

AGENCY FOR INTERNATIONAL DEVELOPMENT  
 WASHINGTON, D. C. 20523  
**BIBLIOGRAPHIC INPUT SHEET**

FOR AID USE ONLY  
**BATCH 60**

1. SUBJECT CLASSIFICATION	A. PRIMARY Food production and nutrition	AQ00-0000-G500
	B. SECONDARY Food science--South America	

2. TITLE AND SUBTITLE  
 LIFE/IFT nutrition/food technology Latin American study, final report; appendices

3. AUTHOR(S)  
 (101) Buchanan, B.F.; Stewart, G.F. (101) League for Int. Food Education

4. DOCUMENT DATE 1977	5. NUMBER OF PAGES 227p.	6. ARC NUMBER ARC
--------------------------	-----------------------------	----------------------

7. REFERENCE ORGANIZATION NAME AND ADDRESS  
 LIFE

8. SUPPLEMENTARY NOTES (Sponsoring Organization, Publisher, Availability)  
 (Main work, 75p.: PN-AAD-729)

9. ABSTRACT

These appendices to the final report referenced as PN-AAD-729 include the final reports of three regional committees established to assess how food technology resources in Latin America can be more effectively applied to problems of malnutrition. The first appendix, the report of the Brazilian Committee, presents detailed information obtained from a survey of the food industry, research and teaching institutions, and industrial research, along with a description of Brazilian food and nutrition programs. Appendix 2, the report of the Northern Countries Committee, presents similar information for Bolivia, Peru, Ecuador, Colombia, Panama and the Central American Countries, Jamaica, and the Dominican Republic. Appendix 3, the report of the Southern Countries Committee, presents information for Argentina, Chile, Paraguay, and Uruguay. Appendix 4 is the Trip Report of the study coordinator and assistant coordinator. Appendix 5 is a set of tabular compilations of information from the three committee reports.

10. CONTROL NUMBER PN-AAD-730	11. PRICE OF DOCUMENT
12. DESCRIPTORS Food technology Malnutrition Post-harvest? Project planning	13. PROJECT NUMBER
	14. CONTRACT NUMBER AID/ta-G-1238 GTS
	15. TYPE OF DOCUMENT
Sector analysis South America Strategy Technical assistance	

AID/ta-G-1238GTS  
LIFE PN-AAD-730

FINAL REPORT

Grant no. AID/ta-G-1238

LIFE/ITF NUTRITION/FOOD TECHNOLOGY LATIN AMERICAN STUDY

Appendices

May 1977

APPENDICES

- I. Brazilian Committee Final Report.
- II. Northern Countries Committee Final Report.
- III. Southern Countries Committee Final Report.
- IV. Trip Report of Coordinator and Assistant Coordinator.
- V. Compilation of Information from Latin American  
Committee Final Reports.

BRAZIL COMMITTEE REPORT

Committee

Dr. J. E. Dutra de Oliveira, M.D., Chairman  
Dr. Luiz Eduardo Carvalho  
Dr. Ottilio Guernelli  
Dr. Roberto F. Kohlmann  
Dr. Cyro G. Teixeira

North American Advisors

Dr. H. E. Calbert, U. Wisconsin  
Dr. W. H. Stahl, McCormick & Co.  
Dr. H. Weinstein, Kibon, Brazil

November 1976

BRAZILINVENTORY OF FOOD TECHNOLOGICAL RESOURCES - Item 5

1.	FOOD INDUSTRY .....	5.2
1.1	Introduction .....	5.2
1.2	Size of Food Industries .....	5.2
1.3	Most important sector of Industrialization .....	5.4
1.4	Quality Control, Research and Development .....	5.4
1.5	Personnel, Facilities and Equipment .....	5.4
1.5.1	Laboratories .....	5.4
1.5.2	Pilot plants .....	5.4
1.5.3	Libraries .....	5.5
1.6	Problems of the Food Industry .....	5.5
1.6.1	Raw Materials .....	5.5
1.7	Summary .....	5.6
2.	INSTITUTIONS OF TEACHING AND RESEARCH .....	5.6
2.1	Introduction .....	5.6
2.2	Institutions of Teaching and Research - Science, Food Technology and Food Engineering .....	5.6
2.2.1	University level courses .....	5.6
2.2.2	Graduate courses .....	5.7
2.2.3	Specialization courses .....	5.7
2.2.4	Training courses .....	5.7
3.	RESEARCH FOR INDUSTRIAL DEVELOPMENT .....	5.8
3.1	Generalities .....	5.8
3.2	More Detailed Information on Various Industries .....	5.8
4.	DETAILED INFORMATION ON SOME OF THE INSTITUTIONS .....	5.14

## INVENTORY OF TECHNOLOGICAL RESOURCES IN THE FOOD AREA

### FOOD INDUSTRY

#### 1.1. INTRODUCTION

More than 120 IFT questionnaire forms were sent to industries. However, they were not answered. Therefore, the option was to use relevant informations from available sources.

#### 1.2. SIZE OF THE FOOD INDUSTRIES

The food industry in Brazil is characterized by a reasonable number of small and medium sized plants operating under poor technological conditions producing low quality products. Therefore, it would be convenient if the small industries could be reorganized to a minimum economical size to permit the use of a more modern technology.

However, there are a number of larger industries using more modern food processing methods.

The 1970 industrial survey including food industries showed the following number of people working in different plants:

<u>Number of persons</u>	<u>Number of plants</u>
1 to 4	7,244
7 to 9	27,529
10 to 19	15,382
20 to 29	5,852
30 to 49	5,120
50 to 69	2,368
70 to 99	1,963
100 to 149	1,482
500 to 999	453
1000 to 1999	141

Source of information: Annual Bul. of Brazilian Statistics, 1975.

The industries in general use 5 to 19 persons to operate.

In the food industries in 1970 a total of 315,508 persons worked in 17,162 plants averaging 17 persons per plant.

On the other hand, considering the value of production the food industries place first according to the 1970 industrial census as follows:

Industries	Value of production Cr. \$ 1,000
1. Food products	6,831,288
2. Metalurgic	6,104,983
3. Chemicals	5,319,858
4. Textile	4,958,862
5. Transportation equipment	4,224,422

Among the large sized industries using more modern processing techniques, according to informations obtained in 1974 are:

Industry	Type	Sales Volume	% profit
1. Sanbra	Oils and margarines	3,911,725	1.8
2. Copersucar	Sugar	3,293,475	
3. Nestle	Milk and chocolate	2,201,839	5.7
4. I.R.F. Matarazzo	Edible oils	1,698,447	4.2
5. Gessy Lever	Oils and margarines	1,616,078	7.4
6. Anderson Clayton	Oils and margarines	1,560,187	4.0
7. Samrig	Edible oils	1,310,807	6.1
8. Bordon	Meat	1,038,232	5.4
9. Swift-Armour	Meat	1,018,622	
10.. Cia. Uniao de Refinadores	Sugar and coffee	960,979	7.5
11. Olvebra	Edible oils	953,839	1.7
12. Refinacoes de Milho Brasil	Corn	810,000	
13. Cica	Canning	733,411	9.3
14. Kibon	Ice cream and chocolate	639,434	3.8
15. Anglo	Meat	576,600	10.8
16. Guapeva	Meat	572,727	0.3
17. Moinho	Flours and oils	505,874	14.2
18. Superbom	Canning	485,000	0.7
19. Sadia Concordia	Meat	463,698	18.6
20. Frigobras	Meat	401,332	7.1
21. Vigor	Milk and dairy products	341,498	5.6
22. Coop. Central Laticinios Sao Paulo	Milk and dairy products	330,000	
23. Moinho Fluminense	Flours	320,239	17.1
24. Paoletti	Canning	318,286	7.7
25. Moagiana de Oleos Vegetais	Edible oils	316,355	0.7

Industry	Type	Sales Volume	% profit
26. Frigorifico Cotia	Poultry	275,000	1.4
27. Oleos Pacaembu	Edible Oils	273,181	3.1
28. Leco	Milk and dairy products	267,000	11.8
29. Laticinios Pocos de Caldas	Milk and dairy products	264,166	
30. Adria	Pasta	262,769	11.7

### 1.3. MOST IMPORTANT SECTORS OF INDUSTRIALIZATION

Examination of the list of the largest industries show that the industrialization of vegetable edible oils, meat and sugar are the most important. Seconded by some large food canning, dairy industries and mills. One large industry processes corn for food and other items such as glue. The orange juice industry has expanded considerably in the last years.

There are a large number of small industries processing fruits, sausages, hot dogs and soft drinks as well. The industries producing flours are usually small or medium sized and located all over the country. The bread production is done in small local bakeries located in various sections of the medium and large cities.

The processing of vegetables is almost only related to the production of tomato concentrate. Small quantities of peas, sweet corn, asparagus and spinach are industrialized. Hearts of palm are canned using very simple technique and it is an extractive industry.

### 1.4. QUALITY CONTROL, RESEARCH AND DEVELOPMENT

A very small number of industries have adequate laboratories for quality control, research and development programs. Less than 0.5% income from the sales are used in quality control, research and development. Some of the largest industries do not reach the 0.5%. The calculation shows 0.1% of the sales. In 1974 the industries invested 3 million dollars on quality control, research and development programs. This value grows with the growth of the food industry of 5% a year.

### 1.5. PERSONNEL, FACILITIES AND EQUIPMENT

#### 1.5.1. Laboratories

All large industries have adequate quality control laboratories and trained personnel.

#### 1.5.2. Pilot Plants

Some industries have a processing pilot plant and some only have a pilot plant in their main factory. However, the food industry, in general, can use the well equipped pilot plants at ITAL, UNICAMP, CEPEO, ICTAL and others.

### 1.5.3. Libraries

Some of the research institutions have specialized libraries where the industries can consult and obtain xerox copies of the needed literature.

## 1.6. FOOD INDUSTRY PROBLEMS

### 1.6.1. Raw material

One of the greatest problems of the food industry is the quality of the raw material. It is usually of poor quality, inadequate for industrialization. There is no production of raw material especially for industrialization. Most of the crops of better quality go to the fresh market. This is the particular case for fruits and vegetables. In the case of frozen orange juice concentrate where almost all production is destined to the exporting market and good quality is required, the situation is different - best oranges and most sophisticated techniques are used. The lack of quality control of the industrialized food products for the internal market causes the slow acceptance by the consumer. Add to poor quality, the high price, above the acquisitive (purchasing) power of the population.

However, competition has forced the food industries to produce food of better quality and lower prices.

The high cost of production derives from low productivity in the processing lines. The cost per unit is high, therefore the sale price is high.

The industrialized food products need to be popularized, the higher demand by the consumer will permit a higher production from industries.

The population must learn the conveniences of processed foods. The food industries must be concerned with the quality of their products to develop consumers' confidence.

Great quantities of food are lost on the fresh food market system. It is necessary to improve technology to avoid waste of raw materials available.

Many industries still utilize imported "know-how" when national "know-how" is already available. The government is studying a plan to substitute imported technology by domestic technology.

## 1.7. SUMMARY

1.7.1. Brazil has a certain number of adequate sized food industries, modern equipped and using modern processing techniques.

1.7.2. By the year 1976 it is expected that 3 million dollars will be invested in quality control, research and development.

1.7.3. Brazil has personnel and facilities to solve the most important national nutrition problems.

1.7.4. AID and other international agencies could stimulate the use of available domestic technology to solve national food and nutrition problems.

## 2. INSTITUTIONS OF TEACHING AND RESEARCH

### 2.1. INTRODUCTION

The number of institutions at University level forming (training) professionals plus the number of institutions in development and ready to operate in the near future in the country is sufficient.

These institutions are described, on the annex of item 3, according to the IFT questionnaire and will only be listed here.

### 2.2. TEACHING AND RESEARCH INSTITUTIONS - FOOD SCIENCE, FOOD TECHNOLOGY AND FOOD ENGINEERING

#### 2.2.1. University level courses

Professional, regular, awarding diplomas of Food Technology Engineers or Food Technologists:

2.2.1.1. School for Food Engineering and Agriculture Engineering, State University of Campinas, Caixa Postal 1170, Cidade Universitaria, Barao Geraldo, Sao Paulo. 5 year college (2 years basic fundamental and 3 years specialization). Food Technology Engineer diploma. Emphasis on Food Engineering.

2.2.1.2. Department of Food Technology, Federal University of Viscosa, Rua P.H. Rolfs, s/n, Viscosa, Minas Gerais. 4 years course. Food Technologist diploma. Emphasis in Food Technology.

2.2.1.3. Department of Food Technology, Centro Food Technology and Agriculture Sciences (CCA), Rua Mr. Hull, s/n Fortaleza, Ceara, Federal University of Ceara, Caixa Postal, 935, Fortaleza, Ceara. 4 years course Food Technologist diploma. Emphasis in Food Technology.

Note: Similar courses are being programmed to start in 1977 in the states of Paraiba, Santa Catarina (Florianopolis) and Rio Grande do Sul. (Food Technologists).

## 2.2.2. Graduate Courses

## Masters and Doctors degree in Food Science and Technology

2.2.2.1. School of Food and Agriculture Engineering, UNICAMP. Masters (MSc) approved by M.E.C.; since 1969 200 Masters degrees have been awarded to Brazilian and other Latin American Countries. Doctors degrees in Science, since 1975.

2.2.2.2. School of Pharmacy, University of Sao Paulo in consortium with ITAL Masters and Doctors degrees.

2.2.2.3. Department of Food Technology, Federal University of Ceara. Masters since 1976

2.2.2.4. Department of Food Technology, Federal University of Vicosa, Minas Gerais. Masters, since 1976.

## 2.2.3. Courses of specialization

Within a regular, professional approach:

2.2.3.1. CENA, Center of Nuclear Energy applied to Agriculture "Luiz de Queiroz," Av. Carlos Botelho, s/n, Piracicaba, S.P.

2.2.3.2. Department of Food Technology, Escola Superior de Agricultura "Luiz de Queiroz," Universidade de Sao Paulo, Caixa Postal, 9 e 56, Piracicaba, S.P.

2.2.3.3. Department of Food Technology, Federal University of Rio de Janeiro, Escola Nacional de Agronomia, km 47, Rio de Janeiro.

2.2.3.4. Departmental Institute of Dairy Products Candido Tostes, Rua Tenente Luiz Freitas, 116, Caixa Postal, 183, Juiz de Fora, Minas Gerais.

2.2.3.5. Technological Center, Federal University of Para, Av. Governador Malcher, 1192, Belem, Para.

2.2.3.6. Department of Food Technology, Federal University of Pelotas, Praca 7 de Julho, 180, Centro, Pelotas, RS, CEP 96100.

2.2.3.7. School of Medicine of Ribeirao Preto, Specialized course in Nutrition, 14100 Ribeirao Preto, Sao Paulo.

## 2.2.4. Courses for Technicians

Secondary level, 4 years course awarding diplomas of Industrial Food Technician, State Technical School of UNICAMP, Caixa Postal, 1170, Campinas, Sao Paulo.

A course for Dairy technicians only given at Departmental Institute for Dairy Products Candido Tostes, Juiz de Fora, Minas Gerais.

### 3. RESEARCH FOR INDUSTRIAL DEVELOPMENT

#### 3.1. GENERALITIES

Brazil already has a reasonable number of Food Science and Technology Research Institutes. Among them are:

1. ITAL - Sao Paulo
2. CEPED - Bahia
3. CETEC - Minas Gerais
4. ICTAL - Rio Grande do Sul
5. CIENTEC - Rio Grande do Sul
6. INT - Rio de Janeiro
7. CEPLAE - Bahia
8. ITEP - Pernambuco
9. CTAA - Rio de Janeiro
10. Instituto de Pesquisa da Marinha - Rio de Janeiro

The operating efficiency of these institutions varies with their physical installations and the number and quality of their personnel.

The policy, therefore, should be to give assistance to the institutes better equipped and they would assist the less qualified institutions. This policy would provide better use of the existing potential and would develop better relationship among the existing institutions and avoid duplication of programs.

ITAL, CEPED, CETEC, ICTAL and others could become regional research centers to interrelate all the other institutions. Research programs should be developed integrating two or more institutions for a better use of our resources in nutrition.

The institutes should be aware of the existing problems of food processing and develop processing techniques to help the food industry. This would bring the institutes and industry closer. This closer relationship would change the industrial operational system to produce food at lower cost to compete with fresh food market prices.

#### 3.2. MORE DETAILED INFORMATION ABOUT THE VARIOUS INDUSTRIES

Following is a list (Annex 3.2.1.) of the institutions with Food Technology programs.

##### ANNEX 3.2.1. INSTITUTIONS WITH FOOD TECHNOLOGY PROGRAMS

1. INSTITUTO DE TECNOLOGIA DE ALIMENTOS - ITAL  
Caixa Postal, 139 - End. Telegrafico: ITAL  
Av. Brasil, 2880 - 13.100 Campinas - Sao Paulo  
Director: Agide Gorgatti Netto  
Under the Secretary of Agriculture  
Activity: Food Technology  
Tel.: PBX - 2-7063

2. **FACULDADE DE ENGENHARIA DE ALIMENTOS E ENGENHARIA AGRICOLA (FEA)**  
Cidade Universitaria "Barao Geraldo"  
Caixa Postal, 1170 - 13100 Campinas - Sao Paulo  
Director: Andre Tosello  
Under the State University of Campinas UNICAMP  
Activity: Teaching and Research concerned with Foods.  
Tel.: 31-4555
3. **DEPARTAMENTO INSTITUTO DE LATICINIOS "CANDIDO TOSTES"**  
Departamento ILCT  
Rua Tenente Luiz de Freitas, 116 - Caixa Postal, 183  
Juiz de Fora - Minas Gerais  
Director: Antonio Carlos Ferreira  
Under State government of Minas Gerais - EPAMIG  
Activity: Teaching and research concerned with milk and milk products.  
Tel.: 212-2695, 212-2715, 212-2557
4. **CENTRO DE ENERGIA NUCLEAR NA AGRICULTURA - CENA**  
Anexo a Escola Superior de Agricultura "Luiz de Queiroz"  
Av. Carlos Botelho, s/n - Piracicaba - Sao Paulo  
Director: Ferdinando Galli  
Under the State University of Sao Paulo - USP  
Activity: Teaching and research concerning nuclear techniques applied  
to agriculture.
5. **FUNDACAO CENTRO TECNOLOGICO DE MINAS GERAIS - CETEC**  
Escritorio central: Av. Bias Fortes, 401  
Caixa Postal 2306 - Belo Horizonte - Minas Gerais  
President: Luiz de Oliveira Castro  
Under Joao Pinheiro Foundation  
Activity: Food Technology (included)  
Tel.: 35-0811 - geral: 35-9255 e 22-6833
6. **CENTRO NACIONAL DE PESQUISA DE TRIGO**  
Caixa Postal, 569  
Passo Fundo - Rio Grande do Sul - CEP 99100  
Director:  
Under Brazilian Organization for Livestock and Agriculture Research.  
Activity: Wheat Technology.  
Tel.: 22-2166
7. **INSTITUTO DE NUTRICAO DA UFPE - INUFPE**  
Cidade Universitaria - Engenho do Meio  
CEP 50000 Recife - Pernambuco  
Director: Nelson Chaves  
Under Federal University of Pernambuco  
Activity: Nutrition and Food Technology  
Tel.:
8. **INSTITUTO DE PESQUISAS DA MARINHA**  
Praia da Bica - Ilha do Governador - Rio de Janeiro -RJ  
Director: Admiral Paulo de Castro Moreira da Silva  
Under the Ministry of Navy  
Activity: Marine Research and Technology.

9. FUNDACAO CENTRO TROPICAL DE PESQUISAS E TECNOLOGIA DE ALIMENTOS  
Rua Dr. Pelagio Lobo, 63  
CEP 13100 - Campinas - Sao Paulo  
President:  
Under:  
Activity: Food Research and Technology  
Tel.: 8-7822
10. INSTITUTO DE CIENCIAS E TECNOLOGIA DE ALIMENTOS  
Av. Luiz Englert, s/n, Porto Alegre - RS  
Director: Dra. Ruth Wiedeman Velloso  
Under the Federal University of Rio Grande do Sul  
Activity: Food Technology  
Tel.: 24-6190, ramal 43
11. CENTRO DE PESQUISAS E DESENVOLVIMENTO - CEPED  
Rua Rio Sao Francisco, 1 - Caixa Postal, 1606  
Salvador - Bahia - CEP 40000  
Technical Scientific Director: Jose Adeodato Souza Neto  
Under the Secretary of Planning, Science and Technology of Bahia  
Activity: Chemistry and technology of regional fruits.  
Tel.: 60026 e 60876
12. FUNDACAO DE CIENCIA E TECNOLOGIA - CIENTEC  
Rua Washington Luiz, 675 - Caixa Postal, 1864  
Porto Alegre - Rio Grande do Sul - CEP 90000  
Director: Dr. Maier Auruch  
Under: Secretaria de Coordenacao e Planejamento  
Activity: Food Technology
13. FUNDACAO INSTITUTO DE TECNOLOGIA E PESQUISAS DE ALAGOAS FITPAL  
Granja Conceicao - Bebedouro - Caixa Postal, 99  
Maceio - Alagoas - CEP 57000  
Director: Edmilson Tales Nascimento  
Under the Secretary of Planning of Alagoas  
Activity: Technology of regional fruits.  
Tel.: 3-4479 e 3-5025
14. ESCOLA SUPERIOR DE AGRICULTURA "LUIZ DE QUEIROZ" - ESALQ  
Av. Carlos Botelho, s/n - Caixa Postal, 9 e 56  
Piracicaba - Sao Paulo - CEP 13400  
Director: Dr. Salim Simao  
Under the University of Sao Paulo - USP  
Activity: Teaching and research concerned with foods.  
Tel.: 3-0011 - ext. 131
15. INSTITUTO TECNOLOGICO DO ESTADO DE PERNAMBUCO - ITEP  
Depto de Engenharia Quimica  
Recife - Pernambuco  
Director: Jose Domingos B. A. Guedes (Eng. Saul Zaverucha)  
Under the Secretary of Industry and Commerce of Pernambuco  
Activity: Fruit technology and padronizacao  
Tel.: 22-4011

16. CENTRO DE TECNOLOGIA AGRICOLA E ALIMENTAR - CTAA  
Av. Maracana 252 - Rio de Janeiro - RJ  
Director: Dr. J. Canoes Orlando  
Under EMBRAPA  
Activity: Food Chemistry and Food Technology
17. INSTITUTO DE PESQUISAS AGROPECUARIAS DO NORTE - IPEAN  
(Centro Nacional de Pesquisas do Tropico Umido)  
Travessa Dr. Eneas Pinheiro, s/n - Caixa Postal, 48  
Belem - Para  
Director: Engenheiro Jose Surlam Junior  
Under EMBRAPA/MA  
Activity: Technology of regional fruits
18. CENTRO TECNOLÓGICO  
Av. Governador Jose Malcher, 1192 (end. da Universidade)  
Belem - Para  
Director:  
Under the Federal University of Para  
Activity: Teaching and research concerned with food.
19. LABORATORIO DE CIENCIAS DO MAR  
Av. da Abolicao, 3207 - Fortaleza - Ceara  
Director: Dr. Melquiades Pinto Paiva  
Under the Federal University of Ceara  
Activity: Fish Technology
20. INSTITUTO DE PESQUISAS AGROPECUARIAS DO NORDESTE - IPEANE  
Joao Pessoa - Paraiba  
Director:  
Under EMBRAPA  
Activity: Technology of regional fruits
21. CEPEC - Centro de Pesquisas de Cacau  
Km 22 - Rodovia Ilheus - Itabuna - C.P.7  
Itabuna - Bahia  
Director: Dr. Fernando Vello  
Under CEPLAC  
Activity: Cocoa products and regional fruits
22. DEPARTAMENTO DE TECNOLOGIA DE ALIMENTOS DA UFRRJ  
Rodovia Presidente Dutra, km 47  
Rio de Janeiro - RJ  
Director:  
Under the Federal Rural University of Rio de Janeiro  
Activity: Teaching and Food Technology
23. DEPARTAMENTO DE TECNOLOGIA DE ALIMENTOS  
Rua P. H. Rolfs, s/n - Vicosa - Minas Gerais  
Director: Adao Pinheiro  
Under the Federal University of Vicosa  
Activity: Teaching and Food Technology

24. INSTITUTO OCEANOGRAFICO  
Cidade Universitaria - Caixa Postal, 9075  
05508 Butanta - Sao Paulo  
Director: Dr. Plinio Scares Moreira  
Under the University of Sao Paulo - USP  
Activity: Marine research
25. CENTRO DE CIENCIAS RURAIS - DEPARTAMENTO DE TECNOLOGIA ALIMENTAR  
Rua Floriano Peixoto, 1184  
Santa Maria - Rio Grande do Sul - CEP 97100  
Director: Prof. Nelcindo Nascimento Terra  
Under the Federal University of Santa Maria  
Activity: Food Technology
26. DEPARTAMENTO DE TECNOLOGIA DE ALIMENTOS  
Praça 7 de Julho, 180 - Centro  
Pelotas - Rio Grande do Sul - CEP 96100  
Director: Guido Karter  
Under the Federal University of Pelotas  
Activity: Teaching and Food Technology
27. INSTITUTO DE PESQUISAS AGROPECUARIAS DO SUL - IPEAS  
Pelotas - Rio Grande do Sul - CEP 96100  
Director:  
Under EMBRAPA  
Activity: Fruits and Vegetables Technology
28. ESTACAO EXPERIMENTAL DE BENTO GONCALVES  
Bento Goncalves - Rio Grande do Sul  
Director: Dr. R. Apolinario Saraiva  
Under EMBRAPA  
Activity: Enology and derivatives
29. INSTITUTO DE RECURSOS NATURAIS  
Rua Conde D'eu, 68 - Sao Luiz - Maranhao  
Director: Profa. Margarida de Barros  
Under the Ministry of Agriculture  
Activity:
30. INSTITUTO DE BIOLOGIA E PESQUISA TECNOLOGICAS DO ESTADO DO PARANA  
Rua dos Funcionarios, 1357 - Curitiba - Parana  
Director: Dr. Dinor Olegario Voss  
Under:  
Activity:
31. INSTITUTO NACIONAL DE PESQUISAS DA AMAZONIA - INPA  
Caixa Postal, 478 - Manaus - Amazonas - CEP 69000  
Director: Dr. Warwick Estevan Kerr  
Under:  
Activity:
32. INSTITUTO DE TECNOLOGIA DE PESQUISAS DE SERGIPE  
Rua Campos de Brito, 371 - Caixa Postal, 115  
Aracaju - Sergipe  
Director:  
Under:  
Activity:

33. INSTITUTO TECNOLOGICO DO RIO GRANDE DO SUL  
Av. Oswaldo Aranha, 271 - Caixa Postal, 1864  
Porto Alegre - Rio Grande do Sul
34. DEPARTAMENTO DE TECNOLOGIA DE ALIMENTOS  
Centro de Ciencias Agrarias - CCA  
Av. Mister Hull, s/n Caixa Postal 254 - Fortaleza - Ceara  
Director: Jose de Anchieta Moura Fe  
Under the Federal University of Ceara  
Activity: Teaching and research in Food Technology
35. INSTITUTO DE QUIMICA E TECNOLOGIA DA UNIVERSIDADE DO CEARA  
Caixa Postal 935
36. INSTITUTO DE TECNOLOGIA DO ESTADO DO ESPIRITO SANTO  
Vitoria - Espirito Santo
37. INSTITUTO DE TECNOLOGIA INDUSTRIAL  
Rua da Bahia, 52 - Belo Horizonte - Minas Gerais  
Director:  
Under the Secretary of Agriculture, Industry, Commerce and Labor.
38. FACULDADE DE MEDICINA DE RIBEIRAO PRETO  
Disciplina Nutricao - Depto. Clinica Medica  
"Campus" Universitario - Bairro Monte Alegre  
Caixa Postal, 301 - Ribeirao Preto - Sao Paulo - CEP 71410  
Tel.: PBX 34-6035  
Director: Silvio Vergueiro Forjaz (Jose Eduardo Dutra de Oliveira)  
Under the University of Sao Paulo - USP  
Activity: Food Research and Nutrition
39. FUNDACAO ZOOBOTANICA DO GDF  
Setor de Tecnologia de Alimentos  
Brasilia - DF  
Director: Prof. Antonio Vivacqua  
Activity: Research and Food Technology
40. INSTITUTO NACIONAL DE TECNOLOGIA - INT  
Avenida Venezuela, 86 - 20000 Rio de Janeiro - RJ  
Director:  
Under the Ministry of Industry and Commerce  
Activity:
41. ESTACAO EXPERIMENTAL DE PELOTAS  
Caixa Postal, 403 - 96100 Pelotas - RS  
Director: Dr. Alberto Lessa Machado  
Under EMBRAPA  
Activity:
42. CENTRO DE CIENCIAS EXATAS E TECNOLOGIA  
Fundacao Universidade do Rio Grande  
Rua Coronel Sampaio, s/n - Caixa Postal, 474 Tel. 21090  
96200 Rio Grande - Rio Grande do Sul  
Director: Dr. F. Selby Love Prelin  
Under the Ministry of Education and Culture  
Activity:

43. ESCOLA SUPERIOR DE AGRICULTURA DE LAVRAS - ESAL  
 Caixa Postal, 37 - 37200 Lavras - Minas Gerais  
 Director: Dr. Fabio Pereira Cartaxo  
 Under Ministry of Education and Culture  
 Activity.

