activities in the area of Science and Technology. INDOTEC's "forte" appears to be in the Agricultural Sector - Research and Development in conservation and processing as well as studies on chemicals used in the Agricultural Sector as well as training in Agricultural Planning, Zootechnics and Veterinary Sciences.

Besides the Agricultural Sector, there are possibilities of co-operation in -

- Up-grading of laboratory professionals;
- Technical Assistance in the fields of documentation and information;
- Analysis, testings and essays of raw material;
- Industrial consulting.

The emphasis was laid on a regional approach for the development of national resources. It will be necessary to pinpoint the sectors which would lend themselves to a co-operation with INDOTEC and devise the appropriate machinery which would allow the taking of concrete

steps with reasonable chances of success. If such a co-operative programme would be envisaged, ECLA should have to assist in locating support from international organizations, as suggested by INDOTEC at the meeting.

At the meeting of Librarians and Documentalists (29 November to 2 December 1977) contacts were already made by the CDCC Secretariat with the Documentation Centre of the Dominican Institute of Technology. The semi-automated system 'Terma-Trex' was recently established at INDOTEC as a system for the storage, classification and retrieval of information on the basis of punch cards and literature projected on a screen.

The INDOTEC services of question and answer should be exploited by the CDCC countries along with the photocopying and exchange of documents. Another area for co-operation should be the use of INDOTEC Newsletter which publishes summaries of research carried out on Science and Technology. Also their collective catalogue of periodic publications on Science and Technology could be used.



