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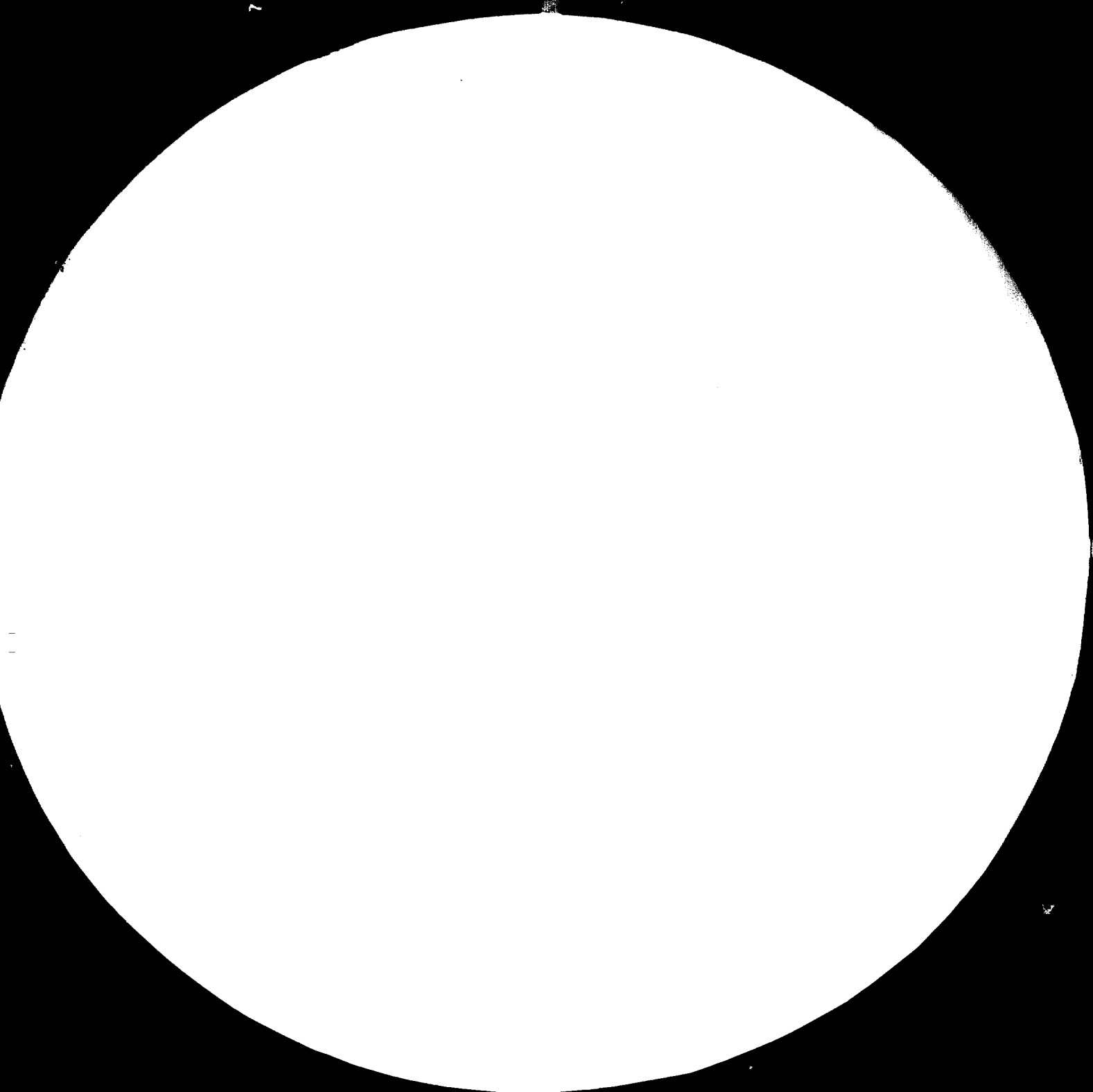

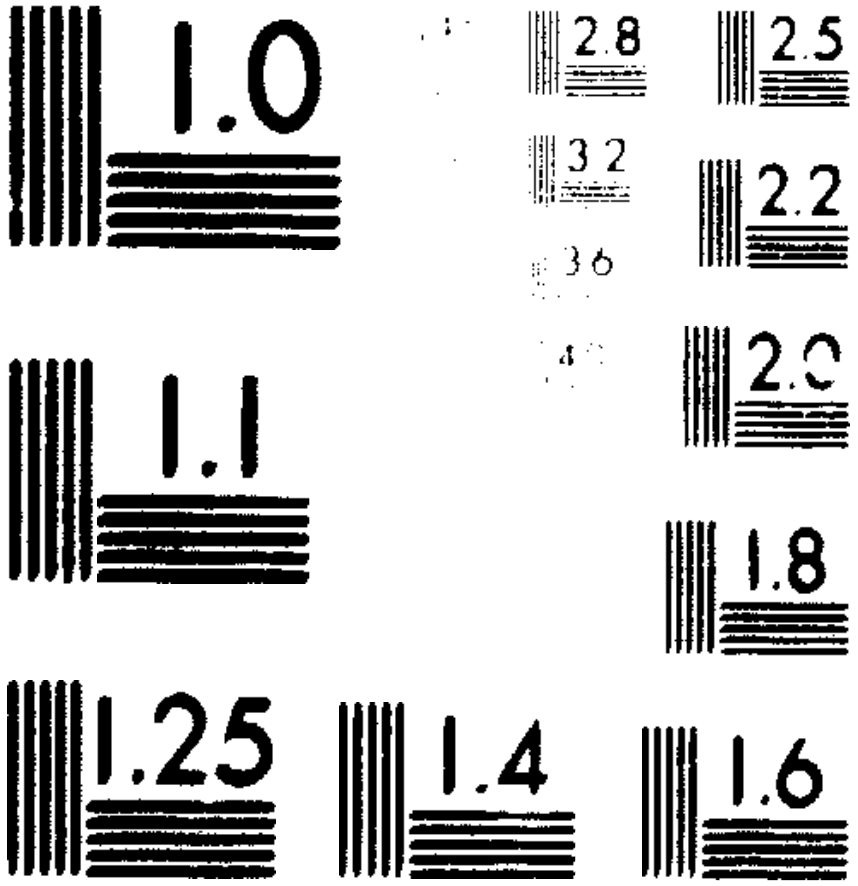

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UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

ASSISTANCE TO THE SISTEMA ALIMENTARIA MEXICANO (SAM)*
UC/MEX/80/168
MEXICO

Mission reports: Food processing research and development

Based on the work of B.S. Chung, M.M. Hamdy,
A. Gorgatti Netto, I. Savic, P.C. Spensley
and the secretariat of UNIDO

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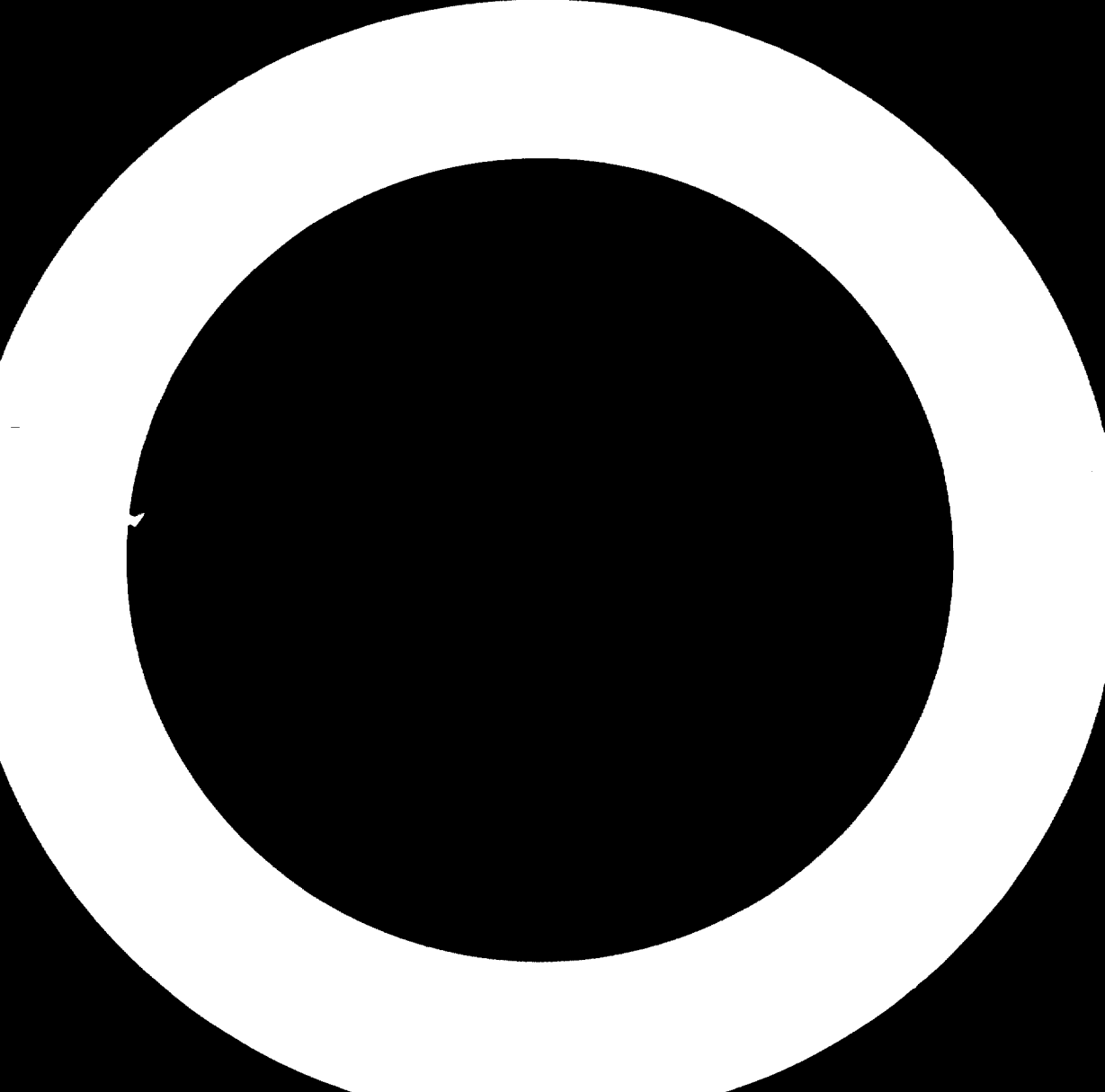
Explanatory notes

The following abbreviations have been used in this document:

ARC	Agricultural Research Council
CCTA	National Council for Food Science and Technology
CONACYT	Consejo Nacional de Ciencia y Tecnologia (National Council for Science and Technology)
CONAFRUT	Comisión Nacional de Fruticultura
CONASUPO	Compañía Nacional de Subsistencias Populares
COPLACYTAL	Comisión Nacional de Planificación de Ciencia y Tecnología de Alimentos (National Commission for Planification of Food Science Technology)
IFT&D	Institute of Food Technology Development
IMPECSA	Impulsora del Pequeño Comercio, SA
INIA	Instituto Nacional de Investigaciones Agrícolas (National Institute for Agricultural Research)
LANFI	Laboratorios Nacionales de Fomento Industrial (National Laboratories of Industrial Development)
PRODETAL	Productora de Tecnología de Alimentos
SAM	Sistema Alimentario Mexicano (Mexican Food System)
TPI	Tropical Products Institute (United Kingdom)
UNAM	Universidad Nacional Autonoma de México (National Autonomous University of Mexico)



CONTENTS

Annexes

INTRODUCTION

Latin America in 1980 had a gross national product evaluated at US$ 220 billion. This amount in real terms is about three times larger than the region produced in 1950. Latin America in the last decades grew at more than 6 per cent, which is a desirable growth rate. Basic changes happened and the economy of the region became very similar to those prevailing in developed countries. The industrial activity grew substantially and went through a process of diversification and technological development. Nowadays about 20 per cent of all Latin American exports consist of manufactured products. The region's economies became more international with large participation of foreign investment, substantial value of imports and also an increased and diversified amount of exports.

The basic constraints to the economy however were not overcome. Large sectors of the population have not fully benefited from the economic expansion. Most of the countries have modern, dynamic sectors combined with backward, stagnant and even decreasing ones. The process of urbanization leading to enormous cities of 4 - 6 - 8 - 10 million people was not entirely a result of modernization and mechanization of the agriculture, it was mainly due to an exodus of the rural population looking for new opportunities, better employment and higher income in the cities. The result was the creation of very large contingents of marginal population, sub-employed and socially unsettled in the urban areas.

The production and distribution of food did not progress in line with the region's overall development. Except for the expansion and modernization of the export crops, the agriculture remained traditional, stagnant, and in many products the region went from self-sufficiency to becoming a net importer. In particular with

respect to seeds, the region today is much more dependent than it was 20 or 30 years ago. Although several research and development institutes both at agriculture and food processing levels were created, the region basically imports all the techniques, equipment and brand-name products. Today Latin America either continues with the old habits of consumption based on small-scale handicrafts and a low-technical level or consumes food produced by large trans-national organizations which produce in Latin America the same food with the same packaging and the same brand name used all over the world.

The region therefore is more dependent today after 30 years of development than it was before. The food processing in Latin America is carried out in the most irrational way with enormous losses of raw materials. With the process of urbanization, the distances between the agricultural areas of production and the consumer markets increased substantially. The cost of transport, storage and distribution is increasing every day especially with the influence of increasing energy costs.

Today Latin America faces a serious economic crisis. The economy, suffering from the influence of the world crisis, is at best stagnant. Industrial activity is not responding to the needs of employment creation to absorb the large labour force which arrives at the market every year. There are signs of unemployment in the sub-sectors which were once the most dynamic, such as the automotive industry. A need is felt for managing the crisis in order to create new avenues and new adjusted economic models.

Integrated agro-industry seems to be one of the most attractive opportunities. It responds to the basic needs of the region. It offers a way to rationalize food production and distribution through integration: market - industry - agriculture. Processing of foods as near as possible to the areas of agricultural production permits better use of raw materials, reduction of wastes and use of by-products. It reduces volumes to be transported and it enlarges the shelf-life of the final products. Processing foods is a need and not a luxury as often understood.

The integration of agriculture with industry permits the creation of employment in the rural areas, employment at a higher level than the average prevailing in agriculture. Therefore, the level of income increases not only in view of the new employment but also due to the fact that the industrial activities need more qualified personnel and are better paid.

Most of the Latin American countries are now growing through a larger and more dynamic programme of agro-industrialization than before. Most of the Governments assign high priority to this economic activity.

The Government of Mexico created the Sistema Alimentario Mexicano (SAM) as a first priority Government programme. SAM is aiming at making Mexico self-sufficient in food, not only concerning production but also with respect to technological development. In order to assist SAM in defining the basic system for research and development in food processing, UNIDO assisted Mexico through the services of six international experts who put their experiences at the disposal of the local experts, and, through analysis and discussions, made recommendations which were felt the most appropriate. The papers produced by the experts are presented in this document in chronological order.

I. ALTERNATIVE PROPOSAL FOR A NATIONAL FOOD TECHNOLOGY INSTITUTE*

A. Introduction

It appears that the question of the National Food Technology Institute in Mexico has been discussed by various bodies on a number of occasions. One concept of such an Institute was elaborated already in 1977 on the basis of an existing similar institute in another developing country. Another concept is apparently being elaborated. Without the intention to enter into criticism of any concept, one concept is presented here for discussion with the hope that the last version will be based on a thorough assessment of all possibilities and specific Mexican conditions. The decision is to be made in principle to what extent if at all the Institute is going to deal with agricultural production or animal raising and also to what extent it is going to deal with products which are not intended for human consumption originating from agro-industrial raw materials and by-products such as alcohol from molasses, furfural from bagasse, medical preparations from animal glands, soap from vegetable oils, etc.

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*By the secretariat of UNIDO.

B. Research and development

Basic research:

The Institute will not carry out basic research activities except in the case that they are not carried out or cannot be carried out within any of the existing institutions and are of special interest. The Institute may support basic research of particular interests by:

- Granting fellowships for graduate and post-graduate studies to be carried out within the existing universities and institutes;
- Providing grants to the existing universities and institutes for carrying out research activities;
- Offering the facilities for research activities to be co-ordinated with the existing universities and institutes.

Applied research:

Most of the research activities of the Institute to be carried out within the Institute itself or supported by the Institute and carried out within other institutes or universities could be of an applied nature with possible application of research results in practice.

The programme of the applied research activities is to be determined by a body consisting of representatives from the Institute, other institutions carrying out applied research, industrial organizations, agro-industrial enterprises, government bodies, etc.

The themes for applied research may relate to any technical, technological, economic, organizational or other aspect of the operation of the agro-industry, from the manufacture of raw materials to the marketing of finished products. It may also include, as an example, activities related to:

- Energy inputs in the production of various products;
- Labour productivity and use of labour saving machinery;
- Selection of farming, storage, distribution and processing equipment most suitable for the country in respect to its sophistication, capacity, possible manufacture in the country, etc.

New products development or adaptation to the local conditions - new or modified technological processes, equipment design, etc. may also be included into the applied research activities.

The Institute would establish an inventory of applied research activities in the country and act as a kind of co-ordinator for monitoring, retrieval and guidance. This should help that only those research projects are selected which are of interest to the country, that they are not repeated and that the results be applied in practice.

C. Training

The purpose of the Institute would not be to become another training institution, particularly not of a degree level. The Institute should however, make an analysis of the country's requirements in trained personnel in the field of agro-industry which should serve as a basis for the organization of the existing educational institutions (universities, institutes) which are expected to produce graduates of:

- Adequate profiles ;
- Adequate numbers;
- Adequate regional distribution.

Training of its own staff in order to upgrade their level, may be done through:

- Study tours ;
- Grants (fellowships) for post-graduate studies ;
- Grants for applied activities either within the institute itself or with other universities and institutes.

All professional staff employed by agro-industry and in related activities may become members of the Institute which would then become their professional organization. A small, symbolic membership fee could be used for publishing one periodical through which members would be provided with various information on the Institute's activities, forthcoming meetings, workshops and seminars, as well as on the market trends, processing technologies, research activities, latest regulations and standardization, etc.

D. Organizational structure

When deciding on the establishment of the Institute and when preparing its charter, one should first decide on its objectives and scope of activities. It should also be decided to what extent it is expected to deal with:

- Agricultural production of cereals and legumes;
- Livestock raising;
- Agricultural production of vegetable oil bearing material;
- Production and marketing statistics;
- Extension services;
- Manufacture of agricultural implements and industrial equipment;
- Professional engineering consultancy services, etc.

Assuming that agricultural and veterinary extension services including inspection services already exist in the country and are willing to co-operate with the Institute, its basic organization may then be outlined as follows:

1) Administration:
   - bookkeeping, cost accounting;
   - budgeting;
   - wages and expenditures;
   - formalities related to staff appointment, travel, annual and sick leaves;
   - maintenance of facilities;
   - conference facilities;
   - transport vehicles;
   - registry, mail handling;

- communication, etc.

2) Food testing and quality control laboratories consisting of:
- bacteriological laboratory;
- chemical laboratory;
- physical testing laboratory;
- sensory evaluation laboratory.

Their activities would cover:
- bacteriological, chemical, physical and sensory testing of raw material, semi products, finished products and packaging and other auxiliary materials;
- food composition studies and tests;
- food standardization in respect to composition and quality;
- evaluation of domestic and foreign food legislation, particularly that related to imports and exports;
- standardization of food testing and quality control methods.

Quality certification by the Institute for products which are produced under the Institute's supervision, may also be introduced, particularly for products intended for export and for those products which are considered somehow to be typically Mexican.

3) Department of food technology should have:
- laboratory facilities with bench size technological equipment;
- pilot plant facilities;
- access to industrial plants for carrying industrial scale testing.

The department should be organized in several units, such as:
- cereals, sugars;
- legumes, tubers;
- meat and meat by-products;
- fish and fish by-products;
- dairy products;
- vegetable oils;
- fruit and vegetables;
- animal feedstuff;
- alcoholic and non-alcoholic beverages ;
- spices, tea, coffee, fermented products.

The activities of this department may be related to:

- evaluation of the existing technological processes, their modification and introduction of new ones;
- new product development;
- trouble shooting;
- preparation of layouts, flow-sheets, equipment specifications, descriptions of technological processes for techno-economic feasibility studies;
- assisting in plant design, equipment installation and putting it into operation.

4) Department of engineering:

May be organized on the basis of activities, if required, dealing with:

- food engineering (unit processes);
- civil engineering;
- electrical engineering;
- mechanical engineering.

Each of these units may consist of several sub-units, such as:

food engineering:

- cereal milling;
- slaughterhouses and meat by-products processes engineeri-
- vegetable oil extraction;
- refrigeration and cold storage;
- canning and packing ;
- sugar milling, etc.

In principle, the food engineering unit should deal with engineering aspects and operation of equipment involved in industrial processes. The food technology department should deal with technological processes involved in treatment of raw material until the final product is produced.

Depending on the size of the food technology and engineering departments and their scope of activities, they may be combined into one department of food engineering and technology. In such

a case a separate department of civil, mechanical and electrical engineering could be established with the tasks:

- civil engineering:
  - architectural designs;
  - civil engineering designs;
  - construction of buildings and facilities.
- mechanical engineering:
  - design and construction of technological equipment;
  - preventive maintenance and repair;
  - plant construction and equipment installation.
- electrical engineering:
  - design and construction of some electrical equipment;
  - maintenance and repair of electrical equipment;
  - plant construction and installation of electrical equipment.

Activities related to plant design, construction, installation and maintenance would be in an advisory capacity and primarily in the phase of the preparation of technical studies, including techno-economic ones, they may act in an advisory or supervisory capacity in the preparation of tender documents, evaluation of bids, plant construction, equipment installation and the beginning phase of operation. The Institute should not try to replace the existing engineering and consulting companies but to fill the gap and assist investors whenever such assistance is required in this field. It's task would be, however, to develop new or modified processes and equipment and to assist or co-operate in this respect with consulting companies and investors.

5) Department of economics:

The organization of this department should consist of basic units with the following main activities:

- economic monitoring unit:
  - collecting and analysing information on market trends for individual food products, domestic and worldwide;

- establishment of an economic information bank with the purpose of providing all kinds of financial, economic and marketing information to the Government authorities and to those working in the preparation of techno-economic feasibility studies, investment studies, development plans and programmes, etc.

- economic studies unit:
  - preparation of techno-economic pre- and feasibility studies, pre- and investment studies;
  - price structures, production costs calculations; profitability calculations for different sub-sectors and products;
  - organization and management of agro-industrial enterprises;
  - budgeting, bookkeeping and cost accounting models.

6) Library:

The main activity of the library would be to collect and to disseminate scientific, technical, economic, marketing and other information. The activities may be grouped within the following basic units:

- collection of information material:
  - reference publications;
  - abstracts;
  - books and periodicals;
  - other documents, reports, studies, etc;
- retrieval:
  - selection of the retrieval system;
  - network of retrieval lines;
  - preparation of required and requested information;
  - dissemination of information.
- publication:
  - reproduction facilities;
  - preparation of information notes;
  - publication of documents, etc.

E. General activities

Very often it may be required that staff members from different departments and units form a team in order to cover all professional competences required for the preparation of specific studies, programmes, research work, etc. Such teams may particularly be required when technological, engineering, economic and marketing aspects are combined in the preparation of some documents, studies, etc.

Regarding the work programme in general, activities may be grouped basically along the following lines:

- ad hoc activities, such as the preparation of studies upon requests received from authorities, individual companies, organizations, institutions, etc.;
- preparation of models or standard designs for integrated agro-industrial enterprises, industrial plants, technological processes, equipment, products, storage warehouse, cold storage plants, transport vehicles, etc.;
- co-ordination of applied research activities carried out within the Institute and other institutions in the country;
- organization and carrying out applied research and training activities, trouble shooting;
- collection and dissemination of technical and other information, etc.

F. Financing

In principle the Institute and its facilities should be established from funds allocated for this purpose as a grant. Part of the investment may be considered on a soft loan basis. Once established, the Institute may try to become partly self supporting by charging its work to the customer, regardless of whether this is a private company or Government authorities. The charge may be kept at a reduced level in order not to be too expensive, however, still charging something in order to maintain a certain feeling of responsibility and desire to satisfy its customers. Non-productive activities, of course, should be financed from grants and on the basis of the work programme prepared for a period of two to five years.

II. MISSION OF 21 JUNE - 10 JULY 1981*

A. Introduction

This report is prepared for the President of the Republic's Office for General, National Coorination and Evaluation to outline a strategy to implement one of the Sistema Alimentario Mexicano (S.A.M.) sub-objectives of developing resources for the well-being of the deprived population.

Specifically we will concentrate on the mobilization of knowledge and its application for developing food technologies to achieve S.A.M.'s objectives. The National Council for Science and Technology (CONACYT) issued a program to outline the procedure for cooperation between the scientific/technical institutions and the industry.

Issues on the scopes of science and technology are defined to clarify the role of each in the overall picture.

An operational plan is recommended for the Institute of Food Technology and Development as a center for technology development, and as a coordinator to investigations and developments carried out at the academic and research institutes. The plan is centered on establishing program portfolio which couples the objectives, strategies and plans with the total deployment of resources available in Mexico and in overseas research facilities.

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*By M.M. Hamdy, expert in food technology and nutrition.

The coordination of each program is assigned to a supervisor/coordinator under the direction of the National Council for Food Science and Technology (CCTA). Avenues to transfer developed technologies throughout the national institutes, and the Institute of Food Technology are defined to reach the Food Production System via the industrial development liaison office of the latter institute.

We suggest three options for the authorities to chose from in order to assure the industrialization of new technological developments.

The environmental impact of the introduced technologies are considered on the basis of ecological impact, and energy requirements.

We emphasize the brevity without sacrifycing completeness as time permitted.

B. Background

CONACYT is S.A.M.'s arm to coordinate scientific and technological activities in all fields and among them is the food production area. Figure 1 shows in perspective the interrelationships of organizations and systems as perceived by the Office for General National Coordination and Evaluation. CONACYT provided the funding for projects proposed by the academic and research institutes as it sees fit. There has been no coordinated direction for these projects to deliver to the industrial food production systems. During interviews with directors from several institutes* they indicated that all their research projects were initiated by their investigators as they saw an opportunity to tie in with S.A.M.'s program. They all welcomed the approach of receiving clear objectives and plans so that they can formulate their project proposals according to specified guidelines and objectives.

Several directors confirmed CONACYT's report of 1980 on the problems that hampered the progress in development in general, and in S.A.M. program specifically.

The report stated these problems as:

A. Lack in coordination of research and development;

B. No interaction between the research and development

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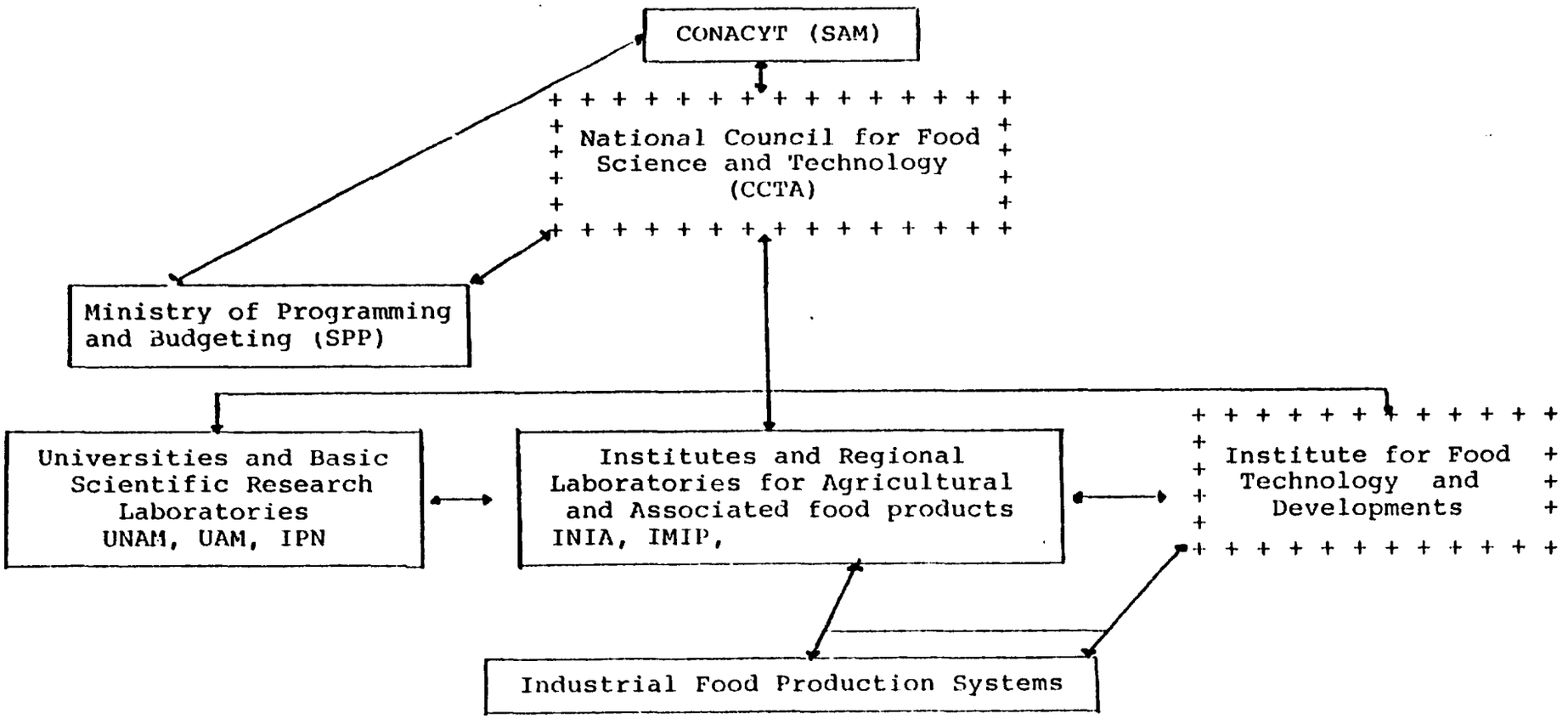
* Annex I

Figure 1. SCHEME OF INTERRELATIONSHIP BETWEEN ORGANIZATIONS INVOLVED IN SAM'S PROGRAM



+ + + +
+ + Organizations non-existing formally at this time.
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institutions, and the public or private sectors of the industry;

C. Shortage of competent professionals and technical personnel skilled in research and development work;

D. Dependence on imported research instruments and chemicals/materials which demand long waiting periods, and disruption of work caused by break-downs of equipment, and lack in spare parts and skilled repair personnel.