4. DETAILED INFORMATION ON SOME OF THE INSTITUTIONS

Food Technology Institute - ITAL .....	5.14
Technological Center Foundation of Minas Gerais - CETEC .....	5.16
Institute of Nutrition (Federal University of Pernambuco).....	5.18
Research and Development Center CEPED .....	5.20
Science and Technology Foundation CIENTEC .....	5.21
Food Technology and Research Institute Foundation FITPAL .....	5.22
Technical Institute of the State of Pernambuco - ITEP .....	5.23
Food and Agriculture Technology Center-CTAA .....	5.24
Northern Agriculture and Livestock Research Institute-IPEAN .	5.25
Marine Science Laboratory .....	5.26
Oceanographic Institute of the University of Sao Paulo .....	5.27
Food Technology Department .....	5.28
Experimental Station at Bento Goncalves .....	5.28
National Institute of Technology .....	5.29
Experimental Station of Pelotas .....	5.30
School of Food Engineering .....	5.31
Dairy Institute Candido Tostes .....	5.31
School of Medicine at Ribeirao Preto .....	5.32
College of Agriculture "Luiz de Queiroz" .....	5.33
Research Center for Cacau .....	5.34
Federal Rural University of Rio de Janeiro .....	5.34
College of Agriculture at Vicosa .....	5.35
Institute of Natural Resources .....	5.36
Center of Agrarian Sciences .....	5.37
University of Rio Grande .....	5.38
Agriculture College of Lavras .....	5.39

FOOD TECHNOLOGY INSTITUTE - ITAL

- Avenida Brasil, 2880 - Caixa Postal, 139 - Phone 41-5555
- Telex 0191009 - 13100 Campinas - SP
- Under the Secretary of Agriculture of the State of Sao Paulo  
 (Planning Commission for Agriculture and Livestock Research).
- Founded: July 14, 1969

- Management:
  - Dr. Agide Gorgatti Netto - General Director
  - Dr. Cyro Goncalves Teixeira - Director of Processing Division
  - Dr. Decio Dias Alvim - Director of Engineering Division
  - Dr. Mauro F. F. Leitao - Director of Research
  - Sr. Albino Antonio Vieira - Administrative Director
- Personnel:
 

Total number	=	424
Number of Technical people	=	195
College level	=	103
Technician level	=	92
- Personnel directly involved in Industrial Food Technology Research (Annex)
- Contracts and Consortiums: ITAL has a large number of contracts and consortiums with Federal Institutions as well as with the Food Industries and Universities, to execute specific plans.
- Physical Property:
 

Land area	=	101,488,00 m <sup>2</sup>
Buildings	=	19,029,37 m <sup>2</sup>
Parks and Gardens	=	51,449,99 m <sup>2</sup>
Roads	=	27,065,44 m <sup>2</sup>

See map enclosed
- Budget for 1975: Cr.\$ 18,362,813.00
- Communications (Type of interchange with organization):
  - a) Interchange of technical-scientific information;
  - b) Interchange of technical-scientific publications;
  - c) Development of projects in coloboration;
  - d) Exchange of services: analysis, technical and economic information, manufacture of products on experimental scale;
  - e) Interchange of training opportunities for personnel through courses, seminars, course work and visits.
- Summarized evaluation of the institutions present and future area of studies. (Annex)
- Agriculture crops demanding industrial development in the region (Annex).

#### SUMMARIZED EVALUATION OF THE INSTITUTIONS PRESENT AND FUTURE AREAS OF STUDIES

ITAL, basically, has worked in the following areas:

- 1) Basic Research;
- 2) Applied Research (90% of its activity);
- 3) Recommendations on instalation of industrial plants;
- 4) Analysis of processed food;
- 5) Quality control analysis;
- 6) Development of new products;
- 7) Specific problem solving: instalation, equipment, processing, packaging and storage related to foods.
- 8) Training of specialized personnel for the industry;
- 9) Answering technical questions;
- 10) Planning to obtain industrial financing for different projects;
- 11) Marketing for new products;

All these activities have been demanded by the national food industries that do not have infrastructure to solve their own specific problems, to develop and improve new products and to train specialied personnel.

On the other hand, the assistance given by ITAL to private and official organizations has improved the efficiency of investments in agri-industrial projects and consequently avoiding waste of funds.

To attend the internal needs and the demands of the exporting market, ITAL could develop programs to:

- 1) Analyze and certify products for exportation;
- 2) Analyze and certify the quality of juices and beverages.

CRITICAL AGRICULTURE SECTORS NEEDING RESEARCH AND DEVELOPMENT THAT WILL LEAD TO THE IMPLANTATION OF INDUSTRIES WITHIN THE GEOGRAPHIC AREA OF ITAL

- a) Vegetable protein food, mainly soy
- b) Animal protein food.

There is a need to develop techniques for aging the fore-quarters of beef as a source of good nutritional and acceptable food at a more accessible price to the consumer.

It is also necessary to improve the processing methods for meat products to a lower cost. Processed meat at the market today costs more than fresh meat.

In the same area of development is the fish market. Fish products are not well accepted for two reasons: fish products are not popular; the available fish products need improvement in appearance and processing condition to achieve a wide national distribution.

- c) Tropical fruits

There is a need to develop techniques to speed the industrial use of national fruits as:

Banana: a great part of the production of bananas is wasted since the fresh market can not absorb the production in such a short time.

Citrus: the fruit juice industry for the exporting market has absorbed more fruits lately, however, many orchards still waste oranges that never reach the Brazilian table.

Tropical fruits, in general, with great external market potential are partly lost in the field and partly sold for high prices at local supermarkets.

Retional fruits principally in the Northeast.

- d) Cereals, legumes and vegetables

For better utilization of these items it is necessary to improve transportation, storage and industrialization methods.

TECHNOLOGICAL FOUNDATION CENTER OF MINAS GERAIS - CETEC

- Avenida Bias Fortes, 401 - Phone: 0312-359255 / 350811  
30000Belo Horizonte - MG
- Under The State Council for Development of Minas Gerais - CED.
- Type of organization: Foundation.
- Founding date: March 29, 1972

- Management:
  - Dr. Clodoaldo da Cunha Bonfim - President
  - Dr. Paulo Gazzinelli - Superintendent
- Personnel:
 

Total number of employees	= 137
Number of technical people	= 86
University level	= 61
Technician level	= 25
- Personnel directly involved in Food Technology:
  - 4 Chemical Engineers
  - 3 Economists
  - 2 Agriculture Engineers (Engenheiro Agronomo)
  - 2 Consultants
  - 1 Chemist
  - 1 Veterinarian
  - 1 Industrial draftsman
- Contracts or consortium with other institutions or industries:
  - Instituto de Tecnologia de Alimentos
  - Universidade Federal de Vicosa
  - Food and Agriculture Organization - FAO
  - Secretaria de Tecnologia Industrial - MIC
  - Fundacao Christiano Ottoni
- Physical property:
 

Occupied area - Technical Section	= 2,020 m <sup>2</sup>
- Administration	= 360 m <sup>2</sup>
- Budget for 1976: Cr.\$ 44,320,000.00
- Services available in Food Technology:
  - Meat and meat products
  - Milk and milk products
  - Quality control and standardization
  - Packaging and others
- Communications (Suggested types of communication with other organizations):
  - a) Interchange of technical information;
  - b) Interchange of technical personnel;
  - c) Training of technical people in specific areas;
  - d) Publication and transfer of technology.
- Summarized Evaluation of the institution's present and future areas of studies (Annex).
- Agriculture sections in need of industrial development in the area:
  - a) The regions of Alto Medio Sao Francisco, Itacambira, Medio Jequetinhonha, Mucuri, Rio Doce e outras, in the state of Minas Gerais are not typical for dairy. However, medium sized dairy plants could be developed in the area.
  - b) In Montes Claros region there is a project to develop a poultry program. SA and ACAR have projects for raising hogs and for industrialization of pork products in the area.
  - c) There is a large project for raising hogs in the region of Tres Marias hydroelectric plant.

## SUMMARIZED EVALUATION OF THE INSTITUTIONS PRESENT AND FUTURE AREAS OF STUDIES

The areas of work for CETEC are related to the needs of the region, to the social and economic importance of each section according to the regional resources.

The dairy industry is spread all over the state and features small dairy plants, family sized properties, using old fashioned equipment producing products of irregular quality and high prices. Therefore, the system is in great need of modernization.

The State of Minas Gerais produces 71% of the Brazilian cheese, 66% of the national butter, 39% of the national dehydrated milk, 33% of the pasteurized milk and 27% of the national production of yogurt.

The country has 610 dairy industries under Federal inspection. 439 (72% of the total) are in Minas Gerais.

The same urge for technical assistance exists for meat and meat products programs. Minas Gerais has 20% of the national cattle population, 30% of which is slaughtered outside the state, 30% is slaughtered in industries located in Minas; the balance (40%) is slaughtered in rural and county slaughter houses without sanitary inspection, thus wasting almost all of the subproducts.

Minas Gerais has a herd twice as big as Sao Paulo or Rio Grande do Sul. However, Sao Paulo industrializes 21,300 tons of meat (1973); Rio Grande do Sul, 20,174 tons, and Minas, 2,493 tons.

The objective of CETEC is to become a first rate meat and dairy research center able to advise the meat and dairy industries. Also, it is CETEC's objective to study marketing, quality control and new processing techniques; to study improved packaging material for more rational and economical use of the State's agriculture and livestock potentials.

### INSTITUTE OF NUTRITION (FEDERAL UNIVERSITY OF PERNAMBUCO)

- Cidade Universitaria - Phone 27-0357  
50000 Recife - Pernambuco
- Under the Federal University of Pernambuco, Ministry of Culture and Education.
- Founding date: July 7, 1967
- Director: Prof. Dr. Nelson Chaves
- Personnel: Total staff = 108  
Technical employees = 48  
University level = 12
- Personnel directly involved in Food Technology Research:
  - 15 Nutritionists
  - 2 Pharmacists
  - 1 Economist
  - 1 Chemical Engineer

- Contracts and consortiums with other institutions or industries:

Sudene/UFOe/INUFPe  
 FAO  
 UNICEF  
 OMS (Suica)  
 OEA/SUDENE  
 SUDENE/SUBIN/USAID  
 INUFPe  
 SUNAB/SUBIN  
 SUBIN/MEC/INUFPe

- Services available in Food Technology:

Canning: fruits, vegetables and fish  
 Cereals  
 Sugar  
 Juices and beverages  
 Proteins  
 Quality control and standardization  
 Packaging

- Summarized evaluation of the institutions present and future areas of studies (Annex).

- Agriculture section in need of industrial development in the area:

A comparative study, important to the economy of the Northeast, on commercialization, waste, price variation, production, industrialization and export market potential was made with 24 kinds of regional fruits. Results (Annex).

SUMMARIZED EVALUATION OF THE INSTITUTIONS PRESENT AND FUTURE AREAS OF STUDIES

1) Canning and beverages in general. In consortium with SUDENE, preliminary research with regional fruits gave the institution the know-how on fruit processing methodology. The institution has a European fruit processing line acquired through a consortium with the Swiss Government which cost about one million Swiss francs.

2) Cereals and grains. The institute ran a survey on the customary diet of the regional population and it revealed a deficiency in calories and proteins. So, since the institute's early days, projects have been developed to rationalize the use of cereals produced in the area. Programs were developed to introduce new sources of calories and protein into the daily diet of the population. As a result of these programs new high protein mixtures were obtained and their acceptance by the population tested.

3) Vitamin enriched sugar. INUFPe found through surveys that the regional population suffered from vitamin A deficiency. Using information from experiences in other countries INUFPe designed a project to add vitamin A to sugar. The project is at this time waiting approval from the government.

- 4) Quality control. Quality control of the products developed by the food technology laboratory. Chemical analysis of the products are also part of the institute program.
- 5) Unconventional products. One of the priorities of the institute is the production of protein from industrial waste by means of fermentation. A pilot plant for industrial fermentation is already installed and ready to operate.

CENTER FOR RESEARCH AND DEVELOPMENT - CEPED

- Km 0 da BR-536 - Phone (0719) 200037/046/164  
48420 Camacari - BA  
Caixa Postal, 1606 - Phone (0712) 25405/22017/21897  
40000 Salvador - BA
- Under the Secretary of Planning, Science and Technology of the State of Bahia.
- Legal organization: Foundation
- Founding date: July 8, 1974
- Management:
  - Dr. Kurt Politzer - Director
  - Dr. Irundi S. Edlweiss - Technical Director
  - Dr. Fernando Magalhaes Machado - Administrative Director
- Personnel:
 

Total number of employees	=	180
Technical personnel	=	105
University level	=	90
Technician level	=	15
- Personnel directly involved in Food Technology:
  - 5 Chemical Engineers
  - 5 Agriculture Engineers (Engenheiros Agronomos)
  - 5 Food Technologists
  - 4 Pharmacists/Biochemists
  - 1 Industrial Chemist
  - 1 B.S. in Human Sciences
  - 1 Administrator
- Contracts and consortiums with other institutions or industries:
  - Bahia Frutos S/A
  - Madrilena Agro-Industrial
  - Grupo de Estudos para os Alagados na Bahia
  - SUDENE (3 convenios)
  - CEASA - BA
  - IPEAL/SA
- Physical instalations:
 

Occupied area - Technical section	=	600 m <sup>2</sup>
Administrative section	=	300 m <sup>2</sup>
- Budget for 1975: Cr\$ 560,000,000.00
- Services available in Food Technology:
  - Canning: fruits, vegetables, fish
  - Beverages and juices
  - Vegetable oils and fats
  - Quality control and standardization
  - Packaging and others.

## - Publications:

## Technical Bulletin # 1

Production, commercialization and industrialization of tropical fruits in the Northeast - Joviniano Neto e John Clarke.

## Technical Bulletin # 2

Marketing proposals evaluation - John Clarke and Luiz C. Sampaio Araujo.

- Past, present and future programs (Annex).

- Communication (suggested kinds of interchange with other institutions):

- a) The CEPED program concerned with Tropical Fruits Technology should maintain a close collaboration with other institutions studying fruiticulture.
- b) The interchange of technical personnel with other institutions is considered of importance as a channel of communication.

SCIENCE AND TECHNOLOGY FOUNDATION - CIENTEC

- Av. Washington Luiz, 675 - Caixa Postal, 1864 - Phone 25-2504  
90000 Porto Alegre - RS

- Under the Secretary of Planning

- Legal structure - Foundation

- Founding date: June 6, 1972

- Management:

Dr. Maier Auruch - Director

Dr. Orion H. Cabral - Administrative Director

- Personnel: Total number of employees = 303  
 Technical staff = 214  
 University level = 73  
 Technician level = 141

- Personnel directly involved in Food Technology:

4 Chemical Engineers  
 2 Economists  
 1 Agriculture Engineer (Engenheiro Agronomo)  
 1 Industrial Chemist

- Contracts and Consortiums with other institutions or industries (Annex).

- Physical property: Occupied area: Technical section = 4,753 m<sup>2</sup>  
 Administrative = 1,391 m<sup>2</sup>

- Budget for 1975: Cr\$ 67,503,000.00

- Services available in Food Technology:

Meats and meat products  
 Cereals and grains  
 Oils and fats  
 Canning: fruits and vegetables  
 Beverages and juices  
 Packaging  
 Quality control and standardization

- Publications (Annex).

- Programs completed (Annex).
- Communications (Suggested types of interchange with other organizations):
  - a) Training courses
  - b) To develop a nation wide informative bulletin for all industries
  - c) Meetings.

INSTITUTE OF TECHNOLOGY AND RESEARCH FOUNDATION OF ALAGOAS (FITPAL)

- Granja Conceicao (Bairro Bebedouro) - Caixa Postal, 99  
Phone 34479/35025 - 57000 Maceio - Alagoas
- Under the Secretary of Agriculture of the State of Alagoas.
- Legal structure: Foundation
- Founding date: October 27, 1967
- Management:
  - Guillermo Maria Vajas Hernandez - Executive Director
  - Oscar de Souza Bello Filho - Director
- Administration and Organization:
  - Industrial Division
  - Agriculture and Livestock Division
  - Chemistry Division
  - Statistic Division
  - Administrative Division
- Personnel:
 

Total number of employees	= 71
Technical personnel	= 16
University level	= 8
Technician level	= 8
- Personnel directly involved in Food Technology:
  - 1 Mechanical engineer
  - 1 Industrial chemist
  - 1 Chemical engineer
- Contracts or consortiums with other institutions or industries:
  - SUDENE - completed
- Physical property:
 

Occupied area: Technical section	= 380 m <sup>2</sup>
Administration	= 36 m <sup>2</sup>
- Budget for 1975: Cr\$ 12,600,000.00
- Services available in Food Technology:
  - Canning: fruits, vegetables and fish
  - Cereals and grains
  - Beverages and juices
  - Vegetable oils
  - Proteins
  - Quality control and standardization
  - Packaging
- Summarized evaluation of the institutions present and future areas of studies (Annex).

### SUMMARIZED EVALUATION OF THE INSTITUTIONS PRESENT AND FUTURE AREAS OF STUDY

As mentioned previously, FITPAL has programs on canning, beverages in general, quality control and standardization, and packaging; and could develop programs on cereals and jams, vegetable oils and proteins.

The Quality Control Laboratory and the Pilot Plant are equipped with the following: vacuum pump, still, deionizer, steam bath, electric plate, incubator, refractometer, muffel furnace, agitator, colorimeter, potentiometer, balance, centrifugal pump, automatic syruper, chopper/pulper, hydraulic press, horizontal pulper, vertical pulper, pasteurizer, heat exchanger, colling tank, heating tank, spiu cooker cooler, can closing machine, exhaust box, open boiling pot, tile top table, metal table on wheels, steam boiler with a capacity of 500 kg. steam/hour, etc.

#### INSTITUTE OF TECHNOLOGY OF THE STATE OF PERNAMBUCO (ITEP)

- Avenida Conde da Boa Vista, 428 - Caixa Postal, 756 - Phone 224011  
50000 Recife - Pernambuco
- Under the Secretary of Industry and Commerce
- Legal structure: Autarchy
- Founding date: October 13, 1942
- Management:
  - Eng. Saul Zaverucha - Tenured Director
  - Chem. Gilvan de Almeida Carvalho - Acting Director
- Personnel:
 

Total number of employees	= 187
Technical people:	= 58
University level	= 43
Technician level	= 15
- Personnel directly involved in Food Technology:
  - 2 Industrial chemists
  - 2 Chemical engineers
- Contracts and Consortiums with other institutions or industries:
  - Superintendency for the Development of the Northeast
  - 2 consortiums completed and 1 in progress
- Physical Property:
 

Occupied area:	Technical section	= 10,755,36 m <sup>2</sup>
	Administration	= 4,479,84 m <sup>2</sup>
- Budget for 1975: Cr\$ 29,400,000.00
- Services available in Food Technology:
  - Canning: Fruits, vegetables and fish
  - Beverages and juices
  - Quality control and standardization
- Publications: Papers published and in development (Annex).
- Communications (suggested types of interchange with other institutions):
 

Many similar technology research institutions were created in the various states of Brazil. Therefore, similar programs have been duplicated by the various institutes. To avoid duplication, ITEP adopted a policy of technical interchange. Within this policy, ITEP has consortiums with IPT of Sao Paulo and technical interchange with INT of Rio de Janeiro and ITAL of Campinas.

- Summarized evaluation of the institution's present and future areas of studies:

With funds from CNPq, part of the "Plano Quinquenal" (five years' duration plan) ITEP acquired a pilot plant for juices and marmalades, and a quality control laboratory. The Northeast is traditionally a sugar producer. However, the great number of juice and marmalade industries have supported ITEP in this area of development. Also, ITEP is developing programs to improve the techniques used by the vegetable oils industries.

#### FOOD TECHNOLOGY AND AGRICULTURE TECHNOLOGY CENTER (CTAA)

- Avenida Maracana, 252 - Phone 234-5490/247-3030  
20000 Rio de Janeiro - RJ
- Under the Brazilian Program for Agriculture and Livestock Development - EMBRAPA.
- Founding date: May 6, 1971
- Management:
  - Jose Camoes Orlando - Director
  - Mario Taveira Magalhaes - Vice-Director
- Personnel:
 

Total number of employees	= 107
Technical personnel	= 33
University level	= 30
Technician level	= 3
- Personnel directly involved in Food Technology:
  - 10 Chemists
  - 7 Agriculture Engineers (Engenheiros Agronomos)
  - 4 Pharmacists
  - 1 Veterinarian
  - 1 Librarian
  - 1 B.S. in physics
- Contracts or consortiums with other institutions:
  - Secretary of Agriculture of Para
  - National Nuclear Energy Committee
  - SUDAN/SAGRINA - Babassu Project
  - National Committee for Foods (Manioc flour)
- Physical plant: Occupied area:
 

Technical section	= 4,767,00 m <sup>2</sup>
Administration	= 643,27 m <sup>2</sup>
Others	= 2,266,11 m <sup>2</sup>
- Budget for 1975: Cr\$ 1,326,000.00
- Services available in Food Technology:
  - Canning: fruits, vegetables and fish
  - Cereals and grains
  - Bakery and pasta
  - Beverages and juices
  - Coffee
  - Proteins
  - Quality control
- Publications (Annex).

- Finished projects and projects in development (Annex).
- Communications (suggested type of communication with other institutions):  
Agreements, consortiums and selling of services.
- Summarized evaluation of the institution's present and future areas of studies:
  - Agriculture and Livestock Technology
  - Food Technology
  - Technical assistance to Agriculture Research Program
  - Development of codes for specific areas to help the official enforcement of Food Laws.
  - Training of own personnel or personnel of other institutions.

NORTHERN AGRICULTURE AND LIVESTOCK RESEARCH INSTITUTE (IPEAN)

- Travessa Dr. Eneas Pinheiro, s/n - Caixa Postal, 48 - Phone 26-154  
66000 Belem - Para
- Under the Brazilian Program for Agriculture and Livestock Development - EMBRAPA
- Founding date: May 4, 1939
- Directors:
  - Agr. Eng. Italo Claudio Falesti - General Director
  - Agr. Eng. Ernesto Maues S. Freire - Acting Director
- Personnel:
 

Total number of employees	=	470
Technical personnel	=	99
University level	=	97
Technician level	=	2
- Personnel directly involved in Food Technology:
  - 3 Chemists
  - 1 Biochemist
- Contracts or Consortiums with other institutions or industries:
  - Gelar Food Industry
- Physical property:
 

Occupied area:	Technical Section	=	60 m <sup>2</sup>
	Administration	=	700 m <sup>2</sup>
- Budget for 1975: Cr\$ 1,050,000.00
- Services available in Food Technology:
  - Canning: fruits, vegetables and fish
  - Beverages and juices
- Summarized evaluation of the institution's present and future areas of studies:
  - a) One of the objectives of the institution is to stimulate the interest of local industries and other organizations to develop model farms for rational farming of the regional crops. This kind of farming will make possible an intelligent commercialization and industrialization of the regional crops.
  - b) Knowing the nutritive value of the regional fruits, the industries could intensify production for exportation to the large national centers and overseas and at the same time develop the Food Technology program in the area.

- Agriculture products in need of industrial development in the area: There is no need for immediate industrial development because the agriculture production is restricted to regional natural fruit trees and small plantations.

#### MARINE RESEARCH LABORATORY

- Avenida da Abolicao, 3207 - Caixa Postal 1072 - Phone 24-1224  
60000 Fortaleza - Ceara
- Under the Federal University of Ceara.
- Founding date: December 2, 1961
- Directors:
  - Prof. Dr. Melquiades Pinto Paiva - Director
  - Prof. Jader Onofre de Moraes - Oceanography Section
  - Prof. Dra. Ivone Mota Alves - Biology Section
  - Prof. Dr. Raimundo S. da Costa - Fishing Section
  - Prof. Jose Raimundo Bastos - Fish Technology Section
- Personnel:
 

Total number of employees	= 80
Technical personnel	= 38
University level	= 36
Technician level	= 2
- Personnel directly involved in Food Technology:
  - 5 Pharmacists
  - 2 Chemical engineers
  - 1 Technologist
  - 1 Agriculture engineer
  - 1 Biologist
- Contracts or consortiums with other institutions or industries:
  - SUDEPE (in progress)
  - SUDENE " "
  - BNE " "
- Physical property:
 

Occupied area:	Technical Section	= 4,340 m <sup>2</sup>
	Administration	= 160 m <sup>2</sup>
- Budget for 1975:
 

Cr\$ 10,500,000.00
- Services available in Food Technology:
  - Canning: fruits, vegetables and fish
  - Proteins
- Summarized evaluation of the institution's present and future areas of study:
 

The work done by the Marine Research Laboratory of the Federal University of Ceara is promising and began to have some influence on the industries located in the Northeast. They are already trying to diversify their traditional fish processing lines.

OCEANOGRAPHIC INSTITUTE OF THE UNIVERSITY OF SAO PAULO

- Cidade Universitaria - Caixa Postal, 9075 - Phone 211-4422  
05508 Sao Paulo - SP
- Under the University of Sao Paulo
- Legal organization: Autarchy
- Directors:  
Dr. Plinio Soares Moreira - General Director  
Dr. R. Vellido - Administrative Director
- Personnel: Total number of employees = 164  
  - Technical personnel = 72
  - University level = 37
  - Technician level = 32
- Personnel directly involved in Food Technology:
  - 1 Marine Engineer
  - 2 Researchers (M.S. degrees)
  - 2 Researchers (Ph.D. degrees)
- Contracts and consortiums with other institutions or industries:  
Ford Foundation  
Research Foundation of the State of Sao Paulo
- Physical property: In Santos (Rented building)  
In Sao Paulo (Building belonging to USP)
- Budget for 1975: Cr\$ 1,066,500.00
- Services available in Food Technology  
  - Fish and other sea products
  - Protein
  - Quality Control and standardization.
- Summarized evaluation of the institution's present and future areas of studies:
  - Present: 1) Research: Rational utilization of the fish by starting preservation on the boat out on the sea, immediately after catching; development of new products; quality control; chemical composition and flavor of the fish.
  - 2) Teaching: Training and courses.
  - Future: 1) Research: Sea pollution and its influence on the fish (heavy metals, pesticides, microbiology).
  - 2) Teaching: Specialized and graduate courses; within the University of Sao Paulo courses integrated to the existing courses in Fish Technology and other courses in Oceanography.