E. Administrative instability, and organizational changes necessitated by the political structure in Mexico.

The issue of loss of competent research workers to the industry was raised by many directors as a serious one which hampers the progress of government programs.

C. Classification of science, technology and autonomous technology

The clas-ification of activity areas at the scientific and research institutes is another issue that must be resolved by all concerned to reach common understanding on their definitions*. CONACYT in their report confined basic research to: physics, chemistry, mathematics, and biology. Food production, agriculture, animal husbandry, forestry, health, marine sciences, earth sciences, space sciences, and social sciences are considered applied research areas. Technical development is mentioned as the third area which covers: food technology, energy, agriculture, animal husbandry, forestry, agricultural machinery, mining, chemical industry, telecommunications, transportation, textiles, ferrous, and nonferrous metallurgy, electronics, metals, pharmaceutical chemistry, tanning, shoe industry, limber, paper, industries, construction, instrumentation, standardization, technical inventions, library science, engineering, and consulting services.

This classification may have been convenient to organize the research and development work at the time of publishing this report, but it does not coincide with the real look at scientific and technological views of today. Scientific or basic research in any field of activity deals with understanding the mechanisms of what, why, and how changes happen, while the application of one or more of one discipline in a system results in a technology*.

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*Definitions of science, technology, etc., appears in **Annex II.**

The significance of this wider scope of definitions for scientific and technological activities allows for combining several related activities under one program that is simple to monitor, coordinate, and administer. For example the dynamic aspects of separation, and concentration of proteins from wheat comprise the technological side while fractionation and studying the properties of each fraction belongs to the scientific or basic side of activity.

We apply this concept to combine basic and technical research projects under one program in a portfolio which is discussed in the following part.

D. Portfolio planning for research and development projects

The concept of portfolio planning incorporates the objective(s) and policy of administrators to implement these objectives with the deployment of human, technical, and financial resources needed. Portfolio planning also allows for organizing various projects carried out at several locations under one program which may be supervised and coordinated by one supervisor.

The Council for Food Science and Technology (CCTA) organizes the Institute of Food Technology and Development as the center organization for coordination and development of projects as shown in Figure 3.

E. The Institute of Food Technology and Development

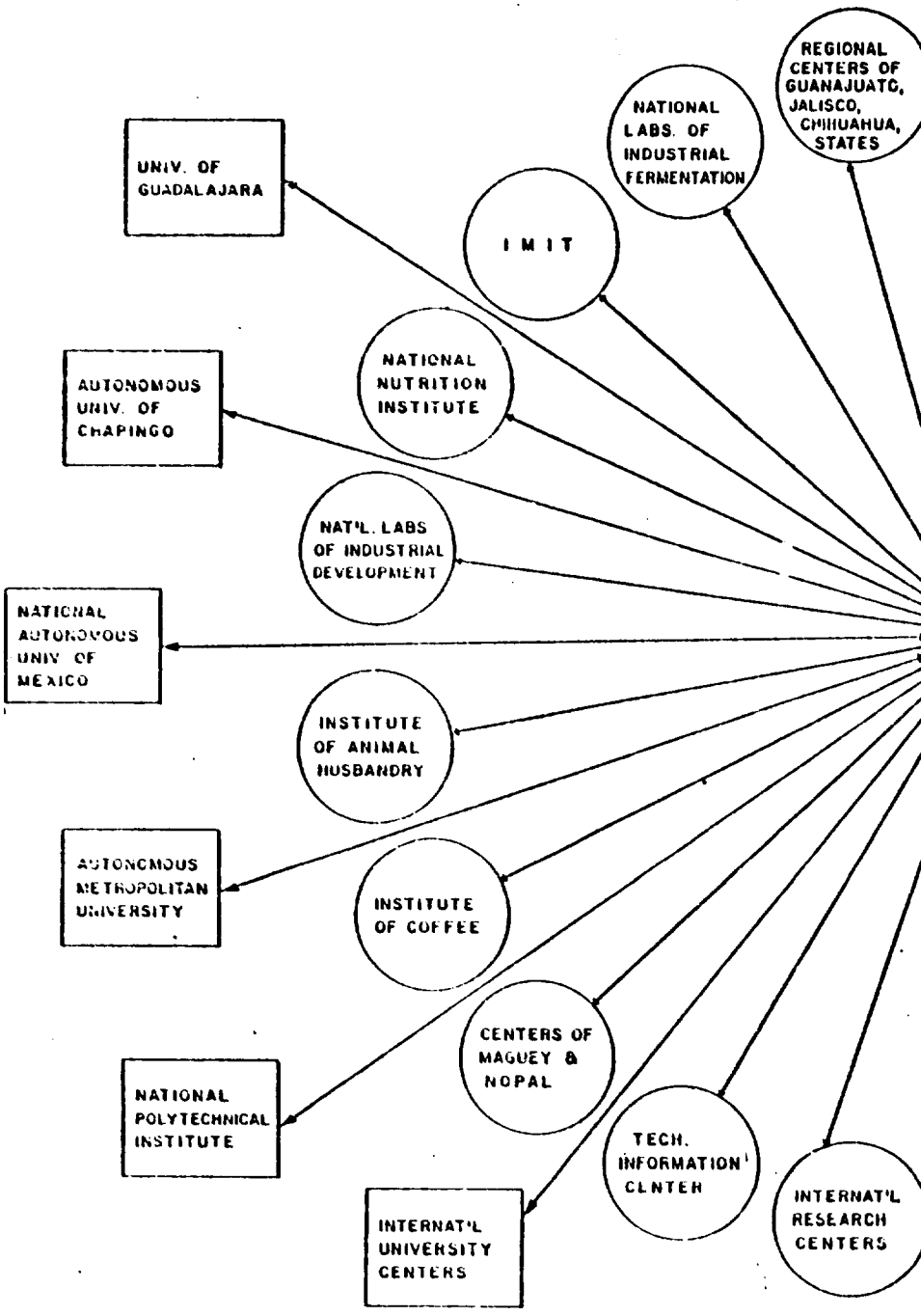
A report prepared in June 1981 covers the details on the organization of this institute, and its operations. We simplified the organization as shown in Figure 2 to: one director reporting to the CCTA, and reporting to him 5 managers who head the 5 operational areas in the institute. Also, a manager for the industrial development liaison office is planned in the organization.

The five operational areas are:

a) Agricultural development for projects on production on the farm, or on post-harvest crops;

b) Animal and marine development for projects on these resources either on the farm or at fishing villages;

c) Biotechnological development for projects on fermentations, enzyme-conversion of nutrients, genetic engineering, etc.;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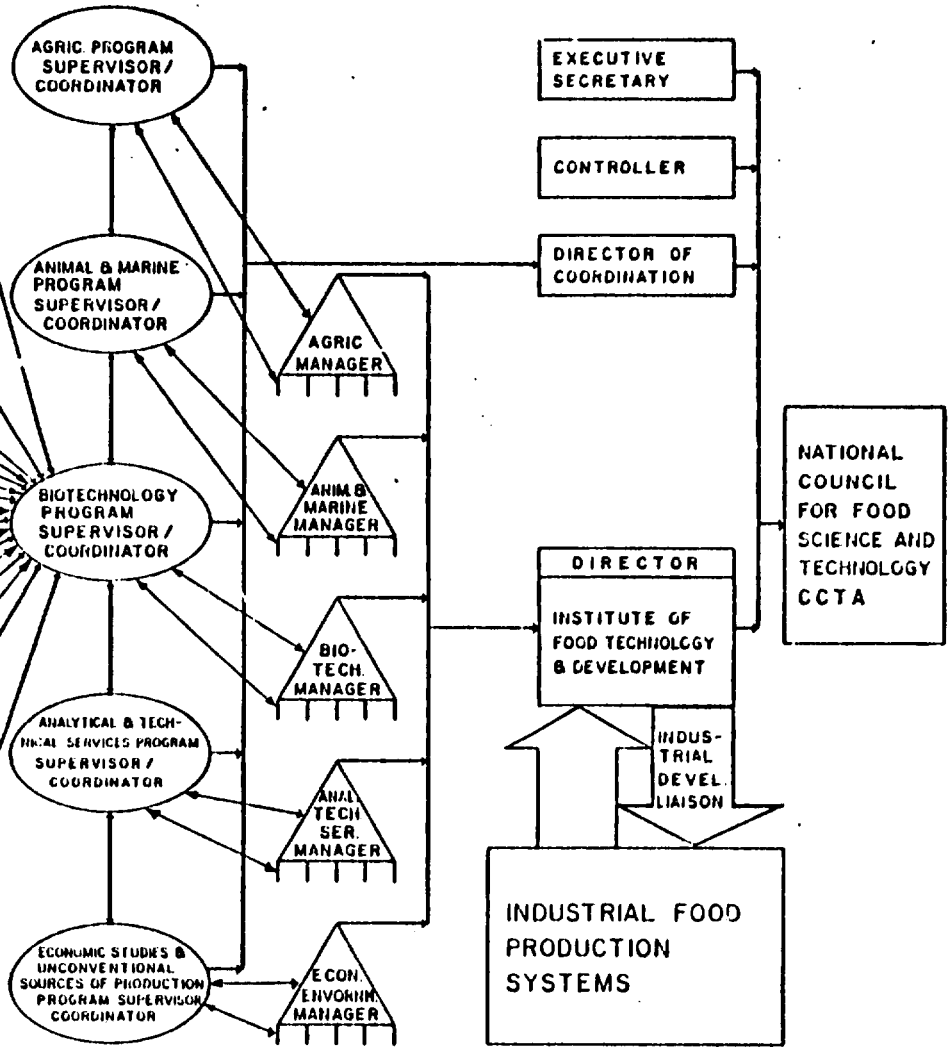
NAT'L. LABS OF INDUSTRIAL DEVELOPMENT
NATIONAL AUTONOMOUS UNIV OF MEXICO
INSTITUTE OF ANIMAL HUSBANDRY
AUTONOMOUS METROPOLITAN UNIVERSITY
INSTITUTE OF COFFEE
CENTERS OF MAGUEY & NOPAL
NATIONAL POLYTECHNICAL INSTITUTE
TECH. INFORMATION CENTER
INTERNAT'L RESEARCH CENTERS
INTERNAT'L UNIVERSITY CENTERS

Figure 2: . THE ORGANIZATION OF CCTA, INSTITUTE OF FOOD TECHNOLOGY & DEVELOPMENT & THEIR RELATIONSHIPS TO OTHER ORGANIZATIONS IN FOOD SCIENCE & TECHNOLOGY



d) Analytical and technical services for projects on quality control procedures, monitoring pollution of food sources or ecology, workshops to update professionals and technical personnel on advances in their respective careers, etc.;

e) Economic, and unconventional sources of food production projects, business entreprise studies, etc.

Each area manager shall have no more than 5 project leaders reporting to him to avoid dilution in effective management. If the number of projects in one area are more than 5, or need arises for expansion, then a second manager shall be assigned projects in the same area. It is highly desirable to limit the size of the institute at this stage to reduce the risk of mismanagement because of size.

F. Co-ordination of activities at the Institutes of Food Technology and Centres of Basic and Applied Research

As the schematic in Figure 3 shows we assigned the coordination activities to a director who reports to the CCTA. Reporting to the director will be 5 program-portfolio supervisors/coordinators who head activities in these areas:

a) Agricultural technologies, basic, and business research in this area;

b) Animal and marine research and developments;

c) Biotechnological research and developments;

d) Analytical and technical services for industries, business, or government or privately-owned operations;

e) Economic analyses and marketing studies for technological developments.

The number and titles of programs are the same as that mentioned in the Institute of Food Technology and Development to simplify the flow and coordination of information with the Institute.

G. The functions of program-portfolio supervisor/co-ordinator

We will discuss the role of program-portfolic supervisors in the following:

1. When he (she) receives the objective of the program from CCTA, he (she) prepares the subobjectives, strategy, and plans to achieve the objective. He (she) presents, with the director, this part of the portfolio to the CCTA to get approval on it. He may have to revise this part; therefore, this should be done as early as possible before the start of the fiscal year, at least 9 months.

2. Depending on the plans in the portfolio he (she) will send a copy of the portfolio to each academic, research and development institute and business research institute and ask for projects to implement the plans assigned.

3. He (she) will discuss the details of project proposals with the organizations which submitted them to clarify any points if need be.

4. He (she) enters the projects in the portfolio program wherever they belong, namely under scientific, technological/ development or business.

5. He (she) presents to the CCTA the complete program-portfolio, and must be prepared to answer questions, and make the changes in the projects as directed by CCTA

6. When the portfolio is approved by CCTA and SPP, a copy of the approved project order is sent to the institution assigned the project.

7. Monthly or biomonthly, depending on the priority of the program, the supervisor--coordinator presents to CCTA progress reports, based on the report he received from the project leaders and on personal contacts with them. He (she) should be prepared to suggest solutions and suggestions to solve problems or issues relative to any project in his program.

8. He (she) prepares a final report on the program at the end of each fiscal year. Final report must show the accurate and actual status on each project, and must make recommendations for the following fiscal year program for continuation or cancellation.

We can see the important role the supervisor/coordinator plays in coordinating and in communicating with personnel with different training, and at several levels. Therefore, the chosen supervisor must be a good communicator, and skilled in the technical and administrative areas.

H. The flow of information and technology to the Institute of Food Technology and Development

Figure 3 shows the direction of the flow as indicated by the arrows from left to right. The pay off of each program is shown in how much it delivers to the big arrow of industrial development liaison which serves the industrial food production systems. Again, the emphasis is on the effectiveness of the supervisor/coordinator of each program, and on the decisions made by CCTA.

The supervisor of each program communicates with other supervisors informally as he sees necessary to coordinate projects that may cover more than one program area. Also, the supervisor is in touch with the Food Institute departments that need and provide information.

I. The Industrial Development Liaison Office

The manager of this office reports to the director of the Food Institute, and is in charge of coordinating, and supervising the transfer of developments to the food production systems as directed. He also expedites authorizations and financial aids through other governmental agencies for final commercializations of new developments.

Establishing good rapport with the food industries is a prime objective of this office, therefore, it must gain the respect and confidence of the industry by delivering on time what is promised.

J. Options to assure commercialization of developments

The transfer of technology to business is by far one of the most frustrating aspects to developers and administrators. Many developments died on the vine for one reason or another with the results of frustration and loss in resources.

We recommend the choice of one of the following options depending on the situation and type of development:

1. Attract industrial entrepreneurs to consider investing in the technology by offering a package of financial, tax, and technical assistance to the investors. Information on the market demand, size and profitability of the new development should be available for presentations to the business community;

2. The State or Federal Government may set up an operational unit for the new development as a model to gain experience, and to resolve operational problems. When the development proves successful the government may start a franchise business by establishing similar operational units in geographically chosen areas. The franchise will be sold to the business community, preferably small business people, at cost plus royalty fees to cover the expenses of the franchise business. This approach is highly desirable for the inexperienced business people because the risk of failure is reduced by buying in operational business;

3. The government may set up the production units in the selected areas. Instead of selling the units under a franchise system as mentioned under option 2, the government retains the ownership of the production units, and offers the private sector the option to manage and operate these units. One or more units may be managed by private companies who

will share in the policy making, and in the profit sharing. This option reduces the large financial requirement for the business sector to start in the new development, and avails the goverment to the managerial skills of the private sector.

K. The National Council for Food Science and Technology (CCTA) as the stimulator and controller of food programmes

It is obvious from the schematic in Figure 3 that CCTA is the final authority that carries the responsibility for stimulating and coordinating all the programs in the food development areas. We show on the schematic two staff positions for CCTA, namely the executive secretary, and controller. The executive secretary is responsible for all administrative operations at CCTA, except that of control on the programs. The controller is in charge of reporting independently from program supervisors/coordinators to the council his assessments on the progress of each program versus its objectives and funding.

His report should confirm that of the program supervisors/coordinators to CCTA. If there is discrepancy between the two reports the CCTA should know about it in time and directs on the course of action for this program.

L. Proposals and budgeting for projects

We showed in Figure 2 a program portfolio in which each project is appropriated a sum of pesos for the fiscal year of each program. A standard form and procedure should be adapted by all institutions active in the food program to avoid confusion and discrimination.

A project proposal form is shown in **Annex III which is** self-explanatory in regard to the information that is necessary to approve a project. The objectives must be stated in clear terms to avoid confusion on any party. It is the responsibility of program portfolio supervisors/coordinators to correct inaccurate information on project proposals before submitting them for approval by CCTA.

For budgeting purposes we recommend that each institute set up the cost of each technical person per year on a project by following this procedure:

First set up a functional budget which covers all the projects at the institute, even if carried out at several locations. ⟷ **Annex** III shows forms of functional and operational budgets for an institution.

The functional budget includes the total salaries, benefits, pensions, etc., for all project workers per year. The operational budget adds to the functional budget the overhead

expenses which include administration, clerical, equipment and material, utilities, travel expenses, and all other expenses related to the function of the institute. The figures do not reflect a factual case, but should help in calculating the cost of each project worker per year at an institute. This cost is entered in the project proposal referred to earlier, to be submitted for approval.

This method permits flexibility that each research and development institute may have a variable overhead depending on the cost of operation at the location of the institute. Also, it guides the administrators to the overhead burden on the budget, and to make an effort to reduce the cost of administration. No major capital expenditures over $100,000 should be included in this budget and rather handled separately under special capital appropriations.

M. The environmental impact of new technological developments

It is fortunate for countries like Mexico to get the chance to learn from the experiences of the industrialized nations in respect to the price being paid to rectify the damage done to their environments. Awareness among governmental, and industrial administrators of the need for projecting the impact of any new industrial development on the environment protects the latter from damage.

The following factors must be considered in assessing the impact of new technical development:

1. Changes in the levels of pollutants in air, soil, water, and noise caused by the operation of new industry. Gases such as nitric oxide, sulphur dioxide, carbon monoxides result from the burning of oil and coal as major sources of energy.

2. Agricultural, animal, and marine food-products processing result in substancial amounts of inedible by-products or waste that must be considered in a new technology to find ways to utilize them in economical ways, or by cycling them in the soil.

3. Additives to water such as detergents, disinfectants etc., for cleaning vegetable and fruits, or for cleaning processing lines must be recovered before disposal in sewers or in disposal lagoons. Incorporation of the closed loop to reuse water after purification in a process is a desirable aspect in areas where water source is limited.

4. Processing of special products such as some flavorings and dehydration of onions or garlic results in offensive odors in the exhaust gases which must be eliminated by passing through scrubbers to eliminate these odors before releasing in the air.

Standards for pollutants in air, water, or soil must be set in a realistic manner without compromising the ecological conditions. It must be warned that setting strict standards for pollutants may kill a number of promising technical developments.

N. Conclusions

There is a genuine effort at all scientific and development institutions visited to improve on their capability to serve S.A.M. program. The concept of establishing procedures to coordinate projects and programs among all institutions was well received and encouraged. The resources at LANFI can be a good nucleus for the Institute of Food Technology and Development. Government institutions must encourage competent scientists and professionals to join or stay on in their jobs by offering them salaries and benefits competitive with those offered by the private sector. CONACYT and the Council of Food Science and Technology, must provide the leadership required to pull the scattered programs on food development together.

Annex I

BRIEFS ON THE INSTITUTIONS AND PERSONNEL VISITED

1. NATIONAL INSTITUTE OF NUTRITION
   Department of Nutrition Physiology and
   Food Technology

   DR. CARLOS GUAL CASTRO, Director General
   DR. HECTOR BOURGES RODRIGUEZ, Subdirector of
   Food Department

The people that work in food technology in this institution know very much about the work that is being done by S.A.M. Nevertheless, their work is purely basic research, they are not worried about what the market is needing in order to plan their research.

They are now developing a food technology program with a pilot plant, in which their main objective is the study of nutritional aspects of food at a low cost.

They feel a need that research has to be linked with the production sector, and the need of coordination between institutions in order to help each other and to avoid duplication in different projects, or specific research.

This institution does very little trainning at M.Sc. level in nutrition 8-9 / year.

We find out that there has been many attempts of creating a food technology institute, since 1973, where DR. JAVIER

PEREZ-VILLASEÑOR, has been one of the most interested men in this project.

2. NATIONAL SCHOOL OF BIOLOGICAL SCIENCES
Department of Graduate Work in Foods
Polytechnic Institute

MR. SANTIAGO REYES HERRERA, Director

They have very little relation with the industry, they are now doing something with Chiclet's Adams, Nitro, Cocotero.

They give very specific courses to other institutions.

The research work they are doing is basically linked with the academic work at M.Sc. level in Food Technology.

They also have very good facilities, such as pilot plants that are not been used.

One of the most important facts I could notice is that they are now organizing a committee with several research institutions* and some state industries** in order to identify the needs of the industries, and in that way they will be able to do the appropriate research that will help these industries.

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* INN, UAM, UNAM, LANFI, CONAFRUT, University of Guanajuato.

** CONASUPO, LICONSA

Relative to how would they feel if an organization, like the one we are creating, will handle the coordination and develop work. They will help and collaborate with all the research institutions in order to achieve the goals set by the Mexican Food System.

They are aware of the need to link the research activity to the production sector, and also about the duplication of activities in the research institutions.

One of their main problems, as I could identify, is the need of financial resources, and experienced research people.

3. INSTITUTE OF TECHNICAL SUPPORT AND INDUSTRIAL FINANCING (IMIT)

DR. IGNACIO DESHAMPS, Director General

This institute is sponsored by the Bank of Mexico to evaluate projects in all aspects such as industrial development, marketing studies and risk of loss to the bank.

The institute is carrying out studies on projects requested by the government. The Director estimates 9 out of 45 projects last year were in the agrobusiness sector. He did not see changes in the policy of the institute at this time.

4. NATIONAL INSTITUTE FOR INVESTIGATIONS ON BIOTIC RESOURCES (INIREB)

DR. A. GOMEZ-POMPA, Director
MR. E. PARDO-TEJEDA
MR. HECTOR LUIS MORALES ZAVALA
MR. PEDRO NORIEGA CURTIS

This institute combines between the scientific, and technological applications, and trainning of personnel in the agricultural areas of rural Mexico. There is a program on integrated farming to increase the productivity and well-being of farmers. New laboratories are set up to study basic problems related to new food sources, toxicological aspects to food and the ecology, etc. The idea of coordination of programs and projects was encouraged, furthermore, the importance of transferring technologies to the productive field was stressed.

5. NATIONAL INSTITUTE OF ANIMAL RESEARCH (INIP)

DR. CARLOS ARELLANO SOTA, Director General

In this institute, I could see that the main problem that they are concerned about is Financial Resources, that is why they have lack of human resources and administrative problems.

He agreed that there is a big gap between the research and the production sector. And that it will be perfect if an organism is created to establish the research that is needed in the country in order to reach the goals setted up by the Mexican Food System.

They are now creating a mechanism in order to coordinate the several research institution in this department (SARH), so that they will not duplicate functions and be able to collaborate with each other in different research programs.

6. AUTONOMUS METROPOLITAN UNIVERSITY
Auxilliary Secretariat of Planning and Information

DR. SERGIO ESTRADA-ORIHUELA, Director

Besides trainning for graduate degrees, the food technology activities cover three areas: basic, and technical development, and social studies related to unemployment in depressed areas. The need for program coordination among academic and research institutes was encouraged. The assistance of experienced international academic and research institutes was sought to formulate meaningful programs, and to provide guidance in research and development. Organizational planning was also mentioned as one of the areas in which assistance is needed.

7. NATIONAL LABORATORIOS OF INDUSTRIAL DEVELOPMENT (LANFI)

MR. JESUS LOZANO, Subdirector of Food and Chemical Products.

MR. FRANCISCO C. MUÑOZ RUIZ, Subdirector of Packaging Technology

This institution has the most organized activities, and capabilities to serve the food industry in Mexico. Expansion in pilot plant facilities is underway to accomodate process

and packaging studies. UNIDO has a joint development program there on packaging of food products.

8. NATIONAL AUTONOMOUS UNIVERSITY OF MEXICO (UNAM)

DR. JAIME MARTUSCELLI, Coordinator of Scientific Investigations

Our timely visit coincided with the issue of "Programa Universitario de Alimentos" which has taken inventory of the university's resources and programs of research. Organization of programs were shown in this report to show the general structure, and to show the programs by maturity.

The university signed an agreement of mutual cooperation with S.A.M. A committe of 4 members will coordinate the programs from S.A.M. to the university. Effort at the latter has been exclusively in basic research; however, they had developed two technologies without success to transfer them to the business stage. The program as proposed does not interfere with the overall coordination objective we recommend in this report. Dr. Martuscelli expressed willingness to accept and to cooperate with systems to coordinate programs from S.A.M. The university has an up-to-date data processing and retrieval center, and facilities to publish periodicals.

Annex II

DEFINITIONS

- Science is a discipline of facts, rules and phenomena that can be reproduced reliably under set conditions.

- Technology is the knowledge of how to apply principles from one or more disciplines to create a product or system of known dimensions.

- Autonomous technology is that created independently of outside supportive help. All the drive and resources are provided from within the system.

- A technological package is a group of systems that are interdependant that each are critical to the success and achievement of set objectives.

Annex III

OPERATIONAL BUDGET

	Cost (Thousands of dollars)
Salaries for Project Workers	1,950
Administration	1,000
Secretarial Workers	1,000
Equipment and Material	250
Utilities	1,000
Travel Expenses	150
Miscellaneous	150
T O T A L :	$ 4,780

Overhead

Operational-functional = $ 2,830

Overhead % of functional budget = 145 %

Calculate cost of each project worker per year as follows.

Cost of man/year + 145% of cost

For example:

from the functional budget the project leader cost/year will be:

35,000 + 145% =

35,000 + 50,750 = $85,750

and,

cost of chemist/year =

20,000 + 145% =
20,000 + 29,000 = $49,000 and so on

Functional Budget

Project Title	Project #	Personnel	Cost (Thousands of dollars)
----------	----------	1 Project leader Grade X	35
		1 Chemist, Grade Y	20
		2 Technicians, Grade Z	20
----------	----------	----------	--
----------	----------	----------	--
----------	----------	----------	--
----------	----------	----------	--
T O T A L :		35	1,950

PROJECT PROPOSAL FORM

Project Title: _____

_____

Project Number: _____ Project leader: _____

Assoc. Personnel: _____

_____

_____

Objective (s): _____

_____

_____

_____

Starting Date: _____ Completion Date: _____

Location of Work: _____

_____

List of project-numbers associated with this project:

_____ _____ _____ _____ _____ _____ _____

General Remarks: _____

_____

Submitted by: _____

Approval by: _____

Supervisor of Program: _____

Name of Program: _____

Date Submitted: _____

Date of Councils' Approval: _____

III. MISSION OF 1-17 JULY 1981*

A. Introduction

The job description (UC/MEX/80/168/11-04/31.7.C) for the three weeks assignment (allowing 2 weeks and 2 days in Mexico) gave the following as the purpose of the project:

"To assist the government to formulate a concept for a type of research and development system which should be created to assist the development of the food processing industry in the country".

The specific duties, requested on arrival, varied somewhat from those listed in the Job Description. No inventory of research and development facilities in the country could be made available and the visits that were possible to leading national authorities in the field of agro-industry development were limited.

I was asked at the outset to concentrate on the tentative proposals, prepared by S.A.M., for the functions, structure, planning and initiation of a projected new National Institute for Food Technology and this took much of the mission time.

However, in the last few days of the mission, discussions in S.A.M. revealed that they were sympathetic to the idea that the Institute needed to function more along the lines of a

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* By P.C. Spensley, expert in food processing research and development.

Development Corporation, with the scientific and technological activities of the proposed Institute closely tied in with a mechanism to implement the findings commercially. This thought is, therefore, developed, albeit rather briefly, in the latter part of this report.

B. Background

The Sistema Alimentario Mexicano (S.A.M.), established by the President of Mexico in 1980, has the following objectives:

1. To secure self-sufficiency in food production in Mexico.
2. To raise the nutritional status of the 19 million poor in the rural areas (30% of the Mexican population of whom more than a quarter are mal-nourished), and so to improve their health and well-being.
3. To help those poor to become more efficient producers and sellers of food, as a means to improving their standard of living further.
4. Additionally, there is a desire to make Mexican food industry less dependant than at present on foreign technology and know-how; also to organise more food processing in the rural areas, close to where raw-material is produced, with a view to improving rural employment.

Substantial progress is already being made with the first of the above objectives. Self-sufficiency in maize and beans is expected to be achieved in 1981.

For the second objective, and essentially also for the third, S.A.M. has developed a strategy which concentrates attention on a "recommended basic basket" of 30 food commodities which, if produced in the calculated quantities and consumed in balanced amounts by the rural poor, should effect the desired nutritional improvement. These 30 commodities are listed in the table.

For the fourth objective, regarding food industry and indeed, the food post-harvest system as a whole, there is expected to be a need in many instances to select and introduce technologies that are new to Mexico and it will be desirable to seek those optimally suited to Mexican rural conditions. This, in turn, will require the establishment of mechanisms for achieving the "optimal technology"* from wherever it may be available; or alternatively developing it "in house" in Mexico.

To press forward this strategy with regard to the 30 food commodities in the recommended basic basket, and the desired reorientation of the food industry in Mexico, S.A.M. is considering the establishment of a new Food Institute. It is on the various characteristics of this Institute that I have been invited to give my opinions and this, therefore, is my starting point.

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*A term coined in T.P.I. to mean the best technology, of whatever level of sophistication, for use in the given situation, taking all relevant circumstances into account.

TABLE.

FOOD COMMODITIES IN THE RECOMMENDED

BASIC BASKET

CEREALS

1. Maize
2. Wheat
3. Rice
4. Others

LEGUMES AND OILSEEDS

5. Beans
6. Others

ROOT CROPS

7. Potatoes
8. Sweet Potatoes

VEGETABLES

9. Tomatoes
10. Chillies
11. Onions
12. Others

FRUITS

13. Bananas
14. Apples
15. Lemons
16. Oranges
17. Avocado
18. Others

ANIMAL PRODUCTS

19. Beef
20. Pork
21. Poultry
22. Sheep and goats
23. Eggs
24. Milk (cows)
25. Other Milks
26. Pork fat
27. Fish and other marine products

OTHER FOODSTUFFS

28. Sugar
29. Vegetable Oil
30. Miscellaneous

Source: SAM.

I should emphasise that I have not been asked to consider whether any existing organisation or institute in Mexico could perform the required function or could be adapted to do so.

It is not, however, the intention to duplicate work in the new Food Institute which is being, or which could appropriately be done in other existing Mexican establishments. The new Institute would, however, play a leading role and act as a national focus for work in food research and development in the country as a whole, drawing on the facilities of other establishments as appropriate.

C. The functions of the new food institute

A tentative document, prepared by S.A.M., indicates the basic objective of the Institute as:

To assist the development of technology for the poorer regions of the country and the achievement of national self-sufficiency in food production, through the identification, selection, development, transfer and introduction of the technological options best suited to local food preservation and processing industries; also, to help with establishing the manufacture of food processing equipment in Mexico.

The document goes on to list the following specific functions for the Institute:

1. To coordinate the scientific and technological research and development activities in the country and to assist the Government and its relevant organisations in the formulation and execution of national policies and programmes of technological development.

2. To promote the best possible use of existing scientific and technological knowledge and to adapt this to meet the socio-economic need to develop the national food industry.

3. To develop areas of investigation which will fill gaps in knowledge and which may lead to the development of new technologies and processes, including packages of

technology appropriate and acceptable to the industries of the country.

4. To carry the development of technology to the point of industrialization and so getting some integration of research with the production sector.

5. To provide technological and technical assistance services to the users of products, equipment or processes resulting from technology development and to undertake technical and economic feasibility studies on projects for new industrial operations.

6. To promote the manufacture in Mexico of the capital equipment required for integrated agroindustries, and to provide technical advice to the manufacturers of such equipment.

7. To establish relationships for the interchange of information and to effect scientific and technological collaboration with national and foreign bodies, in both the public and private sectors, that have common interest in the food field; also to disseminate information of relevance, directly or indirectly, to the food chain.

3. To bring about programmes for raising the expertise of the professionals in the field; to provide training for the investigators (at Masters and Doctoral level); also to upgrade the theoretical knowledge and the practical ability of the workers, administrative and technician personnel.

9. To reach agreements with the bank to enable funds to be made available to the small producers for the establishment of integrated agro-industries, whilst , for its part, the Institute would be responsible for providing the requisite technical assistance and technology.

Comment

I shall be concerned throughout this study to advise on the importance of ensuring, wherever possible, that the Institute does not become an "Ivory Tower", divorced from the mainstream of food industry development in Mexico (as I have seen in many other countries). I would suggest, therefore, that the initial statement of the basic function of the Institute should include the indication that the Institute is to be a major instrument in the execution of Government policy regarding the development and reorientation of the food industry in Mexico.

Following this line of thought, I feel it might be better then to change the order of the specific functions for the Institute and bring to the beginning those that relate directly to links with the industry. There would also seem to be a need to emphasise that a first function of the Institute is to identify the point at which new food industries need to be established in line with Government policy (e.g. in connection with the build-up of production and use of the 30 commodities in the Recommended Basic Basket).

I would suggest, therefore, that the first specific function of the Institute would be a combination of this and of items 3 and 4 and part of 5 above, something along the following lines:

"1. In line with Government policies and priorities for the extension of production of particular food commodities and for the development of particular rural areas and urban enterprises, to identify situations where new or improved agro-industries should be established; to determine, by technico-socio-economic studies, the optimal technology for use in each situation, by reference to the knowledge available in Mexico or obtainable from abroad; or alternatively to undertake or to arrange in other Mexican establishments, appropriate development work to produce suitable technology; then to carry this technology through to the point of commercial production."

The remainder of item 5 above could then become Function No. 2.

"2. To provide an on-going advisory and technical assistance service to the food industry in Mexico."

Next, item 6 above could become No. 3 and the first part of item 9 above could become No. 4 (the remainder of item 9 is really covered in the new No. 2).

These four functions, to my mind, should be regarded as the primary aims of the Institute. The others —the coordination of food research and development work in the country, the gathering and exchange of information,and the build-up of professional specialism and technician skills in the food sector — whilst all very important, are, in a sense, ancilliary to the other functions. I would suggest, therefore, that they be put in under a sentence such as "As a help to carrying out the above primary functions and to improve the national capacity to undertake food industry development generally, the Institute will have the following additional responsibilities:-"

Item 1 above would become Function No. 5, item 7 would become No. 6 and item 9 would become No. 7.

Annex I sets out the above suggestions, with some changes of wording to improve the English version.

D. The organizational structure of the Institute

The organisational structure for the new Food Institute, presented in the S.A.M. tentative document, is most easily summarised in chart form. This is shown as figure I.

Comment

The organisational structure for the Institute will depend to some extent on the size envisaged for the Institute. In what follows, I am assuming that the Institute will employ around 100 professionals in its early stages (say the first 5 years).

It is very important, I think, that the organisational structure not only covers all aspects of the functions envisaged for the Institute, but also is designed to encourage productive patterns of working. For this, I consider it vital to allocate manageable blocks of responsibility to a number of key professionals in the Institute and then to ensure that they have access to all the additional professional expertise, the technician assistance and the other facilities that they need to carry out their part of the Institutes' function, I do not feel that the structure in Table II fully achieves this.

The first of the functions in the revised statement at Annex I, is, presumably, the most important and will involve the greatest amount of effort on the part of the Institute. It covers a wide field and the first decision to be taken is

how to divide it up into manageable blocks of responsibility. These need also to be blocks which provide a stimulating and satisfying specialisation for the officers involved. In my view, the field should be divided on a commodity basis and the officers would be "Commodity Technology Specialists" (CTS). The senior members of this group would be key people in the Institute, as indicated below.

Bearing in mind the Recommended Basic Basket of Commodities Table 1, ←→ a possible break-down of the field, for organisational purposes, would be to have the following Commodity Technology Sections:

CEREALS

LEGUMES AND OILSEEDS

ROOT CROPS

VEGETABLES

FRUITS

MEAT AND EGGS

MILK AND MILK PRODUCTS

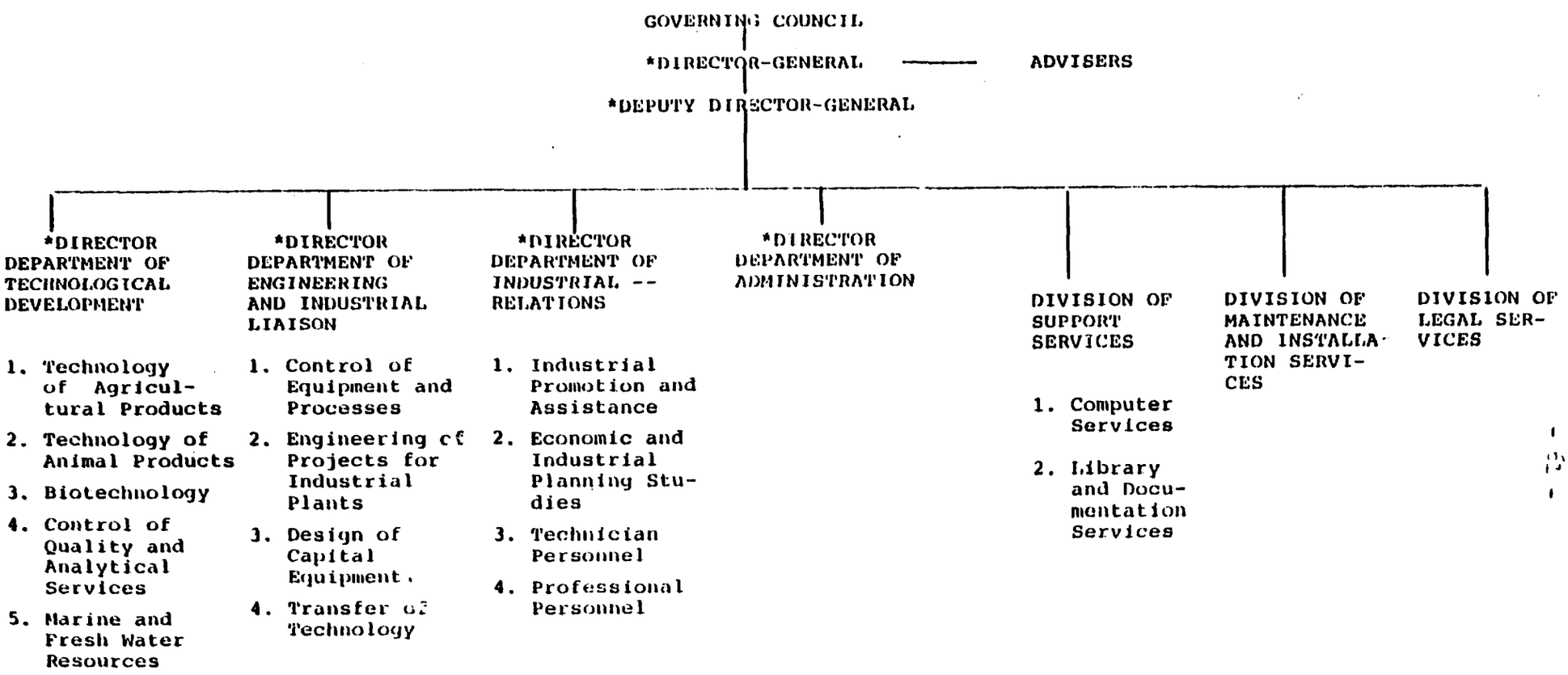
FISH

MISCELLANEOUS COMMODITIES

Each of these sections would have an Officer-in-Charge --"the Chief Cereals Technologist", "the Chief Fruit Technologist", etc.-- and a number of other professionals, depending on the importance of the commodity group and its problems for Mexico. Within each Commodity Technology Section, there would be the possibility of further specialisation either on an individual

Figure I.

ORGANISATION CHART FOR THE FOOD INSTITUTE



* These six Officers constitute the Technical Council

Source: Derived from the SAM document.

commodity basis or on some technological aspect of particular importance within the commodity group e.g. cereal milling, vegetable packaging.

These Commodity Technology Sections, and particularly their Chiefs, would have the prime responsibility under Function No. 1 of the Institute, to identify the field situation offering development potential and requiring research and development work. They would also recommend to the Director-General desirable programmes of work and indicate where this work could best be carried out in Mexico. Later, when the work was complete, the Section would need to see to the application in the field. This is most important. The Sections could have their own laboratories and use of a pilot plant for carrying out work which it was decided that the Institute itself should do (see section E).

At various points in this sequence of operations, the Commodity Technology Sections will need the help of other disciplines, e.g. economists, engineers, chemists, etc., and these will need to be available from Professional Support Sections in the Institute. The important feature, however, is to have it clearly established that the Commodity Technology Sections and their Chiefs have the leading role in this Function No. 1 and that they are responsible for composing appropriate interdiciplinary teams from within, or indeed outside, the Institute as each particular project requires. It would be

the duty of these Sections, also, to keep informed as to what was going on with their commodities elsewhere in Mexico and in other, leading countries.

These Commodity Technology Sections could then be grouped into 2 Departments -a Plant Foods Technology Department and an Animal Foods Technology Department- with a Director in charge of each.

With regard to Function No. 2, requests for advice and technical assistance from the Food Industry in Mexico should go in the first instance to the appropriate Commodity Technology Section as it is important that the Commodity Technology Specialists should be aware of the problems that arise with their commodities, post-harvest. However, they may then depute the action to be taken to one of the support sections of the Institute if the nature of the requirement makes this more appropriate.

With regard to Function No. 3, it might be advisable to make this the responsibility of a separate Section, as it will involve developing procedures which will be different and distinct from those of other parts of the Institutes' work. Some liaison with the Commodity Technology Sections will be appropriate in many instances. This Section is shown in the revised structure as "The Food Industry Equipment Manufacture Section". It is likely to be small, initially perhaps just one industrial engineer. But he will be able to draw on the

other engineers in the Institute as necessary.

Function No. 4 relates purely to the implementation phase and is dealt with under that later.

Turning now to the "ancilliary" functions, No. 5 concerns the "coordination" of scientific and technological research and development work on food in Mexico as a whole. The nature of this operation will depend on the extent of the powers to be given to the Institute to control work in other establishments. The easiest and most effective way of achieving some measure of control would, of course, be to give the Institute the job of allocating grants for research in food at Universities and Polytechnics. The job could be carried out by a small scientific administration section (called say "the Food Research Grants Section"). Decisions on whether or not grants should be given should not, of course, be taken by this Section alone; but there should be a routine procedure whereby the Commodity Technology Specialists give their opinion on proposals and these should then be referred to a Food Grants Committee for which the Food Research Grants Section would provide the secretariat. Incidentally, the Commodity Technology Specialists should also monitor progress on work done under grants in other establishments and submit brief reports, at least annually, to the Grants Section for review by the Food Grants Committee.

In the extreme form, this would mean that the whole of CONACYT's funds and function in relation to food research would be transferred to the new Institute. I would not, however, recommend this step. Instead, I would suggest that the new Institute should merely have a priority call on those CONACYT funds, earmarked for applied food research, to the extent that these were needed for research in other establishments that the Institute had identified as important for achieving its objectives. The volume of this would, no doubt, grow as the Institute developed and some measure of coordination of the work of the other organisations would be effected in the process. More positive control than this would not seem to be an appropriate function for the new Institute.

Indeed, I think it needs to be considered carefully what the aim of coordination is. If it is to allocate limited government funds for applied food research in the best possible manner, the above arrangement will help CONACYT achieve this more effectively. If it is to help organisations working in the food field to be better informed as to what research and development is going on throughout Mexico, this is an information exercise that the new Institute could perform. If it is to provide opportunities for organisations with common interests to keep in touch, the Chiefs of the Commodity Technology Sections of the new Institute could take the initiative and arrange regular workshops or seminars. But other coordination, in the control sense -that is, telling Universities, Polytechnics, etc. what

research they can and cannot do- would not seem to be either an appropriate or an acceptable function for the new Institute.

It does appear that CONACYT is not at present very discerning in its selection or rejection of applications for food research grants. In addition, therefore, to the gradual involvement of the new Institute in the selection process for Government-funded food research, suggested above, the Institute could, when it was well established, offer its wide ranging expertise in the food field to CONACYT to assist them in their consideration of applications for new food research grants.

As to the matter of general advice to the Government and government organisations on the formulation and execution of programmes of food research and development, I would consider this a responsibility of the Director-General of the Institute, drawing on the expertise of the Institute as a whole.

The Institute needs a Library and Information Section for its own, internal purposes, and this same Section can be charged with responsibility for Function No. 6, in so far as information gathering and dissemination is involved. Collaboration linkages of other types (e.g. training, personnel exchange, etc.), could be the responsibility of the Commodity Technology Departments and Sections and the Personnel Development Section (see below).

Finally, Function No. 7 could be the responsibility of a Training and Personnel Development Section. Such a Section will be important for the Institute's own needs; but if it is decided that the Institute will be the focal point for advice on the production and further training of Managers, Professionals and Technicians in the food field for the country as a whole, this Section could be expanded to meet this purpose.

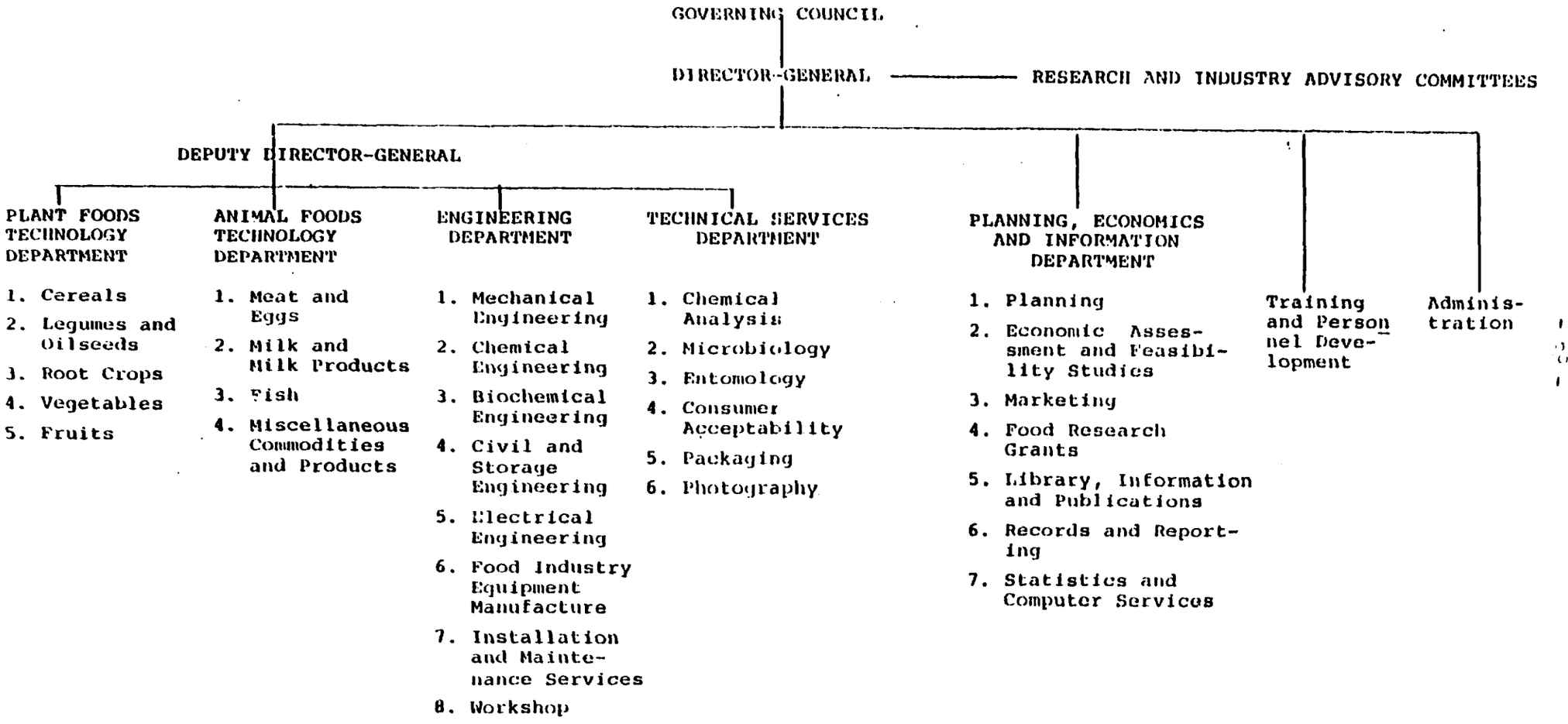
All of the above suggests to me a somewhat different organisational structure for the Institute from that set out in the S.A.M. tentative document. This, I submit in figure 2. (Incidentally, it bears some resemblance to the structure which has evolved at the Tropical Products Institute over the years and which works satisfactorily. The objectives of the two bodies are not quite the same; but both bodies are multidisciplinary organisations concerned with the problems of food development and essentially both are concerned mainly with the post-harvest sector. So, they have much in common).

There are a number of points to which I would like to draw attention regarding this organisation chart (figure 2).

Firstly, because of the leading role that I think should be given to the Commodity Technology Specialists, they occupy 9 Sections and 2 Departments, giving them 2 positions at Director Level. The coverage of each of the Sections is clear from the title and by reference to the Recommended Basic Basket of Commodities (Table 1). The Miscellaneous Commodities Section would cover sugar and could include unconventional products such as microbial protein, if it is decided to have such items in the programme. If at a later date, work is required on commodities outside the Recommended Basic Basked (beverage crops, spices, and possibly also animal feeds), these could be added to the Miscellaneous Commodity Section or be made into new Sections.

Figure 2.

ORGANISATION CHART FOR THE FOOD INSTITUTE



Source: P.C. Spencley, UNIDO expert.

Some of the Commodity Technology Specialists may have had basic training as engineers; others will have graduated as chemists, biologists, food scientists, etc. In any case, they will need considerable support in their duties from different branches of engineering and all of this, I propose, should be supplied by an Engineering Department. This would be divided into Sections according to the different branches required. Furthermore, I suggest that the other requirements of the Institute of an engineering nature be put into this department, giving, the Director-in-charge the possibility of deploying the Institutes' engineering manpower in the most efficient manner.

Hence, the Section responsible for encouraging the manufacture of food industry equipment in Mexico, could be placed in the Engineering Department*. Also, if the Institute becomes one with laboratory and workshop facilities, the maintenance services for these could be placed in this Department.

Each of the Engineering Sections will probably want to have its own design operation and drawing office facilities; but the workshop would only be necessary if the Institute goes into practical development work itself, in which case it could be

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* But see section G.

another Section in the Engineering Department. Note that I have included Storage Engineering as a specialty within Civil Engineering. The Electrical Engineering Section may be only one man, at least initially.

The other scientific and technical disciplines that the Commodity Technology Specialists and the Institute will need are grouped in a Technical Services Department. The Sections of this Department divide naturally on a discipline or function basis. The Chemical Analysis Section would provide the routine chemical and physico-chemical analyses of food samples, for quality control and other purposes. Likewise, the Microbiology Section would conduct routine testing for microbial safety or contamination and might have additional duties if the Institute were to get involved in fermentation or microbial products work.

Included here also is a Consumer Acceptability Section. This may be only one specialist with taste panel facilities, but it will be a necessary input in the work of developing new products and processes for sale in Mexico or abroad.

Also, in the Technical Services Department, a Packaging Section is shown. Substantial efforts to improve Mexican packaging capability are at present in hand at LANFI and elsewhere; so this is a case where wasteful duplication by the new Institute has to be avoided. However, packaging

is so important an element in the preservation, transport and marketing of food products that it will have to feature in much of the work that the new Institute does. I feel, therefore, that it will be necessary to have a packaging specialist on hand to serve as a link man with the packaging groups elsewhere. This, then, may be a further example of a one-man Section.

Another discipline that might need to be covered in this Department is entomology; but this will depend on how far the Institute gets involved in the problems of insect pests in stored foods.

A photographer, with appropriate dark-room and other facilities is another, virtually essential specialist to have on the staff for scientific, publications and public relations purposes.

The four Departments, described so far, I propose should be the direct responsibility of the Deputy Director-General.

Next in the organisation come a number of other professional disciplines and functions which can, for management purposes, conveniently be grouped in a Department which might be called the Planning, Economics, and Information Department.

Very necessary in a number of aspects of this new Institutes' work will be inputs from economists. The Commodity Technology Specialists will need their help in project identification and selection and in ordering priorities. Projects submitted to the Director-General for approval would carry a note of support from a senior economist that the work is considered economically justified. In projects to develop new products and processes or to put up new food manufacturing operations, the economic feasibility will need to be established. In encouraging the manufacture of food equipment in Mexico, the economics of doing so will have to be studied. In attempts to reduce food losses, the cost/benefit ratio of intervention methods will need to be examined. The Director-General will need economists to help him in planning his overall strategy and in looking to the future needs of the country for food industries and skilled personnel. These are a few examples to show the considerable importance of having a strong economist element in the Institute. I suggest two Sections to cover this, a Planning Section and an Economic Assessment and Feasibility Studies Section.

It has been suggested to me that the Institute might need to study some of the macro-economic issues affecting the development of food production and industry in Mexico as well as the micro-economic aspects of individual commodities and enterprises. This could appropriately be done in the Planning Section, with suitably qualified staff.

Marketing is another aspect of food industry development which clearly has to be covered. It is a subject often dealt with as a branch of economics but it is a specialism in its own right and marketing specialists are going to be needed in the Institute. A separate Section is, therefore, allowed for this. As well as providing a marketing input to specific food development projects, this Section could study market trends, as an important contribution to planning strategies.

Next comes the Food Research Grants Section, which also has been referred to above. In charge of this should be a scientist or technologist with research experience in or near the food field and one who has administrative ability. He would be the link man with CONACYT.

It goes without saying that central to any professional institute is its library and information services. These will require careful planning and costing. This will be even more important if, as has been suggested, the new Institute is to serve as a food information centre for the whole country. Specialist advice will need to be taken on this at an early stage in the detailed planning of the Institute and procedures

be worked out for gathering in regularly, information on food activities around the country. Dissemination publications for this information will also have to be designed.

It is convenient also to attach to the library, the operation of editing and distribution of other publications resulting from the Institute's work.

Next, in this Department, there will need to be a Section which maintains records of the activities of the Institute including maintaining a register of projects, collecting progress reports on projects from the various Sections periodically and preparing papers for the Director-General to present to the Governing Council and Technical Advisory Committees (see below). It may be appropriate to computerise some aspects of this work.

If the Institute is expected to prepare an Annual Report for publication, as well as papers for consideration by the Governing Council (and the format of these may be rather different), it would be appropriate for this Section to be responsible for it. The Section might be named the "Records and Reporting Section".

Finally, there will be a need for a Statistics Section in this Department and it may be convenient to have the Institutes' computer services linked with this.

In the division of line management responsibility between the Director-General and the Deputy Director-General, I consider it appropriate that this Planning, Economics and Information Department comes directly under the Director-General.

To complete the organisational structure, I suggest two units which would probably not have the status of Department; that is, they would not be headed at Director level. Both would report directly to the Director-General.

The first would be the Training and Personnel Development Section which has been referred to earlier in this chapter. A section concerned with the recruitment, training, career development and assessment of the Institutes' own personnel will be necessary whether or not the Institute is given the wider, national function of advising on policies and programmes for the production and further training of managers, professionals and technicians to meet the needs of the Mexican food sector. The two functions are, of course, rather different in nature, but there could be considerable merit in bringing them together in the one personnel section. With regard to the wider function, this Section, will have to develop its own techniques for assessing needs and for stimulating further training activities in appropriate teaching establishments. The cooperation of the Education Ministry will, no doubt, be needed.

Finally, there has to be the general Administration Unit for the Institute. This will cover all the usual matters such as payment of salaries, conditions of service, leave arrangements, travel, transport, budgeting and accounting, registry, mail, accommodation, chemical and other stores, stationery, telephone and messenger services, etc. It seems unnecessary to elaborate these further at this stage.

It remains now to consider the two major committees which are proposed in the S.A.M. document.

Firstly, the Governing Council. This is present also in the scheme I proposed and I have no further comment to make here regarding the membership indicated in the S.A.M. document.

However, with regard to the proposed functions of the Governing Council, I feel that these should be kept to a minimum and that the maximum possible authority should be given to the Director-General. This bears in mind that the Council is composed of very senior and busy people and that the Director-General needs to be a highly competent administrator who will be able to carry the responsibilities of running the Institute and who might even resent, with justification, too much detailed direction from above.

I consider that the functions of the Governing Council should, therefore, be limited to the following:

1. To examine and, as it sees fit, approve the annual financial and staffing estimates for the Institute, submitted by the Director-General.

2. To approve the Director-General's programme of activities for the coming year.

3. To consider the implications for the Ministries represented on the Council, of the Institute's findings during the previous year; and to agree what action should be taken.

4. To appoint a new Director-General, when necessary.

It may be sufficient that the Governing Council meets once a year. Too many meetings of a body of this kind can well be counter-productive.

The second Council proposed in the S.A.M. document is called the "Technical Council" and is a purely internal body comprising the Director-General, the Deputy Director-General and the 4 Department Directors. This is, essentially, a "Board of Directors", and would be better called that - or "the Management Board".

In my view, the way such a Board is composed and used, should be left to the personal discretion of the Director-General. (I had such a Board in T.P.I., but preferred to limit its membership to 4 - the two Deputy Directors General, the Director of the Economics and Planning Department and myself. This Board considered all major issues of policy, conducted regular reviews of the programmes of each of the Sections in the Institute, approved the travel programmes, etc., etc.)

The S.A.M. tentative document also puts forward the idea of advisers to the Director-General. This again, I think is something which should be left to him to decide. However, it does seem to me that, in the case of this new Food Institute, with its coordination role in food, research and development and its considerable responsibilities towards the Mexican food industry, it would be very valuable -also probably diplomatic- if the Director-General called into being two Advisory Committees at quite high level. The first of these would be senior (preferably top) representatives of the major organisations in Mexico undertaking Food Research and Development. The other would be a Food Industry Advisory Committee, its members being drawn from major food manufacturing concerns or associations, food marketing and distributing organizations and the like.

The Director-General would be the Chairman of both these advisory committees and they could probably each meet usefully once a year.

This then completes the structure for what is a fairly normal technical Institute, albeit one which has a much greater than usual responsibility for planning, initiation, coordination and utilization of the work of others.

It leaves open the matter of translation of its findings into practice. This is the ubject of section G.

E. Detailed planning and initiation of the Institute

The S.A.M. document has a chapter on "the Programme of Execution of the Institute", which divides up the work of establishing the Institute into 3 "Phases of Development". It was suggested that these might represent approximately yearly steps.

Comment

I am in broad agreement with the pattern of progression indicated in the document. I do not think that it will be practical to go much further with the detailed planning of the Institute until the policy decision has been taken that there will be such an Institute and the Presidential Decree, setting it up, has been issued.

When that step has been taken, the Governing Council can be created and the members appointed; and then the Council, in turn, can appoint the Director-General for the Institute. There will be considerable merit in having the Director-General involved in all aspects of the detailed planning of the Institute from the earliest possible moment.