DEPARTMENT OF FOOD TECHNOLOGY

- 97000 Santa Maria - RS
- Under Federal University of Santa Maria
- Founding date: February 1966
- Director: Prof. Nelcindo Nascimento Terra - Supervisor
- Programs: Animal products technology  
Vegetable products technology
- Personnel: Total number of employees = 14  
Technical personnel = 10  
University level = 9  
Technician level = 1
- Personnel directly involved in Food Technology:
  - 5 Biochemist pharmacists
  - 3 Agriculture Engineers
  - 1 Veterinarian
- Contracts or consortiums with other institutions or industries:
  - FAPERGS
  - MIC (2 consortiums)
- Physical property: Occupied area: Technical section = 800 m<sup>2</sup>  
(10,000 m<sup>2</sup> constr.)  
Administration = 180 m<sup>2</sup>
- Budget for 1975: Cr\$ 1,440,000.00
- Services available in Food Technology:
 

Meat and meat products	Vegetable oils and fats
Milk and milk products	Protein
Beverages and juices	Quality control and standardization
- Agriculture products in need of industrial development:
  - Dairy industry
  - Vegetable oils industry
  - Wine industry

EXPERIMENTAL STATION OF BENTO GONCALVES

- Avenida Oswaldo Aranha, s/n - Caixa Postal, 130  
95700 Bento Goncalves - RS
- Under the Brazilian Organization for Agriculture and Livestock  
Research Development - EMBRAPA
- Founding date: October 20, 1937
- Supervision:  
Dr. Roberto Apolinario Saraiva - Station Supervisor
- Personnel: Total number of employees = 38  
University level employees = 4
- Personnel directly involved in Food Technology:
  - 2 Chemists
- Physical property: Area occupied: Technical section = 837 m<sup>2</sup>  
Administration = 110 m<sup>2</sup>

5.29.

- Budget for 1975: Cr.\$ 925,000.00
- Services available in Food Technology:
  - Beverages and juices
- Summarize evaluation of the institution's present and future areas of study (Annex).

#### SUMMARIZED EVALUATION OF THE INSTITUTION'S PRESENT AND FUTURE AREAS OF STUDIES

The Experimental Station of Bento Goncalves is a Viticulture and Enology Research Center to serve the Northwest region of the State of Rio Grande do Sul. Its only purpose has been research related with grapes and grape subproducts.

The wine production of Rio Grande do Sul increases every year - (270,000,000 liters of wine and grape juice in 1974). New industries are blooming as: Suvalan and Moet Chandon.

With a national higher living standard the demand for fine wines and grape juice is increasing. The Law #73,267, Decree #365 (new juice law) favors and imposes the use of 10% of grape juice in beverages in general and 30% on those called grape refrigerantes.

The Station recommends the use of fine grapes for red wines (Cabernet and Merlot); (Italian Riesling) for white wines; (Concord, York Madeira) for juices and, for cognac, the use of white hybrid grapes (Couderc 13 and SU 65-1). The Station recommends better industrial techniques through the use of enzymes, heat treatment and controlled fermentation, etc.

Up to now the Station has been limited to a very small budget. However, presently, with funds from EMBRAPA, the Station hopes to develop a more active research program.

#### NATIONAL INSTITUTE OF TECHNOLOGY (INT)

- Avenida Venezuela, 86 - Phone 243-1428  
20000 Rio de Janeiro - RJ
- Under the Ministry of Industry and Commerce
- Founding date: December 29, 1921
- Directors:
  - Dr. Paulo Mauricio Guimaraes Pereira - General Director
  - Dr. Abrahao Iachan - Acting Director
  - Dr. Julio de Melo Garcia - Administrative Director
- Personnel: 

Total number of employees	=	448
Technical personnel	=	189
University level	=	159
Technician level	=	30
- Personnel directly involved in Food Technology:

6 Chiefs of Research	10 Graduates
10 Specialists	7 Assistants

- Contracts and consortiums, in progress, with other institutions and industries:

Brazilian Coffee Institute  
IPEAN  
Vegetable Products of Piaui  
INBASA (Goias)

- Physical property: Occupied area:
 

Technical section	=	18,730 m <sup>2</sup>
Administration	=	10,752 m <sup>2</sup>
Food Technology	=	2,752 m <sup>2</sup>
Others	=	2,794 m <sup>2</sup>
	=	2,432 m <sup>2</sup>

- Budget for 1975: Cr.\$ 21,700,000.00

- Services available in Food Technology:

Cereal and grains	Vegetable oils and fats
Bakery and pasta	Quality control and standardization
Sugar	Coffee
Beverages and juices	Proteins
	Others

- Publications (Annex)

- Projects: finished, in progress and future (Annex).

- Summarized evaluation of the institution's present and future areas of studies:

- Besides the areas of studies cited on item 1.3, the institution could study:

Industrial pollution  
Residual elements on food  
Starch, flours and subproducts  
Utilization of Livestock and Agriculture waste material  
Utilization of tubers, manioc, etc.

- Agriculture products in need of industrial development:

INT is a national institution, therefore, will have the same problems facing other regional institutions.

#### EXPERIMENTAL STATION OF PELOTAS

- Caixa Postal, 403 - 96100 Pelotas - RS

- Under the Brazilian Organization for Agriculture and Livestock Development - EMBRAPA

- Founding date: January 13, 1938

- Supervision:

Dr. Alberto Lessa Machado - Supervisor

- Personnel: Total number of employees = 70
 

Technical personnel	=	12
University level	=	9
Technician level	=	3

- Budget for 1975: Cr.\$ 1,850,000.00

- Services available in Food Technology:

- a) The Station has a small sensory evaluation laboratory to evaluate the processed product from new cultivars (crops)

developed by the Genetic Department or by other national or international institutions.

- b) The Station has a plant breeding program to develop new peach varieties and other temperate climate fruit varieties to attend the demand from the canning industry of the southern states.

#### SCHOOL OF FOOD ENGINEERING

- Caixa Postal, 1170 - Campinas - SP
- Under the State University of Campinas
- Legal organization: Autarchy
- Founding date: 1962
- Directors: Prof. Dr. Zeferino Vaz - Dean  
Prof. Dr. Andre Tosello - Director
- Personnel: Total number of employees = 112  
                   Technical personnel = 81  
                     University level = 56  
                     Technician level = 25
- Personnel directly involved in Food Technology: 81
- Contracts or consortiums with other institutions or industries:
  - Organization of American States
  - Tropical-Center Foundation
  - Federal University of Belo Horizonte
  - University of Rio Grande
  - Several industries
- Physical property: Technical section = 5,900 m<sup>2</sup>  
                                   Administration = 100 m<sup>2</sup>
- Budget for 1975: Cr.\$ 8,000,000.00
- Services available in Food Technology:
 

Meat and meat products	Bakery and pasta
Milk and milk products	Sugar
Canning	Beverages
Cereals and grains	Proteins
- Summarized evaluation of the institution's present and future areas of studies:
 

All problems concerning Food Science, Food Technology and Food Engineering.

#### DAIRY PRODUCTS INSTITUTE "CANDIDO TOSTES"

- Rua Tenente Freitas, 116 - 36000 Juiz de Fora - MG
- Under the Secretary of Agriculture of Minas Gerais
- Founding date: September 3, 1940
- Director: Cid Mauricio Stehling
- Personnel: Total number of employees = 133  
                   Technical personnel = 24  
                     University level = 17  
                     Technician level = 7

- Personnel directly involved in Food Technology: 10
- Contracts and consortiums with other institutions or industries:
  - Federal Agri-Livestock Foundation
  - Central Bank
  - Consortium USAID - Purdue
- Physical property: Occupied area:
 

Technical section	= 3,500 m <sup>2</sup>
Administration	= 9,000 m <sup>2</sup>
- Budget for 1974: Cr.\$ 5,600,000.00
- Services available in Food Technology:
  - Milk and milk products
  - Quality control and standardization
  - Packaging
- Summarized evaluation of the institution's present and future areas of studies:
  - All problems concerned with milk and milk products.

SCHOOL OF MEDICINE AT RIBEIRAO PRETO -

- Department of Medical Clinic - Nutrition
- Faculdade de Medicina de Ribeirao Preto  
14100 Ribeirao Preto - SP
  - Under the University of Sao Paulo
  - Founding date: 1952
  - Directors:
    - Prof. Dr. Silvio Vergueiro Forjaz - Director
    - Prof. Dr. Cassio Bottura - Chairman of the Department
    - Prof. Dr. J. E. Dutra de Oliveira - Chairman of Nutrition
  - Personnel: Total number of employees = 8
 

Technical personnel	= 6
University level	= 2
Technician level	= 4
  - Personnel directly involved in Food Technology: 3
  - Contracts or consortiums with other institutions or industries:
    - Secretary of Education of the State of Sao Paulo
    - Secretary of Health of the State of Sao Paulo
    - National Institute of Food and Nutrition
  - Physical property: Occupied area:
 

Technical section	= 60 m <sup>2</sup>
Administration	= 12 m <sup>2</sup>
  - Budget for 1975: Cr.\$ 800,000.00
  - Services available in Food Technology:
    - Cereals and grains
    - Proteins
  - Summarized evaluation of the institution's present and future areas of study:

The Nutrition Section has a laboratory in condition to study proteins, aminoacids, fatty acids, some vitamins and minerals.

Has facilities to keep animals for biological assay of foods. Has equipment to study nutritive value of foods in children through metabolic balance.

Can also survey consumer reaction on new products.

AGRICULTURE COLLEGE "LUIZ DE QUEIROZ" - Department of Rural Technology

- Avenida Carlos Totelho, s/n - Caixa Postal, 9  
13400 Piracicaba - SP
- Under the University of Sao Paulo
- Founding date: June 5, 1901
- Directors: Prof. Ferdinando Galli - Director  
Prof. Otavio Valsechi - Department Chairman
- Personnel: Total number of employees = 76  
Technical personnel = 38  
University level = 24  
Technician level = 14
- Personnel directly involved in Food Technology: 24
- Contracts or consortiums with other institutions or industries:  
Ohio State University - USAID
- Physical property: Occupied area: Technical section = 1,800 m<sup>2</sup>  
Administration = 100 m<sup>2</sup>
- Budget for 1975: Cr.\$ 4,500,000.00
- Services available in Food Technology:
 

Meat and meat products	Beverages
Milk and milk products	Oils
Canning	Coffee
Cereals and grains	Proteins
Bakery and pastas	Quality control and standardi-
Sugar	zation
- Summarized evaluation of the institution's present and future areas of studies:

The development of Food Technology programs in schools like "Luiz de Queiroz" is sensible. The school curriculum includes courses on crop production, human nutrition and basic sciences such as chemistry, bio-chemistry, microbiology and others. The Rural Technology Department of the College of Agriculture "Luiz de Queiroz" has students majoring in Agronomic Engineering or Home Economics taking compulsory and elective courses in Food Science. The Department is organizing a graduate course. For this purpose it is planning a consortium with ITAL (Campinas) which will be financed by EMBRAPA.



- Summarized evaluation of the institution's present and future activities:

Presently the activity of the Food Technology Department is teaching basic courses in Food Science and Technology to students majoring in Agriculture (Agronomic) Engineering, Chemical Engineering, Veterinary Medicine, Home Economics and Animal Husbandry.

Next year the Department will initiate a program in Food Engineering to attend the great demand for such new profession. Next August the Department will start a graduate course, masters degree level. This course is of great importance within the geographic area for the Department.

VICOSA COLLEGE OF AGRICULTURE - Department of Food Technology

- Federal University at Vicosa  
36570 Vicosa - MG
- Under the Federal University at Vicosa - Ministry of Education and Culture.
- Legal organization: Foundation
- Founding date: March 30, 1922
- Management:  
Antonio Fagundes de Souza - Reitor  
Dilson Teixeira Coelho - Department Chairman
- Personnel:
 

Total number of employees	=	25
Technical personnel	=	20
University level	=	20
Technician level	=	0
- Personnel directly involved in Food Technology: 19
- Contracts and consortiums with other institutions and industries:
  - CAPES
  - PEAS
  - CCPL -RJ
  - UFMG/CETEC/Fund. J. Pinheiro
  - Prodeca
- Physical property: Occupied area:
 

Technical section	=	2,955 m <sup>2</sup>
Administration	=	1,050 m <sup>2</sup>
- Budget
- Services available in Food Technology:
  - Meat and meat products
  - Milk and milk products
  - Canning
  - Cereals and grains
  - Bakery and pastas
  - Sugar
  - Oils
  - Proteins
  - Quality control and standardization

- Summarized evaluation of the institution's present and future programs:

Canning of fruits and vegetables: The Department has a pilot plant not complete but in operating condition to process regional fruits and vegetables for classes and research. When completed, the pilot plant will play a great role in the development of the regional food industry.

Milk and milk products: The dairy pilot plant has been used for classes and research projects absorbing the regional milk production. The expansion of the pilot plant could provide a more diversified line of research.

Vegetable oils: The pilot plant is not finished for lack of funds. When finished it will be used for classes and research.

Meat: Meat is a very important commodity in this region. A pilot plant for meat processing is necessary.

Nutrition: The Department has human resources to develop a research program in nutrition, however, the physical facilities and equipment available are not sufficient. There is an urge to develop facilities for nutrition programs.

Laboratories in general: There is an urgent need to improve the conditions and equipment of the laboratories to permit a more sophisticated type of research.

More specialized personnel would help to make better use of available resources and the development of new lines of research.

INSTITUTE OF NATURAL RESOURCES

- Rua Isaac Martins, 84 - 65000 Sao Luiz - MA
- Under the Secretary of Planning of the State of Maranhao
- Legal organization: Autarchy
- Founding date: June 26, 1972
- Management:
  - Cosme Eurico Dias Carneiro Neto - General Director
  - Ruberval Machado Palmeira - Director
- Personnel: Total number of employees = 16
  - Technical personnel = 12
  - University level = 9
  - Technician level = 3
- Personnel directly involved in Food Technology: 9
- Contracts or consortiums with other institutions or industries:
  - Ministry of Agriculture
  - Maranhao University Foundation
  - Research Department of Secretary of Agriculture
- Physical property: Occupied area:
  - Technical section = 119 m<sup>2</sup>
  - Administration = 62 m<sup>2</sup>
- Estimated budget for 1976: Cr.\$ 4,000,000.00

- Services available in Food Technology:

Meat and meat products	Oils
Milk and milk products	Proteins
Canning	Fish
Cereals and grains	Non-conventional foods

- Summarized evaluation of the institution's present and future areas of study:

The laboratories available are sufficiently equipped for the work in progress. However, they should be improved to attend more sophisticated research.

- Agriculture products in need of industrial development in the area:

- 1) Regional fruits
- 2) Babassu: The pulp of babassu is rich in oil and starch, good for human food. The residue from oil extraction is good for animal feed.

AGRICULTURE SCIENCES CENTER - Food Technology Section

- Avenida Mr. Hull, s/n - Caixa Postal, 354  
60000 Fortaleza - CE

- Under the Federal University of Ceara - Ministry of Education and Culture.

- Legal organization: Autarchy

- Founding date: June 24, 1954

- Management:

Antonio Albuquerque de Souza Filho - Director

- Personnel: Total number of employees = 26  
 Technical personnel = 18  
 University level = 14  
 Technician level = 4

- Personnel directly involved in Food Technology: 3

- Contracts or consortiums with other institutions or industries:

Superintendency for the Development of the Northeast.

- Physical property: Occupied area: Technical section = 937 m<sup>2</sup>  
 Administration = 258 m<sup>2</sup>

- Estimated budget for 1976: Cr.\$ 700,000.00

- Services available in Food Technology:

Meat and meat products	Sugar
Milk and milk products	Juices
Canning	Oils
Cereals and grains	Quality control and standardiza-
Fish	tion

- Summarized evaluation of the institution's present and future areas of studies:

The institution works with a wide range of products. However, it has devoted more time to the study of regional tropical fruits. The institution has worked in projects related to plant breeding to develop better

tropical fruit varieties, vegetables and cereals. Banana, "caju" (cashew), "goiaba" (guava), "ata", "graviola" and mango are the tropical fruits that are most studied by the institution. The programs with cashew and banana are well developed. Less time has been devoted to the other fruits. The reason for this is the small number of technical personnel and limited facilities.

A survey is in progress to explore all possible alternatives for rational use of the regional raw materials in human and for animal food.

The results of the survey show that for the agri-industrial development of the area, basic scientific and technological information are needed on a wide variety of commodities.

UNIVERSITY OF RIO GRANDE - Exact Sciences and Technology Center

- Rua Coronel Sampaio, s/n - Caixa Postal, 474  
96200 Rio Grande - RS
- Under the Ministry of Education and Culture
- Legal organization: Foundation
- Founding date: August 20, 1969
- Management:
  - Prof. Euripedes Falcao Vieira - Director
  - Prof. Selby Sove Prehn - Director
- Personnel:
 

Total number of employees	=	14
Technical personnel	=	11
University level	=	9
Technician level	=	2
- Personnel directly involved in Food Technology: 9
- Contracts or consortiums with other institutions:
  - Superintendency for the Development of Fishing Technology
  - Group for the Development of The Fish Industry
  - Fish Industry
- Physical property:
 

Occupied area:	Technical section	=	630 m <sup>2</sup>
	Administration	=	140 m <sup>2</sup>
- Services available in Food Technology:
  - Canning
  - Proteins
  - Quality control and standardization
  - Fish
- Summarized evaluation of the institution's present and future areas of studies:
  - Presente:
    - 1) The Exact Sciences and Technology Center is forming university level personnel through undergraduate, graduate and extension courses
      - Undergraduate program: Industrial-Chemical Engineering emphasizing Food Technology
      - Extension: Food Technology courses
      - Graduate: Masters degree in Fish Technology.

2) The Center provides services to the private industries in chemical analysis of food products, technical assistance and food analysis certificates.

3) Applied research

Short term projects (in addition to the above)

- 1) Technical assistance to private and public organizations on fish and fish products technology and chemical analyses of fish products.

Long term projects

- 1) To organize research projects for the technical development of the fish industry and fish products industry.

LAVRAS COLLEGE OF AGRICULTURE

- ESAL - Caixa Postal, 37 - 37200 Lavras - MG
- Under the Ministry of Education and Culture
- Legal organization - Autarchy
- Founding date: 1908
- Management:
  - Dr. Fabio Pereira Cortaxo - Director
  - St. Adimilson Bosco Chitarra - Chairman of Food Science and Technology Department
- Personnel:
 

Total number of employees	=	5
Technical personnel	=	8
University level	=	8
Technician level	=	0
- Personnel directly involved in Food Technology: 8
- Contracts or consortiums with other institutions or industries:
  - Agro-Ipanema Industria
  - Agriculture and Livestock Research Organization of M. Gerais - EPAMIG
- Physical property:
 

Occupied area:	Technical section	=	500 m <sup>2</sup>
	Administration	=	200 m <sup>2</sup>
- Budget for 1975: Cr.\$ 559,547.00
- Services available in Food Technology:
  - Milk and milk products
  - Canning
  - Beverages in general
  - Coffee
  - Proteins
- Summarized Evaluation of the institution's present and future areas of studies:

The Department of Food Science and Technology of Lavras College of Agriculture works basically with fruits and in small scale with vegetables. The Department hopes to develop a quality control program to assist the industry on raw material selection, varieties selection and harvesting procedures.

Coffee and dairy research are future lines of work.

CURRENT MALNUTRITION PROBLEMS

The problems of malnutrition in Brazil might be considered serious on account of the territorial extension of the country with more than 8 million square kilometers and around 110 million inhabitants. A report issued by the National Institute of Nutrition around 1970 made the forecast that if urgent measures were not taken at about 1985 the malnourished section of the population would be bigger than the well nourished one.

## 1) Types of malnutrition

Perhaps the situation is not so critical as such but really malnutrition in its subclinical forms might be considered well spread over the whole country. In its more advanced forms the clinical ones it is present predominantly in certain areas and regions of Brazil. Common occurrence in the country are protein-calorie nutrition, vitamin A, iron and iodine. Dental caries is one of the problems of great importance in Brazil attached to nutrition.

The protein-calorie malnutrition is shown mainly in children of 1 to 3 or 4 years of age, in most cases in a moderate form. It is not common yet in Brazil. The total malnutrition of the marasmus type which is found in children under 1 year of age. Under-nutrition of our children is mainly characterized by deficient growth, muscular atrophy, changes in hair and skin. A great number of malnourished children show these conditions followed by infections and diarrhea. Intestinal parasitosis is quite common with these children.

Careful studies on the evolution of general infant mortality and proportional for the country in the physiographical regions were carried out during the period of 1941 to 1970. (Yunes e cols.). As for infant mortality, which is related to food and nutrition, in 30 years there has been a decrease of about 46.2% of its coefficient. In the last 10 years there has been shown an increase of this coefficient. (The Interamerican survey).

The Interamerican survey on infant mortality carried out by the Panamerican Health Organization has included three Brazilian areas: Recife, Sao Paulo and Ribeirao Preto. In these areas it has been shown that malnutrition was the basic or the associated cause of major importance in infant mortality.

In the adult individual, chiefly in patients with mental problems and alcohol addicts, also there are the same malnutrition aspects in Brazil. This kind of malnutrition is of the protein or protein-calorie, is always a multi-deficiency, which shows up in some cases with clinical edema mainly in the inferior members and sometimes generalized anemia in the majority of times of the hypochromic microcytic type related to hookworm disease, ancylostomiasis, changes in the skin and hair. In other occasions these adult individuals show malnutrition through a vitamin plurideficiency, predominating the symptomatology of pellagra. The persons show typical dermatological changes, with injuries of the hands, arms, legs and neck. The symptomatology includes diarrhea and many times the mental condition typical of the disease. Beriberi in Brazil is not common. It has been shown in some alcoholic addicts and it is characterized mainly by heart changes.

Protein-calorie malnutrition is the most serious deficiency in Brazil. There are types of vitamin A deficiency prevalent in certain areas, mainly in the northeastern area and it is characterized mainly by ocular changes - changes in the eyes. These ocular changes sometimes are serious with cases of xerophthalmia or even of keratomalacia.

Deficiency of Vitamin C is not common in Brazil on account of the availability and obtainable consumption of fruits.

Deficiencies of other vitamins of the B complex show in some adult patients, but it is not common in the country, nor are deficiencies of folic acid or vitamin B<sub>12</sub>, even in the vulnerable groups such as pregnant and nursing women.

The small deficiency of vitamin D may be due to plenty of sunshine and lack of clothing in children. This deficiency does not constitute a major problem or a problem of significance in Brazil.

Among the more important mineral deficiencies in the country it is worth mentioning iron deficiency. Many times associated with parasitosis rather than a deficiency or poor intake of this element. In children the symptoms are the type of hypochromic microcytic anemia, but it shows up in the other vulnerable groups such as the pregnant and nursing women.

Calcium deficiency seems not to be of major importance in Brazil, even though the intake of this mineral by the population is so much lower - in levels much lower - than the levels compared to the intake in the developed countries.

Iodine deficiency in foods in certain areas of Brazil has been responsible for simple goiter, however, this type of malnutrition is not one of the more important medical, nutritional problems of the country.

11) Location and surroundings of the malnourished individual  
The large urban concentration in Brazil, even in richer areas of the country such as in Sao Paulo and Rio de Janeiro, where the boundary population lives in inadequate situations of housing and hygiene without water resources and sewage disposal, the prevalence of malnutrition is somewhat serious, with the possible aggravation if proper steps for educational and food assistance and economic improvement are not taken. The population groups more affected by malnutrition were the lactating mothers and pre-school children where the clinical signs are more evident. The other affected groups where the sign of malnutrition is not so clear, is made up by the pregnant women and nursing mothers. These populational groups live in the borderline areas of the major cities of Brazil where immigration is large and where the living conditions are very poor. The Brazilian population is becoming urbanized very quickly, at the present time, with more than 50% of its inhabitants living in the cities.

However, malnutrition in its different forms is also present in the small cities and villages in the poorer areas of the country where poverty and illiteracy are the major causes. In these areas, too, the more affected groups are the lactating women and pre-school children where it shows better, but it is also evident among the pregnant women and nursing mothers.

BRAZIL

## REASONS FOR MALNUTRITION

As in many countries the reasons for malnutrition in Brazil are multiple.

The proper or adequate feeding of the population is dependent on the food production, its marketing practices, and the direct consumption or through industrialization, or the economical and social educational aspects.

In 1970 the Brazilian population was about 90 million people with about 1/3, that is 30 million, within the age group of 1 to 10 years old and 20 million from 10 to 20 years old. Thus, more than half of the Brazilian population was below 20 years of age and in the same year of 1970 around 13 million children were enrolled in the primary schools and 4 million in high schools. In 1976 the estimated population was 110 million people. The number of children in primary schools, in high schools and in universities as well as those in adult education has been increasing over the last years with very promising results for the next years.

I) Accordingly, if illiteracy is one of the most important factors in the presence of malnutrition in Brazil this should decrease in the near future because the population is being educated. It is, however, important to point out that the Brazilian schools in the different levels of training do not teach, or teach very little, on how to feed properly. It does not educate and also it could not educate along these lines because the teachers themselves do not learn and do not know the value of the foodstuffs. Therefore, in Brazil, as in many other countries, there is an urgent need for proper food education within the framework of its educational system.

II) The economic situation of the population is no doubt one of the causes of malnutrition. Calculations have pointed out that the minimum wage paid to a worker plus wife and three to four children is totally spent on foods, but it has also been shown that soon better utilization of the budgetary resources buying foods of the season, or foods of higher nutritive value, these persons could have a better diet.

III) Food Habits. Food habits which vary in a large country such as Brazil have, no doubt, their influence in the prevalence of malnutrition in the country. In the northeast area, for example, basic diet is made up of beans and mandioca meal. In San Paulo it is made up of rice and beans. The food pattern of the main daily meals is also different in the other areas of the country. Data on preference and consumption of foods in Brazil collected by National Food Commission have shown variety of uses and food habits. Within our territorial extension and food varieties there is no doubt that food habits, taboos, religious restraints, etc. contribute toward the prevalence of malnutrition. It must be pointed out, for example, that with certain more vulnerable groups of the population such as children of 1 to 3 years old, the mother, herself, more than the medical doctor acted upon a proper selection of diet. It thus indicates that any campaign towards attacking infant malnutrition through a better diet should not be made through the medical doctors.

IV) Food supply.

A) Food production is increasing at higher rates than the growth of the population.

Even though the Brazilian population has been increasing at high rates, it does not seem that this is the major factor towards malnutrition

prevalent in Brazil. The food production in the country, the explosion of production of certain food items, such as soy beans during the latest years, admits that production is more than sufficient to feed properly a much larger population than the present one.

If we only take into account the 1973/74 crop of corn, soy beans, rice, beans and wheat without taking into account other food stuffs of vegetable and animal sources it can be seen that it is sufficient to supply more than 3000 calories and more than 70 grams of protein per capita in Brazil. It shows also that the soy bean production in Brazil of about 12 million tons would be sufficient to supply calories for 44 million Brazilians and proteins to some 160 million people at the levels considered nutritionally adequate.

B) Inadequate transport.

Inadequate storage and transport are certainly contributing to losses of foods and increase of prices.

C) Planning of production.

That we know there are not plans for production in relation to the nutritional needs and thus the lack of planning might correlate to malnutrition.

D) Food processes and preservation drawbacks.

Inadequate food processing and storage collaborate towards a loss of food value. However, we are not aware of the data to prove the effective loss of nutrients. To date we do not know of any research work carried out to identify losses of nutrients through technological processes as applied to foodstuffs in order to relate it to malnutrition problems in the country.