I disagree, somewhat, with the order of recruitment of senior staff to the Institute, proposed in the S.A.M. document. This will, of course, be a matter of immediate concern to the new Director-General and will be for him to decide. But if I were in his shoes, and had agreed with the order of objectives and the organizational structure proposed above, I would go first for a number of the key Commodity Technology Specialists, for two or three senior economists and for the heads of the Library and Information Section and the Administrative Unit -not for the Deputy-Director-General or even the Department Directors, as the S.A.M. document proposes. My reasons for this are as follows.

Before any clear picture can emerge as to the pattern of the work of the Institute in its early years, a number of detailed studies will have to be carried out to determine the nature of the Institute's involvement in the various areas with which it will be concerned in, say, its first five years. As the suggested break-down of the Institute's work is on a commodity basis, these studies should likewise be done separately for each major commodity or group of commodities.

The Director-General would, I suggest, instruct the Commodity Technology Specialists, as soon as they are recruited, to undertake these studies, in cooperation with the economists.

Each of these commodity studies will need to examine the following aspects:

1. The size of present production in Mexico and in what areas.

2. The proportion of this production retained for consumption by the local, rural community.

3. The pattern of handling, storage, processing (if any) and distribution of this part of the crop.

4. The losses sustained between production and the consumer.

5. The pattern of handling, preservation, storage, processing, marketing and distribution of the proportion not retained in the production area. The various products involved.

6. The characteristics of the industries based on this commodity in Mexico.

7. The pattern of consumption, at home and abroad, for the various products, and trends in demand for them.

8. The losses sustained with the material going through these other channels.

9. The requirements to increase production of this commodity in the National Strategy.

10. The implications of this for post-harvest preservation, storage, processing, distribution and marketing in the rural and/or urban areas, including the S.A.M. proposals for new distribution networks, with associated storage and processing operations.

11. The main differences in the patterns of the post-harvest system for this commodity in Mexico from that of more advanced countries. Recent developments in technology.

12. Deriving from the above, the potential for new rural or urban post-harvest activities and enterprises with this commodity and the need for help to achieve them.

13. The extent of relevant work going on in other establishments in Mexico to this end, and their practical effectiveness.

14. The need, in consequence, for the new Institute to take the initiative and undertake or stimulate activities to help the production and utilization of this commodity to advance.

Answers to all of these questions for the commodities of importance to Mexico are necessary to define clearly what are the national needs in the food development sphere. The studies will demand considerable effort and will take many months to do well. The Commodity Technology Specialists may, however, be considerably assisted by studies, covering many of the above questions, which are currently in hand in in S.A.M.

Next, from each of these commodity reviews, the Commodity Technology Specialists should make recommendations to the Director-General for a programme of work by the new Institute on this commodity. This should be divided into the following aspects:

1. The research and development needs.

2. How far these could be undertaken in other Mexican Institutes and laboratories and what funding would have to be made available to initiate such work.

3. What research and development work would be left to be done by the new Institute itself and what inputs would be required from the various Sections of the Institute.

4. What assistance is needed to establish or improve operations in the rural areas and what should the new Institute do.

5. What assistance is needed to help existing or start up new enterprises in urban areas and how should the new Institute set about it.

6. What is the need for technology transfer and action by the Institute in this respect.

7. What is the need for production in Mexico of processing equipment for this commodity and what action should be taken by the Institute's Food Industry Equipment Manufacture Section.

8. What is the need for professional and technical personnel in relation to the industry and other operations, based on this commodity, and what action should be taken by the Institute's Personnel Section.

From studies and recommendations of the above kind, covering most, if not all, of the commodities important to Mexico, the Director-General will be able to build up his initial programme of work. He will then be able to gain a first indication of the work load that will fall to each

of the various Sections of the Institute and would be able to decide what number and grades of staff he should start recruiting. He will also be able to see which of the Commodity Technology Sections are going to require their own laboratories and technician staff and which will merely be ensuring that this laboratory work is done in other establishments, leaving the new Institute staff free to devote most of their time to exploring, initiating and progressing developmental activities in field and factory. These latter would, therefore, be office-borne. The Fruit Technology Section, for instance, would need to consider carefully what it needed to do, in the light of the operations and facilities of CONAFRUT; the Fish Section likewise in relation to the Instituto Nacional de Pesca; and so on.

The requirements of these Commodity Technology Sections would, in turn, determine the extent of need for practical facilities, rather than just professional advice and assistance, in the various Sections of the Engineering Department and the Technical Services Department.

All of this information I would consider it essential to collect before being committed to a final pattern for the Institute and certainly before setting about planning and designing a permanent building for the Institute. I think it necessary to be very flexible in the thinking up to this point. If it is the sincere intention (a) not

wastefully to duplicate facilities already available in Mexico and (b) to work to the maximum extent possible with other organisations existing in Mexico, so long as this is consistent with achieving the practical objectives, the possibility has to be borne in mind that the new Institute might need to be just an exploratory, initiatory, steering, and pressurising body, getting its investigatory work done by others, with funds at its disposal. Only with studies of the above sort completed will it be possible to reach a sound judgement on this major issue. In any event, the Institute will need the range of professional expertise indicated in **section D** ⟷ and the organisational pattern in **figure 2** ⟷ may still be appropriate.

A further reason I had for suggesting that senior Commodity Technology Specialists should be recuited before the Directors of the Commodity Technology Departments was that it could be valuable to the Director-General to see these people in action at an early stage. Those that showed up well could be given the position of Head of Section; and if any of them proved outstanding, they might be candidates for the Head of Department (Director) post. It is always encouraging to staff to see internal promotions taking place. But it is good also for the Director-General to have had prior experience of the people he is putting into the senior positions.

It would, of course, be possible to embark on the above Commodity reviews at an even earlier stage — before the Institute

had been created and the Director-General had been appointed. This would presumably mean S.A.M. employing some commodity technologists temporarily to work with them for the time it would take to do the studies. This would have the advantage of getting things moving more quickly; and also of producing further evidence of the role that the Institute would be performing to justify its being created. It would have the disadvantage of not being under the control of the Director-General.

If then it is favoured to get the Institute created as soon as possible and then to proceed to develop the programme, my suggestion would be that the Director-General should first recruit at least one, and preferably more, Commodity Technology Specialists for each of the 9 sections in the two Technology Departments, together with a senior economist for the Planning Section and several other economists who might eventualy go into the Planning Section or the Economic Assessment and Feasibility Studies Section.

Also, of high priority at the outset would be a person for the Library, Information and Publication Section, probably the person who will eventually be in charge. This is because it will be very important to make an early start on the business of gathering together information about the activities of other food research and development groups in Mexico and to be able to make available to the Director-General and his technologists, the access to the world literature that they will need.

Also very important at an early stage will be gathering together information about laboratory, pilot plant, workshop and other physical facilities available for food work in other Mexican establishments. This task could appropriately be given to the professional officer who will be in charge of the Food Research Grants Section. He, therefore, should be another very early appointment.

Inevitably, one also has to have an element of the Administration Unit in at the start. As soon as there are members of staff, there are administration problems -if only getting them paid their salaries. Maybe an administrative service could be provided initially by a foster-parent relationship for the Institute with another organisation; but probably, even with this arrangement, the Director-General will need an officer on his staff that can make all the necessary linkages.

I would though, like just to say at this point that it is highly desirable, from the outset, to guard against the Administration Unit growing over large. Such units have a habit of doing this, as they do have many duties to perform. But they are not the reason for the Institutes' existence and should not be allowed to become inefficient and to consume more than an appropriate proportion of the Institutes' financial (salary) resources -say 10-15%. It was for this reason that I reduced the level of the Unit from that shown in the S.A.M. document.

With regard to the other various steps and stages in the implementation of the Institute, referred to in the S.A.M. tentative document, I feel there is little I can usefully say at this stage. The findings of the commodity studies will determine the initial programme of the Institute and this, in turn, will indicate the further recruitment required. The early work will have to be done in temporary office accomodation, and soon, no doubt, consideration will be given as to where the permanent building should be erected. I can well appreciate the view that it should not be in Mexico City. I would only make one point on this, with the "Ivory Tower" risk in mind. If the new Institute is to be for the purpose of helping the food industry, it should be as close as possible to some important section of this. This will be of mutual benefit.

F. The staffing of the Institute

"The Institute will be as good as its staff and no better than its Director-General".

It goes without saying that the initial appointment to the Institute of the Director-General is of the utmost importance to its future success. I will not presume to expound on the personal qualities required in this officer, but, with the functions that the Institute has, long experience in or close to the Food Industry would seem highly desirable. A suitable salary should be available to secure the right man.

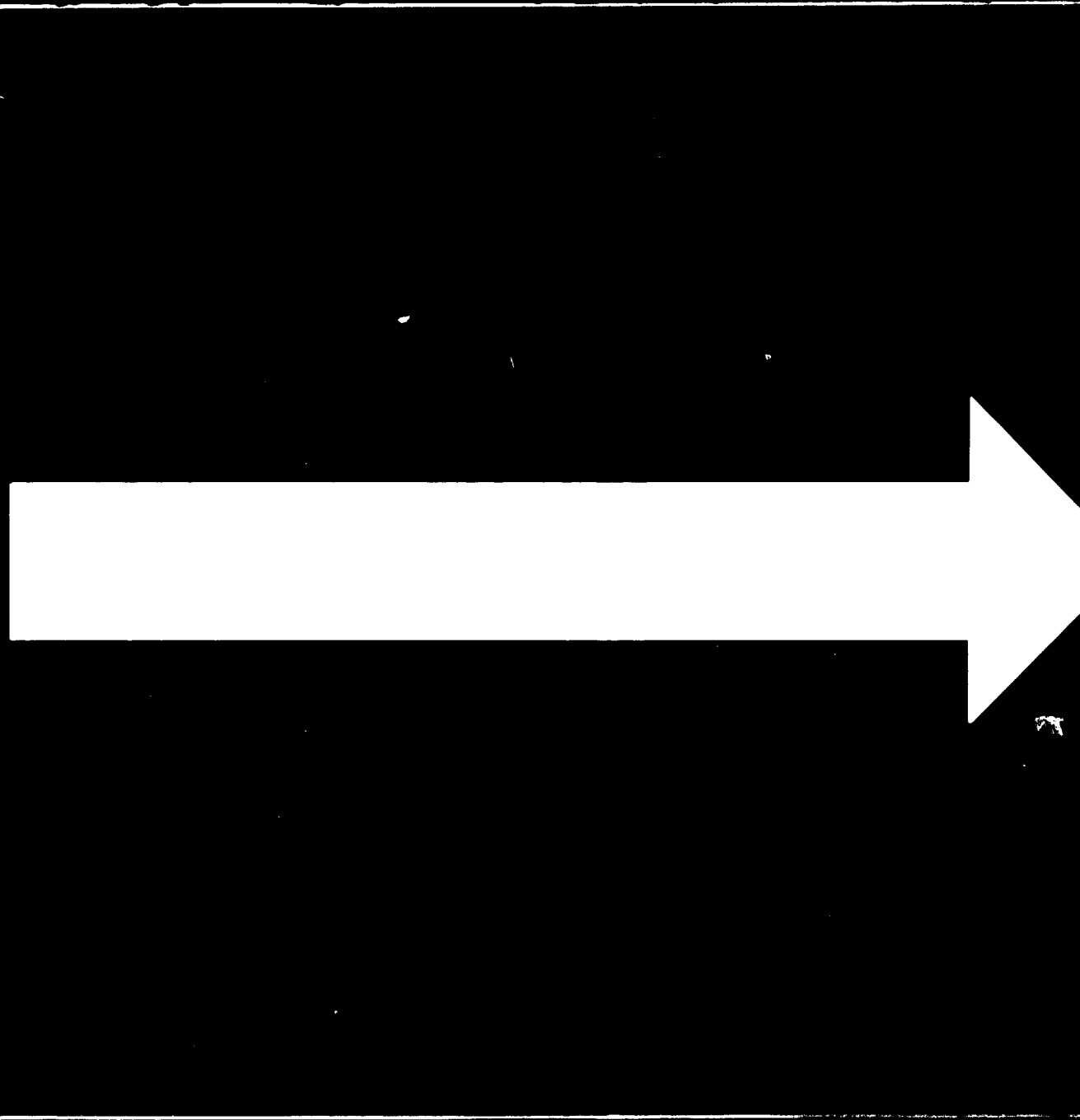
With regard to the other professional staff, here again industrial knowledge and experience will be of considerable importance. If it is to be staffed purely by people with academic degrees and no industrial experience, I would have grave doubts about it being able to achieve its objectives. It would not be able to gain the confidence of Industry and this is vital to its operations. It would be in serious danger of becoming the "Ivory Tower" that I am trying studiously to avoid.

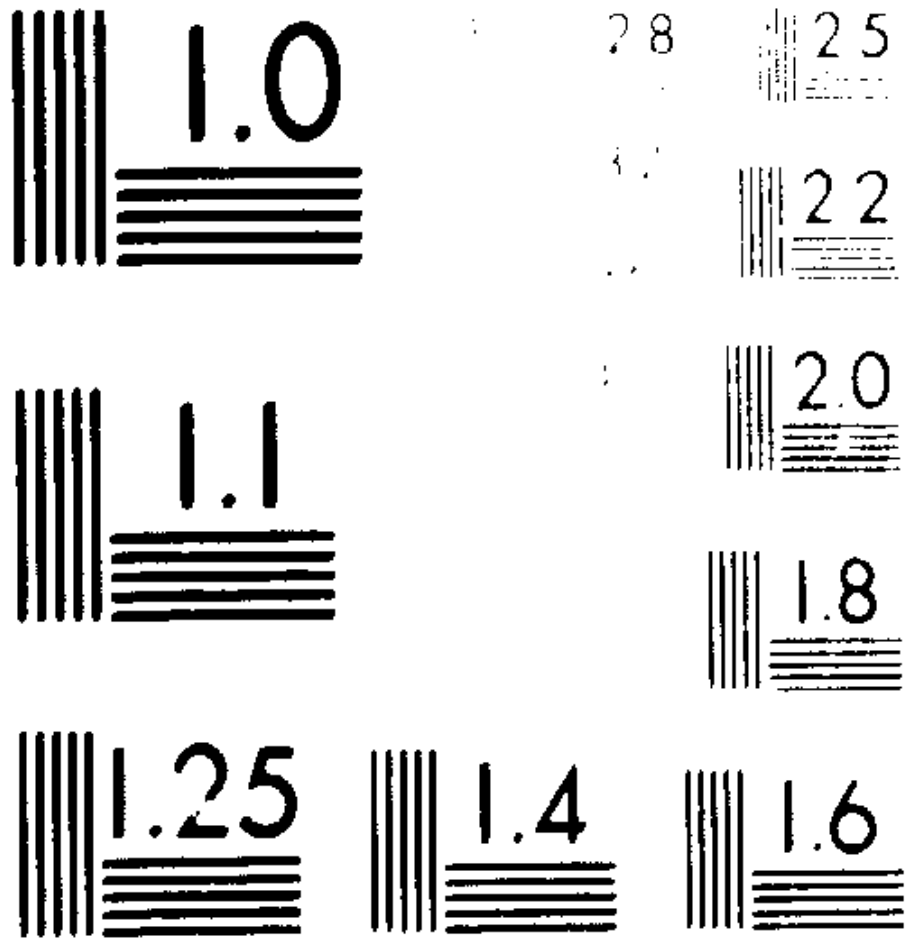
This is not to say that every member of the professional staff has to come from industry. Some certainly should; but others could be first-class, young graduates who are prepared to specialise in one or other subject area of the professional

sections of the Institute and are prepared to take time getting trained in the practical, including the industrial aspects, of the subject, both in Mexico and in some instances also abroad.

I would emphasise further that, for an Institute of this sort, industrial experience is every bit as important as a Ph.D. degree. I would hope that the salary structure for the staff would be such that this fact could be fully recognised. I am very much opposed to the practice which applies in a number of countries of determining an officer's salary by his paper qualifications. What matters is how he performs in the job and this is what, to my mind, should determine how much he is paid. The work for a Ph.D. degree may, of course, help him in his job; but in the case of this Institute industrial experience is going to do so even more. 3 to 4 years industrial experience should at least equate to a Ph.D. and 1 to 2 years to an M.Sc. (I was glad to discover that LANFI has flexibility to fix salaries and has been able to attract some people from industry onto its staff).

Additionally, during employment in the Institute, facilities should be provided to the more junior professionals to broaden their industrial and field experience and outlook. The more senior officers ought to be in constant touch with these sectors anyway.

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1.6

I am not able to judge how many experienced professionals, who could immediately identify and lead practical programmes of work the Institute will be able to recruit. The rate at which the Institute can "get off the ground", will depend on this. It may be wise to plan on a fairly lengthy time-scale.

G. Translation into practice

The above sections deal with various aspects of what is essentially a technical Institute of fairly conventional pattern, though one with particular emphasis on surveying, planning, initiation of work and linking with the activities of outside institutions.

There is often a desire on the part of professional institutes to be independent (autonomous). It seems frequently to be a source of pride that they are so. I consider this, however, to be a mistaken aim for an Institute that has strictly applied and practical objectives. If Institutes are free to determine their own programmes and activities, they are usually in a position that the rest of the country is free to ignore them. Then, the "Ivory Tower" situation arises again.

I had thought, in the early part of this mission, that the proposed new Food Institute would have to strive to get its findings implemented through the several Ministries with executive responsibility for food development and by all possible persuasion of the food industry in the private sector. I came to the view, however, that it was likely to be far more effective if the Institute could work in closely with a new body, made responsible for setting up food operations, on its own or in partnership with the private sector. Better still would be that the new Institute should be an integral part

-the Technical wing- of say a"Food Industry Development Corporation". I was encouraged to develop this idea.

A Development Corporation of this kind would need to be established by Government as a statutory body, with a loan from Government funds of up to a fixed sum for a period of, say, five to ten years, during which time the Corporation would be expected to be building up income. If successful, the Corporation should, in time, be able to meet its running and further development expenses out of income; and later to pay interest on the loan.

The staff for such an operation would be mainly business men -managers with entrepreneurial ability, accountants, executives and others with experience of running industrial concerns. Teams of them would be necessary to mount and run individual projects, after they had been identified, assessed and recommended for implementation by the technical Institute.

It would also be appropriate to put into the Development Corporation, the specialists to deal (a) with development bank loans for the funding of small scale integrated agro-industries in rural areas (Annex I, function 4) and (b) with the legal aspects of technology transfer operations.

Whilst I would now strongly recommend that this entrepreneurial activity and the technical functions of the Institute should, if possible, be combined in one organisation, the two

wings will need, for some years, to be separately funded and the funds separately accounted for. The Commercial Wing could not be expected to carry the cost of the Technical Wing, at least until it has reached the stage of having considerable income from its activities. Even then, a case could surely be made for some Governmental support for the Technical Wing as this would certainly still be performing some general public functions, not directly related to the Corporation's commercial activities. Initially the Technical Wing should be funded in the same way as any other new Government Institute. Apart from this, however, the two Wings should work very closely together. The Commodity Technology Specialists, in particular, should take a close interest in the outcome of the enterprises stemming from their work, should advise the business team on the technical aspects and problems, and should learn for the future from any mistakes made.

If it is not in accord with the policies of the Government that the Corporation should continue indefinitely to run the enterprises it has created; these could be sold off as going concerns to the private sector. In the case of rural undertakings, this might be to individuals or to producers cooperatives. Moreover, the Corporation could seek to embark, at the start of new undertakings, on joint ventures with the private sector.

At the outset of the mission, I was not very happy about the name being used for the Institute -"The National Institute for Food Technology". This had a somewhat detached and rather

academic ring about it. It would have seemed better to call it "The National Institute for Food Industry Development", this giving a clearer impression of its practical objectives. However, with the idea of combining the technical and entrepreneurial activities into "The National Food Industry Development Corporation", an even better image is projected.

A condensed organisation chart for this body, showing a possible arrangement of outside linkages is at figure 3.

The main change that this scheme would require to the pattern of the Food Institute suggested above (and in figure 2), in making it the Technical Wing of the Corporation, would be with regard to the Governing Council. This would now be replaced by the Chairman and Board of Directors of the Corporation. The Board could, however, have many of the same people on it as had been envisaged for the Council.

It might also be appropriate to move over to the Commercial Wing, the Section concerned with encouraging the production of food industry equipment in Mexico; and it would not, of course, be necessary to have separate Administration Sections for the two wings.

A more complete Organisation Chart for the Corporation, covering these various features is at figure 4. A few other adjustments have been made in this.

Figure 4.

ORGANISATION CHART (CONDENSED)

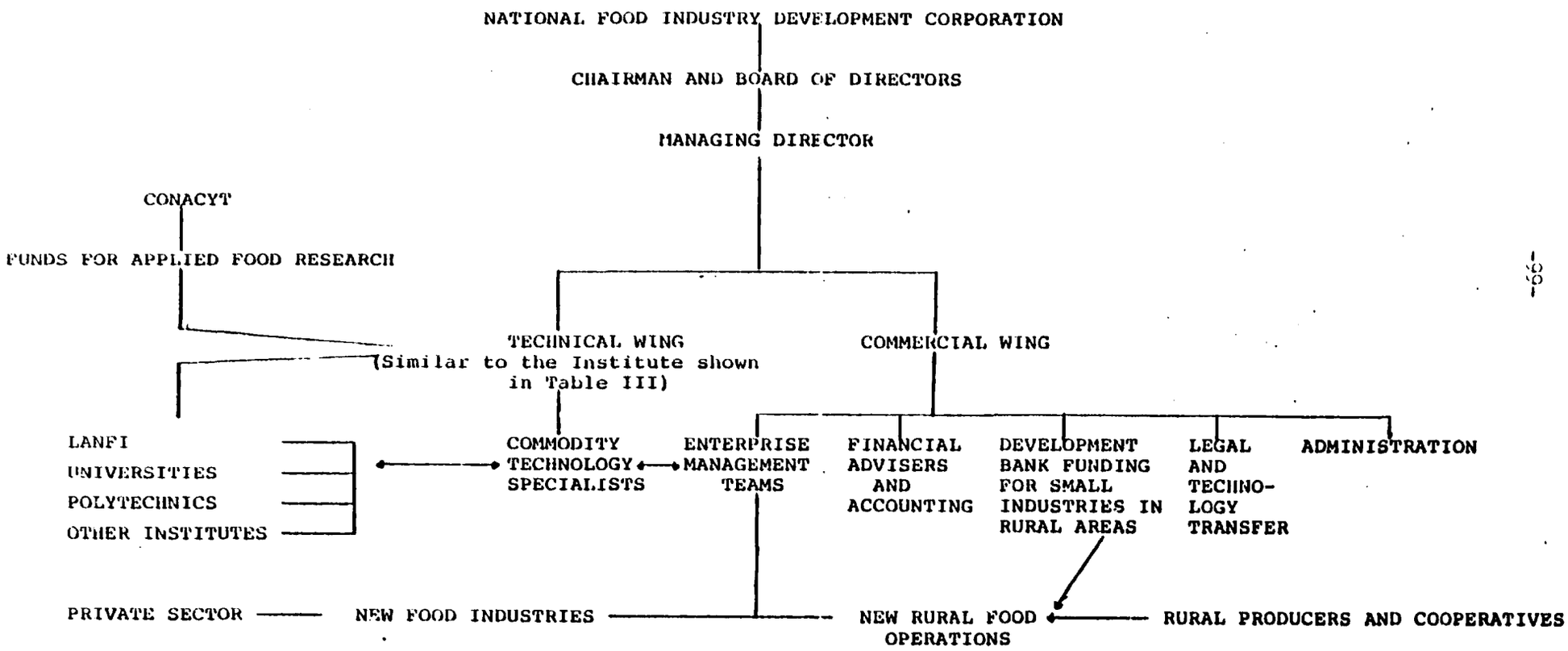
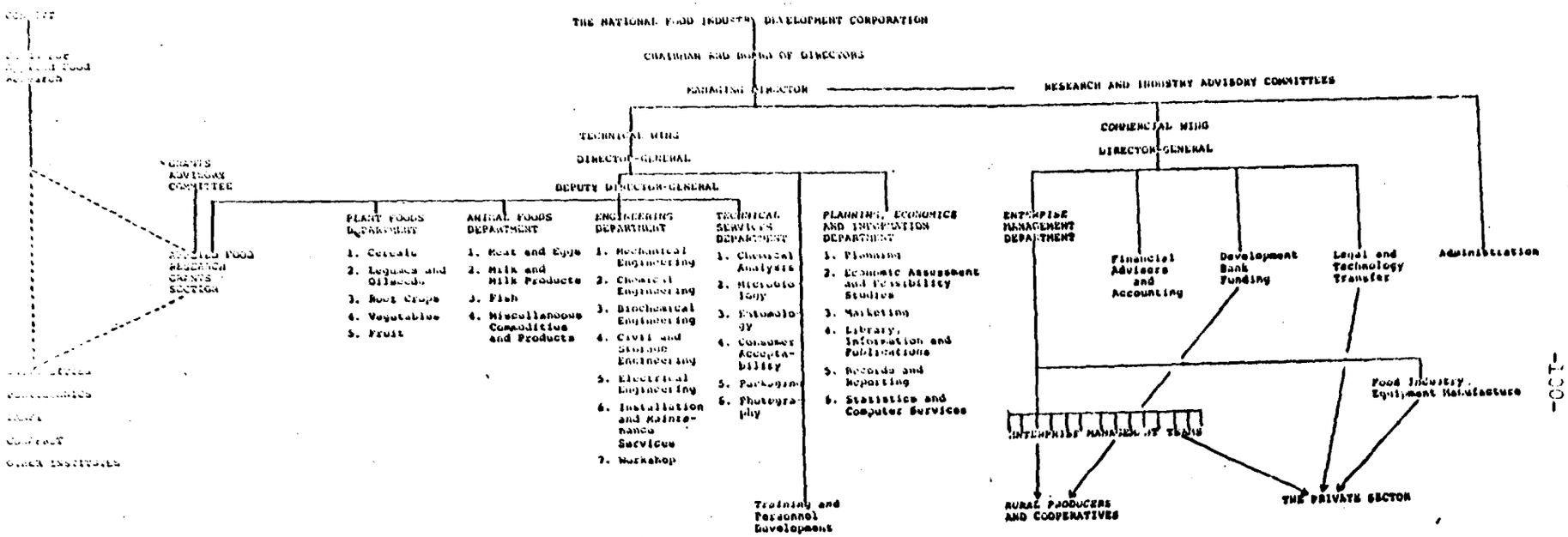


Figure 4.

ORGANISATION CHART



H. External assistance for the Institute/Corporation

There will, without doubt, be many points at which the new Institute and Corporation could benefit from technical cooperation from abroad. It will, indeed, be an important element in the work of their professionals to be aware of the state of technology in more advanced countries in their special areas of interest. Whilst some of this knowledge can be acquired from the international literature, there is no complete substitute for personal visits for familiarisation and training in these countries. Specific needs will, of course, depend on the programme of work and the previous experience of the members of staff. I will limit my suggestions here to a few special topics where the Tropical Products Institute (T.P.I.) in the U.K. could, for instance, help.

T.P.I. is a centre of international cooperation in the matter of food loss assessment and reduction in grain and has considerable interest in the corresponding problems with the perishable commodities. It can provide training in this area, including arranging attachment to specialists working in the field in third countries.

T.P.I., in the course of its own development and particularly during the last 20 years, has evolved management procedures for project control (initiation, assessment, approval, progressing, termination and reporting) which may be useful to the new Institute. Similarly, procedures have been developed

for the management of research grants to external bodies. The officer (or officers) to be responsible for activity records, reporting and research grants might benefit from a familiarisation visit to T.P.I.

The officer in charge of the library and documentation services would also be one to benefit from personal experience of other major libraries in the food field, such as T.P.I.'s. Also, the person to be responsible for maintenance of records of food research and development work being conducted in other institutions in Mexico, many like to study the methods used by the Agricultural Research Council (A.R.C.) in the U.K. for performing a similar function there. The A.R.C. has developed a classification of Food Research which enables the operation to be computerised and this could readily be adapted to Mexican needs.

For the commercial side of the Corporation, something of a model for study could be provided, in Britain, by the Commonwealth Development Corporation, which runs many enterprises in developing countries.

I would recommend especially, that the Chairman and/or the Director-General of the Technical Wing should take an early opportunity for visiting the U.K., to establish contact and develop links with T.P.I. and other organisations working in the food field such as the Food Research Institute and the Meat Research Institute. He should also see two examples of the Research Associations in Britain which are funded by the Industry but with some support from Government. The two appropriate ones would be the British Food Manufacturing Industries Research Association and the Campden Food Preservation Research Association. (T.P.I. already has a good working relationship with research organisations in Mexico and has received a number of Mexican graduates for training.)

Needless to say, a number of other countries could provide further useful training and experience.

I. Summary and concluding thoughts

1. Summary

Within its major policy objectives of securing self-sufficiency in food production, improving the nutrition and standard of living of the poor, and making Mexican industry less dependant on foreign technology, the Sistema Alimentario Mexicano (S.A.M.) has considered establishing a new National Institute for Food Technology with a number of functions.

Analysis of these functions indicates that the primary objectives are (1) to identify where new or improved agro-industries could benefit Mexico, and then through research, development and commercialisation to establish these; (2) to assist existing food industries with their problems; (3) to encourage the manufacture of food industry equipment in Mexico and (4) to help small producers in rural areas to set up local agro-industries. The other functions are important as means to the above objectives but are not primary objectives in themselves. These are (5) to coordinate food science and technology research and development throughout Mexico; (6) to improve the food information network and (7) to raise the standard and numbers of professionals and technicians available for the food industry.

To deal with the primary objectives, the field has to be divided into manageable blocks of responsibility with key professionals in charge of each. The division proposed is on a commodity basis and the key professionals will be the "Commodity Technology Specialists". The structure of the Institute is then designed round these so as to provide them with all the professional, technical and administrative support that they need to carry out the several aspects of their responsibilities (identification of needs, technology selection or development, industry planning, etc.) (see figure 2).

To bring to bear on these objectives, the facilities of other institutions in Mexico (Institutes, Universities, Polytechnics, etc.), funds from CONACYT, earmarked for applied food research, should go, as a matter of priority, to those projects which the new Institute has identified as important. This would effect a measure of coordination, and all that would seem appropriate at this juncture. Too much emphasis should not be placed on the merits of academic coordination per se.