It seems to us that up to now Food Technology in Brazil has been always engaged in maintaining the organoleptic properties of foods rather than keeping or improving the nutrition value of them. Research on the improvement of vegetable and animal foodstuffs in the great majority has been related to increasing productivity, higher resistance to infection and diseases without taking into consideration that foodstuffs are the vehicles to various essential nutrients for the maintenance of good health.

The problem of protein malnutrition is one that afflicts some sections of the population for long decades. Some excellent sources of proteins for human consumption such as oil seeds have been considered. Other sources which need technological sophistication in order to be prepared have shown higher interest. A good example is the single cell protein. Brasil has been one of the World's major oil producers, has substantial amounts of press cakes of high protein value which up to the present are used almost exclusively for feedstuffs.

Other problems such as the contamination by *Aspergillus* flavors, aflatoxin of our peanut crops have not been duly considered. The detoxification processes of the raw material contaminated with aflatoxin have been studied without any visible clinical results. It seems that the best way would be to start plans for the prevention of the contamination through immediate drying of the seeds after collection. However, for this to be economically feasible it would need the planning or the concentration of the Agriculture production so that the peanut crops would be in well adapted areas with drying facilities through the work of cooperatives, and this, in turn, certainly would cut down costs. The way this crop is handled at the present time, drying becomes a

serious problem without a solution. As a result almost the total production of press cakes from peanuts produced in the country, which could be used as protein sources for human consumption, is simply lost.

Some other aspects related to food processing and preservation are considered briefly:

1) Refrigeration and cold storage: The country has enough supply of cold weather housing mainly for meat and imported fruits (apples, pears and grapes). These units are located near the centers of imports or centers of consumption. Frozen foods are available in the country but at very high prices.

2) & 3) Dehydration, canning or any other form of food preservation in Brazil result in higher prices for the consumer. In Brazil, process of foods are more expensive than fresh foods. Pineapple, for example, might cost about 15¢ in the fresh state, whereas, when canned in a 2½ can its price goes up to almost a dollar.

4) Others

Food losses are larger than it seems due to many causes. In 1970 some data showed food losses in the country at the farm levels, the producer levels:

Grains .....	3%
Sweet potato .....	10%
Potato .....	8%
Mandioca (wild variety) ...	10%
Mandioca (sweet variety) ..	10%
Garlic .....	5%
Onions .....	10%
Tomatoes .....	15%
Dried leguminous seeds ....	3%
Fruits .....	10%
Eggs .....	10%

Food supply losses are considered to be heavy in the country. There is no pre-processing in the field.

At present, the staff of the Department of Agriculture states that "Brazil loses yearly around 40% of its crop of corn, 33% of its crop of beans, 30% of its crop of soybeans, 42% of its crop of cocabeans, due to the lack of proper facilities for sanitary control."

E) Food Marketing.

Inadequate food marketing might be responsible for malnutrition in Brazil being closely related to food supply and cost.

The main reason for malnutrition in regard to foods is related to cost and education. Foods are not available to those who need them most on account of low purchasing power and education.

V) Potable water supply.

Potable water is available in the majority of the main urban centers. The prevalent poor sanitary conditions in the house is certainly responsible for diseases, especially in inadequate condition of diet and nutrition. Certainly the lack of potable water in many areas of Brazil is an important factor in infections and infestations towards the seriousness of malnutrition. In the city area of Sao Paulo, for example, one of the most developed in Brazil, water supply goes up to only 31% and the sewage disposal to 32% of the population of about 7,800,000 individuals. This is certainly inadequate and contributes to problems of health and nutrition.

#### VI) Inadequate foods.

It seems that there are not foods which may be related to causes of malnutrition. Some foods such as mandioca of ample utilization in the northeast area might be considered responsible for malnutrition because it is offered to children of lower age in substitution to breast milk or to cows' milk.

Processed foods are mainly for the upper social economical brackets of the population. There are no policies towards producing or processing foods to the lower income group, those whose purchasing power is below the regular market prices.

There is not in the country a conscious wide spread meaning in relation to the nutritive value of foods.

#### VII) Food Industries not using available technology.

The food plants in Brazil apply, in a general way, an adequate technology for the processing of foods. But in an economy of scale of low productivity, low demand of processed foods, etc., prices go high. And industrial costs are also high.

Due to many reasons, industry is not ideally linked to the producer; foods are produced for direct consumption and not to be processed. Market prices swing constantly; when low, foods go to the industry, to the food plants. On the other hand, high financing costs are also responsible for the high industrial costs. Seasons are short such as in the case of fruits, and the concentration of capital for the processor is another factor of high prices. If the low demand is considered it is easy to understand why processed foods in Brazil are so expensive.

#### VIII) Better ways of communications among specialists, industry and government.

Reasonable ways of communication among nutritionists, industry and government are on the move during the last years.

#### IX) National Food and Nutrition Policy.

As far as the problem of the national policy on nutrition for the whole country much has to be done. In a general way nutritionists have no precise data indicating the prevalent deficiencies in the country. Actually, it is assumed certain deficiencies and something is done in relation to them. For example, it was recommended the enrichment - food enrichment - with vitamins and minerals without knowing scientifically which sectors of the population were really deficient of these nutrients. Specific nutrition deficiencies in our population must be determined through complete and systematic surveys. Some fragmentary work has been done along these lines without being part of a general policy.

Up to now there is not a clear and precise policy in relation to foods and nutrition in Brazil. Production should be stimulated, whenever possible, through higher minimum prices to the producer. Distribution and storage facilities are other important items under government control. But together with these measures, two other factors are fundamental: increase of income and education. As these factors take time to influence and to improve the status of the consumer, this must be a decision of the government to establish standards of quality for the foods which are considered stable for the majority of the population.

To improve the quality of the foods used by infants, to provide fortification of bread, mandioca meal, rice, etc., a program of school lunch and pre-school feeding with the participation of the community are also other aspects to be considered in a national food and nutrition policy.

The National Program for Foods and Nutrition of the Federal Government which is submitted with this report in annex includes some activities in these areas and is being presented by the National Institute of Foods and Nutrition (INAN).

X) Others.

1) Early weaning.

In Brazil, as in many other parts of the world, breast feeding is decreasing. In many areas of the country children are fed porridges or gruels made out of mandioca, uca, or with extremely diluted milk formulas. In a survey made in Recife 73% of children who died during the first year of life had been breast fed less than 1 month.

2) Relation between income and malnutrition.

Data of the Institute of Economical Research at the University of Sao Paulo and from the Department of Preventive Medicine, Escola Paulista of Medicine, have shown a relation between family income in minimum wages and the protein-calorie malnutrition. When the family income in minimum wages per capita is lower than 0.5 related frequency of malnutrition is of about 48%, whereas with 1.5 or more minimum wages this figure gets down to 14% or less.

These studies indicate that even though the income is considered the most important factor in explaining the variations in the individual nutrition intake its improvement is a long way process. Short time measures would include frequent readjustment of salaries, wages or the distribution of a bonus for buying foods.

3) Brazilian hunger.

People many times talk about the "Brazilian hunger" as if it were a phenomenon spread all over the country. No doubt there are areas in Brazil where the incidence of malnutrition is relatively high. It is not possible, however, to compare industrialized areas of the south with the northeast, but in both there is malnutrition and its causes are multiple. The first thing that comes to mind is of an economical nature. It is shown that in some areas in Brazil malnutrition is prevalent among the lower social brackets of the population. The educational problem is also of great importance. One of the principal causes of hypoproteinemia in the northeast is the high consumption of mandioca. But ignorance, habits, fads, and taboos have also a great part in malnutrition. (O. Ballarin).

4) Others.

Other forms of diseases and conditions inadequate to health which make difficult the utilization of foods and which collaborate towards malnutrition:

- Badly oriented radio and TV advertising wait for consumer.
- Economical interest only in the sale of foodstuffs.
- International programs of foods looking towards interests of donors only.
- Lack of trained personnel in foods and nutrition in the country itself.
- Inadequate use of conventional foods.
- Stimulus to production and consumption of non-conventional foods for a population of low social economical level.
- Attempt to sell foods to a population which has no funds to buy it.

POST-HARVEST LOSSES

## 1. Main foods subjected to post-harvest losses

Grains in general (cereals, legumes, etc.) and also almost all fruits and vegetables suffer significant post-harvest losses. Post-harvest losses occur heavily in fruits such as mango, cashew, papaya, lemon, avocado and fig. Among the vegetables the main losses occur in potatoes and onions.

## 2. Where losses occur

## 2.1. Places of loss occurrence

Besides the losses that are usually observed in the production areas due to deficient harvesting and handling procedures, considerable losses are also found during transportation, storage and marketing of grains, fruits and vegetables.

## 2.2. Reasons for food losses

In the case of grains in general the losses are caused by different reasons such as:

## a) mechanical harvesting:

- insufficient number of harvesting machines to attend the demand of high production;
- lack of tradition in the agricultural areas in using practical and rational systems of work;
- harvesting seasonability

## b) storage:

- inadequate and insufficient storage units;
- product handling (cleaning, drying and bagging);
- attack by insects, rodents and microorganisms

## c) marketing:

- poor infrastructure in transportation and distribution sectors (lack of nearby roads which are the paths for inland commodities), and also problems concerned to product packaging.

In the case of fruits and vegetables a series of factors are also detected which are responsible for post-harvest losses.

Usually the process starts in the growing areas where the crops are not properly treated (without adequate disease and pest control) resulting in inadequate storage capability of fruits and vegetables (due to high incidence of microorganisms favored by climatic conditions). Most of the cases involve factors such as utilization of varieties of poor storage capacity; improper harvesting and handling procedures; seasonability of tropical agricultural products and, finally poor or almost non-existing infrastructure for marketing and storage of fresh fruits and vegetables.

Data related to foods of animal origin (meat, fish, eggs and poultry) are hard to find. Anyway, in the case of fish the losses are significantly high.

## 3. Amount of food losses after harvesting

According to a CIBRAZEM (Brazilian Warehouses Company) report on the basic research program for the establishment of an overall storage system the estimated losses are those shown in table 1. Table 2. shows main post-harvest losses for fruits and table 3. for the case of vegetables.

Table 1. Fragmentary data on occurrence of losses, in percentage, during transportation and storage of several agricultural products

Products	Period	
	Transportation	Storage
	%	%
Rice	1	1 to 30
Corn	insignificant	2 to 40
Beans	insignificant	0 to 10
Soybeans	insignificant	0.5 to 3
Wheat	0 to 2	1 to 4

Table 2. Estimated losses, in percentage, based in the total crop for the fruits which are more susceptible to post-harvest losses

Fruits	Percentage of losses	Total amount losses (1,000 fruits)
	%	
Cashew	80	3,199,356
Lemon	50	900,000
Mango	30	559,420
Papaya	20	14,948
Avocado	10	50,192

Observation: The production data were collected from the Statistical Yearbook of the Brazilian Institute of Geography and Statistics 1974, where the data are reported in 1,000 fruits.

Table 3. Estimated losses, in percentage, based in the total crop for the vegetables more susceptible to post-harvest losses

Vegetables	Percentage	Amount lost (tons)
Potato	30	401,030
Onion	30	100,000

In the case of the other vegetables losses are estimated to be around 10%. In Brasil storage capacity for grains and cereals as well as for fruits and vegetables is insufficient. In many cases the conditions for storage are also inadequate.

#### 4. Adopted procedures to minimize losses and obtained results.

For handling and storage of grains and cereals a structure is being created to give support to transportation and storage of those products. For that purpose the PRONAZEM (National Storage Program) and GREMOS (Executive Group for Crop Release) was created. So the construction of grain terminals is being stimulated for handling products such as soybeans, wheat and corn although several factors have contributed to limit their success.

For the case of fruits and vegetables CIBRAZEM has started the "Cold Storage National Program" which will enable the growers to store and preserve vegetables such as onions and potatoes and even fruits like apples, under refrigerated conditions, and also to extend the benefits of cold storage through the marketing chain including transportation and selling system of those products.

A research program is also being carried on by governmental institutions to develop the most adequate technology for storage of grains and cereals.

Researches projects in the field of transportation and storage of fruits and vegetables are also being conducted in research institutions such as the institute of Food Technology (ITAL), and considerable information concerning the necessary technology is available to be transferred to the consumers.

HOW FOOD TECHNOLOGY RESOURCES CAN BE APPLIED MORE EFFECTIVELY TO  
MALNUTRITION PROBLEMS

This subject can be faced from several points of view such as normative, executive and private.

1. Official action

- 1.1. Normative, establishing rules towards the improvement and increase of qualified technicians in the fields of Food Technology, at all levels, in order to capacitate efficient collaboration in Government plans related to:
  - 1.1.1. Food and nutritional planning;
  - 1.1.2. Food provisioning policy and food availability;
  - 1.1.3. Uniform legislation, directed to the improvement (not police supervision) of industrial and commercial activities;
  - 1.1.4. Typing, classification, standards of identity and quality of raw materials and processed products;
  - 1.1.5. Minimum production cost; industrial cost and commercial cost;
  - 1.1.6. Storage systems in the production area, storage systems in the consuming area (industry and commerce);
  - 1.1.7. Rationalization of commercialization practices, actions by industry and commerce actions as a means of education and nutritional orientation of the consumer.
- 1.2. Executive, through the introduction of practical measures.
  - 1.2.1. In programs of executive character, described in the items 1 to 7 of paragraph 1, adopted according to the necessities and opportunities.

2. Private Sector, related to regular activities of the food industries and food commercialization

- 2.1. Predomination of free enterprise in the several sectors related to foods comprising processing, preservation, storage, distribution, commercialization, etc.
- 2.2. The free enterprise should also predominate in the control of activities and efficiency of the food processing industries, storage and distribution; in the control of commercialization activities; in the control of the norms visualizing the rationalization of production and commercialization; in the control of the norms related to ethics in advertising of food products.

3. General deliberations

Item 1 would lead to the establishment of the Basic Plan for a Food and Nutrition National Policy, while item 2, subordinated to that Basic Plan, would offer all the necessary components to the sector rationalization. In other words, it is our thought that Brasil needs a kind of Food Secretariat, to establish the basic policy to face food demand of a growing population and to play a decisive role in world food supply.

The activities planned and programmed according to the national interests, coming from a central organism with enough power and funds would certainly offer a series of benefits in the following areas of food and nutritional planning:

9.2.

- 3.1. Zoning of production areas in order to minimize storage risks and distribution costs:
    - 3.1.1. Reduction of losses in food production;
    - 3.1.2. Appropriate storage, geographically distributed to permit a better movement from the production to the consumption areas.
  - 3.2. Rationalization of commercialization, distribution costs, primary packaging, storage conditions as well as a minimum price policy.
  - 3.3. Rationalization of economic incentives (credit), for production, processing, storage, distribution and commercialization.
  - 3.4. Rationalization in the establishment of food industrialization centers, distributing the incentives according to socio-economic (health) interest as well as to production planning.
  - 3.5. Rationalization of food product characteristics through the establishment of standards of quality and identity for fresh and processed products. Special emphasis should be given to those food products directly affecting low income consumers and vulnerable groups (infants, pre-schools, and primary school children, adolescents, pregnant and nursing mothers, laborers, etc.).
  - 3.6. Rationalization of marine products industry; catching incentives; maintenance of catching quality; better incentives to aquiculture.
  - 3.7. Planning programming for improvement of nutritional characteristics of basic food products through the addition of substances locally produced or minor nutrients which can be produced in Latin American areas; balanced diets; introduction of new consumption habits, etc.
4. Immediate action measures

Immediate actions which could be enumerated which represent an appreciable contribution of Food Technology in the solution of principal food and nutrition problems are:

- 4.1. Wheat: improvement in availability and quality
- 4.2. Improvement of nutritional characteristics of basic infant foods at reasonable prices
- 4.3. Quality Control Program of raw materials and processed foods creating better conditions for the success or economic strengthening of food and correlated industries with positive effects in the production, processing and local consumption of foods.
- 4.4. Program to reduce post-harvest losses, starting with:
  - 4.4.1. Wheat, corn, rice and bean losses;
  - 4.4.2. Sea products losses;
  - 4.4.3. Potato onion losses

Those are the ones of more significant social-economic importance

FOOD INTERVENTION PROGRAMS - PAST, PRESENT, FUTURE

## Part I - A National Food and Nutrition Policy

## Introduction - PRONAN

The Brazilian society, more and more, becomes aware of the fundamental importance of correct diet and nutrition of vulnerable biological groups - pregnant and lactating women, children between 0 and 14 years of age - and low paid laborers. These groups, which are directly affected by food and nutrition problems, are the ones who show less resistance in spite of their importance in the Brazilian progress.

In order to fulfill what was written in the second National Plan of Development (PND) in the strategy of social development, regarding nutrition, it has created PRONAN, Programa Nacional de Alimentacao e Nutricao - National Program of Food and Nutrition for the period of 1976/1979.

With this program the government aims to reduce the degree of absolute poverty that still exists in a large group of the Brazilian population. Besides this program will have a great economic effect and social affect because it will give good help in a decisive manner to the small farmer.

PRONAN is articulated with the Ministeries of Health, Social Security, Work, Education and Culture, Agriculture and has a large range of programs and projects which form an integrated and coherent plan of work.

## Programs and Projects.

1. Programs of food supplementation which contains:
  - a) Service to pregnant women and those who nurse their babies until from 0 to 6 years of age;
  - b) Food to school children from 7 to 14 years of age and to pre-school children.
2. Program of help to the small farmer.
3. Program of activities of complementation and health (formation of human resources; research on food and nutrition, including technological research, enrichment of food, etc.).
4. Mechanics of implementing a Food Program for the workers, with emphasis on the worker of low income.

## Diretrizes Gerais de Acao

- A. Rationalization of offering of service of food supplementation.
  - a) Dinamizacao of official programs of supplementation of foods to pregnant women who nurse their babies and children of 7 years of age belonging to the low income groups and to children under 7 years of age belonging to the low income group and to school children of government schools of first grade;
  - b) Modernization and dinamizacao in the performance of the structures of coordination and education of government programs of food and supplementation;

c) Integrated participation of governmental entities in the financing of distribution of food supplementation to their affiliated and other members;

d) Expansion of the workers' food systems developed by corporations and civil institutions of workers and employers;

e) Concession of specific financing and fiscal incentives to the companies in order to get their participation in the programs of food to the worker;

f) Expansion and modernization of health official structures in order to enable them to act in a permanent way in places where there is no assistance.

**B. Rationalization of system of production and commercialization of food.**

a) Establishment of measures with the objective of rationalization of the buying program of different foods: the PRONAN will work with, in order to avoid possible fluctuations of price and fluctuations of dispensibility of basic foods; also, to make it possible the trend of regional economies, giving special attention to the small farmer and to the agro-industrial cooperatives established in the areas where there is a large number of small farmers.

b) Development of assistance programs to the small farmer;

c) Concession of financing tax and market incentives to the small farmers who belong to the cooperatives;

d) Rational approval of the production of the small farmer in order to support the official programs of food supplementation;

e) Organization of an integrated system of buying, storing and distribution of the food to be used in the food supplementation program.

f) Adequacy of tax and housing policies in suburban areas, to produce a development of horti-agriculture and to avoid the speculation of agriculture soils in those areas;

g) Organization of a commercialization system of basic products, especially those utilized in the official programs of food and nutrition.

**C. Combating specific nutritional deficiencies.**

a) enrichment of food of everyday use, as vehicle of insufficient nutrients in the diet;

b) Implementation of a fluoridation system of the public water and of control of kitchen salt iodation.

**D. Studies and research in food and nutrition.**

a) Development of technology of production of food of low cost and adequate nutritional value and incentives to industrialization and consumption;

b) Evaluation of nutritional status of the population;

c) Definition of agriculture policy nutritionally oriented;

d) realization of applied research.

**E. Forming an improvement of human resources.**

a) The development of programs of training of personnel planning, managing and execution of projects;

b) Improvement of the graduation and post graduation teaching on nutrition;

c) Strengthening of the nutrition teaching in the courses of the health areas and agriculture science;

d) Development of programs forming personnel of elementary and medium level necessary to develop the activities of PRONAN.

## Part II - PROGRAMS OF FOOD SUPPLEMENTATION

### The Four Programs of PRONAN

The programs of food supplementation of PRONAN aim to help the pregnant women, those who nurse their babies, and children from 0 to 14 years of age, to the complementation of their diet.

In the execution of the project to pregnant women, those who nurse their babies and children from 0 to 6 years, it will be used in existing operational structures such as INPS, Brazilian Legion of Assistance (LBA), Foundation SESP, FUNRURAL, CNAE and Secretaries of Health of the States, Territories and Federal District.

Through the Project of Food for School Children they will try to reinforce the already existing structure of the National Campaign of Food for the School Children that is currently active in the Municipal and State Schools and with the community.

The four projects of help that are planned:

- School children and pre-school children - MEC
- Pregnant women, those who nurse their children, and children - INAN
- Social Security
- Workers.

The first two are already being worked on and they are detailed in the following pages. The last two projects are in implementation phase, but plans are already being structured. The Project of the Ministry of Social Security in practice will use industrialized food for distribution in the metropolitan areas (Part IV). The Project of the Minister of Work has no definite menu and the Decree that created it is included.

Other programs of help in municipal and state areas - some of them are private enterprises - are already being developed or being structured. Some of them are cited in the following pages and continued in Part IV.

### Assistance to Pre-School Children

Some of the programs of assistance to pre-school children are being developed in different states of Brazil:

- PLANEDI - Secretaria Municipal de Educacao de Sao Paulo - Program introduced in elementary school;
- Assistance to deficient children from 0 to 3 years in the Programa de Bem Estar Social - Secretaria do Bem Estar Social da Prefeitura Municipal de Sao Paulo;
- CAPE - Rio de Janeiro with orientation from OMEP/Brazil
  - Parada de Lucas
  - Leblon
  - Bangu
  - Mangaratiba
  - Pan Grande
  - Paroquias de Santa Cruz

Projeto Lares Substitutos de Cuidados Diurnos - initiative of religious orders with assistance from OMEP - Ceilandia, DF;  
 Programs of assistance to pre-school children with participation of LBA;  
 Program of incentive to the woman's work and assistance to children in the low income group. Centro de Educacao e Recreacao Infantil da Secretaria de Bem Estar Social da Prefeitura de Joinville, Santa Catarina;  
 Centros Infantis da Secreatria do Bem Estar Social de Sao Paulo.

### Other Programs.

In the State of San Paulo there are different governmental structures that deal with assistance to children, many of which offer medical, educational or nutritional assistance. Such structures reach only a small part of the child population.

In the city of Sao Paulo the Parques Infantis, in 1970, received around 13,000 pre-school children from a group calculated to be 700 thousand.

Right now Pfor. Yaro Ribeira Gandra is working with the Centros de Educacao e Alimentacao do Pre-Escolar (CEAPE) which is a program preventive, economic, practical and efficient, that hopes to give assistance and nutritional education to a large number of pre-school children, using the official schools of the State of Sao Paulo.

In Ribeirao Preto the nutritional assistance to pre-school children is proposed to the Programa Comunitario de Alimentacao (PCA). It is based on the utilization of food produced, commercialized and distributed in the community. This program uses the normal distributional machinery of the small groceries where the families used to normally buy, and gives assistance to pre-school children who live in the neighborhood.

### Part III - FORMER RESEARCH AND PROGRAMS

Food of low cost and high nutritive value.

Many projects for the development and utilization of food of low cost and high nutritive value were realized in Brazil. Some of this food has formulas developed in the country from low cost raw material, and others were formulated from international research.

In the School of Medicine of Ribeirao Preto many products made of soy, milk opac to corn were developed and tried, and they proved to be of very adequate nutritive value for human nutrition, especially of babies and pre-school children. In the Institute of Nutrition of the University of Recife, similar research was developed with Northeastern products.

A soy milk from Coca-Cola, called Saci, some products made of soy flour as Fortifex from Nestle, Derealina from Corn Products and Incaparina from Quaker, also were produced and evaluated in Brazil.

### National Commission of Food - 1950 - 1953

First activity - General Plan of Work - Included in the beginning of the Programa Nacional de Merenda Escolar - effective in 1953 - with the collaboration of UNICEF. It belonged to the Ministry of Education and Health. It started in the Northeast and Amazon region through the Secretary of Education: distribution of powdered milk - UNICEF - mixed flour of cereals were part of the program.

### 1954 - 1955

The program changed its name to Nacional Campanha de Merenda Escolar; it is not part of the Ministry of Health any more but of the Ministry of Education. It promoted the start of enrichment of many of the flours in the Northeast, enrichment of soy in 1954, and enrichment of food with iron salts to fight anemia, 1954-55. There is also the enrichment of salt with iodine. With these studies there is a law in Brazil that enforced the use of iodine in salt in order to fight endemic goiter.

The laws initiated at this time to enrich the flour with vitamins and mineral salt was based on the works of Norman Jolliffe, New York.

A National Commission of Food, Comite Interministerial, established in 1945, realized many problems in the area of food and nutrition in Brazil when it was ended in 1971; it was replaced by INAN.

#### Other Programs.

##### U.S.A.I.D.

The Food for Development office arranges for distribution of PL 480 commodities such as grains, powdered milk or a milk substitute such as CSM, and other available foods to various Brazilian organizations concerned with school feeding, maternal and child health, pre-school feeding, work-front projects, disaster relief and public welfare as well as to agricultural projects such as feed-grains, poultry and swine raising and others designed to increase local food production. Recently the Food for Development program has undergone a number of significant changes, transforming its original charitable aims into the utilization of food commodities as a tool of development. Food inputs support such community development activities as house construction, vocational education, adult literacy, health education, maternal and child care, agricultural development and home economics.

##### Food for Peace Program - Milk Distribution - CPM

The original agreement for this program was signed in 1962 by the National Food Commission, which then turned the milk over to the National Department of the Child for distribution. This never functioned efficiently, since there was a division of responsibility and great duplication of administrative efforts. At the start of 1967 a new agreement was signed directly with the Department of the Child, which later became CPM, and it was hoped that the program would be more effective. It was expected that 600,000 to 800,000 beneficiaries among the most vulnerable groups would receive milk and/or milk substitutes in this distribution program. Unfortunately, due to lack of resources, both financial and in personnel, the program was unable to function in a satisfactory manner. With the creation of INAN, it was decided that food distribution would be handled by that new organization while CPM would provide all other basic health and child care services to this most vulnerable group.

#### Part IV - SUMMARY OF FOOD PROGRAMS

##### Project Guri (small child) - Federal District - GDF/SEC/FEDF

1. Enriched bread with soy, milk and sweet or salted filling.
2. Bread with 60 grams with 8% soy flour, filled with sweets such as guava, pumpkin, banana, quince, salted filling: margarine.
3. Prevention of protein-caloric malnutrition.
4. Brazilia, D.F., approximately 10,000 children from 4 to 6 years of age, distributed in 31 schools.
5. There was a pilot program in 1975. Now it is giving assistance to pre-school children in the deficient areas of the Federal District, by the enrichment of bread, milk and salted and sweet fillings. The first experimental phase was realized during a Children's Camp Holiday with children from 7 to 14 years. (January 1976).



6. From August 1975 INAN is financing the part related to the evaluation that that is to be helped in the program ending December 31, 1976.
  7. The nutritional and psychometrica evaluation is being done and it should have the global results of this work by the end of this year.
  8. The expansion of this program referring specifically to the adopted methodology is already expected and related in the conclusive report about the assistance to pre-school children, elaborated by INAN/DEF/CNAE. This expansion aims to implement the program of supplementation to pre-school children in areas of the country that are deficient (Northeast Region, North and Centro-West).
- Observation: The evaluation is being done in cooperation with INAN.

CEAPE - Belo Horizonte

1. Products being distributed to the National Campaign for Food for School Children - CNAE.
2. Standard Menu:

1st and 3rd weeks		
Monday	Hot dog	Fruit juice
Tuesday	Sweet rice	1 banana
Wednesday	Bread and cheese sandwich	Butterscotch milk
Thursday	Corn bread	Fruit juice
Friday	Meat, bread & butter	Butterscotch milk
2nd and 4th weeks		
Monday	Corn meal mush with cheese	1 banana
Tuesday	Hot dog	Fruit juice
Wednesday	Hominy with coconut and peanuts	
Thursday	Bread with meat sauce	Butterscotch milk
Friday	Cornstarch pudding with eggs and coconut	1 banana

3. To reduce protein-calorie malnutrition in children from 4 to 6 years of age.
4. Municipio de Belo Horizonte - MG, with annual assistance to 20,000 pre-school children. Total assistance in 4 years - 80,000 pre-school children.
5. This is a large scale program.
6. Beginning 1975. Expected duration: 4 years.
7. There is no doubt of realized evaluation.
8. This is an expansion of CEAPE/SP.

Program of Food Assistance to Pre-School Children  
Município do Rio de Janeiro

1. Products Used:

sugar  
rice  
canned meat  
tomato sauce

carbohydrates of corn  
canjica - a special kind of corn  
chocolate  
powdered beans

peas  
 corn meal  
 powdered milk  
 high protein noodles  
 molasses  
 oil  
 eggs  
 salt

weiners  
 dehydrated seasoning  
 banana paste  
 guava paste  
 quince paste  
 sweets made of milk  
 food supplementation  
 high protein mixture of milk

2. Menu:

Rice with fish, sweet  
 High protein noodles with eggs, sweet  
 Dobradinha rice and corn meal, sweet  
 Beans with dobradinha and rice, sweet  
 Corn meal with meat, sweet  
 High protein noodles with weiners, sweet  
 Sweet rice with molasses  
 Corn meal with molasses  
 Carbohydrate meal with chocolate  
 Canjica

3. This menu is supposed to protect protein-caloric deficiency of iron and vitamin A and B complex (riboflavin, thiamin and niacin).

4. Municipio do Rio de Janeiro - 15,000 school children benefit

5. Large scale program

6. This program is being developed for many years under the Municipal Secretary of Education through the school system.

7. We have no data of evaluations.

8. No.

Program of Nutrition and Health from the National Institute of Food and Nutrition.

1. Rice	Manioc flour
Skim powdered milk	Sugar
Corn meal	
2. Rice - 10,737,400 kilos	Manioc flour - 203,100 kilos
Skim powdered milk - 5,749,600 kilos	Sugar - 18,644,900 kilos
Corn meal - 10,737,400 kilos	
Total - 46,072,400 kilos	

3. These contributed to the improvement of the nutritional aspects of the groups biologically more vulnerable - pregnant and lactating women and children with more than 6 months of age and less than 7 years of age from the low income families of the population.

4. PNS was implanted in all the States of the Federation, aiming to reach 1,066,659 people by the end of the year.

5. PNS is a mass national program.

6. PNS - Began in 1975. Duration up to 1979.

7. The evaluation of the efficiency and effectiveness of PNS is being studied.

8. Fish in Pilot-Experiment is being implemented in the Municipality of Fortaleza, CE, a project of the distribution of fish to the beneficiaries of PNS, through the Health Secretary, CEPESCA e PES CART.

## 9. Menu per person:

Groups of Beneficiaries	Milk	Sugar	Corn Meal	Rice	Manioca flour
Pregnant women	17	67	67	67	.
Lactating	17	67	67	67	.
Children:					
6 - 11 months	34	34	.	.	17
1 to 6 years	17	67	34	34	.

Program of the State of Sao Paulo for Pregnant and lactating women, and children.

This program is being developed by the joint work of the Secretaries of Health, Education, Social Promotion, Planning and Agriculture.

The Institute of Food Technology of the Agriculture Secretary is in charge of developing the series of formulations to utilize different programs.

In the case of assistance to pregnant women, a mixture was developed called Gestal to be distributed through the Health Centers. It aims to reach the more vulnerable population of pregnant women. At the beginning 450 tons of mixture were distributed in 4 months time, expecting pregnant women to eat 100 grams daily.

The Agriculture Secretary is beginning a program aiming especially toward assistance to pre-school children from 5 to 6 years of age, including soy milk, bolachas (cookies, salty and sweet) and noodles enriched with soy flour. Formulas for the products utilize wheat flour, corn flour, and soy flour with no oil. Other products are dehydrated soups - the composition of the soups includes rice flour, bean flour, soy flour, corn flour and noodles.

In the case of the program of the Secretary of Social Promotion, children are being assisted from 0 to 6 years, as well as pregnant and lactating women. There will be assistance in different programs. The products to be utilized are the same as those used in the Secretary of Health and Education, and there is an objective to develop also an educational program in order to get a better and more balanced utilization of available food in the different communities.

#### Ministerio da Previdencia E Assistencia Social

Program of food supplementation for vulnerable groups of the population in the large urban areas of the country.

1. They expect to give assistance to children from 3 to 12 months with the supplementation of 20/25% of daily requirements in terms of calorie, proteins, vitamins (B-1, B-2, C, Miacin, A) and mineral salts (Ca, Fe, P)
2. Assistance to pre-school children and school children with the supplementation of 20/25% of daily requirements as above.
3. Assistance to pregnant and lactating women with the supplementation of 25% of daily requirements as above.

16 samples of instant preparation products are put in plastic containers of 1 kilo for institutional use were studied and prepared.

Of the 16 products 3 were finally chosen based on the facilities of production, availability of raw material, price, facility for storage, distribution and administration.

The 3 products selected were checked according to their

- a) chemical analysis
- b) microbiological contamination
- c) biological value

and afterwards they were tested by groups of persons, according to different age levels: in Recife (Prof. Nelson Chaves, Institute of Nutrition), Brasilia (Prof. Joao Bosco Salomon, University of Brasilia), and Campinas with the assistance of LBA in day care institutions and the schools of the city of Campinas and other cities in the neighborhood.

All of the three products had acceptability grades above 84% and this was passed by medical and social assistants.

#### Composition of the products.

The products are based on whole powdered milk, soy flour, corn, rice, manioc, dextrino maltose, hydrogenated fat, egg protein, vitamins, minerals, lecithin, flavor, sugar, salt, etc.

The products are thus designated:

3/12 GH-3

Product for the preparation of bottles for children from 3 to 12 months; 60 grams/180 ml will give 20/25% of the daily requirement for this age group.

MO-2

Product for the preparation of "milk-shake" or cream for pre-school children and for adults, including pregnant and lactating women. 70 grams/150 ml will give 20/25% of the daily requirements.

SoO-3

Product for the preparation of soups (liquid or cream) for the use of pregnant and lactating women or for pre-school children and school children. 70 grams/150 ml or 70 grams/200 ml will be enough for soup, liquid or cream, that will give 25% of daily requirements for pregnant and lactating women.

#### Nutritional Value

Those products have caloric value of 400 calories per 100 grams; from 10-12% protein with NDpCal% between 6 to 8; caloric relation between carbohydrates and fat between 1:1.2 and 1:1.5; biological value in terms of NPU are the same as the casine.

The program will start at the end of 1976 (October or November).

#### Campanha Nacional de Alimentacao Escolar (CNAE)

The National School Lunch Program, founded by Decree-Law No. 37,016 of March 31, 1955, really began developing on a national scale starting in 1964 as a result of the simultaneous input of additional PL 480 commodities for an expanded school feeding program and new Brazilian Government directives which recognized that a school lunch program was important to the development of the country as well as to its national security. As a result, the school feeding program expanded rapidly from 1964 to the present.

For example:

Years	Schools	Students	Meals
1964	34,087	3,939,078	270,316,098
1965	52,487	5,680,257	308,676,424
1971	94,281	11,014,961	1,294,783,680
1972	94,281	12,279,357	1,463,041,059
1973	105,168	11,703,941	1,567,397,074

In 1973 there were 26 regional offices and 252 sector offices to supervise the program. In Brazil there are also 4000 municipalities, each of which has one or two supervisors implementing the school lunch program; these contain more than 100,000 schools assisted by CNAE, which are supported by one or more cooks and kitchen helpers. If one considers those people working in the ports, transporting the commodities, doing community work, and mothers, teachers and other part-time workers, there are at least 300,000 people directly or indirectly working in the program, in addition to those mentioned. CNAE's official payroll in 1971 was Cr\$2,410,394.96.

Warehousing has been improved in all states and territories, with many state governments contributing towards the building of completely new structures, and others remodeling and improving existing facilities. In a few instances, where the state was unable to meet this responsibility, Federal funds were contributed to guarantee the safe storage of the commodities.

The number of vehicles for transportation of commodities as well as for inspection trips by supervisors has expanded from the original 38 trucks, 15 jeeps with trailers, and 15 pontoons for river transportation in the Amazon area contributed by AID from excess property in the 1960's to a total of 315 in use in February 1974. Furthermore the Brazilian Air Force collaborates, when requested, to transport food to geographically difficult sectors, especially in the Amazon region; and the Federal Railroad System provides free transportation of school lunch commodities on all railroads throughout the country.

At the state level most states contribute warehousing, transportation, and supervisory personnel; and at the municipal level, local mayors are usually required to transport the food to their areas in their own municipal trucks and provide supervisory personnel for the local control of the program.

Budgetary allotments are difficult to calculate accurately, since in addition to federal funds, each state, each municipality, and often the local community make additional contributions and sometimes contributions are in cooking fuel, gasoline and maintenance of vehicles, warehousing costs, etc. At the federal level, the national budget for the school lunch program over the past few years has been:

1963	Cr\$	200,000
1964	Cr\$	500,000
1965	Cr\$	2,000,000
1970	Cr\$	160,000,000
1973	Cr\$	255,000,000
1974	Cr\$	400,000,000

Although the school lunch program started out in many parts of Brazil with the most precarious of equipment, this has gradually been improved by both federal and state contributions, as well as local community assistance. Some basic equipment, such as cooking pots, one-burner stoves, cups, plates and spoons, was furnished by AID/W through "Operation Ninos" to start the program in difficult areas, but since then the input by CNAE and others has been much greater than anticipated. Many communities, especially in the economically more favored areas, have sensed the need for better equipment and have raised funds to purchase such items as refrigerators, blenders, and milk-mixing machines; in the state of Guanabara many schools have pressure cookers for beans and the tougher cuts of meat. In many areas the Army is using its equipment to convert the U.S. flour into macaroni and bread for the school lunch program, and the macaroni machines donated by the American Corn Millers Federation to the states of Rio de Janeiro and Sao Paulo have long since been replaced by larger units for much greater production, while the original units have gone to smaller states. Just as an example, the macaroni production in one plant in Sao Paulo is now more than 2 tons a day.

Training has always been an important element of CNAE's expansion. In addition to increasing and training its own staff, CNAE has also obtained technical assistance through closer relations with other organizations, such as ABCAR (Rural Extension Service), State Secretaries of Education and other entities. Furthermore, voluntary assistance by the community has increased, through parents groups, mothers clubs, and local service clubs such as Lions and Rotary.

One of the basic features of the school lunch program has also been training in nutrition education for school directors, local and regional supervisors, teachers and right on down to the semi or completely illiterate cooks who prepare the food. National, state, regional and local training courses have been given, in multiplier effect, in all areas of Brazil. Furthermore, since in Brazil over 30% of the primary school teachers have not had normal school training, the Ministry of Education is giving many in-service training courses, and CNAE has participated in these, giving training in basic nutrition, hygiene and school lunch administration, as well as kitchen demonstrations of food preparation. In addition to its training courses, CNAE has also recognized the need for emphasizing nutrition education in the schools and established a didactic sector at its headquarters to prepare educational materials. It has published books on child care, food preparation, and nutrition education in the primary school, as well as more specific material as needed. To enlighten the general public, a 10 minute documentary film on school lunch was prepared, funded by donations from various firms in Sao Paulo, and was shown in more than 1,000 theaters throughout Brazil. A monthly magazine has also been published and given wide distribution.

CNAE is also purchasing local products, specially where marketing problems exist, such as Brazil nuts, mate, cocoa - thus developing a taste for regional foods among future consumers and at the same time helping stabilize the local economy.

In a special area in the State of Bahia, CNAE is operating a project under the World Food Program, reaching 300,000 students: The project includes training courses, school gardens, and a broad educational program as well as food distribution (see World Food Program).

A most important aspect of the program, developed over the years, has been increasing inputs, both in food purchases and in other costs, by the Brazilian Government. As an example, in Calendar Year 1971, CNAE cost breakdown was as follows:

#### Food Contribution

International:	Title II - \$6,298,031 (16,651 M/T)
	W F P - \$1,588,325 (4,198 M/T)
National:	\$6,533,933 (21,377 M/T) - excludes 3.5 million (10,000 M/T of NFDM and blended food purchased commercially in the USA)

#### Administration Cost

Personnel .....	\$ 9,639,207
Warehouse & Transportation .....	2,333,883
Materials & Miscellaneous .....	1,304,693
Training courses .....	85,531

#### Total Program Costs

International:	\$ 7,886,356
National:	22,149,683
Grand Total:	\$30,036,039

#### Pre-School Program

Starting with informal inclusion of pre-school children in the School Lunch Program, CNAE has gradually expanded this area of its activities. In 1967 around 85,000 pre-schoolers were attended, principally through child-care centers in Sao Paulo. Other states, such as Goias, have also expanded their activities in reaching pre-school children. This is still an area, however, which needs additional consideration. PL 480 assistance over the year has provided Brazil an opportunity to develop a socially oriented program without diverting resources from developmental efforts in other sectors. The present program is now a popular, practical and effective system of delivering food and nutrition education to an important target group, the school-age child. It now involves a majority of Brazil's 20 million families, and is one of the few established systems through which GOB is giving positive evidence of attention to social/economic inequities. Due to Brazil's rapid economic growth, GOB has agreed to a programmed phase-out of total USAID Title II assistance by FY 1977. The USG contribution of foods will be limited to the disadvantaged North, Northeast and Central West regions of Brazil. Specifically excluded will be the States of Rio Grande do Sul, Santa Catarina, Parana, Sao Paulo, Guanabara and the Federal District of Brasilia

It should be noted that the GOB is expected to supply a minimum of 75 grams of food per school day to 12 million primary school children prior to FY 1977. This 75 grams of food per day is a basic minimum and will be supplemented by school gardens providing fruits and vegetables and donations of fresh meat, eggs, etc., from the community.

## CONSELHO DE DESENVOLVIMENTO SOCIAL

E.M. No. 01/76

Em 04 de Fevereiro de 1976

Excelentissimo Senhor Presidente da Republica (\*)

Temos a honra de submeter a elevada consideracao de Vossa Excelencia a anexa minuta de Projeto de Lei, que dispoe sobre a deducao, do lucro tributavel, para fins de imposto sobre a renda, o dobro das despesas realizadas em programas de alimentacao do trabalhador.

2. Conforme e do conhecimento de Vossa Excelencia, o Programa Nacional de Alimentacao e Nutricao - PRONAN preve o estabelecimento de mecanismos de estimulo ao desenvolvimento, pelas empresas, de programas de alimentacao dos trabalhadores.

3. Os referidos programas consistem, principalmente:

a) no estabelecimento de incentivo fiscal ora proposto, atraves do qual parte das despesas realizadas pelas empresas com a alimentacao do trabalhador, e computada em dobro, para efeito do calculo do lucro tributavel pelo imposto sobre a renda;

b) no apoio financeiro para que as empresas com mais de 100 empregados instalem servicos de alimentacao;

c) na participacao do SESC, SESI e sindicatos para utilizacao e instalacao de servicos de alimentacao, inclusive em esquema articulado com as empresas de menor numero de empregados.

4. Estima-se que, como esultado do Programa, podera ampliar-se em cerca de 5,6 milhoes, ate 1979, o atendimento alimentar no trabalho aos empregados, com dispendios totais, no periodo, de cerca de Cr\$ 12,0 bilhoes.

5. O Projeto de Lei anexo, de outra parte, ao limitar a deducao permitida a 5% do lucro tributavel deverater impacto pouco significativo sobre a receita do imposto de renda, sobretudo quando comparado com os beneficios que podera trazer a saude, bem-estar e a produtividade do trabalhador brasileiro.

Aproveitamos a oportunidade para reiterar a Vossa Excelencia os protestos do nosso mais profundo respeito.

JOAO PAULO DOS REIS VELLOSO  
Ministro Chefe da Secretaria  
de Planejamento

MARIO HENRIQUE SIMONSEN  
Ministro da Fazenda

ARNALDO PRIETO  
Ministro do Trabalho

PAULO DE ALMEIDA MACHADO  
Ministro da Saude

LUIZ GONZAGA DO NASCIMENTO E SILVA  
Ministro da Previdencia e Assistencia Social

Aprovado pelo Excelentissimo Senhor Presidente da Republica  
em 04 de fevereiro de 1976

## PROJETO DE LEI No. DE DE DE 1976

Dispoe sobre a deducao, do lucro tributavel, para fins do imposto sobre a renda das pessoas juridicas, o dobro das despesas realizadas em programas de alimentacao do trabalhador.

## O PRESIDENTE DA REPUBLICA

Faco saber que o Congresso Nacional decreta e eu sanciono a seguinte Lei:

Art. 1. - As pessoas juridicas poderao deduzir, do lucro tributavel, para fins do imposto sobre a renda, o dobro das despesas comprovadamente realizadas, no periodo base, em programas de alimentacao do trabalhador, previamente aprovados pelo Ministerio do Trabalho na forma em que dispuser o Regulamento desta Lei.

- 1. - A deducao a que se refere o caput deste artigo nao podera exceder, em cada exercicio financeiro, isoladamente, a 5% (cinco por cento) e cumulativamente com a deducao de que trata a Lei No. 6.297, de 15 de dezembro de 1975, a 10% (dez por cento) do lucro tributavel.

- 2. - As despesas nao deduzidas no exercicio financeiro correspondente, poderao ser transferidas para deducao nos dois exercicios financeiros subseqüentes.

Art. 2. - Os programas de alimentacao a que se refere o artigo anterior deverao conferir prioridade ao atendimento dos trabalhadores de baixa renda e limitar-se-ao aos contratados pela pessoa juridica beneficiaria.

Paragrafo unico - O Ministerio do Trabalho articular-se-a com o Instituto Nacional de Alimentacao e Nutricao - INAN, para efeito do exame e aprovacao dos programas a que se refere a presente Lei.

Art. 3. - Nao se inclui como salario de contribucao a parcela paga in natura, pela empresa, nos programas de alimentacao aprovados pelo Ministerio do Trabalho.

Art. 4. - O Poder Executivo regulamentara a presente Lei no prazo de 60 (sessenta) dias.

Art. 5. - Esta Lei entrara em vigor na data de sua publicacao, revogadas as disposicoes em contrario.

POSSIBLE ACTION PROGRAM - BRAZIL

(Item 11 of Guidelines &amp; Work Plan)

Program for the integration of applied nutrition and food technology in one small Brazilian community with the participation of the University of São Paulo (Faculty of Medicine) and Campinas (Faculty of Food Engineering), Institute of Food Technology of Campinas, Brazilian Association of the Food Industry (SAPRO), and other institutions.

GENERAL OBJECTIVE OF THE PROGRAM

Utilization of appropriate technology to facilitate the industrialization of local agricultural products and to help improve the nutritional state of priority groups (pregnant and lactating women, preschool and school children and laborers).

SPECIFIC OBJECTIVES

- 1) Study of the industrialization of local cows milk so that the conditions of conservation and distribution can maintain an adequate sanitary and nutritional level.
- 2) Study of the industrial utilization of the whey which is, until now, only used as animal feed.
- 3) Local industrialization of corn products, so that it can be utilized by the population and that its nutritional value can be improved.
- 4) To industrialize mixtures of rice and beans in proportion that have the maximum nutritional value so that they can be consumed daily by the population.

GENERAL GOALS

- 1) To demonstrate possible utilization of an appropriate technology in a small community, favoring the utilization of primary products produced locally, and facilitating its commercialism and consumption by the population.
- 2) To demonstrate that this utilization can benefit the nutritional state of priority groups.
- 3) To demonstrate the economical importance that the application of this technology can represent.

NUTRITIONAL GOALS

- 1) About 200 pregnant and lactating women will be assisted annually, who will receive one of the local industrialized products.
  - a) Increase the hemoglobin level
  - b) To follow the weight curve

- c) To verify weight gain
  - d) To stimulate maternal lactation
  - e) To furnish iron sulfate and vitamin A to the diet
- 2) About 1200 nursing infants and preschool children in urban and rural areas will be assisted.
    - a) To accelerate growth development (weight and height)
    - b) To increase the hb level
    - c) To reduce the prevalence of malnutrition by second and third degree
  - 3) About 1000 school children in urban and rural areas will be assisted
    - a) To accelerate growth development (weight and Height)
    - b) Increase the hemoglobin level
  - 4) About 1000 cold meals will be provided
    - a) To diminish morbidity
    - b) To increase the hemoglobin level

PROJECT LOCATION - SÃO TOMAS DE AQUINO

Generalities

São Tomas de Aquino, situated in the South of Minas, elevation 1200 meters.

Basic activities: agriculture, cattle ranching, commerce and a small percentage of professionals necessary to sustain society. Industry: cheese and butter factory.

This Municipality is inclined toward cattle ranching, especially to milk production, still with a rudimentary technology, the product of which is sold to the local factory and to the cooperative in São Sebastiao do Paraiso. It produces about 8,000 liters of milk daily.

The Municipal Government maintains a slaughter house for the supply and maintenance of the butcher shops, where 32 cows and 20 pigs are slaughtered monthly and distributed to the six butcher shops of the city. These butcher shops are managed by their owners and relatives. The sanitary conditions of the slaughtered animals are supervised by lay officials of the Municipal Government.

In the city there are 7 shops (clothing, shoes, yardage, etc.), 10 bars (small markets), 10 food stores (staple goods), 1 supermarket, 1 bakery, 1 store specializing in goods for agricultural use (manure, machines, pesticides), and 2 automechanic shops.

There are 325 vehicles in the city including 40 trucks, 16 stationwagons and 10 taxi cabs.

The city is served by 4 bus schedules that connect it to the Municipalities of Patrocínio Paulista and São Sebastiao do Paraiso.

There is a consumption of 505 thousand cans (20 liters each) of gasoline annually, pumped by 2 gasoline stations.

The majority of the population is Roman Catholic and the families are, in general, stable within the Brazilian patterns. There is 1 main Church and 3 Chapels in the city and 11 (Chapels) in the rural area.

There are 2 Primary Schools in the city, supported by the State, and 1 Secondary School, supported by the Municipal Government; they are attended by 343 and 95 students respectively. There are 12 rural Primary Schools with 388 students and 18 teachers supported by the Municipal Government.

There are 313 TVs receiving channels 4 and 5 from São Paulo. There is 1 recreation club and 1 soccer stadium.

There is 1 rest home for the elderly poor which also shelters the chronically ill, invalids and destitutes.

As you can see, São Tomas de Aquino is a small city with a stable population whose agricultural activities approximates to the great majority of the other Brazilian Municipalities dedicated to the cultivation of the land

This city has been well studied from the nutritional point of view, because since 1968 its population has been the object of anthropometric studies and nutritional inquiry. Since there has been only one doctor for more than 13 years, with a hospital file well organized, the city's data in mortality, morbidity and social-economical conditions is easily evaluated within a very precise criterion.

It becomes, then, the ideal place for the realization of any scientific work to serve not only as subsidy, but also as a pilot plan for the application of techniques and methods that can in the future be applied to bigger areas of the country.

The problem of the commuting laborer (cold meal) constitutes a real plague to the urban centers, and a permanent object of preoccupation to the high administration of the country. Without any guaranteed employment these laborers leave the rural areas, either attracted by the comforts of the city or deceived by the rural proprietor who no longer wants them on his property. Without specialized qualifications, or steady work, these laborers become easy prey to malnutrition or endemic diseases and epidemics producing little and creating a generation of mental deficient that sooner or later will weigh on the social structure of the country.

#### Data About The City

The Municipality of São Tomas de Aquino is a city situated in the micro-region called Mogiana Mineira, in the State of Minas Gerais. Its population is of 6,879 inhabitants, of which 2,563 live in the urban area and 4,316 live in the rural area.

Its economy is based exclusively on the cultivation of the land and raising of cattle, to which both rural and urban population are dedicated.

Here small estates (small farms) predominate, for it is enough to say that in an area of 279 km<sup>2</sup>, one of the smallest municipalities of the State, there are about 500 properties.

Its major income derives from: coffee, corn, milk, rice, and beans.

#### Production Statistics - 1975

Milk	2,943,491 liters
Corn	92,000 sacks (60 kilos each)
Rice	27,000 " " " "
Beans	1,500 " " " "

The city has only one industry - The Fabrica de Laticinios Santa Rita Ltda. It receives 4,000 liters of milk daily.

It produces: "prato" cheese, parmesan, sardo, mussarela and butter  
Whey: 2,500 liters daily for animal feed.

#### Number and Size of the Properties in the Municipality

The Municipality of Sao Tomas de Aquino has 527 rural properties.

Classification of the properties per area:

More than 200 Hectares	42 properties
From 100 to 200 Hectares	38 "
From 50 to 100 Hectares	55 "
From 10 to 50 Hectares	262 "
Less than 10 Hectares	128 "

#### Mechanization and Manual Intensive Labor

The treatment of the land like the preparation of the soil, i.e. ploughing and grading, as well as sowing of cereals, is mostly done by machine. But since the Municipality is a great producer of coffee (about 4 million plants), and because this tillage is still done manually, the agricultural work like weeding, fertilizing, planting and especially harvesting is accomplished without the help of any mechanization.

The great contingent of manual labor is obtained in the city, from where the laborer leaves in the morning in trucks, with his meal already prepared in containers, and which is eaten at the place of work, without heating and with passable organoleptic and nutritional properties.

#### Number of Commuting Laborers

There are about 500 laborers in the city working in the conditions mentioned above.

#### Commercialization

The great majority of the agricultural products is traded (commercialized) in the neighboring cities, with the exception of milk which is partially sold to the cheese factory and partially delivered to a cooperative located in the city of Sao Sebastiao do Paraiso, 24 kilometers from the city.

### Warehousing

There are few warehouses in the city which belong to private firms and are insufficient to store all the corn and rice production. However, for the coffee there are two private firms especially dedicated not only to the commercialization but also to the preparation of the product, capable of storing a great part of the production.

### Indicators of the Nutritional State

Since the city of São Tomas de Aquino constitutes a stable population, we have been gathering data about the nutritional state of the community since 1968.

Several studies were done in São Tomas de Aquino on children from 0 to 12 years old which show weight, height, hemoglobin, nutrition, etc. Some of these studies are reported below:

- I. Aspects of the nutritional state of the child population of São Tomas de Aquino from 1968 and its relation to the social economical standard of the family.
- II. Acceptance of opaque corn II by the child population and possible benefits that its use can bring began in 1969.
- III. Anthropometric study done on students of the age group of 7 and 8 years in Sao Tomas de Aquino in 1971. Study presented to SIBAN.
- IV. Growth, development and nutritional habits of children from 0 to 12 months of age - 1975. Presented to Fourth SIBAN.
- V. Later on, in 1975, the children whose weight and height were recorded in 1968 were weighted and measured again, showing that their weight and height development were below the standards cited above.

### Net of Health Service

Hospital: 1  
Health Clinic: 1  
Pharmacy: 1

### Hospital

Our Lady of the Sacred Heart Hospital is maintained by the community with State Government funds, federal and municipal funds and by conventional agreement with FUNRURAL. It is charitable and 80% of its 36 beds are reserved for the needy and the rural laborers.