When the Institute has been created, the first action will be to put in hand a substantial number of detailed commodity studies which will be designed to identify the needs for technology development and application in the Mexican interest. From these studies, programmes of work will be drawn up and consideration will be given as to the extent to which this work could be (or is being) satisfactorily done in other Mexican institutions. The remainder will form the

beginnings of the programme of the new Institute. At this stage it will be seen whether the new Institute needs to have its own laboratories, workshop and pilot plant or will operate merely as an office-borne, planning, initiating, progressing, steering, stimulating, assessing and advisory body -which pattern could have advantages. It should not be expected that an Institute of this sort can be established and be producing results in a very short space of time.

Next came consideration of the way the findings of the Institute should be commercialized. The recommended solution was to establish a National Food Industry Development Corporation and to incorporate the proposed new Institute within it, as its technical wing. A few consequential adjustments in structure would then be appropriate. (See figures 3 and 4)

The Institute and Corporation will be able to benefit in a number of directions from technical cooperation with various other countries.

2. Proposals of Mr. K. Sepic (United Nations Industrial Development Organization)

A UNIDO Senior Industrial Development Officer visited Mexico in March 1981 and, in his report, put forward proposals regarding a possible structure for the new Food Institute (see the chapter by the UNIDO secretariat). It will be seen that there is a considerable measure of similarity between his thoughts and mine as regards the organizational structure. The reports are, to some extent, complementary.

The UNIDO report makes the interesting suggestion that there might be some form of individual Membership of the Institute, as a kind of professional association. There is, however, already in existence, an Association of Food Technologists of Mexico (an offshoot of the I.F.T. in the U.S.A.) which really fulfills this function.

What would, however, be valuable would be if individual Food Industries could have some positive linkage with the new Institute/Corporation. Ideally, they should have a financial stake in the organisation as this would encourage them to use it fully. In Britain, we have a number of Industrial Research Associations which are partly paid for by companies in the subject field concerned (e.g. food) and partly by Government. These work quite well. Mexico may not be ready yet for substantial support for the new body from the food industry; but a modest membership subscription in return for some periodical newsletters and other publications from the Corporation could be a helpful start to building up the very desirable linkages with industry.

3. Difficulties Ahead

A major difficulty that I see confronting the new Institute/Corporation is the fact that it is a central, national body, but it has to be dealing with essentially local matters, either in urban or rural areas, and these for the whole country. It will certainly not be a successful operation if the staff spend their

with their problems and needs, this might sometimes be awkward. A policy for dealing with this situation would be necessary.

4. Work Programme

No attempt has been made, nor would it have been possible in the time, to give consideration to possible work programmes that might be developed by the Commodity Technology Sections. These should only be decided after the Proposed Commodity Studies have been completed. However, an important aspect of work, common to all commodities, that is likely to emerge, is the need to mount investigation into the extent of post-harvest losses and into methods of reducing them. The situation regarding these losses should be examined in each of the Commodity Studies and if satisfactory investigational work is not going on at present, this will be a clear point for intervention by the new Institute/Corporation.

Only passing reference to the need for sociologist inputs to the studies and projects of the Institute/Corporation has been made. These may be important, particularly in some rural situations. Whether or not a sociologist should be included in the range of professional disciplines in the new organisation is a matter perhaps to be decided as the programme develops. In the early stages, the expertise can, no doubt, be brought in from outside, as required. It may, indeed, be

desirable to deal with several of the specialist inputs required, in this way (e.g. expertise in refrigeration, pest control, etc.)

5. Conclusion

Whatever structure and staff complement is finally decided for the Corporation and its Technical Wing, I would like to emphasise finally, the supreme importance of placing the key people in positions where they have clear and concise objectives to which they can devote themselves single-mindedly. They should not have secondary occupations or responsibilities, inside or outside the Corporation. The target is to produce new or improved food industries for Mexico and this should be to the fore at all times. The success of the Commodity Technology Specialists and other key staff should be measured, in due time, by the value that there is to Mexico in the commercialization of their efforts, not in the research that may have been necessary along the way. (There may be some useful competition between CTS's in this regard).

It is very much for this reason that I think it of the greatest importance to secure experienced, dedicated and even somewhat aggressive staff for the key positions; and then to have them in the environment, not just of a Food Technology Institute, but of a Corporation, dedicated to commercialization. I would hope that any pressure to detach the Institute from the Corporation would be resisted strenuously, as this

time working in their main offices or laboratories, when they should be exploring the situations and needs in rural areas or should be going round factories discussing their problems and requirements. A conscious effort to deal with this situation will have to be made by all concerned and steps should be taken to ensure that there is at least no financial disincentive for staff in going on visits away from the Institute and from their homes.

In time, it might be possible to develop the cooperation with other institutions around the country in a way that they become, to some extent, outstations for the Corporation, collecting and referring to the Technical Wing, local problems and needs, and subsequently helping with the local application of the Corporations' findings and recommendations.

How well the Universities and Polytechnics will be able to perform along these lines will remain to be tested. But with their proper preocupation with student teaching, I would not expect that they could be counted on very fully.

Another problem for the Corporation and its Technical Wing may be some conflict of interests within its objectives. A major function will be to build up or help build up, rural food processing operations; but these may, in some instances, be at the expense of possible or existing urban industries. As the ccrporation is also seeking to help the urban industries

would be likely to leave Mexico with a situation little, if any, better than at present.

However, it must not be expected that results will come quickly. It will be best to proceed step by step, in a controlled fashion, and work to increase the influence and effectiveness of the Corporation. If it overreaches itself in the early years, its credibility may be lost.

6. Acknowledgements

I wish to acknowledge, with gratitude, the interest, help and kindness that I received from DR. ROBERTO GUADARRAMA SISTOS and ING. GUILLERMO FUNES RODRIGUEZ.

Also, I am very grateful to ING. MIGUEL ANGEL LOPEZ BRACHO, who was attached to me as a counterpart. Without his help, I would have had considerable difficulty getting going with this assignment.

Lastly, I am most grateful to Ms. SANDRA LUZ PERALTA ROJAS for her willing and excellent bilingual secretarial assistance.

Annex I

I. REVISED STATEMENT OF THE FUNCTIONS OF THE NEW FOOD INSTITUTE

(Proposed by the expert)

The basic purpose of the Food Institute is to act as a major instrument in the execution of Government policy regarding the development and reorientation of the food industry in Mexico. It will seek to help the development of the poorer regions of the country and the achievement of national self-sufficiency in food production through the identification, selection, development, transfer and introduction of technological options best suited to national conditions and enterprises. It will, also, aim to encourage the manufacture of food processing equipment in Mexico.

More specifically, the function of the Institute may be described as follows:

1. In line with Government policies and priorities for the expansion of production of particular food commodities and for the development of particular rural areas or urban enterprises, to identify situations where new or improved agro-industries should be established; to determine, by technico-socio-economic studies, the optimal technology for use in each situation, by reference to the knowledge available in Mexico or obtainable from abroad; or alternatively to undertake, or to arrange in other Mexican establishments, appropriate development work to produce suitable technology; then

to carry this technology through to the point of commercial production.

2. To provide an on-going advisory and technical assistance service to the food industry in Mexico.

3. To promote the manufacture in Mexico of the capital equipment required for the food industry in the country.

4. To make arrangements with appropriate banks for funds to be made available to the small producers for the establishment of integrated agro-industries in rural areas.

As a help to carrying out the above primary functions and to improve the national capacity to undertake food industry development generally, the Institute will have the following additional responsibilities:

5. To coordinate the applied scientific and technological research and development work on food in the country as a whole and to advise the Government and government organisations on the formulation and execution of future programmes of food research and development.

6. To establish mechanisms for the exchange of information between Mexican institutions working in the food field, as an aid to their work and to collaboration between them; also to extend these mechanisms to provide information and collaboration linkages with appropriate food research and development organisations abroad.

7. To stimulate programmes for the production and further training of appropriately qualified and experienced managers and technologists for the food industry; also to encourage appropriate, practical training courses for technician personnel.

Annex II

PERSONS SEEN

Office of the President
of the Republic;
Coordination Office of the
National System of Evaluation,
Sistema Alimentario Mexicano (S.A.M.)
General Direction of
Studies and Strategies

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Laboratorios Nacionales
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UNDP Field Office	MR. FERNANDO FAJNZYLBER MR. ANDRE FAUST	UNIDO/SIDFA UNIDO/JPO

Annex III

DOCUMENTS PROVIDED

1. Notas Analíticas y Lineamientos Metodológicos para el Proyecto Sistema Alimentario Mexicano. (S.A.M. Publication, August, 1979)

2. Primer Planteamiento de Metas de Consumo y Estrategia de Producción de Alimentos Básicos para 1980-1982 (S.A.M. Publication, 5/3/80)

3. Medidas Operativas Agropecuarias y Pesqueras. Estrategia de Comercialización, Transformación, Distribución y Consumo de los Productos de la Canasta Básica Recomendable. (S.A.M. Publication, 7/5/80)

4. Estrategia de Comunicación Social. (S.A.M. Publication, December, 1980)

5. Estrategia de Comercialización y Distribución de Alimentos Básicos e Insumos Productivos. (S.A.M. Publication, 23/12/80)

6. S.A.M. Tentative Document concerning a new National Institute of Food Technology. (June, 1981)

7. Organisation Chart of S.A.M.

8. Information Manual of the Laboratorios Nacionales de Fomento Industrial (LANFI)

IV. MISSION OF 4-20 AUGUST 1981

A. Introduction

This report is prepared for the office of the President of the Republic for General Coordination and Evaluation to outline a strategy to implement one of the Sistema Alimentario Mexicano (S.A.M.) sub-objectives of developing resources for the well being of the rural population.

The specific duties requested on arrival, varied somewhat from the job description. No inventory of research -- and development facilities on the country could be made -- available.

I was asked my comment on the revised proposals "Scientific and Technological Structure and S.A.M." and "National Food Technology Producer", prepared by the S.A.M. and I was also asked to prepare technology assistance system for the Institute of Food Technology and Development (I.F.T.&D.).

Most of my mission time was devoted to formulation of the Technology Assistant System.

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* By B.S. Chung, expert in food processing research and development.

B. Background

The S.A.M. established by the President of Mexico in 1980, has the following objectives:

1. To secure self-suficiency in food production in Mexico.
2. To improve the nutritional condition of the 19 million poor in the rural regions, and so to improve their health and well-being.
3. To help those poor to become more efficient producers and sellers of food, as a means to improving their standard of living further.
4. Additionally, there is a desire to make Mexican food industry less dependent than at present on foreign technology and know-how; also to organize more food processing in the rural areas, close to where raw-material is produced, with a view to improve rural employment. (Table)

Production of agriculture raw products already showed substancial results on 30 Basic Basket of commodities.

However, comprehensive projects formulations on coordinated research and Institute of Food Technology and Development were elaborated already and waiting for the last stage.

TABLE.

FOOD COMMODITIES IN THE RECOMMENDED

BASIC BASKET

CEREALS

1. Maize
2. Wheat
3. Rice
4. Others

LEGUMENES AND OILSEEDS

5. Beans
6. Others

ROOT CROPS

7. Potatoes
8. Sweer Potatoes

VEGETABLES

9. Tomatoes
10. Chilies
11. Onions
12. Others

FRUITS

13. Banana
14. Apples
15. Lemons
16. Oranges
17. Avocado
18. Others

ANIMAL PRODUCTS

19. Beef
20. Pork
21. Poultry
22. Sheep and goats
23. Eggs
24. Milk (cows)
25. Other Milks
26. Pork fat
27. Fish and other marine products

OTHER FOODSTUFFS

28. Sugar
29. Vegetable Oil
30. Miscellaneous

C. The Institute of Food Technology and Development

"National Food Technology Producer" showed that the organization and functions of new Institute of Food Technology and Development as follows: (See Fig. 1)

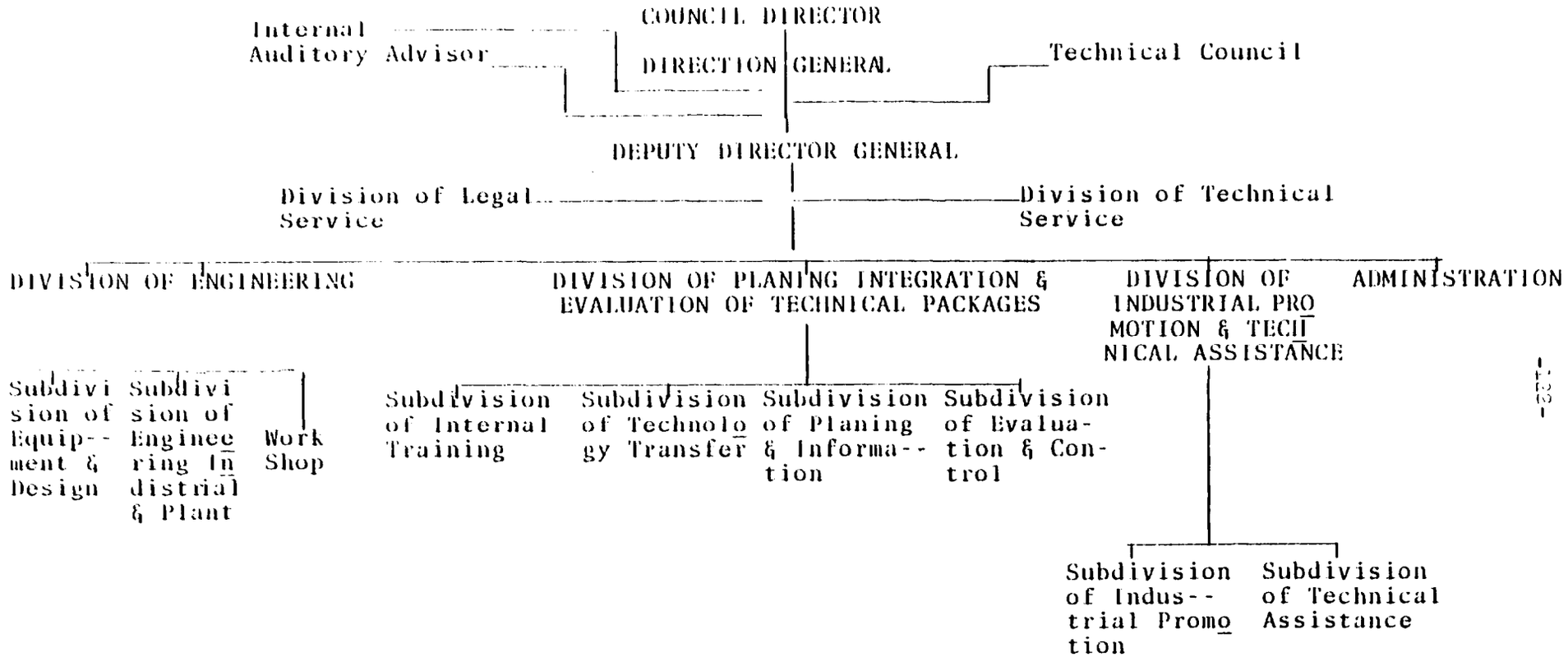
The main 3 operational areas are:

1. Engineering Direction
   a. Equipment design and fabrication
   b. Plant design and instalation
   c. Industry assistance

2. Planing, Integration and Evaluation of Technological Package Direction
   a. Information collection
   b. Evaluation of long term development plan
   c. Technical and economic studies of development plan.
   d. Technology transfer service and importation of technology
   e. Internal training
   f. Registration of patent

FIGURE 1. ORGANIZATION CHART FOR THE INSTITUTE OF FOOD TECHNOLOGY AND DEVELOPMENT

(TENTATIVE)



Source: SAM.

3. Industrial Promotion and Technical Assistance Direction

   a. Industrial promotion

   b. Technical assistance

Comment

Some considerations will be needed on having 3 laboratories in the I F T & D namely Physico-chemical analysis of food laboratory, Microbiological analysis of food laboratory and Organoleptic analysis of food laboratory.

If the institute is going to use the laboratories for technical assistance purpose better to utilize laboratories of the state universities, otherwise some difficulties and disadvantages will be encountered such as the sample deterioration problems during course of transportation from country-side to Mexico City.

If the government gives some finnancial assistance surely the state universities will establish an adequate 3 laboratories and good results will be expected from them.

To recruit of the I F T & D staffs is very important - particulary staffs of technology transfer and technology - assistance staffs are extremly import and the staffs must - have adequate technological knowledges and high public -- service moral.

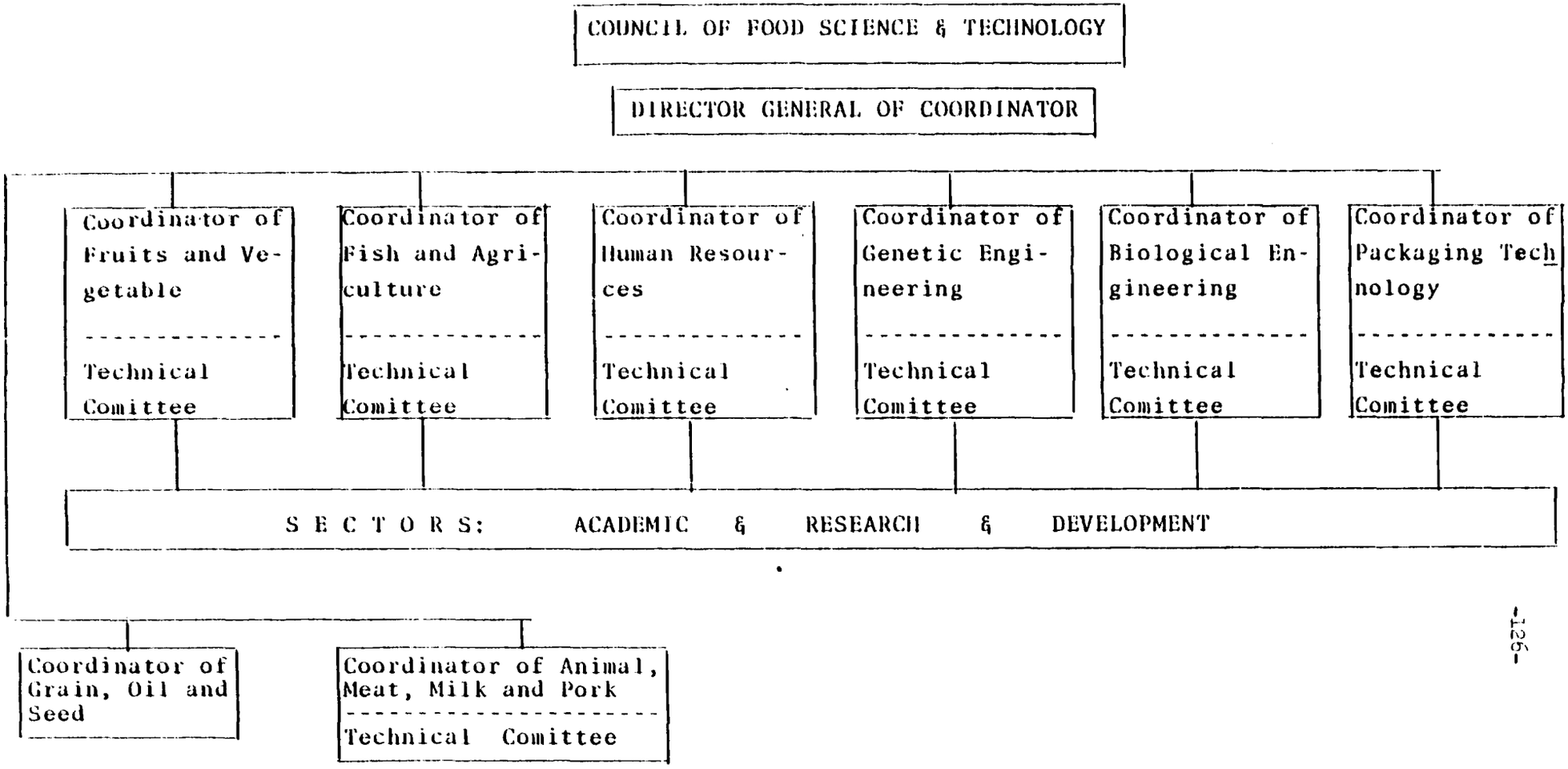
D. Council of Food Science and Technology

Under the Director General of Coordination 8 coordinators who had the activities in the academy, applied and development areas that cover recommended Basic Basket of commodities and others. (See Figure 1, 2)

The main 6 research fields are the following:

1. Grain, oil seeds
2. Meat, milk, pork
3. Fruits, vegetables
4. Fish, agriculture products
5. Human resources
6. Genetic
7. Bioengineering
8. Packaging

FIGURE 2. ORGANIZATION CHART FOR THE COUNCIL OF FOOD SCIENCE AND TECHNOLOGY



E. Suggested technology assistance system

The assistance of technology, newly developed technology provided by the coorporated works and/or already existing technology to the industry, is one of the most important sectors of the S.A.M. project. It is particularly true for small and medium scale food processing industry.

The unique characteristic of the industry is the highly diversified nature of its products. Production process is simple and does not require heavy investment in fixed assets like machineries. Small processors can cater to the same market as the large ones. Small scale industries. However, in general, small food processing companies can not have enough research and development activities, necessary information and required manpower like large establishments which lead to diversification of product, improvement of existing product range, improvement of existing product qualities and new product development, and improve overall management and market expansion. However, the importance of small and medium food industry is to generate more employment in the rural areas and to improve the farmer's economical conditions.

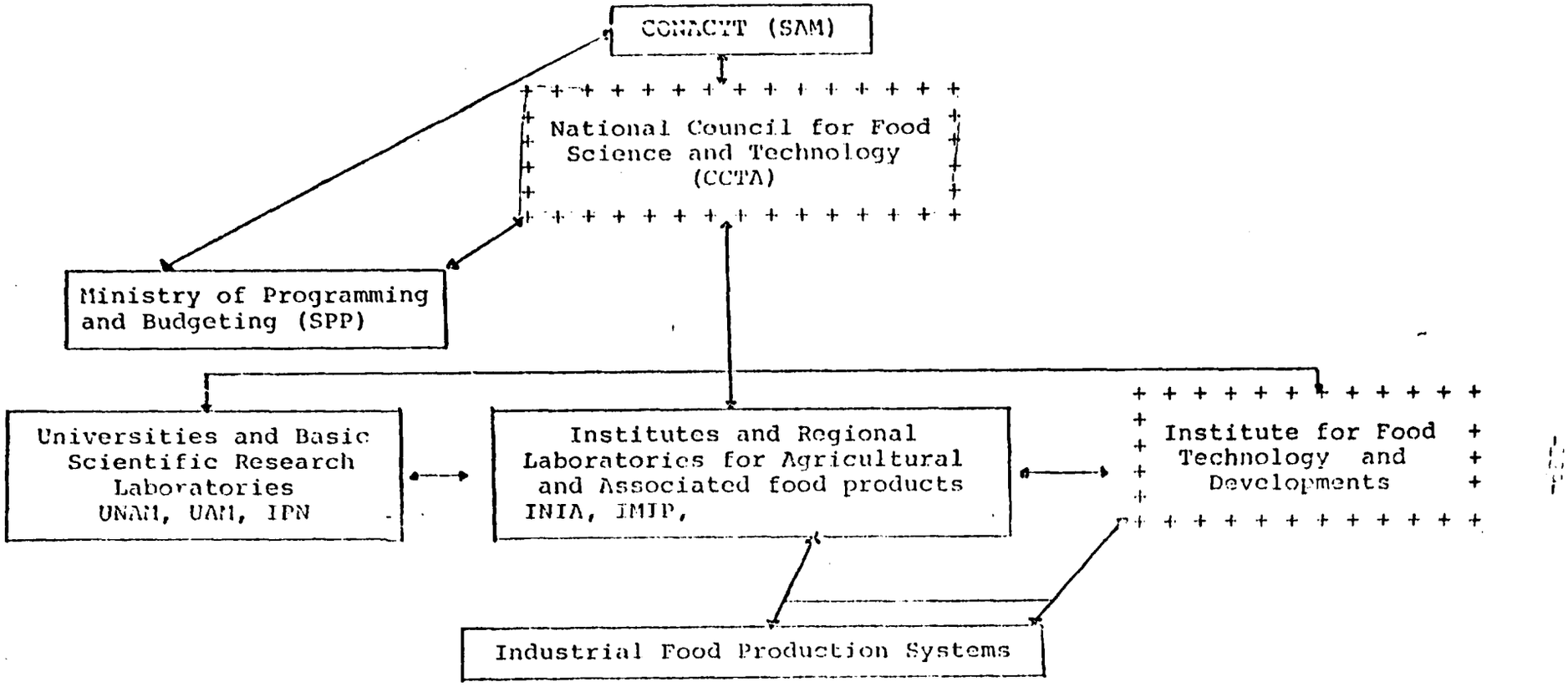
Thus, I would suggest a powerful technological assistance system fot the new INSTITUTE OF FOOD TECHNOLOGY AND DEVELOPMENT.

Comment

Marketing is a very important sector of the food industry development. It is particularly true fot he country-side producers, new food products producers, and small business-men. For small business men the sub-contract system should be developed and for country-side producers contractual arrangement and elimination of intermediates are critically needed for the development of rural areas. In this aspect coordinated research programs should establish a marketing specialists are going to be needed in the I F T & D.

To get the best results strong monitary and evaluation system must provided to tie the scattered programs on food development together.

Figure 3: SCHEMATIC OF INTERRELATIONSHIP BETWEEN ORGANIZATIONS INVOLVED IN SAM's PROGRAM



+ + + +
+ + Organizations non-existing formally at this time.
+ + + +

Purposes for setting up technological assistance system.

1. To give technical assistance to the food industry, particularly to the country side medium and small scale industry, to improve and modernize it.
2. To collect statistics and information of the industry.
3. To develop more business in the rural areas.

Suggested system.

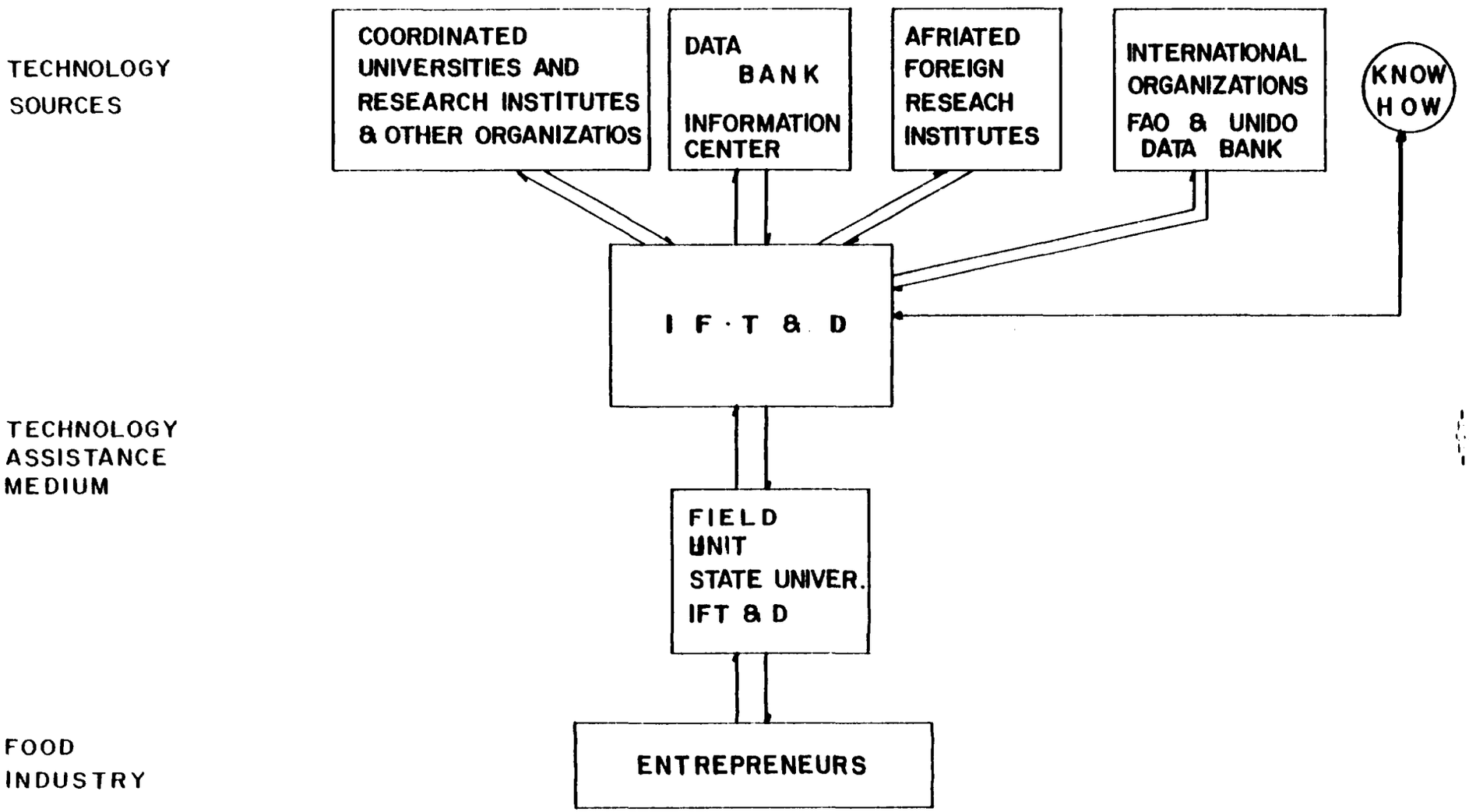
This system will create a channel between industry, I F T & D and the technology resource institutions which will be sufficient and adequate. (Figure 4)

The State Universities - The transfer medium.

The state universities will serve as the transfer medium between the industry and technology resources. Small plants do not have the level and range of technical expertize necessary to bring about the improvements by themselves. Therefore, the small businessman needs the services of consultants to assist him to improve and morenize his industry. Fortunately the state universities have the capacity to give assistance on management, technical, marketing and financial consulting, under the guidance of I F T & D, to the food industry immediately and adequately.