The hospital receives out-patients with an average of 700 monthly consultations where child care, prenatal care, accidents, intercurrents and follow-ups on chronic cases are practiced. The greatest contingent of hospitalization is pediatric and obstetric with an average of 40 monthly hospitalizations and about 20 to 26 monthly deliveries.

CHILD POPULATION - São Tomas de Aquino, Mg. - VIII General Census of 1970

Age (years)	-1	1	2	3	4	5	6	7	8	9	10	11	Total
Urban Area	53	47	51	50	55	73	68	65	59	67	69	62	719
Students						7	28	45	51	64	63	47	305
Rural Area	142	117	154	126	136	122	131	130	121	93	160	124	1,556
Students						2	24	67	96	80	125	101	495
Total	195	164	205	176	191	195	199	195	180	160	229	186	<u>2,275</u>
Students - Total						9	52	112	147	144	188	148	800

It has 1 X-Ray machine of 100 mA; 2 rooms for consultations; 1 room for small surgeries; 1 surgery room; 1 simple laboratory, and complete file.

Para-medics personnel: 4 nursing helpers (LVN) Licenses vocational nurse.

### Health Clinic

The health clinic is maintained by the Government of the State of Minas Gerais with 1 doctor and 1 attendant. This clinic distributes medication such as: vermifuges, etc. Prevention of infectious sickness through permanent vaccination such as: tetanus, smallpox, diphtheria, whooping cough, poliomyelitis, measles, and tuberculosis. It exercises sanitary and pigmentary vigilance on the bearers of leprosy and tuberculosis.

### Suggested Types of Industrialization

- 1) Milk: sterilization or powdered
- 2) Corn: flour compounds (soy)  
noodles (pastas)  
Cookies (including crackers)
- 3) Rice and Beans: mixtures  
soups
- 4) Lunch food: laborer's cold meal (to be taken to work)

Estimate:

Personnel:

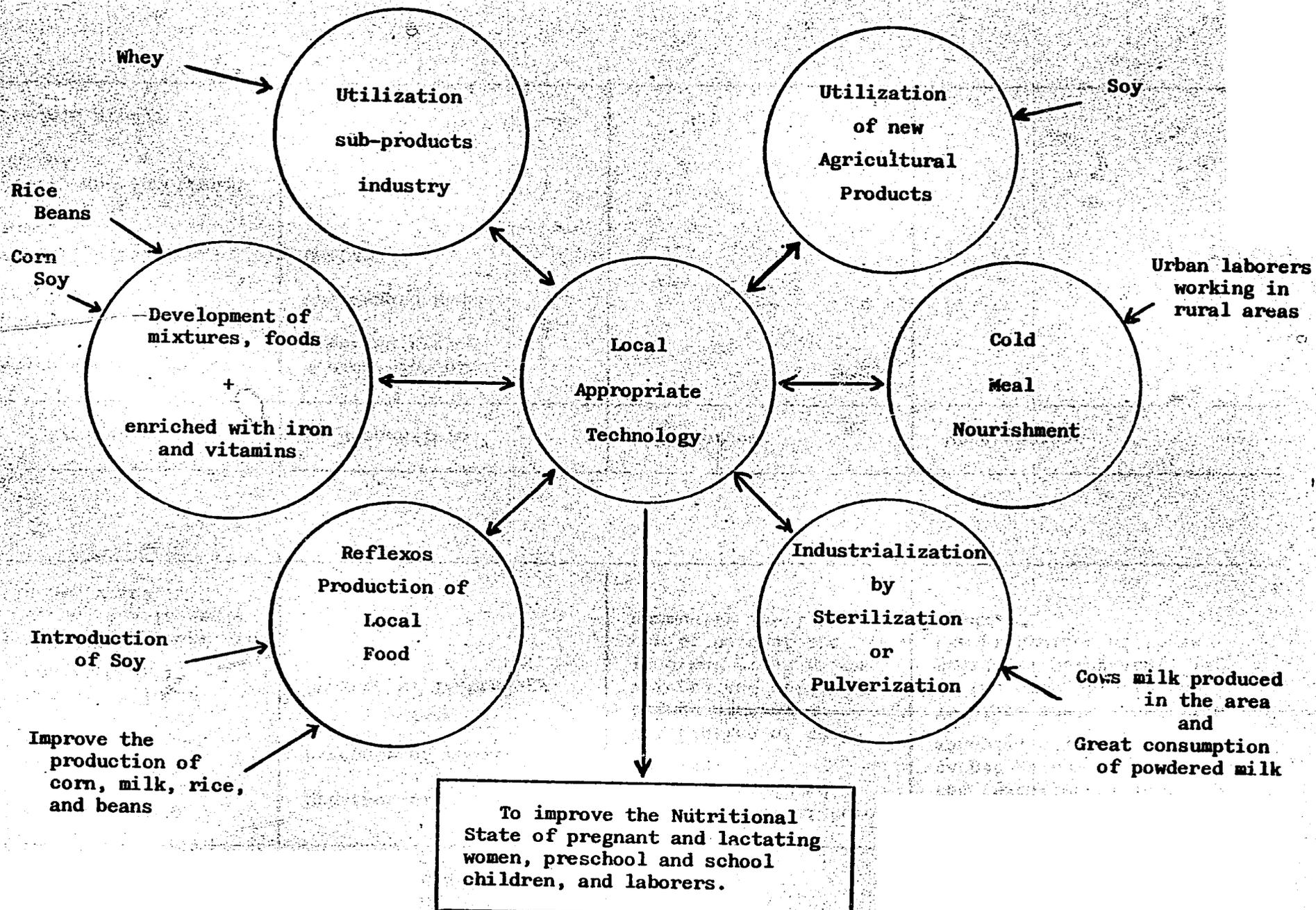
Equipment:

Material of consumption:

### Time of Duration

At least 3 years.

The help requested must be diminishing, being progressively substituted by local help and by official departments.



Objectives	Justifiable Necessities	Strategy	Action
<p>1) To improve the nutritional state of pregnant and lactating women, pre-school and school children, and laborers.</p> <p>2) To apply appropriate technology to small urban areas.</p>	<p>Presence of Malnutrition</p> <p>Presence of Anemia</p> <p>Absence of Technology.</p>	<p>Enrichment or mixtures of foods produced locally.</p> <p>Utilization of technology already developed and utilized in other areas which can be used at the community level.</p>	<p>To distribute and control the ingestion of foods by target groups through schools, clinics, markets.</p> <p>To place small industries in the city through the Municipal Government, for the production of these foods.</p>

Evaluation	Responsible	Resources	Observations
<p>Weight-height curves</p> <p>Determine level of hemoglobin</p> <p>Clinical Nutritional exams.</p> <p>Quality and functional control</p> <p>Economic study.</p>	<p>Medical School Ribeirao Preto</p> <p>Dr. Renato Russo</p> <p>UNICAMP</p> <p>ITAL</p> <p>ABIA</p>		

### Technological Goal

Simple and appropriate technology for local processing of the agricultural production so that the processed foods can reach target groups. This will embrace processing of milk, corn, rice, beans and other crops, like soy, that can be produced in the area.

The technology will include methods of food conservation, their mixtures, and establishment of a communal kitchen to furnish a balanced meal to the laborers who live in the city and work in the rural zone.

Responsible: Dr. Cyro Teixeira (ITAL), and  
Dr. Ottilio Guernelli (UNICAMP)

### Technological programs

#### A. Suggestions of ITAL

##### 1. Objectives

- 1.1 Study of various nutritional products that can be produced by the use of simple technology applicable to community level, trying to utilize raw materials easily obtained in the region, to improve the nutritional level of the diversified population groups.
- 1.2 Establishment of the outline for simple processing adaptable to the community, indicating the most adequate equipment and establishing industrial costs.

##### 2. Accumulated experience

Utilizing the local resources some products could be purchased with the purpose of being introduced in programs to improve the nutritional level of the population.

Therefore, through simple technology, the flours of corn and the flour of soy integral can be introduced locally.

Another product that can be produced locally would be soy milk either pure or in mixture with cows milk. In compliance with the experiments conducted in ITAL, such a product can be sterilized in bottles at accessible prices, and be used by the target population, especially by children. This should be attempted in order to avoid the use of powdered milk.

In the case of pregnant and lactating women, mixtures could be utilized, similar to Gestal, based on corn meal and soy flour integral and others, with good protein and caloric value.

Formulas for dehydrated soups, utilizing corn flour, beans, soy and rice as raw material, can be adopted, especially for the nourishment of school children as well as pregnant and lactating women.

Some of the products to be adopted can be enriched with mineral salts and some vitamins of which the population shows deficiency.

Experiments done by ITAL with children and adults taken place in Elementary Schools and in the Fundo de Assistencia Social do Governo do Estado de Sao Paulo (Dep. of Social Assistance) have revealed good acceptance of enriched pastas and cookies (salty and sweet), which also constitute other options for local production.

### 3. Plan of Action

- 3.1 Incentive for local production of diverse raw materials necessary for the manufacture of the diverse nutritional products selected.
- 3.2 In the beginning feasible products could be produced in the pilot lines like the ones existent in ITAL, so that preliminary attempts can be made in the community to evaluate the degree of acceptability and effects on the improvement of the nutritional state of the groups in study.
- 3.3 In a second phase, the processing lines necessary for the application of simple and efficient technology would be installed in the community.
- 3.4 Possibility of utilization especially in institutional programs, of other types of food produced on a large scale, in industry of great capacity, using more sophisticated technology, if economically possible.
- 3.5 Educational program to make the population more conscious of how to better use the foods available in the region, aiming to raise its nutritional level. This program would also aim to improve the usage of residues and by-products in rations to obtain foods from animal origin.

### B. Suggestions of UNICAMP

"Revision of the technological process and quality improvement of basic products of child nutrition."

#### 1. Objectives

Apply more modern methods in the industrial production of foods traditionally used in the child diet, as well as to establish methods inclined to increment the quality of these foods.

#### 2. Justification

This work justifies itself with one more point of support in the experiment that is intended to take place in the locality of São Tomas de Aquino (as well as in other Brazilian localities), deriving from this experiment a volume of technical knowledge necessary to uniform the characteristics of quality of the products destined to the child nutrition, in a general way.

#### 3. Subjects to be considered

In the present work the following subjects will be considered:

- a) processing of similar raw materials
- b) improvement of inherent technological processes

c) improvement of the nutritional quality through additives and through special techniques of food production for the child usage.

d) establishment of uniform production patterns (rationalization of production patterns), estimates of industrial costs, types of packaging, shelf-life of the product, nutritional value, types of consumer information.

e) industrial costs, of promotion and sales, distribution, commercialization, small weight packaging, and institutional packaging.

f) subsidy to the establishment of production regulation and of quality control of these products.

#### 4. Products more used in child nutrition - object of this program

4.1 Wheat and its derivatives: bread, noodles, cookies (salty and sweet)

4.2 Mixtures of flours (composed of flours) for diverse preparations: bread, cookies, formulas, noodles, etc.

4.3 Rice flour, corn flour, corn starch, flakes of manioca, arrowroot, etc.

4.4 Margarine

4.5 Various industrialized milk, normal and/or modified milk; various milk powders, milk derivatives (creams, puddings, yoghurt, etc.

4.6 Sugar (saccharose) for all purposes.

#### 5. Economical feasibility

Study of the economical possibilities of new technological implantation; processing costs; equipment; utilities (vapor, energy, labor, etc.); legal aspects; packaging and inversion with packaging; margins of profit; promotion and sale; technical assessment; analytic and microbiological quality control; functional quality control; quality control of biological nutrition.

#### 6. Responsibility of the project execution

a) Project São Tomas de Aquino

b) F.E.A.A., through its Dept. of Food and Nutrition planning.

c) Center of Nutrition of UNICAMP of Paulinia

d) Department of Nutrition of the University of Ribeirao Preto (Dr. Dutra de Oliveira)

e) Ministry of Health, Rio de Janeiro, Permanent Commission of Food Standards and Laws.

f) ITAL

g) INAN

Under the coordination of 1 a, it is foreseen the organization of the Working Team that will take the responsibility of the Project in cause.

Duration of the Project: The same duration period as the Project São Tomas de Aquino.

BRAZIL - PRONAN - Brazilian Food and Nutrition Program - 1976-1979

## REFERENCE MARKS

The food distribution curve follows very closely and has strong correlation to the income distribution curve. Therefore one can only think in terms of a well fed population when mechanisms for correcting direct income distribution are introduced, capable of assuring the repassing of the results of economic growth to the entire population. Thus, any pure and simple supplementary feeding program does not incorporate definitive improvements in the survival condition of the population, but functions as a corrective of direct distortions which, in the short term, continue to prevail. For this reason the various indirect redistributive programs through which governmental action seeks to improve the conditions of life of the most needy of the population are regarded as highly strategic.

The Food and Nutrition National Program - PRONAN is seeking to resolve the serious nutritional problem of the country, in a correct and realistic manner, attempts, simultaneously, to stimulate the system of food production and distribution through the use of incentives and actions to rationalize its performance.

This synergetic action, in keeping with the current social development policy, is based on the evidence that nutritional deficiencies stem from an extensive group of variables within which the PRONAN will function in an integrated manner on the factors which are most critical and most directly correlated with its area of competence.

The National Food and Nutrition Program concentrates on three broad streams of action:

1. Food supplementation to pregnant women, nursing mothers and children under 7 years old, school children from 7 to 14 years and workers;
2. Rationalization of the System of Food Production with emphasis on the stimulation of the small producer;
3. Complementary Support Activities, destined basically to combat specific nutritional deficiencies through fortification of currently consumed foods; the support of studies and research, including technological studies and research, in the area of food and nutrition; the qualification and improvement of human resources and the development of an adequate infrastructure for the distribution of foods.

This over all focus stems from the principle that the improvement of the nutritional conditions of a population depends on the reduction of cost production and trades of basic foods, and a better distribution of income.

The Projects comprising the PRONAN - which reflects the proposed national policy - attempt to provide a response of proportional size to the social extension of the problem. Resources estimates for the PRONAN in the next four years amount to 12.4 billion cruzeiros and the purchase of foods will reach the size able sum of 8.6 billion cruzeiros. Starting with a purchasing power of this magnitude, there arises immediately the possibility of giving the projects of supplementary feeding a double social content. It is known that traditionally the areas which produce food for internal consumption are, in great part, made up of small and medium size farmers. This purchasing power for foodstuffs, if managed with the purpose of maximizing the well-being of the population, can contribute, with impact, to the economic and social promotion of a considerable rural population. It is in this way that the growth of assistance programs may favorably influence the well-being of needy people in the

city and on farms. It is emphasized that it is not only a question of increasing assistance programs to the point of giving them social significance, but also, and perhaps principally, through the large volume of directed purchases, activities of the small producer, assuring him governmental assistance up to now almost exclusively available to the large producer. Moreover, it seeks to act as an agent of rationalization and modernization of the entire system of food production and trade.

This modernization of the Brazilian Agriculture which is expected to be attained by increasing the supply of technical and credit assistance and by the emergence of a large institutional market (official supplementation projects), will benefit the whole population ensuring an adequate supply of low cost foodstuffs. This increased supply will permit an improvement in both health and nutritional status of lower income groups. Furthermore, it will increase the purchasing power of the other income groups, as a result of a relatively smaller expenditure of food consumption, fostering, in this manner, economic activity.

#### BASIC PROGRAMING

##### A. Food Supplementation

1. Supplementation of food to pregnant and nursing mothers and children under 7 years old.

- 1.1. General Objective.

Provide food supplements to the biologically most vulnerable groups - pregnant and nursing mothers and children under 7 years old - whose monthly family income is not higher than twice the highest minimum salaries in the country at that time.

- 1.2. Execution.

Ministry of Health, Ministry of Social Security and Social Assistance, and Ministry of Education and Culture.

- 1.3. Specific Objectives.

- Reduce the mortality rate of children born underweight;
- Stimulate and enable the prolongation of the period of breast feeding;
- Assure favorable conditions for growth, weight increase and the growth of the nervous system in children below 7 years old.

- 1.4. Strategy.

In view of the fact that attending a geographically dispersed population is operationally more difficult and costly, it was decided to adopt as strategy two types of coverage. A more intense one in the areas of the seats of municipalities (counties) and areas regarded as urban by the census, in view of the fact that in addition to operational facilities, the most severe food deficiencies are found in the poor populations in direct proportion to the increase in the degree of urbanizations. The second, to take place in all municipalities in their areas considered to be rural. Priority attention will be given to the semiurban marginal populations around metropolitan centers or in rural areas having a low level of development.

The number of persons to be attended will be estimated by special cross-tabulations used by FIBGE, which will furnish the number of the biologically vulnerable within the pre-established income level. The execution of the project will be undertaken primarily on the basis of natural demand for health services available, or to be established.

The Executing Organs, within their sphere of action, will concentrate resources in State Units and municipalities which are in greatest need,

giving special emphasis to the stimulation of the expansion of the official health network, of a permanent nature, in localities which are at present without assistance.

1.5. Goals.

The project foresees regular attendance at the end of the four year period 1976/1979 of approximately 1,900,000 pregnant and nursing women, and 800,000 children under 7 years old.

2. Supplementation for 1st Grade Children and Pre-school Children.

2.1. General Objective.

Provide supplementary feeding to school children from 7 to 14 years old and pre-school children who lack resources.

2.2. Execution.

Ministry of Education and Culture, through the CNAE, and Ministry of Health and Ministry of Social Security and Social Assistance.

2.3. Specific Objectives.

- Reduce the rate of absenteeism, repeated school years and school evasion;

- Contribute to the improvement of food habits of school children.

2.4. Strategy.

The project proposes to give priority attention to children enrolled in the grades of the 1st level of the official school network providing a substantial increase in the nutritive content of the school lunch, increasing the frequency and guaranteeing continuity of distribution. At the same time resources will be applied in the endowment of improvement of specific school equipment for the distribution of the lunch in the areas of greater density of low income population.

2.5. Goals.

The project foresees regular attendance at the end of the four year period 1976/1979 of approximately 9,100,000 school children.

3. Food for the Worker.

3.1. General Objective.

Provide facilities for feeding low income workers.

3.2. Execution.

Ministry of Labor.

3.3. Specific Objectives.

- Improvement in the food and nutrition and consequently in the health of the worker;

- Increase in labor productivity;

- Reduction in the rates of absenteeism and labor hazards.

3.4. Strategy.

The project will be based on various forms of distribution as a result of the dispersion of worker occupations. Enterprises with 100 or more employees should establish canteens of their own, whose installations can be financed through special lines of credit from the BNDE, and should benefit from income tax incentives.

The structures of SESC, SENAI and of Labor Unions should be expanded and utilized in such a way to establish, in urban areas with large concentration of workers, appropriate restaurants destined to attending, by means of agreements, the employees of small firms. These installations may be financed through resources of the FAS.

Rural workers as well as civil construction workers, may be served with pre-prepared meals stipulated by the project.

### 3.5. Goals.

The project foresees regular attendance, at the four year period 1976/1979, of approximately 5,600,000 workers.

#### B. Rationalization of the System of Producing Foodstuffs with Emphasis on the Small Farmers.

##### 1. General Objective.

Promote the rationalization of the system of production of the small farmer, with a view toward improving the supply of foodstuffs at the local level, and supplying governmental projects of food supplementation.

##### 2. Execution.

Ministry of Agriculture, through EMBRATER, INCRA, SUDEPE, COBAL and CIBRAZEM.

##### 3. Specific Objectives.

- Rationalize the utilization of agricultural lands;
- Promote the agricultural worker socially and economically through the activation of colonization and agricultural restructuring projects;
- Promote the establishment of agro-industrial cooperatives which organize the small and medium producers, making them economically viable;
- Promote the organization of fishermen, principally those who devote themselves to manual fishing, into cooperatives or colonies;
- Reduce and organize the channels of trade for basic products pertaining to the official food supplementation projects and others devoted to the popular diet;
- Assure a priority market - through projects of official supplementation - to agro-industrial cooperatives of small producers who should deliver industrially transformed and nutritionally fortified foodstuffs when pertinent.

##### 4. Strategy.

###### 4.1. Agro-industrial and production cooperatives.

In each State, areas of basic foodstuff production explored by small and medium producers will be identified, and development projects for these will be prepared, respecting agricultural vocations, but stimulating diversification of production when viable.

These development projects will promote the organization of producers in the form of associations establishing agro-industrial groupings into one or more cooperatives on the basis of economy of scale of production.

Experience in associative projects emphasizes the extreme importance of governmental presence in the initial phases of these, not only in the formation of basic social capital of the agricultural communities, but also in management questions.

Unsophisticated processes of food fortification will be utilized by the agro-industrial cooperatives, which will find priority market to the official projects of supplementary feeding. The official storage and transportation system will give priority attention to the development of the programs stimulating the small producer. It is also proposed to open a special line of agricultural credit, at low interest rates and conditions which will facilitate its use.

Within the policy of rationalizing the use of agricultural lands, the expansion of livestock in "crop lands" will be discouraged, thus avoiding the use of fertile land exclusively for pasture.

#### 4.2. Stimulation of the development of fishing.

Because of its high nutritive value, fish can contribute in a significant manner to the improvement in the nutritional level of the population. With a view towards stimulating the consumption of this food, measures will be adopted destined to reduce the losses resulting from the lack of an infrastructure of warehouses and distribution facilities, which cause a discontinuous flow in the supply of fish, as well as excessive fluctuations in the price and quality of the product.

The organization of fishermen, specially those dedicated to manual fishing, into cooperatives; the mounting of infrastructure of unloading and distribution facilities; the development of fishing in interior waters - these are basic objectives of the project.

#### 4.3. Green belts in semi-urban areas.

In subsequent stages, through an adequate manipulation of tax and housing policy, an effort will be made to curb speculative maneuvers of agricultural lands in semi-urban areas. Their rational application will promote the formation of truck-gardening green belts, thus reducing transportation, conservation and waste and avoiding middleman interference. To this end installations of urban-agrarian housing units will be used. In these the availability of arable areas will improve the food diet and the real income of the dwellers. This will involve coordination with urban development policy organs and their financing agents such as the BNH, the CEF, the Housing Cooperatives.

#### 4.4. Goals.

The goals will be defined when details of the projects are determined by the Ministry of Agriculture.

### C. Complementary and Support Activities

#### 1. Combat Specific Nutritional Deficiencies Through Food Fortification.

##### 1.1. General Objective.

Promote the reduction of the more widespread nutritional deficiencies and those having the most serious consequences on the population, through the addition of nutrients to commonly used foods.

##### 1.2. Execution.

Ministry of Health

##### 1.3. Specific Objectives.

Reduce nutritional deficiencies specifically of iodine (endemic goiter), iron (anemia derived from lack of iron), fluor (dental decay), and vitamin A.

##### 1.4. Strategy.

In view of the widespread nature of these deficiencies, they will be combatted, basically, by the use of certain foods of common use in the entire population as the vehicle for the nutrients which are lacking in the diet. The use of this method is justified by the low relative cost and wide outreach to the population. Besides this it respects already established food habits.

### FLUORIDATION OF WATER FOR PUBLIC USE

The project seeks to reduce up to 65% the incidence of dental decay through the consumption of fluoridated water distributed through systems to be implanted in the cities of more than 50,000 inhabitants since the tests of publicly supplied water show deficiency of fluoride.

### IODIZING SALT

The project seeks to train auxiliary personnel in the Secretariats of Health in the State Units in the control of iodized salt. The

responsibility for analysis and control of salt for human consumption is attributed to local health inspection organs. The training of specific personnel for this purpose becomes necessary. The training will be short term and will be given under the responsibility of SUCAM, with support from INAN.

#### FOOD FORTIFICATION

The project seeks to promote the nutritional fortification of commonly used foods such as sugar, salt, mandioc flour and flour substances used in infant feeding, through the addition of vitamins, mineral salts and proteins. These products will be used initially in official food supplementation projects, to test receptivity, efficiency and costs. Later they will be launched at incentive prices to the consumer on the commercial food network, starting with units of the Brazilian Foodstuffs Company - COPAL.

### 2. Development of Technology of Low Cost Foodstuffs Having High Nutritional value and Incentives for Their Industrialization and Consumption.

#### 2.1. General Objective.

Promote the development of technology and industrialization of foodstuffs with high nutritional value destined for low income groups.

#### 2.2. Execution.

Ministry of Health and Ministry of Industry and Commerce.

#### 2.3. Specific Objectives.

- Stimulate development research and adequate techniques for processing foodstuffs of high nutritive value, promoting their publicity and use;

- Stimulate the diffusion and assist in the establishment of technological processes of industrialization for fortification of foodstuffs;

- Promote the consumption of fortified foodstuffs through sales at prices accessible to low income consumers, and their distribution through projects of supplementary feeding;

- Assist agro-industrial cooperatives in supplying techniques which have been developed.

#### 2.4. Strategy.

The project is based on the assumption that modern technology for processing and industrializing foodstuffs permits the use of alternatives in the processing fortification, concentration and commercialization, at low price, of food-stuffs capable of contributing to modifications in the feeding habits and, consequently, in raising nutritional standard of the population.

### 3. Studies and Research in Food and Nutrition

#### 3.1. General Objective.

Promote the realization of studies and research destined to the evaluation of the nutritional state of the population and defining operational measures most suitable for the implementation of activities related to the promotion of an attack on malnutrition.

#### 3.1. Execution.

Ministry of Health and Ministry of Agriculture.

#### 3.3. Specific Objectives.

- Promote the systematic and periodic evaluation of the nutritional state of the population;

- Support the realization of studies and research destined to provide guidelines for policy in the agricultural sector, by way of attending to the food and nutritional needs of the population;
- Promote studies and research on the most efficient and economical solutions to combat poor nutrition in the country.

#### 3.4. Strategy.

The activities of this project will be developed in the following fields:

- Realization of tests of new ways of attending priority group;
- Research on the efficacy and efficiency of projects under way, and alternatives for the control of nutritional deficiencies;
- Research related to the supply and demand for foodstuffs in order to improve the nutritional state of the population;
- Study of the nature of the geographical and age group distribution of nutritional deficiencies.

Studies and research on a national scale to evaluate the nutritional state of the population, will be developed through FIBGE, which will install a data bank on food and nutrition. Studies related to nutritionally oriented agricultural policy will be conducted by the Ministry of Agriculture through SUPLAN, which will mobilize universities and other Research Centers for this purpose. These will also receive support for promoting the studies necessary for a definition of the most efficient and efficacious measures to combat malnutrition. Other nutrition research projects may be developed by competent institutions in accordance with the evolution of the PRONAN.

### 4. Increasing the Capacity of Human Resources

#### 4.1. General Objective.

Intensify the training of personnel required for planning policies, projects and activities of food and nutrition as well as their implementation.

#### 4.2. Execution.

Ministry of Health, Ministry of Labor and Ministry of Education and Culture.

#### 4.3. Specific Objectives.

- Qualify personnel at the national and state levels for the administration and planning of food and nutrition projects;
- Qualify personnel for the elaboration and management of state level projects;
- Improve and expand the undergraduate courses in nutrition;
- Strengthen instruction in nutrition, in the courses in the area of health sciences;
- Provide complementary training in nutrition as applied to public health for professionals of careers related to the programming of food and nutrition;
- Train middle level and auxiliary personnel needed to implement the food and nutrition projects.

#### 4.4. Strategy.

The project includes activities destined to intensify the training of personnel required to analyses and up-date information, prepare the national program of food and nutrition and execute the corresponding projects. It includes training activities at the graduate, undergraduate and middle levels, and short term, intensive courses, utilizing the existing structure of education in the country. For this purpose resources will be provided so that the Universities and Centers of instruction will strengthen their teams with invited professors and acquire additional equipment needed for instruction. Besides this, resources will be provided for the maintenance of trainees during the training period. The development of the project will count on the participation of FINEP and of PIPMO (Ministry of Labor).

5. Implantation and Implementation of the Network of Posts for the Distribution of the Projects for Supplementary Feeding

5.1. General Objective

Enlarge and strengthen the infrastructure destined to implement projects of food supplementation at the local level.