FIGURE 4

SUGGESTED TECHNOLOGY ASSISTANCE FRAMEWORK



Suggested technology assistance system framework is as follows:

1. Field Unit (the state university)

   a. The state university professors of management, food technology (various fields), bio-chemistry, mechanical engineering, architecture and marketing will serve as specialists. Their number depends upon their availability.

   b. 5 I F T & D staffs

      One management specialist

      One marketing specialist

      Three food technologists

      One driver for mobile van training unit.

2. Entre preneurs

   a. Walk-in client and plant visit.

      Field unit specialists diagnose a client's operations and identify areas of improvement. A research on the client's operations is made and it will show the errors that are expected, and this will bring forth the formulation of an improved system. The cost and benefits of applying such changes are quantified and the client is given assistance for the proposed improvements.

   b. Other entrepeneurs

      A large number of small entrepeneurs shall not

be fully aware of the services offered by the I F T & D, some may not know that the Technical Assistance Unit exists. At the same time, it may be difficult to link the needs of the business with know services, as these are, at times, described in highly technical terms, or the usefulness of these services if they are not evident.

Small scale entrepeneurs usually have to spend much of their time managing their production and marketing. It is difficult to expect such entrepeneurs, specially those in regions far from large cities, to find the time or justify various expenses that would be incurred, more so, if their knowledge of the service available is insufficient. The solution to this problem is for the field unit specialists to visit these entrepeneurs with the Training Mobile Van Unit to give them assistance, if any need be, and collect information for future assistance (see **Annex I**).

After sunset, if the unit shows, to their staffs and workers, technical films and slides which are fit for their plant operation, the effectiveness of the specialist's visit will be increased extensively.

3. Problems will be classified according to the level of technology.

   a. First Level - Problems which I F T & D specialist can help to solve.

   b. Second Level - Problems not within the capacity of I F T & D specialists but within the capability of state university professors with or without some experimental works.

   c. Third Level - Problems need some research (within a year) to enable the cooperated universities and institutions or the state university to solve them.

   d. Fourth Level - Problems need a research for at least, from one to three years to achieve a definite project. Refer problem to I F T & D.

   e. Fifth Level - Highly technical problems that need to refer to institutions of foreign source, affiliated to I F T & D, or need to import technologies.

C. New prospective Entrepeneurs

New entrepeneurs are created by giving information on new research results, and the prospect of such new enterprises is the result of research performance. Booklets on outline of feasibility studies for new enterprises, origi-

nated by the development, information on activities and functions of I F T & D, radio and newspapers, might be effective to motivate prospective entrepeneurs to new ventures. Also exhibition of new products, seminars, and national conventions of food industry in future prospects.

To motivate entrepreneurs to new food processing field need to give finnancial benefits such as remmission of taxes, low interest bank loans, free technical tour etc. besidesabove mentioned informations.

To make the technology assistance system effective and worable, I recommend the following:

1. Establishing the field units of technology assistance system in the state universities with the coordination of the necessary professors for the unit.

2. Strengthen, if need be, the state universities in the field unit aspect for technology assistants for the food industry in the state, by equipping facilities for microbiological analysis, physico-chemical analysis, sensory tests and equipment for quality control, a small library and a Mobile Van Training Unit (see **Annex II**)

3. The unit offices will be scattered all over the country and also far from the main office. Establish of standard operation manual and evaluation of performance will be critical.

Small and medium food processing entrepeneurs have difficulty to leave their plants to assist to such training - even though for only ten or more days. Entrepeneurs don't often travel far away from their plants due to the fact that they have no competent supervisors to look over the production. Another reason is the traveling and lodging expenses they have to shoulder and the difficulty of getting cheap accomodations in large cities. The same is true for plant workers.

The functions of the mobile van training unit will be as follows:

1. To be able to train entrepeneurs and workers in food processing in the countryside.
2. To be able to give services for calibrating process control equipment, such as weighing scales, cylinders, thermometers, etc.
3. To be able to dive out technical information.
4. To be able to collect, analyze and interpret necessary information for small and medium food processing industries.

Training Programs

1. For entrepeneurs and plant workers

   In general, small and medium scale entrepeneurs are unaware of their plant's needs and problems. They

are reluctant or hesitant or request or even accept assistance from the government. The reasons behind this attitude could be due to ignorance, prejudice, and fear that information obtained from them will be channeled to the tax authorities, to the competitors or regulatory agencies. Also they have inadequate or functionally unbalanced management skills.
Plant workers of small and medium scale food industries are either semi-skile or unskiled.

To overcome those problems, I suggest the following:

a. I F T & D Technology Assistant field unit will organize training programs for entrepeneurs, supervisors and managers from five to ten days and the state university will conduct actual training program, using in full, the available university facilities during vacation time.
b. The field unit will organize symposiums, seminars, conventions, exhibitions (machines, food products) and the coordination with the state university, particularly with their students.

2. For field units specialists.
The training programs for the strengthening of the field unit specialists for giving plant level consultation will two forms, namely; the informal and the formal training program.
a. The informal training.

The informal training program will be continuous. Information will continuously and field unit specialists small be informed of any new reference materials that are available for dissemination as technical reference of the "Technical Bulletin", by Sub-direction of internal training or Su-direction of technical assistance.

b. Formal Training Program

Once a year unit specialists will be trained in the aspect of skills upgrading and to strengthen public service mind.

3. Plant workers.

a. Foreman

The foreman's role in the food processing plant's very important in the small and medium scale food industry, because he takes care of many important processing steps, and also, he is the first one to receive technology assistance. Most of the foreman in the small food processing plants were formerly artisans and they have been working in plants for many years. However, the majority have received no formal education, they only have learned their from plant owners or their friends.

I suggest the following:

1. Foremen need relatively skilledtechniques in various fields on the food processing industry.

Large food processing companies may shoulder the training of skilled technicians, for example, seamer operator of canning company and compresser operator of freezing plant.

2. Extensive license system for technicians will be needed.

b. Plant workers

Mobile training van unit will be very effective for countryside plants.

Technical Information Program

The establishment of a technical information program with the aim to give out technical information to small and medium scale food industry and technology assistance unit is also very importat.

The following are the recommended thrusts:

1. To review, abstract and computerize all researches published on Mexican foods and tropical foods that will be useful for future works.
2. To have computer terminals of date bank and information center which will be essential.
3. Subdirection of planning and information and subdirection of technical assistance and one of the coordinated university, will form the committee to decide on the articles to be disseminated to the in-

dustry. The committee will also be responsable in choosing the form of media this information will be presented.

4. The information will be presented in the form of:
   booklets
   films
   slides
   periodicals (news letters, monthly)
   Technicals reports on terms will be translated into layman's language by the technical staff in the information system.

5. A monthly periodical (news letters) published by agency and distributed by mail food processors, field unit and food related organizations.

6. I F T & D, need to have good size of own library.

F. Conclusions

The strong technical assistance system is needed to bridge bewteen the technology sources and food industries to achieve one of S.A.M.'s objectives.

To get the best result the Council of Food Science and Technology seems to need an advanced monitering and evaluation system.

Acknowledgements

I wish to acknowledge, with gratitude, the interest, help and kindness that I received from DR. MARIO MONTANARI MASSARELLI, DR. ROBERTO GUADARRAMA SISTOS and ING. GUILLERMO FUNES RODRIGUEZ.

Also, I am very grateful to ING. ARTURO GOMEZ BARRERO my assistant, on my assignment, for his extraordinary tolerance to accomplish our job; MISS VIOLETA CHIRINO and ING. JESUS CARDENAS VALLES.

And also my thanks to MISS DEBORAH VIZCAINO NAVARRETE, typing this report.

ANNEX I

TECHNOLOGY ASSISTANCE REPORT

(REPORT ON PLANT VISIT)

1. NAME OF COMPANY:
2. ADRESS:
3. DATE OF ESTABLISHMENT:
4. NATURE OF BUSINESS:
5. TOTAL NUMBER OF EMPLOYEES:
6. ANNUAL SALES:
7. CAPITALIZATION:
8. CONTACT PERSON:
9. DATE OF VISIT:

A. ENTREPRENEUR'S BACKGROUND

10. LEVEL OF TECHNICAL EDUCATION
11. ACCESS TO BASIC TECHNICAL LITERATURE

B. DESCRIPTION OF PLANT OPERATION

12. TYPE OF ACTIVITY

C. RAW MATERIALS:

13. NEED PER VOLUME OF PRODUCTION
14. SOURCES, AVAILABILIYY, PRICE
15. NORMAL INVENTORY LEVEL
16. STORAGE PRACTICE

D. PROCESS DESCRIPTION

17. PROCESS FLOW
18. EQUIPMENT OUTLAY
19. DEGREE OF AUTOMATION
20. RATE OF INNOVATION
21. PLANT CAPACITY AND OPERATION RATE
22. RATE OF PRODUCT REJECTION
23. SOURCES OF PROCESSING TECHNIQUE

E. APPRICATIONS

24. PROPER DEFINITION AND UPDATING OF PRODUCTS AND PROCESSES
25. TRAINING OF OPERATORS AND OPERATORS RECRUITING METHOD
26. AVAILABILITY OF APPROPRIATE AND ACCURATE MEASURING DEVICES
27. SANITATION
28. PACKAGING
29. PLANT LAY-OUT
30. LABOR PROFILE

F. PLANT LEVEL PROBLEM AND ASSISTANCE

31. OWNERS ASSESSMENT OF GENERAL AND ASSISTANCE
32. ATTITUDES DISPLAYED BY PROPRIETOR

G. COMMENTS AND RECOMENDATIONS

ANNEX II

MOBILE VAN TRAINING UNIT

The recommended vehicle to be used as mobile van is a regular Land Rover JEEP.

The facilities to be set-up inside the mobile van training unit are the following:

1. Equipment for calibrating process control

A. EQUIPMENT	No. OF UNITS
Refractometer (porlable) 0°80°BX	1
Mercury in Thermometer	
-10°C - 100°C	2
50°C - 130°C	2
Thermometer	
-60°C - 50°C	2
Balance	
Cap. 500 g. Accuracy - 0.01g	1
Micrometer for can seam test	1
Vacuum gage 0 - 50 in.	1
Maisture meter, electric	1
Caliper	1
Graduated cylinders 5ml. 20ml. 100 ml. 500 ml. 1.000 ml.	5

B. AUDIO VISUAL EQUIPMENT	No. OF UNITS
Projector for film	1
Projector for slide	1
Speaker	1
Generator 3kw.	1
Amplifier	1
Tape recorder	1
Screen	1

C. LIBRARY

EQUIPMENT	No. OF UNITS
Booklets for dissemination	
Books on food processing	30
Films on food processing	30 rolls
Slides on food processing end-quality control	25 sets

V. MISSION OF 12 AUGUST - 1 SEPTEMBER 1981*

A. Summary

The reports concerns the mission of assisting the government to formulate a concept for a type of R & D to support the agroindustry in the country, carried out between August 12 to September 1, 1981.

The consultant worked with members of the Executive Board of SAM, and visited as many as possible Institutions trying to understand the objectives of SAM and to identify areas in which more support will be needed with respect of research work, organization and cooperative projects with abroad organizations.

The consultant also helped to prepare a tentative schedule program to be followed by the SAM coordinator in a trip to Brazil as well identify areas in which both countries can cooperate together.

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* By Agide Gorgatti Netto, expert in food processing research and development.

B. Introduction

The Government of Mexico established as top priority the necessity to reach self-sufficiency in the production of basic food commodities for the country. Within this framework was organized the so-called "Sistema Alimentario Mexicano - SAM" (Mexican Food System).

SAM is a program which sets out basic guidelines and strategies for achieving the target of self-sufficiency and a better food supply to the lower income groups.

UNIDO, as the agency of United Nations Development Program to provide assistance of the Industrial sector of Economy, is given support to many projects in a way or another related to SAM and is very much interested to assist the Mexican Government through SAM in all technological aspects.

This report reflects the experience of spending about three weeks visiting Government Agencies, Research Institutions, and other Government and Industry Authorities, with the only purpose to join in the effort to give advise with the objective to increase production, better preserve the food products produced and try to identify areas in which colaboration and more efforts to reach the established goals were needed.

C. Findings

"Analyse the inventory made of research and development facilities in the country".

The basic information on the subject was obtained contacting authorities only in Federal District that for their position in both Government and Universities offices would provide the necessary information required.

Contacts were made, meetings were held and the findings are as follows:

1. Most of the Research and Development Institutions are installed in Mexico City on its surroundings. As a matter of fact and just to give an example. UNAM - Autonomous National University of Mexico, is solely responsible for more than 50% of the graduated people within the Mexican System of Government financed Universities.

2. Considering the actual needs of SAM - Mexican Food System one can observe that an unbalanced development of action in the field of research and development were taken in the past which were not accordingly with the so called priorities of the country.

Many Research, Development and Auxiliary Institutions have experience and personnel to give support to SAM. Among them we may list:

a. INIA

National Institute for Agricultural Research.

b. PRONASE

National Seed Company

c. INIP

National Institute for Animal Husbandry Research

d. CIEA

National Center for Advanced Studies

e. LANFI

National Laboratories for Industrial Development

f. IPN

Instituto Politécnico Nacional - Polytechnic Institute

g. INN

National Institute of Nutrition

h. UNAM

Autonomous University of Mexico (through PUAL - University Program on Food Science and Technology)

i. ALBAMEX

Balanced Foods Mexican Company

j. INFOTEC

Inovation, Information and Technology Institute

3. There are other very important Institutions like "Instituto Tecnológico de Estudios Superiores de Monterrey" (Technological Institute for Advanced Studies of Monterrey) that is considered a very much respected and knowlegible Institution, however, due to the fact of being private and not Government own that may be an unsurpassable handicap. Anyway this Institution could prepare the very much needed professionals to occupy key positions in management within Government.

4. It is necessary to mention that the National Program for Science and Technology prepared by CONACYT - National Council for Science and Technology, that is englobed in the Master Plan for Development of Mexico, considers an increase of the national spenditure in science and technology to reach 1% of PIB - Gross National International Product by 1982. So, CONACYT should be also considered an important organization to give support in the development of programs in the field of Food Science and Technology particularly considering its liaison with Secretary of Planning and Programming.

5. UNAM organized the PUAL - University Program on Food Science and Technology and defined five Sub-programs with the following objectives:

1st. To make the diagnosis and state of art of Science Technology.

2nd. To define actions of diffusion and conscientization.

3rd. Development of multidisciplinary projects in order to put together and integrating the different groups working at the University.

4th. To give support to the scientific and technological infrastructure of the University, as well provide funds for the improvement of formation of specialized human resources.

5th. Development and Transference of Technology to the private sector of the economy with the objective to convert the research results into productive action.

So, UNAM and the system SAM-SINE signed an agreement to co-operate one to another ans SAM-SINE will be responsible to look towards funds to implement PUAL. PUAL if implemented accordingly is an instrument important in the R and D system.

6. Since one of the major by-products of SAM was to act as a catalyst putting together many professionals, scientists and technologists, it is necessary not to forget that within the country may exist other institutions and universities that could become integrated in an effort to give their contribution to find out solutions, particularly those that are competent and know the problems and may easily reach solutions because they are more familiar with both the natural and human resources in their area of activities.

7. Some of the listed institutions were more studied, such as:

LANFI

Through the Mexican Government, the United Nations Development Program (UNDP) and the United Nations Industrial Development Organization is becoming very well qualified in the field of packaging. Right now LANFI is building an Operations Unit Pilot Plant that will be useful to carry out processing procedures and to help to integrate the packaging studies with the needs of the drying, freezing and canning industries of Mexico.

LANFI as also stated as its main objectives:

a. improvement of more nutritional products derived from cereals.

b. improvement of nutritional of products derived from legumes.

c. Built a sensorial analyses laboratory; and

d. Give support to subproject No.18 of SAM.

INIA

This National Institute for Agricultural Research has eleven Regional Research Centers which have fifty four experimental stations covering to some extent all country. The Table below shows the major Research programs conducted by INIA in 1980.

Table .

Number of experiments and inquiries by Grouped Programs in 1980

	Grouped Programs	Experiments	Inquiries	Total	%
1.	Cereals	4.131	71	4.202	42.92
2.	Edible Legumes	1.0[illegible]2	14	1,106	11.30
3.	Edible oil crops	666	8	674	6.88
4.	Temperate climate fruits	368	16	384	3.92
5.	Tropical and subtropical fruits	332	27	359	3.67
6.	Vegetables	510	10	520	5.31
7.	Forage	440	29	469	4.79
8.	Fibers	284	33	317	3.24
9.	Roots and Tubers	110	0	110	1.12
10.	Medicinal and Industrial species	[illegible]5	4	39	0.91
11.	Support programs	1.4[illegible]	111	1,560	15.94
	TOTAL	9.4[illegible]	323	9,790	100.00

This table shows that is an interest to concentrate emphasis in the so called basic crops for human feeding.

ALBAMEX

Is a Government own decentralized company manufacturing balanced food. Nutrimex is a new division to produce high protein human food products primarily to children. Fermex is a division responsible for the production of the aminoacids methionine and lysine.

Albamex actually produces 600, 000 tons of balanced food and its formula are developed through the technical assistance of the National Institute of Nutrition.

"Analyse the basic plans for the food industry development according to the Sistema Alimentario Mexicano (SAM)".

The Sistema Alimentario Mexicano - SAM was established with the main objective to increase and improve agricultural production to reach selfsufficiency regard to basic food products such as grains (cereals and legumes). Are also main targets of SAM to avoid food imports and fight malnutrition and by providing more income to the "campesinos" and other sectors of economy be an instrument for the country's development. So by definition SAM is really promoting selectively the development of segments of agroindustry in Mexico. For the basic food products there is also a very well established channel for industrialization, distribution and sales through a decentralized company Government owned called CONASUPO - Companía Nacional de Subsistencias Populares. Their associate companies are responsible, individually, for the following products and purposes:

a. LICONSA Milk processing

b. MINSA Corn processing

c. TRICONSA Wheat processing

d. DICONSA CONASUPO's distributing Company

e. BORUCONSA (Bodegas Rurales Conasupo, S.A.)

CONASUPO's channel of commercialization through small stores.

In 1977 was created IMPECSA - Impulsora del Pequeño Comercio, S.A. de C.V. to promote small commerce for basic food products and by avoiding too much intermediators in the commercialization chain, improve small commerce management capacity and so creating a strong commercial middle class. Until 1977 DICONSA attended 10,000 "tiendas". IMPECSA intends to reach 250,000 "tiendas" and that means to be responsible for the supply of basic foods to 47% of Mexican families.

The Mexican Government and SAM paid attention to production and distribution to a large extent.

There is considerable need to organize the research system as is pointed out in Duty 3.

However, there is quite a lot to be done in relation to storage: at rural level, in silos and large storage houses in the production area as well at the market channels. Losses of food commodities runs at a very

high levels. So the Government has been losing larger amount of money (through the heavy subsidised incentives he gives to the farmers) because of the losses in the field as well as in the other steps of the chain, mainly in transportation and distribution channels.

Besides storage, packaging and post harvest physiology are two major areas in which Government Agencies and Industry should work together to improve the quality of food goods as well as decrease losses. During the Fruticulture Congress held in the middle of August in Guadalajara City, it was said that 50% of the fruit production is lost and that was a figure confirmed by many specialists. So Institutions like LANFI that receives a strong support from UNDP and UNIDO should be invited to play an even higher role in those mentioned areas. A joint program between CONAFRUT and LANFI in post harvest physiology would be something else to be into heavy consideration.

Food Engineering projects are among the recent worries of SAM executives, and PRODETAL may be the tool to be used to improve the competence of the country in this area. Finally I must say that a very strong and agressive 5 year plan of training should be organized. CONACYT should take the lead to organize a program to provide better professional qualification to the researches working at Government Agencies.

This program should be organized in a way to give emphasis in the training of two major groups of professionals:

	Level
Scientist (Researchers):	a) M.S.
	b) Ph.D.
	c) Specialization
Management (Executives)	a) M.S.

"Discussions with the leading national authorities in the field of agro-industries development"

The meetings we held with Mexican authorities have shown us that:

1. Unless something unusual occurs, Mexico will have a very good production of corn and beans. An expected 18 million tons production of corn is almost to occur.

2. Storage is very poor all over the food chain. SAM executives predict that an 60% increase on storage facilities shall be planned and installed. By 1982 special attention shall be given to the underground storage of grains in small rural properties.

3. PRONASE until 2 years ago was selling 65,000 tons of certified seeds. Today it is putting in the market 315,000 tons (mainly varieties developed by INIA). However, this number seemed to me very small comparing with the huge objectives established by SAM. So, special attention and support shall be given to PRONASE to make this seed company even stronger providing all the means that is necessary to give the small farmers the best seed they can afford. An education program is very necessary to teach and to induce the small farm to use improved seeds. PRONASE claims that 2,000,000 ha. of corn are right now being cultivated through the use of improved seeds developed by INIA and sold by PRONASE. A mechanism such a exchange of "grain" by "seed" could be visualized since it can lead to the conclusions that the "campesino" will profit from it, by having a better crop, which will be reasonably paid (though a minimum price policy) and as a final result an increase in the "campesino" income.

4. ALBAMEX says that a major program is just to be started in the area of corn processing. A product called "Super Tortilla" developed with the help of the "Meals for Million Institution" is just about to be put in the market. They say that sensorial analyses carried out by the National Institute of Nutrition showed that "Super Tortilla" was very well accepted by the consumers. The actual production of tortilla flour by MINSA and MASSECA primarily is 800,000 tons; by 1985 a programmed production of 2.4 million tons is expected to reach

the market. So, a huge effort of industrial planning improved packaging materials and distribution facilities is going to be necessary.

5. My very first conclusion is that SAM should really pay attention to the basic foods, and for that I mean the grains (cereals and legumes) salt, sugar, vegetable oils, meat, milk, and maybe eggs. The "Canasta Basica Recomendable" however, besides being a well studied exercise, may suggest some repairs. It is going to be difficult to provide fresh fruits and vegetables to the main target populations calculated to be within the range of 19 to 35 million people.

So, I would advise to pay attention at least in the first phase of SAM to those mentioned products and try to organize a very well planned program to increase production of fruits and vegetables, giving emphasis to those that are less season dependent and that can be grown and marketed to a lower price possible.

"Make suggestions concerning the type of food research and development system which should be established in the country."

It was my understanding that a co-ordination system should be visualized in order to utilize the human resources that even are not in great number still maybe sufficient to launch some major activities in R + D.

There is some criticism about the role of CONACYT very clearly discovered since even in the newspaper one could read complaints about the lack of priority given by CONACYT to Agricultural and Food Science and Technological Research areas. This is something to be verified very closely.

Not so long ago it was created the Company "Mexicana de Tecnología, S.A. de C.V." to play a role of preparing the complete packages of technology and provide to the investors all the necessary information needed to make the investments.

However, the SAM executives have told us that the field of action of "Mexicana de Tecnología" was too big and for that reason it would be difficult for "Mexicana" a group of specialists in design, developments and construction of prototypes of equipment for the food system chain, since food equipment are in their majority imported from developed countries, particularly the United States and Europe.
Being in the exposition AgroMexico 81 it was possible to see how big is the dependence in that particular area. As SAM is organized in a system way, basing on its assumption on how much food is going to be consumed, and in which form, and analysing afterwards aspects of commercialization, processing and distribution of food, it is very important to have a stronger concern on the engineering of food equipment, because of the increase of the number of agroindustries that are going to be installed to produce the products selected in the "Canasta Basica Recomendable" (Basic Food Basket).

SAM executives are proposing the creation of "Productora de Tecnología Alimentaria - PRODETAL" which would have the responsability to put together in a technological package the existing know-how, providing support in processing and transformation of foods comprised in the Basic Food Basket.

Since it was found that only scarce number of professionals are in the field of equipment design, PRODETAL intends to select this area as a top priority for action.

They are convinced that the experience developed by the group of Prof. Dr. Rodolfo Quintero in the "Institute for Biological Investigation" at UNAM may be used as a basis for the activity of PRODETAL in the design and construction of food equipment.

I gave the advice not to try to build huge machinery shop facilities and to use the existing ones in food equipment industries.

However, I was told that food equipment industry in Mexico in many areas is very incipient so at least the initial initiative in the first 5 or 6 years may depend upon Government decision.

CONACYT is responsible for co-ordinating and financing the system of science and technology. This dual function according to their directors is responsible for many conflicts in the system. I would advise to study the feasibility of creation of a Financing Agency just to give financial support to the projects considered as priority by Government and that could be conducted inside or outside Government Institutions. So CONACYT would play the role of co-ordination and the other financial agency, similar to FINEP (Agency for Financing Studies and Projects) in Brazil would be responsible for analysing proposing and providing funds for the approved projects submitted to feasibility analyses by qualified committees of specialized experts.

Since it is under study the creation of a "National Commission for the Planning of Food Science and Technology - COPLACITAL" with executive power, which will provide to COPLACITAL the definition of priorities, strategies and decision making actions in planning and programming as well as financing, maybe COPLACITAL could be considered as one of the major program within the scope of Financing Agency for Studies and Projects, avoiding duplication of efforts.

Anyway, co-ordinating action is necessary to give full support to SAM, and with the level of information I was able to get I would propose the following scheme:

S A M

CONACYT ——— Mexican Financing Agency for Studies and Projects.

- Through National Committees of Experts identify and define priorities in the field of Science and Technology.
- For example: Give support to Agricultural and Food Science Technology Projects — Support SAM

COPLACITAL

- Define which Projects can be financed in Food Science and Technology.
- Define R & D Institutions to be financed.
- Allocate the necessary funds.

PRODETAL

- Executive Branch of MFASP and COPLACITAL.
- Conduct Research and Development work that cannot be carried out by existing Institutions.
- Prepare the Technological Packages and select private groups to implement them.

D. Recommendations

Considering SAM was conceived as a system that must be as coherent as possible with reality to reach its goals, I recommend:

1. To support strongly the seed system and give PRONASE financial help and trying to reach the situation in which most of the corn, beans, rice and other basic crops can be grown with the use of seeds of good and known quality.

2. Organize as soon as possible a storage program giving particular emphasis to storage of corn, rice and beans at the farm level. This policy will result in diminishing losses and provide all year round grains to be managed by the "campesino" selling it when it is needed or to be used for its own consumption.

3. Select and support research Institutions to carry out post harvest physiology studies on fruits and vegetables. This initiative may have dual purpose: a) put into market better products with lower losses and of course, with better quality and b) help to export excess production.

4. It is recommended to give continuous support by both Mexican Government and International Agencies as UNIDO to packaging programs such as the one under way through LANFI. Packaging is very important area and within LANFI's program special attention shall be given on the training of personnel at all levels.

5. A co-operation program should be established through the sponsorship of UNDP and UNIDO in the area of transference of technology among developing countries with the aim to give support to SAM in the following areas:

   a. Genetics
   b. Packaging and quality control
   c. Storage of foods
   d. Food engineering
   e. Structural organization of R + D Institutions.

6. Provide means to establish a very effective system of exchanging information. That is necessary and important because through this type of mechanism many countries may profit from the other's experience and help as well in providing the answers to problems in a more rapid and effective way.

ANNEX I

LIST OF CONTACTS AND VISITS

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México 22. D. F.

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VISIT

AGROMEXICO 81

August 26. 1981. Mexico City

First International Exposition on Research and Development Technics for Latin American Food industry.

Participation as a delegate with the Head of the Brazilian Delegation, Ministro Gilberto Martins Ferreira and SAM representatives to some SELA - Latin American Economical System - meetings at Mexican Chancellery.

The objective of this SELA meeting held from August 24 to August 28. 1981 was to propose to SELA Consil recommendations on proposals and projects to increase cooperation among Latin American countries in the field of food and agriculture business.

ANNEX II

IDENTIFICATION OF POSSIBLE AREAS OF COOPERATION BETWEEN MEXICO AND BRAZIL IN THE FIELD OF AGRICULTURAL SCIENCES

1. Storage of grains and legumes. Emphasis of storage at rural property.
2. Production and processing of cassava. Inmobilization of enzymes for the production of ethanol from cassava.
3. Support of the organization of PRODETAL through ITAL - Institute of Food Technology and CETAGRO (ex-CTAA) National Center for Agroindustry Development of EMBRAPA.
4. Management of water resources for semiarid regions. Program to be held between Mexican Institutions and CPATSA-National Resource Center for Semi-arid tropic of EMBRAPA
5. Joint cooperative program on nitrogen fixation.
6. Training and exchange of experts in areas to be selected between the coordinating agencies of both countries.

ANNEX III

LIST OF FOOD PRICES

Surveyed

Place: Supermarket Aurrera
Rio Sena Street
Mexico City, D. F.

Date: August 22, 1981

FOOD PRODUCT		Unity	PRICES		
			US$	MN$	CR$
1. Corn flour MISECA	Harina maíz nixtamalizada	kg	0.30	7.60*	30.90
2. Corn flour MINSA Conasupo	Harina maíz nixtamalizada	kg	0.30	7.60*	30.90
3. Wheat flour	Harina de trigo	kg	0.28	6.90*	28.00
4. Rice	Arroz	kg	0.88	21.80*	88.50
5. Black beans	Frijol negro	kg	0.73	17.30*	72.70
6. Yellow beans	Frijol "Carioca"	kg	0.73	17.30*	72.70
7. Peruvian beans	Haba pelada	kg	2.60	63.30	259.40
8. Iodine salt	Sal yodatada	kg	0.16	4.00*	16.30
9. Refined sugar	Azúcar refinada	kg	0.55	13.50*	54.80
10. Corn oil	Aceite de maíz	1 lt.**	1.40	34.50	140.00
11. Sunflower oil	Aceite girasol	1 lt.**	1.38	33.90	137.70
12. Saflower oil	Aceite cártamo	1 lt.**	1.38	33.90	137.70
13. Small white bread	Pan blanco	50 g.	0.02	0.50*	2.00
14. Biscuits	Galletas María	170 g.	0.23	5.80*	23.50

* Administered price
** Plastic bottle

	FOOD PRODUCT		UNITY	PRICES		
				US$	MNS	CRS
15.	Tortilla paste	Masa para tortillas	kg	0.21	5.30*	21.50
16.	Potatoes	Papa Alfa	kg	1.78	43.90	178.20
17.	Potatoes	Papa criolla	kg	1.70	41.90	170,10
18.	Eggs	Huevos	kg	1.17	28.90	117.30
19.	Milk in TetraPak	Leche fresca	lt.	0.45	11.20	45.50
20.	Vegetable butter	Manteca vegetal	kg	1.35	33.20*	134.80
21.	Cow milk butter	Manteca leche	kg	5.50	135.50	55.00
22.	Canned Nestle milk	Leche Nido	340 g	1.86	45.80*	186.00
23.	Cheese	Queso tipo fresco	kg	5.48	135.00	548.10
24.	Cheese	Queso tipo Argentino	kg	5.74	141.25	573.50
25.	Tomatoes	Jitomate	kg	0.89	21.90	88.90
26.	"Pimiento"	Chile poblano	kg	0.52	12.30	52.40
27.	Red pepper	pimienta	kg	22.30	54.90	222.90
28.	Onions	Cebolla	kg	0.80	19.90	80.80
29.	Lettuce	Lechuga romana	piece	0.72	17.90	72.50
30.	Lettuce	Lechuga orejona	piece	0.72	17.90	72.00
31.	Carrots	Zanahoria	kg	1.01	24.90	101.00
32.	Cucumber	Pepino	kg	0.32	7.90	32.00
33.	Cabbage	Col blanca	kg	0.24	5.90	24.00
34.	Banana	Plátano Juanita	kg	0.52	12.90	52.00

* Administered price

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List of Food Prices
(continued)

	FOOD PRODUCT		UNITY	PRICES		
				US$	MN$	CR$
35.	Apple	Manzana Starking	kg	1.09	26.90	109.20
36.	Apple	Manzana Rayada	kg	0.89	21.90	88.90
37.	Limón	Limón agrio	kg	1.09	17.90	72.70
38.	Orange	Naranja	kg	0.60	14.90	60.50
39.	Papaya	Papaya	kg	0.77	18.90	76.70
40.	Mango	Mango Paraiso	kg	0.77	18.90	76.70
41.	Avocado	Aguacate Hass	kg	1.78	43.80	177.8
42.	Quince	Membrillo	kg	1.13	27.90	113.30
43.	Thompson Seedless grapes	Uvas sin semilla	kg	2.23	54.90	222.90
44.	Peaches	Duraznos	kg	1.82	44.90	182.30
45.	Pears	Pera Mota	kg	1.13	27.90	113 30
46.	Melon	Melón	kg	0.68	16.90	68 60
47.	Grinded beef	Carne molida de res	kg	2.84	69.90	283 80
48.	T. Bone steak	T. Bone	kg	4.87	119.90	487 00
49.	Miscellaneous beef	Otro tipo de carne	kg	2.23	54.90	223 00
50.	Pork cutlets	Chuletas de cerdo	kg	6.62	162.90	661 40
51.	Chicken fillet	Pollo limpio	kg	4.06	99.90	405.60
52.	Mojarra fish	Mojarra	kg	1.52	37.40	151,80

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List of Food Prices
(Continued)

	FOOD PRODUCT		UNITY	PRICES		
				US$	MN$	CR$
53.	Canned Aurrera Sardines	Aurrera sardinas	350g (net weight)	0.60	14.90	60.50
54.	Canned Calmex Sardines	Calmex sardinas	227g (net weight)	0.48	11.80*	47.90
55.	Canned tuna fish	Ybarra Atún	200g (net weight)	1.13	27.80	112.90

* Administered price

Note:

US$ = American dollars

MN$ = Mexican pesos

CR$ = Brazilian Cruzeiros

1 US$ = MN$24.60 and CR$100.00

ANNEX IV

LIST OF CONSULTED DOCUMENTS (REFERENCES)

1. Notas Analíticas y Lineamientos Metodológicos para el Proyecto Sistema Alimentario Mexicano - August 1979- SAM
2. Primer Planteamiento de Metas de Consumo y Estrategias de Producción de Alimentos Básicos para 1980-1982 - March 5, 1980. SAM
3. Medidas Operativas, Agropecuarias y Pesqueras, Estrategia de Comercialización, Transferencias, Distribución y Consumo de la Canasta Básica Recomendable. May 7, 1980 - SAM
4. Estrategia de Comercialización y Distribución de Alimentos Básicos e Insumos Productivos. December 5, 1980 - SAM
5. Estrategia de Comunicación Social. December, 1980 - SAM
6. La Estructura Científico - Tecnológica y el Sistema Alimentario Mexicano . July 20, 1981 - SAM
7. La Estructura Científico-Tecnológica y el Sistema Alimentario Mexicano. August 17, 1981 - SAM
8. Productora de Tecnología de Alimentos (PRODETAL) August 1981 - SAM
9. Programa Universitario de Alimentos. August, 1981 UNAM
10. Mecánica Operativa de los Programas del FIDEICOMISO de Riesgo Compartido. Contrato de Fideicomiso de Riesgo Compartido. March 31, 1981 - SARH y Banco Nacional de Crédito Rural, S.A.

11. Ley de Fomento Agropecuario . February 1981 - Presidencia de la República

12. Seguridad Alimentaria en el Marco de la Cooperación Regional August 24-28, 1981 - SELA

13. Experimentos Realizados por el INIA. March 1981, INIA-SARH

14. Manual Informativo - LANFI . March 1981- LANFI

15. AgroMéxico 81 - Catálogo de Expositores. August 1981 - FEMAC/SEPAIC

16. El Afiliado ANO I Vol.I, números 1 e 2 - IMPECSA - Impulsora del Pequeño Comercio. S. A. de C. V. June, July 1981

VI. MISSION OF 31 AUGUST - 16 SEPTEMBER 1981

A. Introduction

Within the project UC/MEX/80/168/11-05/31.7.C, a Senior Food Processing Research and Development Expert visited Mexico from 31 August to 16 September 1981. Its main purpose was to assist government to formulate a concept for a type of research and development system which should be created in the country to assist development of the national food processing industry. The specific expert's duties were:

1. Analyse the inventory made of research and development facilities in the country,

2. Analyse the basic plans for the food industry development according to the Sistema Alimentario Mexicano (SAM),

3. Have discussions with the leading national authorities in the field of agro-industry development,

4. Make suggestions concerning the type of food research and development system which should be established in the country.

As already has been decided that PRODETAL should start in the very near future with its activities as the leading food processing research and development institution, the expert was asked to concentrate his attention on organizational structure and future research and development programme of the PRODETAL.

*By I. Savic, expert in food processing research and development.

This report is divided in three parts: 1.) Background information; 2.) Suggestion and comments on food technology research and development system envisaged by PRODETAL; and 3.) Some aspects and suggestions concerning the education of PRODETAL's food research and development staff.

B. Background information

During the mission, the Expert reviewed the following documents:

a. SAM

1. Notas Analíticas y Lineamientos Metodológicos para el Proyecto Sistema Alimentario Mexicano,

2. Primer Planteamiento de Metas de Consumo y Estrategia de Producción de Alimentos Básicos para 1980-1982,

3. Medidas Operativas, Agropecuarias y Pesqueras, Estrategia de Comercialización, Transformación, Distribución y Consumo de los Productos de la Canasta Básica Recomendable,

4. Estrategia de Comunicación Social,

5. Estrategia de Comercialización y Distribución de Alimentos Básicos e Insumos Productivos,

6. Estrategia de Desarrollo Agroindustrial,

7. La Estructura Científico-tecnológica y el SAM,

8. Productora de Tecnología de Alimentos (August, 1981),

9. Sistema Integral Huevo (June, 1981).

b. UNDP/UNIDO

1. Report prepared by the secretariat of UNIDO on Mission to Mexico (4-3 March, 1981),

2. Report prepared by B.S. CHUNG on Mission to Mexico (4-20 August, 1981)

An analysis of SAM's document is following. Some comments are also included.

ad 1. Notas Analíticas y Lineamientos Metodológicos para el Proyecto Sistema Alimentario Mexicano (August, 1979).

Starting from the fact that today's world food situation is basically characterized by a process of internationalization of production and marketing of agricultural products as well as by an increasing standardization of technology on the world level, the above document emphasizes the enhancing role of the state in the social economy. The administrative, economic and other measures may have also a direct impact on nature and structuring of the whole food supply chain. This fact point out that the methodology and strategy of making food supply analysis, must be carefully selected and properly adopted to the real necessity. The study areas of primal interest in this document are: regionalization of production, type of the production units, production economy, rural economy, natural resources, technology applied, marketing channels, type of processing, consumption by different social classes, etc.

This document provides over-all strategy and methodology for a nation-wide policy in reaching food self-sufficiency. Based on local circumstances, appropriate techniques of analysis food production situations are accepted and special technical terms introduced and defined. According to such a concept, SAM (Sistema Alimentario Mexicano-Mexican Food System) represents an aggregation of different "subsectores" (=a grouping of "sistemas integrales"), including all their phases: production, marketing, processing, distribution and consumption.

A special approach to the methodology of collection of data concerning basic food -Canasta Básica Recomendable- (food subsectors of special importance for national diet) is accepted and practical suggestions made. Canasta Básica Recomendable not only reflects basic nutritional requirement of the whole population but also it serves as an important planification instrument.

Each food subsector includes a certain number of "sistemas integrales" and each "sistema integral" contains distinct systems, characterized for different regions of the country. It is emphasized the promotion and stimulation of agroindustrial integration in order to "create a dominating nucleus of each system". There are four subsectors for animal products (meat, milk, eggs and honey), one fish subsector and seven subsectors for other foods (fruits, basic grain, etc.)

"Canasta de Consumo Actual" (actual consumption) includes, according to this document, 38 products, which present 85.88% of food expenses of a low-income family. "Canasta Básica Recomendable" (recommend Basic Diet) includes foods able to satisfy nutritional requirements of the majority of country's population, taking strictly into account local circumstances .

ad.2 Primer Planteamiento de Metas de Consumo y Estrategia de Producción de Alimentos Básicos (1.3.1980)

This particular study is directed toward a very specific question: are the agriculture and fishery resources of Mexico, if properly used, capable of providing an adequate level of nutrition to the growing population?. This is a question of great national concern.

The answer is based on the accumulated results of the past experience, information collected and strategies and activities proposed .

The estimation of nutritional requirements of different social categories of population is made and a "Canasta Básica Recomendable" fixed, taking into consideration cost and availability of selected food items in different regions of the country. A few examples, taken very much at random, might be mentioned to demonstrate that the increased production of some

basic foods, can be realized in Mexico, if necessary measures are to be taken.

For example, in Mexico, the maiz maintains still its position as the most important crop. This is due not only to its importance to everyday diet of population, but also because it is the main crop of the rural economy. The results of a study mentioned in this document, show that Mexico has a real potential to increase maiz production from the present 10 million to about 20 million Tons in the near future. According to the same study, beans production can also be relatively easily increased by other 600,000 tons. There are also important possibilities for increasing sorgho production.

"Canasta Básica Recomendable" requires an increase of fish production from 16 g at the present time to cca 30 g per capita and per day in the near future. Although it is always difficult to forecast potential yields from large oceanic areas of which modern research has touched only a small part, Mexico's coastlines of more thousands kilometers, numerous islands and innumerable coastal inlets give it great fishing potential. The marine catsch in Mexico includes two ocean marine resources, but many rivers and lakes provide also rich aquatic resources. It suggests that policy and strategy adopted by the document may give desired results.

Various regulating mechanisms and policy to achieve final goals of "Canasta Básica Recomendable" (policy of guarranted prices, improved cultural practices, extension of areas under cultivation...) are considered and recommended.

ad 3. Medidas Operativas Agropecuarias y Pesqueras, Estrategia de Comercialización, Transformación, Distribución y Consumo de los Productos de la Canasta Básica Recomendable (5.3.1980)

This document is a continuation of the above mentioned. It discusses activities to be taken and strategies to be realized in order to improve marketing, transportation and distribution, particularly of foods recommended by Canasta Básica Recomendable. The final goal is the development of food industry, able to insure national self-sufficiency in food consumption.

The document includes a list of twenty SAM (Sistema Alimentario Mexicano) projects, and provides a short information on each of them. The objectives of these projects are directed toward reaching requirements of Canasta Básica Recomendable but also they tend to improve the purchasing power of rural population (80% of maiz and beans producers belong to low-income layers of population). In this context, a whole system of different measures and new crediting and insurance policies and special price for fertilizers and insecticides, are proposed.

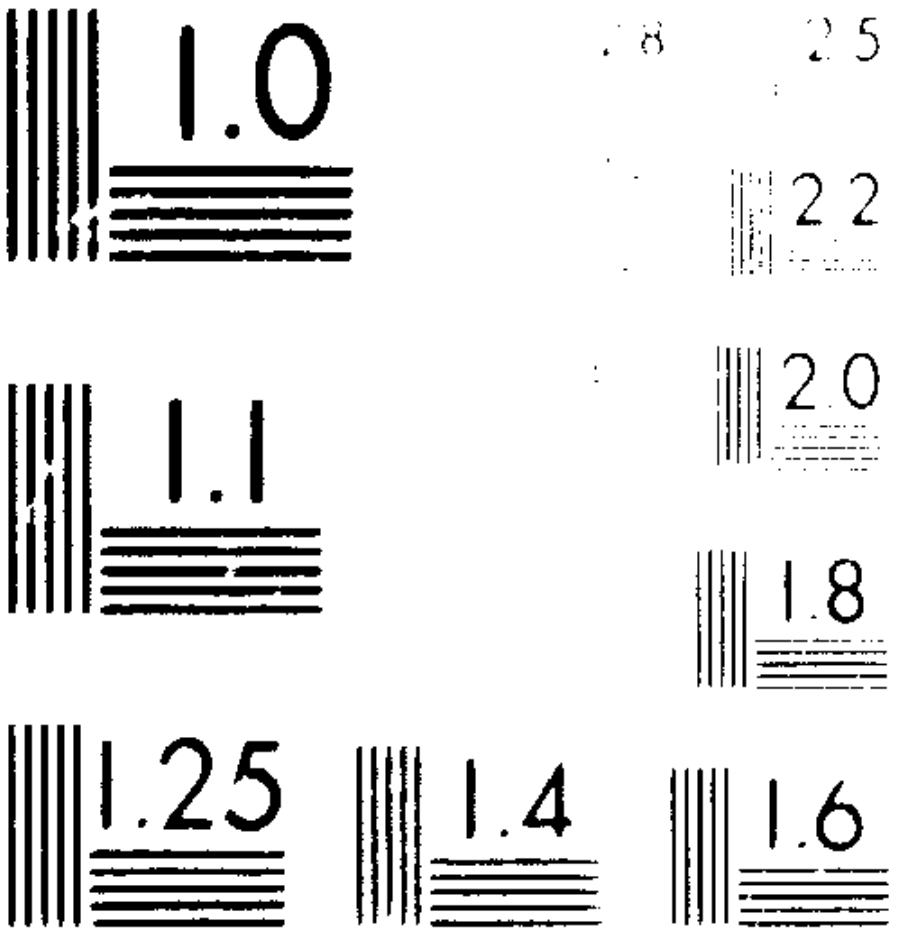
In improving meat production (Chapter V of the document) modern cattle breeding will be encouraged. The objective of the economic planners in Mexico is to reach 14.6 kg of meat per capita in 1985. Thus the goal of Canasta Básica Recomendable, will be realized. It can be stressed out that, given a sufficient level of application of modern technology in respect of disease control, pasture improvements, feeding, management and breeding, total livestock output in terms of milk and meat even from herds of existing size, could certainly be considerably greater than presently. It is suggested the construction of twelve new sloughtering plants in order to meet the actual needs. A meat grading system, and its introduction in the practice, is considered as a priority in improving marketing and consumer protection.

2.4 million ton of fish should be produced in 1982 (today's production is about 1.4 million tons). It means that average annual fish consumption per capital will be 9 kg in 1982 (i.e. 4 kg more than in 1979) or 25 g per capita per day. As it can be seen, although the volume of fish production in Mexico, is already impressive, even more impressive is the rate of increase which may be achieved. From the standpoint of food production, there is the twofold problem here of safeguarding those stocks already intensively fished, which are of well established economic and nutritional importance, and that of extending areas of exploitation as well as making better use of species not yet fully exploited commercially.

The efficiency of fishing operations could be very readily increased by the adaptation and use of fishing vessels and gears with modern fishing equipment, already used in other fisheries. The SAM's strategy is to increase the number of fishing units to a level of 13.000 in 1982.

It is almost impossible to overemphasize the importance of the problem represented by the extreme perishability of fish in its fresh state. Considerable spoilage usually occurs during the distribution over larger areas. Therefore, any measures which would eliminate such wastage and permit distribution over a wider consuming area could have the immediate effect on making fish available to more people as well as that of increasing the incentive to catch more fish. In order to overcome the fish distribution problem, a programme of different measures is elaborated and proposed by the document.

One of the basic goals of SAM's strategy is reorientation of the national industry on the production of Canasta Básica Recomendable foods (Chapter VIII). This will be achieved by a policy of financial stimulation. Such a food industry, should be integrated with primal producers and distributos of final products. The emphasis will be given to those products, which satisfy traditional food patterns.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ad 4. Estrategia de Comunicación Social.
December, 1980

The population of Mexico passed 60 million some time in 1978. The birth rate in Mexico is 3.5% and it will be a further increase in population within the next decade.

It is not possible to say how long it will take before birth rates begin to come down and how rapidly they will fall. Therefore, the nutritional education of population, particularly of women, is of crucial importance. It is clear that an increasing number of population wants to know the correct way to eat. Unfortunately, some food industry branches have helped to create a situation where many consumers incorrectly feel that certain nutrients are good and certain nutrients are bad. This is the reason why the emphasis in this document is placed on the promotion of a balanced, sufficient and regular diet, especially for children, young people and mothers. As the radio, television, printed materials, etc., are important means of today's nutritional education, four nation-wide nutritional education compaign are proposed. They have the littles: "Combination of Different Foods in Everyday Diet", "Diet of Pregnant Women and Women in Lactation", "Diet of Infantils", and "Food Hygiene, Preparation and Conservation".

ad 5. Estrategia de Comercialización y Distribución de Alimentos Básicos e Insumos Productivos (23.12.1981)

This document is a continuation and further elaboration of those cited under 2,3 and 4. Starting from a necessity tc create a new food economy aiming at the satisfaction of nutri tional requirements postulated by the Canasta Básica Recomendable, this study is directed enterely toward objectives and instruments of strategy of achieving national self-sufficiency in basic food supply, but the emphasis is placed on analysis and role of commercial and distribution segments of food supply chain. An important means in keeping interest in food production and its distribution is the policy of price guarrantee. The improvement of transport means in number and quality, and a better organization and integration of all segments of food supply chain, storage facilities, subsidies to the final products which are lacking and products presentation are other essential elements of the strategy accepted by the SAM.

ad 6. Estrategia de Desarrollo Agroindustrial (draft document, 1.4.1981)

The main structural characteristics of the national agroindustrial system are:

- a diversity of agroindustrial units with regard to size, technological level, etc.

- there is a leading food industry segment, determining general development of the sector; it is private and often transnational; the participation of public sector does not exceed 20%;

- big food enterprises are basically oriented toward supplying of high-income population levels, thus producing high-priced food products but not necessarily of high nutritional value. Transnational companies are primarily engaged in milk processing and animal feed production. The activities of the public sector are mostly concentrated in primary industries, where industrial processing is not highly sophisticated;

- agroindustrial integration is still at its very beginning;

- the degree of technology used in initial stages of industrial processing is usually on a lower level, but more sophisticated technologies are found in the final phasis of processing. Small-sized food enterprises are users of more simple technologies;

- a predominant part of the technological equipment is imported;

- industrial processing capacities are predominantly located in consuming areas;

- the lack of a raisonable integration and liaison between the food processing industry and agriculture and livestock production sector as well as transport defficiencies, among other reasons, contribute to a disequilibrium in qualitative and quantitative supply with raw materials;

- the activities of different bodies and organisms, responsable to regulate agroindustrial policy, seem to be generally dispersed and of reduced power.

It is emphasized (Chapter 1.1) that the present agricultural production is insufficient and imports are needed. In 1980, grain import reached 10.5 million tons (in 1968 Mexico was self-sufficient in grain production;). The grain production per capita felt down from 338 kg in 1968 to 315 kg in 1978; at the same time, the per capita consumption increased from 320,4 kg in 1968 to 365,6 kg in 1978. Among the other agricultural production problems, the use of fertilizers, disease control and insufficient use of mechanization are pointed out.

Collection, transport and storage of grain (Chapter 1.2) are characterized by a structure of intermediairies and a lack of transport and storage infrastructure. This is the reason why the losses in this phase are estimated cca 20 percent (US $10 million annually). Milling and oil-extracting industry encomposses cca 25.300 establishments, located

predominantly in consuming areas (Chapter 1.3). The participation of transnational companies in Mexican oil-extracting industry is cca 10%; the same is true for the public sector.

In livestock production (Chapter 1.4) intensive (monogastric animals) and extensive methods (cattle raising) are applied. Genetic composition of Mexico's beef animal in 1972 were: 57.4 criollo, 29.2% zebu, 9.0% Hereford, 2.8 Charolois and 1.6% Aberdeen Angus. In the milk production, specialized breeds included only 12.5%, until crossed animal proportion reached 87.5%. Milk cattle population numbered 8.2 million heads in 1978; a half of this population is concentrated in five federal units: Veracruz, Jalisco, Chiapas, Chihuahua and Tabasco. The total national milk production is not sufficient and the imports are increasing (the value of this import was increasing by a rate of 12.2% annually in the course of 1970-1978).

Poultry production is predominantly controlled by a transnational sector.

The expansion of the pork industry has been remarkable: from 230.150 tons in 1965 to 409.698 tons in 1977. Pork constitutes more than 50% of national meat consumption. There are several types of pork production, but intensive production, using a high-quality genetic material and

semi-intensive production based on traditional feeding systems, account for 40% and one third of the total production respectively.

Sheep and goat production has been stagnating within two last decades. The present mutton consumption is cca 0.4 per capita; wool importation is increasing, sheep milk production insufficient. There can be no doubt, however, that the possibilities for increased milk and wool production, through a policy of selected breeding, control of parasites and diseases and better feeding, are really tremendous. In respect of mutton and lamb, it is evident that, here too, production could be multiplied by breeding, better feeding and control of diseases.

Feed industry is characterized by high utilization of sorgho of 5 million tons (1 million tons is imported annually), oilseeds of 1.5 million tons (in 1979 - 50% imported), fish meal and some chemical components for monogastric animals. In assessing feed resources, it is necessary to consider cattle and sheep, which secure most of their food from grazing, separately from pigs and poultry. In the latter case, there is no fundamental difficulty about a great increase in numbers, provided that effective use is made of waste and by-products, with grains being fed where resources permit and, where needed, to provide a balanced ratio. In particular, the opportunities for increasing poultry numbers would be possible with very

little competition in terms of land area. The possibility of increasing the carrying capacity in terms of livestock is a basic question in any study of food production potentials and deserves special attention. It is, therefore, proposed to examine this subject in more details.

Industrial processing of grain and animal products, which are of primary importance for Canasta Básica Recomendable has also been analyzed in this document. It is cited that grain processing is carried out in about 25.300 units, having a sufficient capacity to satisfy the present needs. It is distinguished between the enterprises using a high-level technology and those traditional, mostly small -or medium- sized processing units (the majority of enterprises are small -or medium- siezed units;).

A structure of 1,300 municipal and other slaughtering plants and slabs is dispersed throughout the country. Only 30 of these units are located in big cities, and the rest is operating in small urban areas. The private sector tends to install their plants in livestock producing areas, but public sector units are concentrated in consuming centers. In 1975, about 410 meat packing plants were registered. The biggest four process 37 per cent, and the biggest two processing plants are located in Mexico State.

In milk processing industry, 8.5% big industrial units process 59 per cent of the total volume of milk.

Much attention the document is giving also to technological aspects of food supply chain (Chapter 1.6), emphasizing that national food-processing equipment producing companies are not able to satisfy present needs. One of the reasons for it is the lack of a clear concept of crediting of the whole agriculture and livestock sector, which urgently needs financial resources. A substantial increase of financial resources may contribute to the rapid reorientation and further development of agriculture and livestock sector. A whole system of different crediting and financing measures and mechanisms is proposed, particularly in the field of genetic improvements, oilseeds, wheet, soya, rice and beans production, grain marketing, agricultural insurance, agricultural mechanization, implementation of "technological packages", animal production, etc.

However, an important tool in stimulation, identification, evaluation, choosing, transfer and utilization of different technological options and solutions, convenient for the local circumstances, will be creation of the National Institute of Food Technology. Its main function will be to coordinate different research and development activities and promote technological progres in food sector. The Institute will be also active in the matter of food standardization and legislation. Its special task will be to assist development of national agroindustrial consulting and engineering compa-

nies and help functioning new food processing lines and plants.

ad 7. La Estructura Científico-Tecnológica y el Sistema Alimentario Mexicano (preliminary version, August, 1981)

Recognizing the nature and severity of the nutrition problem in Mexico, the authors of this document try to develop national policies and programmes of food and nutrition to cope with them. At the same time, it is recognized that locally adopted technology, not just the adoption of technology from developed countries, are needed to process and preserve local foods. Above all, these foods must be produced to fit in with traditional food habit patterns in the country.

In order to realize the self-sufficiency in food technology, National Commission for Planification of Food Science and Technology (Comisión Nacional de Planificación de Ciencia y Tecnología de Alimentos) - COPLACYTAL is to design the strategy and to fix priorities and food development projects.

COPLACYTAL should be a top executive body, making decisions in planification, programming and financing the whole food science and technology system. COPLACYTL will also coordinate activities of academic research and other development institutions and it will stimulate and market

"technological packages" in respect to the production sector.

The members of COPLACYTAL should be representatives of ministries concerned, universities, research institutes and industry. COPLACYTAL will have two structures or divisions: a.) scientifico-technological (or academic) and b.) "technological packages". COPLACYTAL will organize and deal with investigation, particularly in five selected "sistemas integrales": 1.) grain (maiz, sorgho, beans, rice, wheet...); 2.) meat and milk; 3.) fruits, sugar, etc.; 4.) fish; 5.) human resources and in three strategical areas: 1.) genetic; 2.) bioengineering and 3.) packaging. Each of mentioned "systems" and areas will be presented by a coordinator and his five assistants. A Technical Committee will be assisting in evaluation of projects submitted by the competent institutions and elaborated according to the programmes already established.

Basic research will be carried out by educational centers and research institutes (Instituto Nacional de Investigaciones Agrícolas, Instituto Nacional de Investigaciones Pecuarias, Instituto Nacional de Investigaciones Forestales). Interdisciplinary studies will be stimulated by the creation of a special council for each sector.

In the sector of food conservation and processing, only a limited number of engineering and consulting companies is functioning as a link between the production and research

sector. Direct connections between universities and research institutes with food industry are also very limited. This is the reason why the creation of a Productora de Tecnología de Alimentos -PRODETAL- or a Food Technology Institute is proposed.

The main objective of PRODETAL will be the integration of "technological packages" in the phase of food conservation and processing, collaborating closely with both production and academic sectors in research and technological development. Integration of "technological packages" involves patent proces design, engineering, pre-investment studies, machines and equipment problems, industrial plant construction, organization of the enterprises and personnel training. In order to realize such an objective, PRODETAL, in close collaboration with engineering companies and research and industry sectors, should:

- carry out technico-economical studies pre- and feasibility studies, pre- and investment studies,

- perform semi-industrial investigations on pilot plant levels,

- evaluate and give technical assistance in all activities related to designing, constructing, installing and maintaining of food processing plants, including their equipment,

- promote the sale of processes and new products, elaborated by institution and facilitate its industrial realization,

- function as consulting body for Registro Nacional de Transferencia de Tecnología and Comisión Nacional de Inversiones Extranjeras.

ad 8. Productora de Tecnología de Alimentos (PRODETAL) (preliminary version, August, 1981)

One way to increase the supply of food in Mexico is to improve the efficiency of food production by the application of technology. Such improvement can help the food supply, and keep with population and living standard growths. A good organized food science and food technology research related to processing packaging, storage, distribution, safety and nutrition can result in enormous return that would far outweigh the costs.

PRODETAL (or National Institute of Food Technology) is designed as a system of divisions allowing the solution of interdisciplinary food research programmes as well as development and transfer of technology. PRODETAL will impulse food science and technology development quantitatively and qualitatively and regulate choosing and utilization of technology in food production and processing.

PRODETAL will be guided by Executive Council, which president will be Director General of the Food Science and Technology Council; the member of Executive Council of PRODETAL will be representatives of interesting Government bodies. The Executive Council hast the duty to evaluate and fix annual programmes and financial plans of PRODETAL.

The Director General of PRODETAL will profite help of a special Technical Committee (evaluation of projects and programmes, collaboration with other institutions). The number of Technical Committee will be directors of directions and General Director's assistant. The other PRODETAL's body will be Auditoría Interna and two Advisory Committees on high levels: academic and industrial. The assistant of General Director will coordinate activities of Technical Service Division (División de Servicios de Apoyo) and Juristic Division (División of Apoyo Jurídico).

Technical Service Division is charged to establish the systems of information, technical documentation and bibliography and it will have two departments: Library and Documentation.

Engineering Direction has to:

- develop engineering aspects on pilot level in order to design food processing and preserving equipment;

- evaluate and develop activities related to plant designing, constructing, installing and maintaining;

- cooperate and assist food processing plants in all questions related to food technology development and plant construction.

Engineering Direction will have three units: 1.) Department for equipment designing (with mechanical, food, electric, biochemical and control engineering subunits); 2.) Department for industrial plant projects and 3.) Works and Installation Department.

Direction for planification, integration and evaluation of "technological packages" will have following four units: 1.) Department for industrial training; 2.) Department for transfer of technology and patent registration; 3.) Department for planification and installation and 4.) Department for evaluation.