5.2. Execution.

Ministry of Health, Ministry of Social Security and Social Assistance, and Ministry of Education and Culture through CNAE.

5.3. Specific Objectives.

- Adapt the units of the health network for the execution of the projects of supplemental feeding, annexing to them food distribution posts;

- Promote the distribution of foodstuffs in municipalities (counties) which still do not have medical assistance services, through stimulating the implantation of simplified health units;

- Improve equipment and the places of food distribution in the school network.

5.4. Strategy.

The executing organs will concentrate resources of the project in areas of low of income, giving, furthermore, special emphasis to States which possess the largest number of municipalities not attended by the official health network and to peripheral zones of large cities.

ACRONYMS -

FIBGE - Brazilian Institute of Geography and Statistics (Foundation).

CNAE - School Lunch National Program.

SESC - Trade Employees Social Service.

SENAI - Industrial Training National Service.

EMBRATER - Technical Assistance and Rural Extension Brazilian Enterprise

INCRA - Colonization and Land Reform National Institute.

SUDEPE - Superintendency for Fishing Activities Development

COBAL - Foodstuffs Brazilian Company.

CIBRAZEM - Warehousing Brazilian Company.

SUPLAN - Ministry of Agriculture Planning Sub-Secretariat.

FINEP - Projects and Research Financing Organism.

PIPMO - Intensive Program for Training Labor Power.

BNDE - Economic Development National Bank

FAS - Fund for Supporting Social Development.



NORTHERN COUNTRIES COMMITTEE REPORT

Committee

Dra. Teresa Salazar de Buckle, Colombia, Chairwoman  
Ing. Francisco Aguirre, ICIATI, Central Am. & Panama  
Dr. Ricardo Bressani, INCAP, Central Am. & Panama  
Lic. Maria Inez de Castanos, Bolivia  
Dr. Jose M. Portilla, Ecuador  
Dr. Guillermo Lopez de Romana, Peru  
Dr. Mario Solorzano M., Nicaragua

North American Advisors

Dr. Horace D. Graham, U. Puerto Rico  
Dr. Miguel A. Jimenez, Reynolds Metals Co.  
Ing. Eduardo R. Mendez, Jr., Fries & Fries Intl.,  
Mexico

November 1976

## AKNOWLEDGEMENTS

The Chairwoman wishes to thank the following I.I.T. people, who collaborated in preparing this report:

Misael Castaneda, Chemical Engineer (data retrieval and initial analysis).

Hernando Riveros, Chemical Engineer (data compiling on Colombian food technology infrastructure and post-harvest food losses).

Eileen McAlinden de Casabianca, chemist, and Guillermo Prada S. Ph.D. (collaboration in the English version of the test).

## CONTENTS

	<u>Page</u>
I. <u>INTRODUCTION</u> .....	1
II. <u>INFORMATION OBTAINED AND ITS ANALYSIS</u> .....	2
A. Institutions .....	2
B. Physical Resources .....	2
C. Teaching Centers .....	2
D. Library Facilities and Information Services in Food Technology .....	2
TABLE No. 1. Physical Resources .....	3
TABLE No. 2. Laboratory Resources .....	4
TABLE No. 3. Pilot Plant Resources .....	5
TABLE No. 4. Teaching Centers .....	6
E. Nutritional Information .....	7
F. Post Harvest Losses .....	7
TABLE No. 5. Library Facilities .....	8
TABLE No. 6. Nutrition Information .....	9
TABLE No. 7. Food Supply Factors .....	10
TABLE No. 8. Food Losses .....	11
G. Food Intervention Programs .....	12
TABLE No. 9. Food Intervention Programs .....	13
TABLE No. 10. Food Intervention Programs Present .....	14
III. <u>HOW CAN FOOD TECHNOLOGY BE APPLIED MORE EFFICIENTLY TO MALNUTRITION PROBLEMS</u> .....	15
A. Foreword .....	15
B. Actions to be taken in the Field of Food Technology .....	18
IV. <u>POSSIBLE ACTION PROGRAMS</u> .....	19
TABLE No. 11. Classification of Action Programs .....	20
V. <u>REFERENCES</u> .....	23
VI. <u>ANNEX I ESTABLISHING PRIORITIES</u> .....	24
VII. <u>ANNEX II PEOPLE OTHER THAN COMMITTEE MEMBERS WHO ASSISTED IN ASSEMBLING INFORMATION</u> .....	26
VIII. <u>ANNEX III INFORMATION RECEIVED FROM THE DIFFERENT COUNTRIES.</u> .....	Volume II, of this Report Not Attached.

## I - INTRODUCTION

The present report corresponds to the work done within the I.F.T. Nutrition/Food Technology Study for the Northern Countries Region that originally included Bolivia, Peru, Ecuador, Colombia, the Central American countries and Panama.

Information was also obtained for Jamaica and the Dominican Republic.

The purpose of the study was to identify actions which could be taken by governments of less developed countries, AID or other donors, to stimulate increased application of present food technology resources to help solve nutrition problems in Latin America.

The specific objectives of the study were aimed at obtaining information concerning the following topics:

- Present Food Technological Resources in Latin America,
- Problems which contribute to malnutrition in the target group (preschool children and pregnant and lactating women),
- Reasons for the relatively low impact of Food Technology on the solution of these problems.

To accomplish the objectives of this study, the advisors assigned to the program prepared a set of questionnaires to be filled out by several institutions within the different countries and assigned committees of local nationals to the different geographic regions. The Committee and North American Advisors for the Northern Countries Region are listed on the cover page.

There were four Committee meetings for the Northern Group which took place in Bogota, April 26; Quito, July 11-12 (attended by representatives of Colombia, Bolivia, Ecuador, and E. Mendez); Panama July 20-21 (attended by representatives of Guatemala and Colombia); and Panama, September 6-7.

During the first two meetings the Committee members discussed the methodology to be followed, the results obtained, and the strategy to pursue in order to complete and analyze the information gathered.

In the last meeting a preliminary analysis was made of the information collected up to the end of August.

The information obtained for the region appears in Tables 1 to 10 and the corresponding discussion in Section II-B. The possible action programs identified by each member of the Group were discussed with the advisors, reviewed and accepted for presentation (See Sections III and IV).

A list of projects or programs was produced by the Committee and the lists were subjected to a priority analysis. The method selected for this analysis consisted in evaluating the relative impact that different action programs could have on a given objective. A set of criteria was selected as well as deliberation factors. The criteria selected and the results of this exercise are included in Section IV-B.

## II - INFORMATION OBTAINED AND ITS ANALYSIS

The information gathered for the Northern Region is summarized in Tables No. 1 through 10. The original forms filled out by the different institutions and countries are contained in a separate Volume II of this report (Annex III) and are not attached as a part of this report. Annex II contains a list of the people that collaborated in the different countries by providing information useful to this study.

In Tables No. 1, 2, and 3 data on the available physical resources in Food Technology and Nutrition for the Northern Region are presented. In some cases this information is quantitative and in others, it is only qualitative in nature (based on the knowledge available to the Committee members) because the promised data was never received by the Chairman of the Committee (This was the case of Nicaragua, Costa Rica and Panama).

### A. Institutions

The majority of existing institutions (research and teaching) are sponsored by the local government or by international organizations (case of INCAP). The Professional staff active in the field is abundant in Colombia and Guatemala. It seems to be scarce in Honduras, Bolivia and Jamaica.

### B. Physical Resources. (Tables 2 and 3).

Physical resources, as far as laboratories and pilot plant facilities are concerned, seem to be adequate for all countries with the exception of Bolivia, Salvador and Honduras. Laboratory equipment and instrumentation seem to be adequate. The absence of sensory testing facilities and experimental kitchen in several institutions is noticeable. With reference to Pilot Plant facilities the most complete and versatile seem to be located in Colombia and Guatemala,\* followed by those of Quito, Ecuador. There are specialized facilities for meat and milk processing in Colombia, Dominican Republic and Ecuador. The original forms did not allow us to discriminate specific facilities for the handling and processing of cereals or vegetable proteins.

### C. Teaching Centers (Table No. 4)

In the Northern Region there is only one school that offers a technical degree (intermediate level) in Food Technology, (U. de Antioquia, Colombia). There are five universities that offer a first degree in Food Technology and 3 centers that offer graduate studies in the same field. There are seven schools of nutrition at the undergraduate level five of which are located in Colombia. Post graduate studies in Nutrition are offered in Guatemala and in Colombia. In Colombia, courses in Food Technology at the undergraduate level are offered in the school of Chemistry, Pharmacy and Chemical Engineering, while courses in Nutrition are offered in the Schools of Medicine.

### D. Library Facilities and Information Services in Food Technology (Table 5)

Library facilities in this field seem to be good in Colombia and Guatemala, adequate in Ecuador and Peru, incipient in the rest with the exception of Bolivia and Nicaragua where they appear to be poor. There is a recently created Food Technology Information Service that includes the

---

\* and Peru

TABLE NO 1  
 PHYSICAL RESOURCES IN FOOD TECHNOLOGY AND NUTRITION IN SOME COUNTRIES OF THE NORTHERN REGION  
 RESEARCH AND EDUCATIONAL INSTITUTIONS

ITEMS	COUNTRIES																																						
	COLOMBIA			ECUADOR			PERU			BOLIVIA			GUATEMALA			EL SALVADOR			HONDURAS			DOM. REPUBLIC			JAMAICA			NICARAGUA			COSTA RICA			PANAMA					
	NO	ACTIVITY			NO	ACTIVITY			NO	ACTIVITY			NO	ACTIVITY			NO	ACTIVITY			NO	ACTIVITY			NO	ACTIVITY			NO	ACTIVITY			NO	ACTIVITY					
	T	N	D		T	N	D		T	N	D		T	N	D		T	N	D		T	N	D		T	N	D		T	N	D		T	N	D				
Government	7	2	2	5	5	5	2	6	5	1	3	2	2	1	3	2	4	2	2	2	1	1	3	2	1	2	2	2											
Mixed character	1	1	1																																				
Private	2			2				1	1			1	1																										
Personnel	NUMBER			NUMBER			NUMBER			NUMBER			NUMBER			NUMBER			NUMBER			NUMBER			NUMBER			NUMBER			NUMBER			NUMBER			NUMBER		
	T	N	D	T	N	D	T	N	D	T	N	D	T	N	D	T	N	D	T	N	D	T	N	D	T	N	D	T	N	D	T	N	D	T	N	D			
Professionals	73	237	115	36			59	18		13			141		18				4	4	43	11	16		16														
Non-Professionals	58	131	31	19			11	7		2			51								5	3	11		12														
Administrative	71			20			30	5		1			2								14	5		15															
Operational Physical Resources	AVAILABILITY			AVAILABILITY			AVAILABILITY			AVAILABILITY			AVAILABILITY			AVAILABILITY			AVAILABILITY			AVAILABILITY			AVAILABILITY			AVAILABILITY			AVAILABILITY			AVAILABILITY			AVAILABILITY		
Laboratories and Pilot Plants	XXX			XXX									XXX			XX			XX			XXX			XXX			X			XXX			X			X		

Conventions: T = Technological Research  
 N = Nutritional Field  
 D = Education  
 X = Incipient  
 XX = Adequate  
 XXX = Good

- 1/ According to the Regional Division and selected by IPT for this work There is more than one organization working in this activity.
- 2/ See Tables 2 and 3.
- 3/ Source information for these countries: Directorio Provisional de los Centros Latinoamericanos de Investigación en Tecnología Alimentaria y Nutrición Humana. Editado por la FAO, Chile, Febrero de 1976.
- 4/ Includes non-technical staff.
- 5/ Some Institutions perform 2 or 3 activities at the same time.





TABLE Nº 4  
TEACHING CENTERS AND TYPE OF EDUCATION OFFERED

COUNTRY	INSTITUTION	TECHNICAL DEGREE				UNIVERSITY DEGREE (UNDERGRADUATE LEVEL)				POSTGRADUATE STUDIES			
		DURATION	NO OF STUDENTS	FOOD TECHNOLOGY	NUTRITION	DURATION	NO OF STUDENTS	FOOD TECHNOLOGY	NUTRITION	DURATION	NO OF STUDENTS	FOOD TECHNOLOGY	NUTRITION
COLOMBIA	Univ. Nat. Departamento de Quimica 1/					10 semestr.		x					
	Univ. Nat. Departamento de Farmacia 1/					12 semestr.		x					
	Univ. Nat. Inst. de Ciencia y Tecnol. Alim. 1/							x					
	Univ. de Antioquia Facultad de Medicina 1/					14 semestr.	1,272		x				
	Univ. de Antioquia Dept. Tecnología Alim.	6 semestr.	177	x									
	Univ. Ant. Fac. veterinaria Dep. Nut. y Tec.					10 semestr.	198		x				
	Escuela Nacional de Salud Pública U.A. 2/					9 semestr.	250			2 semestr.	56		x
	Universidad Jorge Tadeo Lozano					10 semestr.	85	x					
	Universidad Industrial de Santander 2/					8 semestr.	136		x				
	Universidad del Atlántico 2/					8 semestr.	261		x				
Universidad Javeriana 2/					8 semestr.	238		x					
Universidad Nat. Ciencias de la Salud 2/					8 semestr.	155		x					
Costa Rica	Instituto de Nut. Para C.A. y Panamá (INCAP)					8 semestr.	x 2/	20 stud.		2 years 1 year	6-8 5-8	x	x
El Salvador	National School of Agriculture El Salvador National University of El Salvador						20 2/		x				
Honduras	Universidad Nat. Autónoma de Honduras												
Rep. Dominicana	Estación Experimental Agropecuaria MICHOME						12-15 2/	x					
Costa Rica	Universidad Nacional					4 años		x					
Panamá	Universidad Nacional					3/							
West Indies	University West Indies					4 años		x				x	
Guatemala	Inst. Invest. Tecnol. Escuela Politéc. Nat. Inst. de Investigaciones Tecnol. e Indust.												
Perú	Depto. Tecnología Pesquera-Univ. Nat. Agraria Depto. Nutrición-Universidad Nat. Agraria Depto. Tecnol. Alimentos y Prod. Agrop. U.C.A.							x		1-2 years		x	
Bolivia	Depto. Química-Univ. Mayor de San Andrés.								x 2/				

1/ Courses are offered in Food Technology and or nutrition.

2/ Schools of nutrition

3/ Senior students from chemistry, pharmacy, agronomy, veterinary med. that do some research projects.

Andean countries, Mexico and Central America, that will certainly speed up communications among the different institutions and should lower costs of library maintenance.

#### E. Nutritional Information

##### 1. Nutritional Problems (Table No. 6)

Protein - Calorie malnutrition is the most generalized problem in the northern region of Latin America. Protein malnutrition is less frequent. Deficiency in Vitamin A and Iron, which are very important elements in a balanced diet, is generalized in the region, while Iodine deficiency occurs frequently. It is interesting to notice that calcium deficiency appears in all countries with the exception of the Central American ones, where lime-treated corn products are eaten daily.

This nutritional information comes from studies made at different times since 1960. Bolivia has the most recent study (1974). Central American studies date back to 1971 and the Colombian ones to 1968.

Malnutrition and low income go together in urban areas. It seems to be generalized in the rural areas of countries like Colombia.

##### 2. Reasons for malnutrition

The reasons for malnutrition could be classified in the following order of importance for the region:

- Economic
- Non-potable water supply
- Inadequate foods available
- Poor communications among Government, industry, nutritionists, food technologists
- Inadequate food supply
- Illiteracy
- Food habits and religious restrictions.

It is necessary to mention at this point that many of these factors are interrelated and cannot be considered independently.

A separate analysis was done by the Committee of the factors that hinder an adequate food supply in the region. The results of this analysis appear in Table No. 7 and show that the factors with the greatest importance are related to population growth rate vs production increase, inadequate transportation of foods and poor marketing practices. In a second order of importance are poor planning, lack of incentives for the development of agroindustries and inadequate processing and preservation facilities.

#### F. Post Harvest Losses

No quantitative information on post-harvest losses was available, for the different countries; estimates were given for Bolivia and Guatemala. A review of several studies made in Colombia (1) in recent years allowed us to obtain the figures that appear in Table 8. While losses in Colombia seem to be not as high as the 30% figure given by FAO and used in the case of Bolivia, the cost of those losses for the year 1975 amounts to \$7000 billion pesos or US\$200 million dollars. According to Table No. 6, countries identified several reasons for post-harvest losses but were not able to point out which ones were more important due to lack of available information.

TABLE No.5

Library Facilities & Information Services in Food Technology

	Bolivia	Colombia	Costa Rica	Dominican Republic	Ecuador	El Salvador
Library	--	xxx	x	x	xx	x
Information Service	x (3)	x	x (1)		x	x
-----						
	Guatemala	Honduras	Jamaica	Nicaragua	Panamá	Perú
Library	xxx	x	x	--	x	xx
Information Service	x	(1)	x (2)	(1)	(1)	x

Libraries

x incipient  
 xx adequate  
 xxx good

Information Services

x established  
 (1) Belongs to the central american system.  
 (2) West Indies System  
 (3) General Technical Information Center .

TABLE NO. 6  
 NUTRITIONAL INFORMATION FROM THE NORTHERN LATIN AMERICAN COUNTRIES  
 - SUMMARY -

ITEMS	COLOMBIA				ECUADOR				PERU				BOLIVIA				GUATEMALA				EL SALVADOR				HONDURAS				DOMINIC. REPUBLIC				JAMAICA				COSTA RICA				PANAMA				NICARAGUA															
	DEGREE OF IMPORTANCE				DEGREE OF IMPORTANCE				DEGREE OF IMPORTANCE				DEGREE OF IMPORTANCE				DEGREE OF IMPORTANCE				DEGREE OF IMPORTANCE				DEGREE OF IMPORTANCE				DEGREE OF IMPORTANCE				DEGREE OF IMPORTANCE				DEGREE OF IMPORTANCE				DEGREE OF IMPORTANCE				DEGREE OF IMPORTANCE															
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4												
Protein					X												X				X				X				X				X				X				X				X				X											
Protein/Calories	X					X			X				X				X				X				X				X				X				X				X				X				X											
Vitamins 1/	A				A				Rib A				A	A	2/		A	B	2/		A				A	2/			B12 B6 C A				A	B	2/		A	B	2/		A	B	2/		A	B	2/		A	B	2/									
Minerals	Fe	Ca			Ca	Fe	I		Fe	Ca			I	Ca	Fe		Fe	I			Fe	I			Fe	I			Co	Fe	I		Co				Co				Co				Co				Co				Co				Co			
Location and Environment of Malnourished 1/	PRE- LACTIN	PRE- SCHOOL CHILD	OTHER		PRE- LACTIN	PRE- SCHOOL CHILD	OTHER		PRE- LACTIN	PRE- SCHOOL CHILD	OTHER		PRE- LACTIN	PRE- SCHOOL CHILD	OTHER		PRE- LACTIN	PRE- SCHOOL CHILD	OTHER		PRE- LACTIN	PRE- SCHOOL CHILD	OTHER		PRE- LACTIN	PRE- SCHOOL CHILD	OTHER		PRE- LACTIN	PRE- SCHOOL CHILD	OTHER		PRE- LACTIN	PRE- SCHOOL CHILD	OTHER		PRE- LACTIN	PRE- SCHOOL CHILD	OTHER																					
Urban 50,000 h		X	LI	X	X	X	LI	X	X	X			LI	X	LI	X	X				LI	X			LI	X			X	LI			X	LI			X				X				X				X				X				X			
Marginal Urban		X	LI	X	X	X	LI	X	X	X			X	X			X	X			X	X			X	X			X	LI			X				X				X				X				X				X							
Population 5,000-50,000		X	LI	X	X	X	LI	X	X	X			X	X			X	X			X	X			X	X			X	LI			X				X				X				X				X				X							
Rural		X	GENERAL LIFE	X	X	X	LI	X	X	X			X	X			X	PCN 2/			X	PCN			X	PCN			X	PCN			X	PCN																										
Reasons for Malnutrition	CLASSIFICATION				CLASSIFICATION				CLASSIFICATION				CLASSIFICATION				CLASSIFICATION				CLASSIFICATION				CLASSIFICATION				CLASSIFICATION				CLASSIFICATION				CLASSIFICATION				CLASSIFICATION																			
Illiteracy	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4								
Economic	X				X				X				X				X				X				X				X				X				X				X				X				X				X							
Food habits Religious Restriction			X				X				X				X				X				X				X				X				X				X				X				X				X									
Inadequate Food Supply 3/		X				X				X				X				X				X				X				X				X				X				X				X				X										
Non Potable water Supply	X				X				X				X				X				X				X				X				X				X				X				X															
Inadequate Foods	X				X				X				X				X				X				X				X				X				X				X				X															
Insufficient "Appropriate" Techn	X	X			X	X			X	X			X	X			X	X			X	X			X	X			X	X			X	X			X	X			X	X			X	X														
Poor communication 4/	X				X				X				X				X				X				X				X				X				X				X				X															
Reasons for Post-Harvest Losses																																																												
Perishability		X																																																										
Animal-Pest		X																																																										
Lack of Roads and maintenance		X																																																										
Inadequate or poor storage		X				X								X				X																																										
Dispersed Product & Distr.Center		X				X								X				X																																										
Poor Transportation		X				X								X				X																																										

1/ Rib - Riboflavine; Fol - Folic Acid; LI - Low Income.  
 2/ Protein Caloric Malnutrition  
 3/ Degree of importance decreases from 1 to 4.  
 4/ Poor communication; Nutritionist, Government, Industries, Food Technologists.  
 5/ See Table No. 7.  
 6/ Not known if it's applicable to other Central American countries.

TABLE No. 7

ANALYSIS OF THE DEGREE OF IMPORTANCE OF THE FACTORS THAT  
AFFECT AN ADEQUATE FOOD SUPPLY FOR THE LATIN  
AMERICAN COUNTRIES OF THE NORTHERN REGION.

	Importance
A. Production increase slower than population growth rate	xxx
B. Transportation inadequate	xxx
C. Poor planning	xx
D. Inadequate processing and preservation facilities	xx
E. Poor marketing practices	xxx
F. Lack of incentives for the Development of Agroindustries <u>1/</u>	xx
G. Lack of Nutritional and Technological Education	x
xxx First Degree	
xx Second Degree	
x Third Degree	

1/ Agroindustry is understood as the integrated production, commercialization and industrialization of foods.

**TABLE No. 8**

**Food Losses**

Country	Roots and Tubers			Grains and Cereals			Milk and Meat			Fruits		
	M.T.M.	M.M. \$ (*)	%	M.T.M.	M.M. \$	%	M.T.M.	M.M. \$	%	M.T.M.	M.M. \$	%
Colombia	273,8	1236,2	10	156,8	1260,7	20	236,6	3624,4	8	335,4	1074,7	20
Bolivia			30			30			30			30
Peru												
Ecuador												
Guatemala						7-10						
El Salvador												20-25
Honduras												
Dominican Republic												
Jamaica												
Nicaragua												
Costa Rica												
Panamá												

(\*) \$1.00 US = \$ 35. colombian pesos.

Tables 6 and 8 point out two important aspects: First, food losses can be very costly to the country and to the consumer who is generally the one that is most affected by them. Second, it is necessary to collect information about post-harvest losses, what they are, and where they occur, before being able to propose any economically feasible solution.

#### G. Food Intervention Programs

The whole group of countries of the Northern Latin American Region has been covered by Food Intervention Programs sponsored by Care, Caritas, World Food Program and AID, among other agencies. Some of these programs are already being dismantled as in the case of Colombia, where imported foods are being replaced by locally grown products. In other countries, the programs will go on for several more years. Tables No. 9 and 10 show a summary of the past and present situation of those programs and of some pilot programs already operating.

There are several characteristics that are common to these programs and that allow us to make the following comments:

1. They have usually taken place simultaneously with nutritional education campaigns but lacking the support of other actions that would have a positive effect on the nutritional status of the population, such as water supply improvements or comprehensive health programs.
2. In spite of the fact that large human and economic investments have been made, there has not been a scientific method for estimating the benefits of these programs or the nutritional changes that they have produced. There is an urgent need to evaluate the validity of these programs and their efficiency by using a certain base line reference situation. (\*) It is necessary to develop a benefit-cost methodology to evaluate these types of interventions.
3. The pilot programs, when they have been carefully planned, have produced some interesting results. Such programs, however, have usually been terminated after their scientific objectives have been attained, with the consequence that their findings have not benefited the poor.

This unfortunate situation suggests that a critical review of the results obtained in pilot food intervention programs be made. The results of such a review would provide some useful information to researchers and research supporting agencies, and thereby facilitate the decision making process to the countries of the region. The need to develop a mechanism that would allow the research findings of food intervention programs to be prudently applied, has been recognized by several experts in the field (2).

4. In many of these interventions, problems related to the handling, preservation and distribution of food have been of great importance and, unfortunately, in some cases it has been necessary to discontinue them.

With respect to future food intervention programs, Central America and Panama are planning to extend the World Food Program for 5 more years. Special foods have been developed for different Central American Countries such as Nutribien for Panama, Maysol for Honduras, Nicaragua and Salvador, and High caloric cookies (8% Soy flour or 15% whole beans) for Guatemala; Bolivia and Colombia plan to gradually replace the donated food with locally grown products. These

---

(\*) At present a revised methodology for this assessment is available for Colombia (3).

TABLE No. 9

**Food Intervention Programs**

- Past -

Country	Type of food and Ingredients	Objective	Coverture and location	Comments
Guatemala	Incaparina	Increase the consumption of high protein foods	100 health centers	Small pilot operation. Discontinued because of distribution and conservation problems
Peru	Wheat, Fish protein concentrate in noodles.	Evaluate the effect of this feeding program on growth and mortality of infants and children.	Rural population, about 130,000 persons for 7 years. This was a research program.	Discontinued when the experimental objectives were completed.
Colombia	CMS/W.S.B. wheat and corn flour	Correction of protein caloric malnutrition	All Provinces and States. This program was extensive.	Methodology for a serious cost benefit evaluation designed in 1976 ( )
Bolivia	Food donated by "Food for Peace". Wheat flour, Bulgur, Vegetable oil, butter fat, non-fat dry milk.	Correction of moderate or serious malnutrition in Pre-school children.	Five rural communities, 464 children in Cochabamba State. Two years of duration.	Transportation difficulties, irregular supplies and food variety during a 2 year period. Irregular attendance. Of the children registered 32% of those recovered, while 60% of them abandoned the program.

**TABLE No. 10**  
**Food Intervention Programs**  
**- Present -**

Country	Program	Type of food and Ingredients	Objective	Coverture and location	Comments
Guatemala	World Food Program	Beans		Earthquake disaster area. This program covers 6 States	It's a vast and complex program.
Jamaica		CSB/WSB	Correction of Protein/caloric deficiency.	School population.	It's been working for 2 years.
Peru	Support of National feeding Plan.	Wheat, milk, oil, corn, soy, eggs.	Correction of a poor nutritional situation.	The program is national. Pregnant, Lactating women, Pre-school, school children, hospitals.	Within this year 200,000 kg of flour were distributed last year.
Colombia	Sponsored by Volag (Voluntary Agencies).	CMS, U.S.B. Wheat & Corn Flour	Correction of Protein caloric malnutrition.	Large scale. It's been working for 22 years	It isn't going to be extended.
	Quality Control.	Infant food	Minimum content of basic ingredients in infant feeding.	National Program developed by the health ministry.	
	National Food and Nutrition Plan	Bienestarina, TVP, Protein enriched pastas, high lysine corn flour	To supply protein calories, Minerals vitamins. To gradually replace WFP'S direct distribution actions.	Pregnant and lactating women, Pre-school children, 10 states and around 4 million people/year.	Started in July 1, 1970
Bolivia	Rural School lunches	Food for Peace	Correction of the protein caloric malnutrition.	Marginal urban and rural areas. Special benefits Institutional children	The program started in 1950 and has been gradually extended. A first survey to determine the program's impact has been carried out.

products will be sold at a reduced price in Bolivia and through a coupon system in Colombia. (4)

Serious efforts are being made by different countries in the region to draw up National Food and Nutrition Plans within an integrated concept, in which a food intervention program is only one of the components. Agricultural production planning, industrialization of enriched food, distribution of fresh and processed foods, health programs, education programs, food legislation and quality control should be considered simultaneously.