Direction of industrial promotion and technical assistance will have two organizational units: 1.) Department for industrial promotion and 2.) Department for technical assistance (including as subunits: fisico-chemical, microbiological and organoleptical laboratories).

Administrative Direction will have as main duty to participate in planification and programming activities of other directions.

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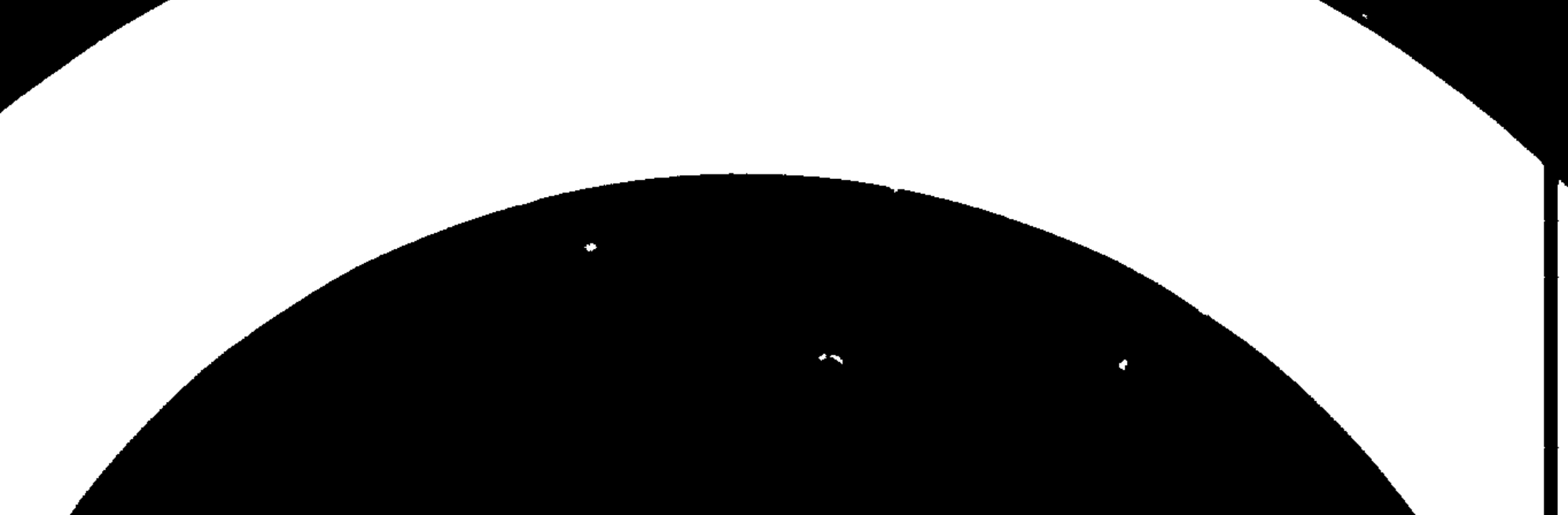
In addition to review of the above documents, various food processing research and development aspects and organizational matters were considered with the food technologists and other SAM's specialists. The list of persons met is given as an annex.



C. Suggestions and comments on PRODETAL's food processing research and development system

PRODETAL'S REASON FOR BEING

The PRODETAL is envisaged as an institution providing technologicalleadership and coordinated management for interdisciplinary research, educational and extension programmes in the food processing area.

It means that the general objective of the PRODETAL should be the utilization of the intellectual and physical resources related to the food science and technology, located in several research institutions, to facilitate the solution of increasingly important food technology problems and to advance the research, education and extension programmes in the food field. Consequently, the PRODETAL should:

- coordinate development in the national food processing industry,

- stimulate and coordinate research and extension programmes in the food processing,

- assist staff members in broadening the base of research support in the food processing,

- serve as the central vehicle of communication at the government agencies, research institutions, industry and all other establishment with an interest in food.

The administrative authority and the management of the PRODETAL's functions are vested in an Executive Council (Consejo Ejecutivo), Technical Committee as well as two Advisory committees (Scientific and Industrial). The Executive Council is empowered to establish financial policy and internal rules of the PRODETAL as well as to evaluate annual programmes. The Technical Committee advices the Director General in developing a coordinated food processing research programmes in the food processing. The advisory committee assists the Director General of the PRODETAL in liaison and extension activities with industrial, professional and other agencies with interest in food processing.

The Director General of the PRODETAL would be responsible for carrying out the policies and he should be relieved of a sufficient portion of administrative and other obligations to allow adequate time for his main duties. He would report to the COPLACYTAL through the Executive Council which president is the Director General of COPLACYTAL.

The activities of the PRODETAL would be as a rule, performed in the research and other facilities of universities and other research institutions. Fund available for operating and other expenses should be transferred to the unit responsible for a specific phase of the work involved. Such flexible arrangement of PRODETAL makes easier to develop a diversity of programmes and allows, when interests and needs dictate, changes to meet challenges of rapidly changing food industrial requirements.

In such an organization, extra efforts must be made to maintain and build bridges for communication between universities, PRODETAL's professional staff and administration and industry. Such activities on a cooperative or trust basis and a good spirit are essentially possible and advantegeous in the case of big research project. However, short-term projects, particularly everyday technical assistance to the industry, in order to strengthen and accelerate industrial liaison and service, require rather the existance of central experimental facilities for selected food processing operations. Taking into account different food industry branches, these facilities may be located either in some research institution or institutions or may be owned by the PRODETAL itself. It is necessary to emphasize once more that PRODETAL, in this period of rapid technological and social changes, should keep its cooperative research orientation and represent a flexible unit for an overall systems approach to food production,

processing and distribution. Thus, PRODETAL can surely serve as a vehicle to form bridges of communication with the research institutions and industry.

PRODETAL - THE INCORPORATED FOOD PROCESSING RESEARCH INSTITUTE

The creation of the PRODETAL is both recognition of need and confidence that research can point the way. The aims of the PRODETAL, as the central research agency for food processing industry, are to foster, promote and undertake research and development on all matters oppertaining to food, food by-products and their processing, and to implement the results of this work within Mexico's food industry. Universities and other research institutions will predominantly carry out the investigations into different aspects of food science and technology.

These activities include organization and carrying out of research in chemistry, bio-chemistry, microbiology, engineering, home economics and other fields, as well as the application of scientific and engineering principles to processing, refrigeration, packaging, storage, transportation, plant design and pollution control. In addition, the PRODETAL should carry out a comprehensive programme of education and liaison with industry.

A further function, a corollary of the work of such an institution as the PRODETAL is, should encourage the industry to expand their own technical staff, their own laboratories, and thus develop a core of technologists within industry itself. Thus industry becomes effective technically and more capable of absorbing the results arising from the work of the PRODETAL. Without strong technical people in industry and without their full involvement with the work of PRODETAL and research institutions, the absorption of new ideas and keenness to innovate will be stifled.

It is a need strongly felt that PRODETAL and national research organizations must be closely involved in new product development and new techniques in processing and handling products of the industry. With such a programme, the agricultural, livestock and particularly food processing industry, will look to the PRODETAL for guidance on how best to supply more and better food to Mexico's population and exportation.

In setting priorities and choosing research policy, the PRODETAL should be continually allert to the necessity for anticipating the current industry's needs. This requires the maintenance of a careful balance between basic and applied development works and between short-term ad hoc investigations and long-term studies in breath and depth. The research programmes should be kept constantly under review and their direction and emphasis should be continually adjusted to

meet changes in the scientific and economic aspects of the various investigations concerned.

The principal task is to assist the industry by research and knowledge leading to improved methods of processing operations and utilization of food. The projects can be associated with product quality improvement in existing processes, development of new processing, improving efficiency and standardization, preservation, storage, utilization of by-products, education and distribution. Some of the longer-term research may aim to provide new knowledge about food and factors affecting its usefulness in diet.

To facilitate the engagement in research activities it is advisable to evaluate the question of where the universities and instituttes are going in food research in the years ahead, i.e. it is necessary to examine the current and planned research activities of universities and related research groups, considering the attitudes of food research funds.

PROPOSED ORGANIZATION STRUCTURE OF THE PRODETAL

The organizational chart of the PRODETAL proposed by SAM's document No. 8 (PRODUCTORA DE TECNOLOGIA DE ALIMENTOS -PRODETAL) can, in principle, be accepted because it offers enough flexibility to implement all main PRODETAL's aims into industrial practice. According to this chart, the PRODETAL is organized into two Divisions and four Directions. The further subdivision into sections (subdirections...) is quite arbitrary and is not meant to imply a rigid compartmentalization of research and other interests; the most important thing is to enable to each PRODETAL's unit to carry out all objectives of integrating research and technology in servicing the food industry.

Brief description of four Directions and their possible sections in term of research and other objectives is included. The activities of both Divisions (División de Apoyo Jurídico y Legal and División de Servicios de Apoyo) will not be outlined, because their functioning is highlighted in the above document.

1. ENGINEERING DIRECTION (DIRECCION DE INGENIERIA)

The Engineering Direction may organize and coordinate the activities and undertake research and development on processes and plant associated with the production, processing

and preserving of foods and their by-products. This includes also organization, stimulation or coordination of basic studies on the interaction of the processes and the plant with the product and the physical mechanisms involved.

Application of this research and development work within the industry will be facilitated and promoted through pilot or full-scale investigations done at universities and other research institutions as well as in the industry itself. A special attention should be devoted to the cooperation and assistance to engineering and consulting companies active in the food processing sector. An important contribution of this Direction may also be standardization work on the equipment used or needed by different food industry segments.

Specialized trouble-shooting, servicing and consulting expertises may be organized to assist different industries.

The main concern of the Direction remains development of new or improvement of the existing food processing equipment and processes.

Engineering services and consultations for other PRODETAL's directions, should be provided.

The training and education of engineering personnel from industry could become an additional function in the future.

Professional staff of this Direction should consist of mechanical, chemical, electrical and other engineers and specialists. After appointment of the first staff members, who will undertake research, detailed programme of activities should be elaborated.

The Direction may include the following sections (or groups):

BIO-ENGINEERING

A major field of this section will be basic bio-engineering of food and food by-products (packing, oil extraction, milling, slaughtering...), with emphasis on small-scale or model experimental investigations, feasibility studies, and economic and other evaluation of new processing methods and techniques. Applied aspects of refrigeration and storage should be specially studied, including primary refrigeration plant, chillers, freezers, cold stores, conditioning installations, transportation equipment and systems. Design criteria, should be established which will satisfy both technological and hygiene requirements.

With the increasing statutory requirements for pollution control, solutions to food waste treatment problems assume major importance. Considerable assistance should be given to the industry to solve this problem.

Mathematical services for statistics and computer applications should be provided for a wide variety of problems,

including theoretical models for bio-engineering and process control systems.

PROCESS AND PLANT DESIGN

This section (group) should deal with self-contained projects, which are essentially mechanical problems, but it will also develop or evaluate designs of new plants or plant extensions and rebuildings.

Processing investigations should be conducted on pilot-scale or full-scalle plants at the research institutions or in the industry. Research into process development should be strongly oriented to engineering.

Work includes development of prototypes of equipment, evaluation and integration of complete processing lines, evaluation of parameters for equipment efficiency, product testing, etc. The emphasis should be given to development and increasing of engineering activities by national companies.

New equipment should be evaluated and tested in a reasonable simulation of industrial conditions.

Close liaison and active collaboration with other PRODETAL's sections, research and engineering establishment and industry should be an important feature of the section's activities. A particular importance should be given to the prototype

commissioning and processing studies which may be undertaken on works plants, etc.

A service for design and construction of experimental apparatus and equipment would be highly desired.

INSTRUMENTATION AND CONTROL

The increasing level of sophisticated technology and mechanization in works operations is dependent on appropriate instrumentation for measurement and control. Automatic weighing, environmental control in conditioning and aging processes, etc., are dependent on reliable and effective measurement and control of temperature, humidity, air flow, etc. These and other instruments should be studied comprehensively and guidance given to the industry.

Activities of this Section may be divided between the fields of measurement physics, applied instrumentation and control system hardware.

Applied instrumentation include calibration, instrumentation for industry and research projects, instrument development, maintenance and service for industry and other food dealing establishments and evaluation of commercial equipment.

INDUSTRIAL SERVICE

This Section concentrates on short-terms extension projects to cater for the immediate engineering needs of the industry or specific companies.

The lifeblood of any food processing plant is the range of work services provided for every department. Their efficient operation is vital to the technical and economic performance of the enterprise. The section should service the industry in all its needs in this field.

In general, the Section's activities include plant performance analysis, plant commissioning, surveys, installation problems and other consultation and trouble-shooting, information service, etc. Evaluation surveys may be made periodically as a direct service to industry. Weakness in design and operation should be highlighted and recommendations made for their improvements.

WORKSHIP SERVICE

Suitable worshop services should be provided to service all PRODETAL's units.

2. DIRECTION FOR PLANNING, INTEGRATION AND EVALUATION OF TECHNOLOGICAL PACKAGES (DIRECCION DE PLANEACION, INTEGRACION Y EVALUACION DE PROYECTOS DE PAQUETES TECNOLOGICOS).

This Direction would be a multidisciplinary group which main concern should be the protection of interest and development of food industry as a whole, carrying out programmes and studies for future food industry and agriculture development, collecting data on world and national technologies, and stimulating transfer of technological knowledge.

The collection and study of economical and other data on food production conditions are of crucial importance for dissemination of knowledge and technology in order to increase technical possibilities; they also may render economically feasible things which are at present technically possible but unprofitable.

In close collaboration with other PRODETAL's units and perhaps, some research and industrial organization, this Direction may periodically organize industrial conferences which should become a recognized forum for the exchange of information and ideas on the economic and other development of the food industry.

The other objectives of this Direction are sufficiently outlined in the mentioned document (page 29).

The Direction may be divided in the following sections:

PLANNING, INFORMATION AND EVALUATION

In the document, these activities are divided into two Subdirections: Subdirección de Planeación e Información and Subdirección de Evaluación, which is highly desirable, particularly in the future.

In addition to the objectives reviewed by the SAM's documents (pages 30 and 31), an important concern of this section (or sections) would be integrating of research and technological knowledge with business disciplines to maintain an enterprise and help it to grow. The Section should perform regular surveys of food industries: their size and organization of factories in relation to their economic operation, the most appropriate location, profit possibilities, supply of raw materials and labour and markets for finished products.

In evaluating the value of new products development and new technologies, the section will emphasize that no new or improved product, however brillant the research behind it, has any value until it succeds in the marketplace. A particular concern of the section should be that all promising new concepts in processing technology can and must be economically evaluated.

TRANSFER OF TECHNOLOGY AND PATENT REGISTRATION

The objectives of this section remain as outlined by SAM's document (page 32; Subdirección de Transferencia de Tecnología y Registro de Patentes y Marcas).

INDUSTRIAL PERSONNEL EDUCATION

A developing food processing industry needs its technology and knowledge more than it needs to have research papers, published in scientific journals. This is the reason why the section should insist to help the food processing industry to obtain particularly qualified and motivated middle management and technical employees. The section should develop a comprehensive plan for meeting qualified personnel needs -through courses, extensive scholarship and training graints, widespread national distribution of information materials, etc. In the future, may be a continuing and growing network of mandatory and voluntary training and certification programmes. Certification may do much to professionalize the food industry. As time goes by the food industry will be much harder for the incompetent.

The strategy of the section will be to convince industrialists that the employment of competent food technologists is a profit-making venture.

The main objectives of this section are listed on the page 33 of the SAM's document.

3. FOOD TECHNOLGY AND INDUSTRIAL PROMOTION DIRECTION (DIRECCION DE PROMOCION INDUSTRIAL Y ASISTENCIA TECNICA)

As the tittle indicates a broader Direction activity field is proposed than it is envisaged by the Document (page 34).

The cornerstone to any advances in understanding of the nature and structure of foods, are biochemical and physical changes therein and their effects on product quality. The section may stimulate or organize research on the foods compositions and the changes they undergo, both pre and post processing. Basic knowledge of raw materials should be translated into new or improved methods of processing, covering storage, transportation, by-products utilization, upgrading of quality, process efficiency, etc.

Suitable environmental conditions for food storage are essential if quality is to be maintained over a satisfacotry shelf life. Extremely large quantities of foods, particularly grain, fruits and vegetables, animal products and fish are directly or indirectly lost during storage, processing and transportation. Transportation is the vital link in maintaining the cold chain between processing and market, influencing quality and shelf life.

A wide variety of by-products is available for processing and their better utilization and upgrading of product quality

and process efficiency are essential to the profitability of the industry.

The Direction should perform permanent investigation and improvement in all these areas. The prerequisite is a close collaboration with the industry and organization of services for immediate transfer of knowledge and research products. Permanent or ad-hoc study groups may cover pre-harvest and pre-slaughter problems, processing operations, quality control, storage packaging, etc. Attention should be currently directed to new techniques and criticism should be directed at the traditional methods. Various procedures should be permanently studied and improved methods suggested.

Laboratory and pilot plant studies may be necessary for the development of full-scale prototypes of different food products.

The Direction is broadly divided in several sections, each with possible subunits.

FOOD PROCESSING AND CONSERVATION

Food processing and conservation section is a multidisciplinary unit consisting of food technologists, microbiologists, chemists, etc. Its principal concern is the application of science and technology to food processing, packaging and storage, utilization of by-products, pollution abatement,

prevention of losses and waste treatment. Activities should include organization, stimulation or carrying out of investigation on development of products and processes or equipment (in collaboration with Engineering Direction) and the selection of raw materials. This section, assisted by Food Quality section may also be involved with changes in composition, physical state, or biological conditions that occur prior to, during or subsequent to industrial processing.

The section includes a diversity of disciplines involved in product development and improvement. Studies should be stimulated, organized or conducted on basic, but first of all on applied levels to promote better utilization of raw materials, specially of edible tissues, the upgrading of product quality and modifications to products andprocesses.

It is the responsability of the section to assist industry to implement research findings, to provide technical services aimed at improved performance and to collaborate with other PRODETAL's units in training and orientation programmes with the educational field as well as to assist in evaluation of imported technology.

The section may be subdivided in subunits or ad-hoc groups (specialist teams), following basic foods (cereal and sugars, fruit, vegetable and nuts, meat and poultry, milk and dairy products, aquatic oods, miscellaneous foods...).

A quite special concern of the section is short -and medium- term research on problems of immediate concern to the industry.

The process development groups may be periodically established to examine all aspects of food processing, including the handling and processing of by-products and waste materials. Although, modern food processing is distinguished by high standards of technology and hygiene involved, particularly in small food processing plants is found largely an updated version of traditional practice. Consequently, there is considerable scope for the investigation and development of radically new processes which will ultimatelly improve the economic efficiency of the industry.

A special (ad-hoc) new products group may be charged to organize and stimulate the research and investigate the economic and technological feasibility of recovering high value products from raw materials either discarded or sold as low value by-products. The economics of the process and the likely end-uses of the product are to be assessed by the economists from Planning, Integration and Evaluation Unit.

The major part of analytical services for this section should be provided by the Quality Control Section. Specialized laboratory and other facilities owned by the section may be organized and provided after collection of sufficient expe-

rience needed to decide on their character and capacity. Although pilot plant and semi-industrial investigations, will in principle, be conducted in other research institutions (adequately equipped) or in food processing units, an experimental control processing hall would be highly desirable, particularly in the future. This processing hall should be carefully designed to incorporate a number of special feature for experimental work. Services such as steam, electricity, compressed air, hot and cold water and gas should be conveyed to many points of the processing area.

FOOD QUALITY

The quality assurance strategy and the quality control function in the food industry have become recognized as essential components of food corporate management. Quality assurance may be defined as a planned and systematic management tool and programme to produce and market food products which are uniform, safe, nutritious, flavour ful, and economical. In this context, quality control can be defined as the day-to-day implementation and execution of the quality assurance strategy to achieve those objectives.

This section encompasses some basic sciences, as biochemistry and chemistry, biophysics, microbiology, histology. Research undertaken may involve studies of the metabolism, post-harvest and post-slaughter changes, and composition of some foods, their reactions

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to the environmenta, including the effects of chemical and physical stimuli on foods prior and after processing.

The section should have a very close collaboration with research and industry laboratories in order to avoid duplication of activities.

The section may have three separate units:

Microbiology

This unit should be concerned with studies aimed at establishing principles underlying growth, viability and distribution of microorganisms. Application of knowledge or research findings to the improvement of food hygiene, microbiological quality control, solution of microbiological problems associated with food spoilage and food processing is of prime importance.

This unit provides assistance to the industry in application of microbiological knowledge and techniques, and provides microbiological studies in support of projects undertaken by the PRODETAL.

Applied Chemistry

Objectives are to acquire basic data on the chemical composition andproperties of raw materials and final products as a basis for improving existing processes and development of new processes and products.

The interaction of raw materials and additives and other ingredients with the physical and chemical conditions imposed during processing may also be of important interest.

The unit may also be responsible for development and evaluation of analytical methods and the provision of specialized analytical services to the industry and other sections within the PRODETAL.

Sensory Evaluation

Facilities for sensory evaluation of food and food products, should be provided and it may be of tremendous value in new products and other studies.

Food Standardization and Legislation

The unit (group) would be responsible for evaluation national and foreign food standards and regulations. It is absolutely required to follow the work of international agencies in this field.

The section would participate in the food regulation-making process in Mexico, both in drafting stage and during comment periods.

INDUSTRIAL ASSISTANCE AND LIAISON

This section corresponds to the Subdirección de Asistencia Técnica (p. 37 of the SAM's document). In addition to the objectives outlined by the SAM's document, the section should

particularly be engaged in solving urgent technological problems and troubles occuring frequently in various food processing factories. Thus, the section would be charged to provide urgent help and advices on all aspects of food technology of interest to the industry. Particularly this is the case with small food processing companies, which do not have enough technological knowledge, necessary information and required manpower like large establishments.

Ad-hoc organized trouble-shooting specialists teams would visit factories or give advice by any means of urgent communication. The section would sistematically investigate urgent problems confronting the industry in order to help management to become much more aware of the areas where PRODETAL can assist.

Formal consultancies with industry can also take place through the industry liaison committees established for different food processing fields which may meet from time to time. At these meetings, recommendations should be made on matters where investigations and assistance are needed.

Details of the research and technological progress may be conveyed to industry through reports for general circulation. A number of confidential reports may also be issued to the management of food processing plants where field investigation have been made.

The Food Technology News Letter may occur to be well received.

The staff of the section should participate within the programmes of other PRODETAL's units in organizing and undertaking short -or medium- term research on problems of immediate concern to the industry.

INDUSTRIAL PROMOTION

This section would be concerned with the same objectives and studies as outlined on the page 35 of the SAM's document.

ADMINISTRATION (DIRECCION DE ADMINISTRACION)

The role of this direction is already established by the SAM (pages 38 and 39 of the document).

D. Some comments and suggestions concerning the education of PRODETAL's food research and development staff

It is worth looking briefly at the manner in which the Mexican food industry needs PRODETAL's help in food technology and science and how the PRODETAL should educate its staff to surmount the difficulties.

1.) If Mexico is on the verge of much more rapid development in the food production and processing industry, PRODETAL should realize closer liaison with the industry to attract the industrial management to participate in common efforts to introduce more up-to-date technology in every-day practices.

It cannot be stated that food industry in Mexico is found on an advanced level of technology. On the contrary, many food processing plants often raise obstacles to the implementation of new more sophisticated practices in their processes. The only advancement that have taken place seem largely to have been imported by the multinational companies. And much of this advancement has been in limited commodity areas, such as dairy products manufacturing.

The dearth of really competent personnel to manage particularly small -and medium- sized industries, has resulted in many enterprises operating much below the margins of efficiency. Consequently, in such plants, they are many pressing problems they need and can easily be solved.

On the other hand as a means of finding a solution to their difficulties, some large enterprises have entered into management contracts with foreign firms, so that the latter would supply the necessary knowledge or management expertise. Such arrangement, where workable, can only be short-term. Therefore, more effective long-term solutions also for this food industry segment must be sought.

2.) It is well known that the success of a research institution does not depend only on the organizational chart and elaborate and complicated equipment and other facilities, but first of all, on the degree of expertise and experience available to ensure optimum utilization of the existing possibilities. The quality of management and research and scientific workers, their ability to understand and organize research work, to apply their theoretical knowledge in the everyday industrial practice and solve different problems influence very much the industry in deciding whether to invest in a particular project or not. Especially in the case of such a complex institutions, as the PRODETAL will be, the staffing patterns have important bearing on the quality and nature of activities desired them to be hired.

It is clear that if the PRODETAL is to function as the central research agency for Mexican food processing industry, its professional staff should be able to assist and advice

the industry on all aspects of food technology of interest to the industry. It suggests that PRODETAL needs critically a cadre of experienced, industry oriented food technologists able to do research and development in this area. The important part of this cadre should be trained to assume very important responsabilities of technical and research guidance and management.

3.) In Mexico, food technology as a profession and knowledge, has obviously been developing rather rapidly during the last decade. Many students have been trained, but too few of them seem to have an advanced practical experienc n the industry.

In choosing its staff members, the PRODETAL should have the opportunity to ask them to be trained in more narrowly defined disciplines or areas of specialization. In most cases, these individuals would then have responsabilities primarily in lines with their speciality. It should be emphasized, however, that whichever type of specialization or type of degree is selected, the candidates should be able to work in both research and industrial levels.

There will be relatively many areas of specializations and options available to each young graduate appointed to a PRODETAL's section and seeking a career in food research and development field. It is obvious that PRODETAL's diverse units

will differ in the extent to which they need in depth training in a variety of areas. The most urgent areas of specialization, at present of absolute priority, are: grain, oil, meat, engineering...

An important number of the PRODETAL's food specialists will need direct food plant experience that should develop their awareness, confidence and appreciation of the concerned food industry branch and enable them to function effectively in the industry or in some other capacity in which they will interact with the food industry. Therefore, there is a serious need in providing diverse training and experience in food industry of some developed countries for those members of PRODETAL's staff covering distinct food technology fields. As the postgraduate programmes, including Ph.D., are regularly offered by Mexican universities, the needs for such a training should be covered locally.

As for as the PRODETAL will be inaugurated and start to work, a comprehensive plan and programme of staff recruiting and education should be elaborated and a list of individuals needed training in a variety of disciplines and professions established. At present, when the candidates are not known, it would be very difficult to outline precisly the exact types of training and programmes that would cover the wide array of interests and needs for each of them. The only what is sure it is that a study of different practical aspects

particularly in functioning medium-scale food industry enterprises should be an important feature of individual training programmes in each basic food technology discipline.

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CONCLUSION AND SUGGESTION

Taking into consideration the above said, it would be highly desirable to provide international assistance in realizing:

a.) Specialization in three or four selected food technology areas (grain, oil, meat, engineering...) in some European medium-sized factories and applied research institutes. The specialization should last at least three months, but the greater part of this time would be spent in the industry, following the specific interest of each candidate. The aim of the specialization is to help the individual to establish a firm basis for future research and industry activities; it also serves to encourage interplay and cooperation among research institutions, consulting and engineering companies, PRODETAL and industry.

b.) A study trip of a group of three senior food technologists keeping key positions in different PRODETAL's units. The group would spend about 6 weeks studying organization and food technology research in selected developed countries. The group would visit food industry enterprises and research institutes to collect as much as possible broad spectrum of information on technology and engineering, in various food areas where a concern and involvement from the level of the producer to that of consumer will be covered. A special interest of this group would be to learn how to develop a research project that can attract enough industrial interest and organize it, carrying it through in such a way that further new interests will be attracted to this work.

c.) Additionaly, it would be extremely useful to provide (as soon as the PRODETAL will be inaugurated and partially staffed), the help of an international senior food research and development expert to function as consultant in setting up different PRODETAL's departments and units, advising in organization research and assisting in establishing industrial liaison services, particularly in his own area of specialization.

E. Summing up

1.) In conclusion can be said that Mexico is currently assessing nation's capabilities for meeting the problem of food production and malnutrition.

The issue is to assure Mexico's own food supply and provide adequate nutrition for domestic people and the rest for the export.

The Sistema Alimentario Mexicano (SAM) launched by the Government of Mexico, is a programme which sets out the basic guidelines and strategies of food production development aiming at self-sufficiency as much as possible.

The SAM has placed main emphasis on efforts to enhance agricultural production. The big gains are, however, to be sought in better utilization of currently available food and in fighting waste and spoilage. This requirement needs to be given top priority and is up to food technologists and scientists, particularly those of the PRODETAL (Food Research and Development Institute) to formulate viable strategies and realize them.

The special PRODETAL's objective is to encourage and support food production andprocessing development and research, where it is desirable. The applied research is an economical and effective way of increasing productivity and introducing technical innovations into the industry served.

2.) In a report of this size it was not possible to give a full account of all discussions and views expert expressed during his stay in the country. The aim was to report only on items of basic interest, so as to show something of the wide range and importance of PRODETAL's research and development activiti[illegible]o express expert's vision of the PRODETAL and suggestions relating its structure and functioning and to define its relevance to Mexican food production and processing industry.

Brief descriptions of main PRODETAL's units, particularly those proposed by the expert, character of their work and fields of research and other objectives are included, so that the PRODETAL's whole activity can be seem within a broader context. The need for flexibility and periodical restructuring of different units is emphasized.

A special attempt has been made to discuss some PRODETAL's staff education points which may be of interest as items of possible international help.

ANNEX

LIST OF PERSONS MET

SAM

1.) ING. GUILLERMO FUNES RODRIGUEZ,
Director de Industria y Tecnología

2.) ING. MIGUEL ANGEL LOPEZ BRACHO,
Jefe de Proyecto

3.) Ms. VIOLETA CHIRINO BARCELO

4.) ING. ARTURO GOMEZ BARRERO

5.) ING. GABRIEL SITJAR ROUSSERIE,
Director de Sistemas y Producción Pecuaria

UNDP

1.) MR. FERNANDO FAJNZYLBER, SIDFA

2.) MR. ANDRE FAUST, JPO