In 1975, the Colombian Government officially adopted an integrated Food and Nutrition Program (4) as an important component of the National Development Plan which started activities in July 1976. The Costa Rica Government is finishing the programming of a similar plan.

The above information seems to show that communications between government, industry and researchers have improved in some of the regional countries.

### III - HOW CAN FOOD TECHNOLOGY RESOURCES BE APPLIED MORE EFFICIENTLY TO MALNUTRITION PROBLEMS

#### A. Foreword

Throughout history there has always been a technological landmark associated with social and economic changes. This fact is illustrated in Graph No. 1. Graph No. 2 illustrates the importance of applied technology to the specific field of food technology (Milling, centrifuging, dehydration, refrigeration and canning).

If technology has played such an important role in the social and economic development of world history, then it's quite possible that it can contribute positively to the solution of specific nutritional problems. It must be stressed that technology alone isn't the only solution to certain problems.

Technology should work together with other disciplines such as sociology and economics to produce results that have short term application.

The information obtained during this study concerning regional physical infrastructure available in the field of Food Technology seems to show that such infrastructure is generally adequate. It has also been shown that there is an awareness of the need to apply solutions to solve the nutritional problems common to the lower income groups of the regional population.

If food technology infrastructure is available, quick solutions to nutritional problems have been agreed on, and research in this area has been carried out over the past 15 to 20 years in some countries of this region, why hasn't food technology demonstrated a greater impact on solving these nutritional problems.

Although no profound studies have been made, the present one has raised the following points:

- 1) Extension work, after research studies have been completed, is deficient.
- 2) Research in food technology hasn't been sponsored taking into account areas such as marketing, distribution, acceptance and prices.





- 3) There hasn't been enough communication between regional research institutions and between these institutions and the production sector.
- 4) The teaching of food technology in different regions may not be focused correctly. Perhaps there should be intermediate careers in nutrition and a home extension service for housewives.
- 5) Food processing may not be that important when compared to the difficulties found in handling, transportation, warehousing, and distribution.

**B. Actions to be taken in the Field of Food Technology.**

- 1) To promote closer relations among regional food technology institutions through:

- a - exchange of information and results,
- b - joint execution of research projects in all phases, from the conception of the idea, sponsorship, experimental and extension work.

It is necessary to point out that through the OAS, joint research projects have been promoted in the region on a small scale since 1969 and more recently regional or local information services in Food Technology have been made available.

The idea is to broaden the scope of these actions.

- 2) To back up existing Regional Latin American Food Technology and to create groups whose function would be to promote the application of appropriate food technology through the following studies or actions:
  - a - To identify extension mechanisms for the dissemination of research study results (i.e. composite flours, protein enriched foods, packaging technology).
  - b - To stress the philosophy that research topics should be related to specific problems and treated as a conceptual package. This may be the way of producing results applicable in a short period.
  - c - To make sure that internationally sponsored Food Technology Programs provide funds to hire local personnel. This will foster the creation of specialized groups in the different countries of the region.
  - d - To identify what type of food technology is more important in each region (processing, handling, packaging, warehousing, etc.).
  - e - To study mechanisms and materials for non-professional extension services concerning food handling and conservation, especially in rural areas.
  - f - To look for appropriate technological alternatives that can be applied to a region or regions, and to promote these technological alternatives on a regional basis so that they can compete with new developments that replace traditional local raw materials. Several of these topics could be analyzed for the region by study groups in seminars and conferences and the results and guidelines published in regional newsletters or periodicals.
  - g - Food Technologists can and should play an important role in the development of national food and nutrition programs working within multidisciplinary groups. The exercise already done in Colombia, Chile, Brasil and Costa Rica stresses this point.

- h - Considering the interesting information obtained during the present study and its usefulness in designing joint regional programs in the future, it is considered important to complete the information gathered so far with special emphasis on institutional infrastructure and specialized areas of research and teaching.

#### IV - POSSIBLE ACTION PROGRAMS (See Table 11)

During the second part of the Panama meeting that took place on September 6th and 7th, the committee members presented a series of ideas that could be turned into possible action projects or programs.

The 10 projects or programs selected were later subjected to a priority analysis based on the relative impact that they could have in obtaining the study's objective. The methodology used for establishing priorities is briefly explained in Annex I of this report.

Of the 10 programs selected, 2 related more to education and extension work (E) of already available knowledge than to Food Technology (T) as such, while 3 are directly related to experimental work in Food Technology as specifically defined for this study. \* The remaining five are combined programs that include activities in both Education and Food Technology. Following is a brief description of the selected programs.

1. - Teaching Food Technology at intermediate levels and establishing extension courses in Food Technology and Nutrition for academic professions such as Agronomy, Medicine, Infirmary, and others.

Priority: 1      Type of Activity: E.

- 2 - To promote among industrialists the production of balanced foods (calorie/protein, vitamin, minerals) within the concept of high nutritional value and low cost products.

Priority: 2      Type of Activity: E.

This promotion could be done through the establishment of working groups composed of researchers, government representatives and industrialists, in which different criteria for their introduction and economic problems related to them could be discussed. Such an exercise promoted by Colciencias of Colombia produced interesting results and helped industrialists in understanding their role within the National Food Nutrition Plan (7).

- 3 - To study and quantify post harvest food losses and to develop practical and economical methods.

Priority: 3      Type of Activity: T.

As has been mentioned before, FAO (8) has estimated that there is approximately 25% post-harvest food losses in developing countries. In the Colombian case, this represents an annual economic loss of US\$200 million dollars. In order to obtain up-to-date information about this problem, a study should be done, evaluating storage, handling, distribution and

---

\* "The processing and preservation of Foods, including destination of foods from harvest until they reach the consumer".

Table No.11

Classification of Programs according to an order of Priority.							
Proposed Program	Nutr. Imp. of Problem (17)	Applic. to diff. count. (23)	Applic. in the near future (16)	Project Cost (13)	Solution to basic Problem (11)	Σ JICI	Priority order
T-T. extension courses to other professions-Teaching Food Technology at intermediate level (E)	4	5	4	4	5	434	1
Industrial Promotion of balanced foods (E)	4	5	3	4	4	407	2
Evaluation of Post-harvest Losses and correct them on economic basis. (T)	4	4	5	2	5	401	3
Pilot Projects for the marketing of high nutritional-low cost foods in low income groups. (E, T)	4	4	5	2	3	379	4
Prototype collection-classification centers for agricultural products. (E, T)	4	4	4	4	2	378	5
Fortification of Foods with vitamins A, B, Fe, Ca (to study vehicles, processes and ingredients) (T)	4	5	4	1	3	373	6
Development of integrated systems for crop exploitation considering also the agroindustrial concept. (E, T)	4	5	2	2	4	365	7
Teaching of food storage, handling and Preservation at the homes of low income families. (T)	4	3	3	4	4	361	8
Promotion of cultivation and use of local agricultural products rich in protein, fat, vitamins. (E, T)	4	3	2	2	4	319	9
Study of packaging Materials and designs used at present for Handling operations looking for maximum protection and min. cost. (E, T)	3	3	4	2	3	303	10

transportation systems in use today. Actual losses must be measured and with this information, possible procedure modifications may be introduced, along with new economical methods and equipment. It would be convenient to promote extension services for the best procedures encountered.

- 4 - To study packaging materials and designs used at present for different food handling operations in order to recommend those that will give maximum protection at minimum cost.

Priority: 10      Type of Activity: E, T.

The high cost of packaging materials in developing countries is one of the most serious economic problems to be faced. There is a wide variety of packaging material available today, so a study should be undertaken, concerning the rational use of these materials for food protection.

- 5 - To establish prototype collection centers for agricultural products within the concepts of simplicity, low cost and efficiency.

Priority: 5      Type of Activity: T, E.

Village level collection centers should be established to partially help solve the problem of post harvest losses. An educational extension service should also be contemplated, which includes harvesting, handling, packing and storage of agricultural products. A prototype collection center must be constructed, so that its efficiency and use can be demonstrated.

- 6 - To establish a pilot operation for the marketing of high nutritional-low cost foods in order to select more adequate strategies for their introduction to low income groups.

Priority: 4      Type of Activity: T.

Marketing is an integrated process that begins with knowing the consumer's needs and relating all necessary factors (materials, processes, prices management structure, packaging, promotion, distribution, etc.) for the maximum benefit of both the consumer and the industrialist. Marketing studies for specific foods should be performed on an institutional and open market basis, in order to select the most adequate strategies, for their introduction at the least possible cost to the needy population.

FAO has recommended preparing personnel on different levels in order to improve the efficiency of retailers in Latin America. However, they estimate that it would take at least 8 years to prepare 20% of the retailers in a city like Bogota. Research should be simultaneously carried out through pilot projects, that enhance this preparation, in order to identify unconventional strategies for Third World Countries.

- 7 - To study the most appropriate vehicles, processes and ingredients for fortification of foods with vitamins A, B-2, Fe and Ca.

Priority: 6      Type of Activity: T, E.

It has been shown that, besides protein-calorie deficiencies, the poor population sector suffers from iron, vitamin A, and riboflavin insufficiency. These micro-nutrients should be incorporated in popular foods and their stability and effectivity should be evaluated. Educational campaigns should also be undertaken to teach people to consume natural products that contain these nutrients.

- 8 - To develop integrated systems for crop exploitation within the agro-industrial concept.

Priority: 7      Type of Activity: T.

This title implies the full exploitation of a crop including the industrial utilization of all the by-products not fully used at present (case of the sugar cane industry, rice milling by-products, etc.). It is also important to mention the need of applying the agroindustrial philosophy to new agricultural operations (large or medium in size). It should be mentioned here that the main objective of this philosophy is to produce and process acceptable food products at the lowest possible cost, while obtaining acceptable profits and re-investable income.

- 9 - Teaching food storage, handling, and preservation at the home level with emphasis on low income families in the rural and surrounding areas of large cities.

Priority: 8      Type of Activity: E, T.

The food technologists should be responsible for selecting the necessary material, and should help organize extension and education campaigns.

10. To promote, after careful agro-economical studies have shown their profitability, the cultivation and use of local agricultural products with high nutritional value such as the quinoa (*chenopium quinoa*) or others that all important sources of fat and vitamins.

Priority: 9      Type of Activity: E, T.

Today, as well as in the past, agricultural and technological activities, have been based on those established in developed countries. This fact has prevented the full utilization of many valuable natural resources.

In closing, some important aspects on the evaluation and selection of possible action programs should be mentioned. The choice of these programs can be made by means of a priority evaluation system. In such a system, the maximum number of points can be assigned to a program is 500, and the ones with the highest scores are selected.

An alternative method consists in grouping two or more programs that share the same objective. This would be the case of a program that has as its main objective to increase the availability of food without a corresponding increase in cost. For this type of program, several supporting projects (priorities 3, 10, and 5 in Table II) in food technology and extension work could contribute greatly to arriving at the main objective. Considering the common problems that seem to affect food handling and distribution in the region, the results of such an experimental program would find high applicability.

REFERENCES

- (1) Riveros H. "Perdidas Post-cosecha en algunos Productos Colombianos - recopilacion de la informacion nacional - Informe interno, IIT, Bogota, junio, 1976.
- (2) Berg, A., National Academy of Sciences, July 31, 1976, internal communication.
- (3) Rueda, W.R., R. Grueso, M. Torres, O. Mora, Evaluation Methodology for the Assessment of the National Nutrition Education and Complementary Feeding Program, Provenca, Colombia, Care, Colombia 1976.
- (4) Departamento Nacional de Planeacion, Colombia, "Para cerrar la Brecha" - Plan Nacional de Alimentacion y Nutricion, 1975-78.
- (5) Depto. Nacional de Planeacion Colombia, Dic. 1975 "Programa de Alimentos Procesados de Alto Valor Nutricional y Bajo Costo", Unidad de Estudios Industriales, Dic. 1975.
- (6) Colciencias, Colombia, "Bases para un Programa Nacional de Investigacion en Tecnologia de Alimentos y Nutricion", (1973), pp 7-12.
- (7) Young, N., T.S. de Buckle, "Consideraciones sobre Alimentos de Alto Valor Nutricional y Bajo Costo", Tecnologia, No. 91, 1974, pp 7-17.
- (8) Bramsnaes F., "Preventing the Deterioration of Raw Materials and Products", Wennergren Center, International Symposium Series, Vol. 14, Pergamon Press, Oxford, 1970, p 348.
- (9) FAO "Desarrollo de Sistemas de Mercadeo Alimentario para las grandes Zonas Urbanas I. America Latina, Informe de la Conferencia Tecnica sobre el tema, Buenos Aires, Argentina, 8-17 de Mayo 1973, p 61.
- (10) NSF, Protein Resources and Technology Status and Research Needs, Grant No. AEN 75-13072, Dec. 1975.

ANNEX 1Establishing Priorities

One of the methods used for the study of research strategies, project classification and establishment of priorities is based on the evaluation of the relative impact that different programs or projects may have in obtaining a given objective. This method requires the selection of a set of criteria and the assignment of weight factor to them. It is also necessary to select grading guides that indicate the impact or the contribution that the development of a given project may have on the particular objective indicated by the criterion. (5,6).

Table 10 shows the set of criteria selected by the Northern Region Committee during the last meeting in Panama, together with their weight factors. These criteria were selected taking into account the main objective of the study: to find out how to improve the contribution of Food Technology in solving the malnutrition problems in Latin America.

Table No. Ia

<u>Project</u>	<u>Evaluation Criteria and their weight Importance</u>	<u>Weight Importance</u>
1 -	Importance of the nutritional problem that is going to be solved through a specific project.	37
2 -	Applicability or the results of the project to a large number of countries.	23
3 -	Results may be applicable in the near future.	16
4 -	Relative cost of the proposed project.	13
5 -	The project will solve basic problems related to food and nutrition.	11

Table IIa contains the criteria grading guides.

Table No. IIa

Criteria Grading Guides

<u>Grade</u>	<u>Estimated Impact of the Project on the Criterion</u>
5	Very high
4	High
3	Moderate
2	Slight
1	None

Grading

Precise figures were not available to the Committee to quantify the impact of a given project on the attainability of an objective. Only qualitative information was used. For each project a global grade was calculated that was obtained from the summation of the products of each criterion times its grade. \*

$$J_i C_i = J_1 C_1 + J_2 C_2 + J_3 C_3 + \dots + J_n C_n \quad i = 1$$

$J_i$  = weight importance

$C_i$  = Grade for the criterion

$n$  = No. of criterions.

The Committee arrived to a given summation for each project. The ones that obtained the higher grades are supposed to have greater probable success to attain the proposed objective. The final classification obtained shows only a relative interval but not a specific one.

---

\* Since a given country usually has capital limitations, a lower grade is assigned to projects that require high financial inversions.

ANNEX II

People who collaborated with information in the different countries besides Committee members.

Bolivia

Cecilio Abela Deheza  
Dir. Depto. de Nutricion  
Ministerio de Prevision Social  
y Salud Publica, La Paz

Wagner Terrazas  
Tecnico, Direccion de Planeacion  
Social  
Ministerio de Planeamiento, La Paz

Colombia

Luis A. Fajardo  
Dpto. de Pediatria  
Universidad del Valle, Cali

Camilo Roza  
Depto. de Nutricion  
Inst. Colombiano de Bienestar  
Familiar  
I.C.B.F., Colombia

Franz Pardo  
Direccion de Nutricion  
Inst. Colombiano de Bienestar Familiar,  
I.C.B.F., Colombia

Martha Isabel de Gomez  
Division de Poblacion  
Depto. Nal. de Planeacion, Bogota

Hernan Cardozo  
Division de Mercadeo  
OPSA, Ministerio de Agriculture, Bogota

Jaime Nova  
Division Agropecuaria  
Depto. Nacional de Planeacion,  
Bogota

Gustavo Sandoval  
Depto. de Quimica  
Universidad Nacional de Colombia, Bogota

Omar Patino  
Inst. de Tecnologia de Alimentos  
Univ. Nacional de Colombia, Bogota

William Cardenas  
Facultad de Veterinaria  
Universidad de Antioquia, Medellin

Salomon Ferreira  
Depto. de Farmacia, U. Nal. de  
Colombia, Bogota

Miryam Ruiz  
Depto. de Nutricion, Facultad de Ciencias  
U. Javeriana, Bogota.

El SalvadorPeru

Nelson Carpio  
Ministerio de Alim. Dir. Gen. de Investig.  
Lima

Jaime Gonzalez  
c/o Icaiti, Guatemala

Dominican Republic

Rafael Murillo  
Indotec, Av. Nunez de Caceres  
Sto. Domingo, R. Dominicana

Jamaica

Fred Campbell  
National Research Council of Jamaica

Honduras

Jesus Castro David  
Facultad de Quimica y Farmacia  
U. Nal. de Honduras,  
Tegucigalpa



SOUTHERN COUNTRIES COMMITTEE REPORT

Committee

Dr. Jorge A. Miller, Argentina - Chairman  
Dr. Fernando Monckeberg, Chile  
Dr. Nelson de Barros B., Paraguay  
Dr. Cayetano Cano Marotta, Uruguay  
Dr. Marcial Gambaruto, Argentina Alternate

North American Advisors

Dr. Robert H. Cotton, Fundacion Chile  
Dr. John Liston, Univ. of Washington  
Dr. Anthony Lopez, Va. Poly. Inst. & State Univ.  
Dr. Max Milner, M.I.T. & Consultant

November 1976

This report contains information assembled by the Chairman as submitted by Committee representatives of each of the four countries constituting the Southern Countries Region.

Detailed information, including responses from various institutions concerning resources, are retained as an addendum to this report - not attached.

In addition to the appointed Committee members from each country, grateful thanks are extended to the many individuals and institutions in each of the four countries for their interest in this project and their assistance in assembling available information regarding food technological resources, why malnutrition exists, why food technologists and food technological institutions have not been more responsive to these problems, and how these constraints might be overcome.

From this information and these deliberations, three potential action programs emerged and are detailed at the end of this report.

**SOUTHERN COUNTRIES REGION - I.F.T. Nutrition/Food Technology Study****ARGENTINA INFORMATION SUMMARY**

The present report summarizes the answers to the survey distributed last May by this Committee and solely to the Argentine Republic.

To proceed in an orderly fashion, the Spanish translation of the survey is enclosed and refers to the corresponding pages in the order that they appear in the questionnaire.

**Inventory of Technological Resources**

In Argentina there exist various centers of investigation, pure and applied, for food technology, both in the official and in the private sector, or mixed. The private enterprises were extremely reticent in answering the questions, as were their advisors, that entailed the different activities of the sector.

Nevertheless, it is known indirectly that the meat industry possesses pilot laboratories and plants for studies of formulation, processing, preservation, etc. of meats and their derivatives, in beef, pork, and in a minor scale, mutton. Likewise, the industry for the processing of fowl also has facilities for the formulation of new products.

A similar case presents itself in the dairy industry where there exists various organizations with quality control facilities, formulation and new processes capabilities, such as in fluid milk, cheese, butter, yogurt, etc.

There was no information on the concentrated foods industry, dehydrated soups, and also for the manufacturers of candies, cookies, chocolates and related products. All of these sectors formulate new products in their own organizations, either in or out of the country, which indicates its potential capacity for the development of new products.

The citrus industry is very advanced in the country, particularly in the litoral zones (Entre Rios - Corrientes - Misiones) and in the northwest (Tucuman - Salta), for the manufacture of primary products such as concentrated juices (canned and frozen), essential oils and dehydrated peel as food for cattle. The formulation of finished products is not common in this sector.

The sugar industry, very important in the northwest of the country (Tucuman - Salta - Jujuy), derives exclusively from sugar cane and produces at the mills sugar without reaching final purification. As derived industries it has alcoholic fermentation and molasses that is employed as the primary material in the making of bread and in pharmaceutical products. There are no technological facilities for the development of new products.

The milling industry is established in the principal agricultural centers of the humid pampa (plain). Basically it makes primary products (flour, starch and derivatives) in various quantities, but except in a very few cases, it does not have the facilities for new processes or studies of novel products.

- 9) Department of Bromatology and Experimental Nutrition - School of Pharmacy and Biochemistry - University of Buenos Aires.  
Ref: Provisional Directory, etc. - FAO - Pg. 14
- 10) Institute of Nutrition - National University of Salta.  
Ref: (a) Provisional Directory, etc. - FAO - pg. 16. (b) particular report.
- 11) National Direction of Sanitation of the Province of Santa Fe - Santa Fe. Ref: Provisional Directory, etc. - FAO - pg. 11.
- 12) Chemistry Division of Food Control - Tucuman  
Ref: Provisional Directory, etc. - FAO - pg. 8.
- 13) Program No. 50 of Science and Technology - U.N. de Tucuman  
Ref: Provisional Directory, etc. - FAO - pg. 12
- 14) Institute of Food Technology - (U.N. of the Littoral) - Santa Fe  
Ref: particular communication.
- 15) Institute of Marine Biology (N.U. of Buenos Aires, La-Plata and Sur  
Ref: Particular Communication.
- 16) Swift - La Plata - Prov. of Buenos Aires  
Ref: Particular Communication.
- 17) Kasdorf S.A. - Buenos Aires  
Ref: Provisional Directory, etc. - FAO - pg. 21.
- 18) Bonafide S.A.I.C. Buenos Aires  
Ref: Provisional Directory, etc. - FAO - Pg. 22.
- 19) Noel and Cia. S.A. - Buenos Aires  
Ref: Particular Communication.
- 20) Information obtained from the Argentine Center of International Studies (CEINAR) Moreno 431 - Buenos Aires, enumerating the projects on studies by various agencies, the the following areas:
  - a) fruihorticulture
  - b) lacteous
  - c) cereals and oleaginous
  - d) concentrated and isolated proteins
  - e) concentrados y aislados porteicos
  - f) meats and fish.

Common Problems of poor nutrition or malnutrition

"The analysis of the food balance sheets show that Argentina possesses available foods that make it possible to insure to the population contributions of food principles that assure a correct state of nutrition" (Serantes).

Nevertheless, even if at the national level there are no protein/caloric needs with balanced and varied diets, there still exists regional problems in the Argentine Northwest and Northeast, as also in marginal zones around the great urban areas.

It seems to us that the best way to inform you about these aspects of nutrition and their defects, at the national and regional level, consists of attaching to this report three recent works. They are:

It is difficult to estimate the loss in tonnage because of the lack of information and statistical data. However, the opinion of experts consulted indicates that losses of over 10% for grains and 15% for milk occur.

Besides losses due to poor storage, it is necessary to mention the poor utilization of preservation processes for raw materials and manufactured products, as well as the deficiencies which exist in the use of refrigeration.

In recent years some positive things have been done to avoid these losses: enlargement of the harvester storage depots, improved transport services, increased capacity of silos, refrigeration capacity and providing covers for storehouses. There has also been an increase in the use of pesticides and improvements in the fight against rodents.

However, since these measures generally come from the private sector, official programming and necessary financial aid are called for to optimize the levels of their use.

How the resources of food technology can be applied in an efficient way to alleviate the problems of malnutrition.

In the first place, it is necessary to educate food technologists at the university level, and technicians at the secondary school level. To compensate for the present lack of technologists, courses should be given to post-graduates in professions such as Agronomy, Veterinary Medicine, Medicine, Chemistry, Biochemistry, Microbiology, and Engineering. The basic principles of food and nutrition should be included in teacher training at the elementary level.

Consequently, it is necessary to improve the information and the communication among concerned sectors. Likewise, the existing technologists should actively participate in the development of programs and in the education of new professionals, and they should participate more in the production and control of food products.

At present, food technologists are being educated in Santa Fe (Universidad de Lujan), Buenos Aires (Universidad Libre de la Empresa), San Rafael - Mendoza (Universidad Reginal), and there are orientation courses in such university majors as Chemistry, Biochemistry, Agronomy, and Veterinary Medicine.

There are various courses in Nutrition for medical doctors and dieticians at the university level (Buenos Aires, Cordoba, and Salta), and there are schools of Nutrition in the same university centers. There are also specialized offices in the Federal, Rural, and Municipal Health Services, and there are research centers associated with different organizations.

Technologists are faced with a variety of limitations in collaborating in the application of resources to alleviate problems of malnutrition. These limitations are principally the following:

- a) a modest food industry and inadequate technologies in use.
- b) a lack of governmental and private sector planning.

## SOUTHERN COUNTRIES REGION - I.F.T. Nutrition/Food Technology Study

CHILE INFORMATIONInventory of Technological Resources

Organization	Location	Approx Budget in U.S. Dollars	Professionals	Technicians	Administrative	Primary Activity
U. of Chile - Oriente	Santiago	387,000	64			Biomed.Nutr.y Food Tec.
Chem.y Tec. - Norte	Santiago	20,000	10	2	6	Food Tec., Chem., Q.C.
Nutr. - Norte	Santiago	95,000	34		19	Nutr.Research
Agron. - Sur	Santiago		17	4	6	Food Tec.
U. Católica - Ing.Chem.	Santiago	50,000	15	5	3	Raw Mat.Util.
Macromol.	Santiago		5			Protein Chem.
U. Católica Val.-DICB	Valparaiso	35,000	7	3	3	Fish Util. Research
Agronomia	Valparaiso	40,000	20	2	6	Agr. Util. Research
Fish & Food	Valparaiso	40,000	13	6	12	Food & Fish Tec.
U. Concepcion-Brm.Nutr.	Concepcion		6	1	2	Food Tec. & Nutr.
Biochem.	Concepcion		2	1		Biochem.Re- search
U. Austral Valdivia	Valdivia	475,000	21	9	28	Milk Research
U. del Norte	Antofagasta	30,000	3	6		Fish & Food Tec.
Inst. Inv. Tec.-Intec.	Santiago	300,000	15	10	12	Food Process- ing.
Div. Protec. Agr. - SAG	Santiago	1,100,000	70	25	46	Q.C.-Legisla- tion.
Inst. Inv. Agr.- INIA	Santiago LaGransa		8	16		Agron.-Enology
Empresa de Comer. Agr.- ECA	Santiago		8	1	3	Nutr.-Min. & Vit.
Min. Econ.-Agr. & Irrad.	Santiago					Food Irradia- tion.
Inst. Fomento Pesq. - IFOP	Santiago	1,500,000	92	30	211	Utilization Research

C.52.

DISPONIBILIDAD DE OFICINAS  
Y LABORATORIOS

CENTROS	ESTADO			DISPON. FISICAS.				PROBL. ESPACIO		INDICES: M <sup>2</sup> /PER	
	BUEN	REG	MALO	NUMERO	M <sup>2</sup>	NUMERO	M <sup>2</sup>	SI	NO	OFICINA	LABORAT
				OFICINAS		LABORAT					
U.CH - QUIMICA Y T.A. ORIENTE TECN. QUIMICA		X		1		2	111	X			4
AGRONOMIA SUR	X				175	6	335		X	11	13
NUTRICION NORTE	X					10	152		X		23
NUTRICION SUR	X					7	800		X		
U.C - QUIMICA	X				22	2	72		X	7	14
ING. QUIMICA	X			2	20	1	31	X		3	8
FRUT/VIÑAS.F.A	X				194	1	100		X	28	9
ZOOTECNIA.F.A. MACROMOL	X				400	2	500		X	33	27
U.C.V - ING. BIOQUIMICA	X				80	2	120		X	16	18
AGRONOMIA	X			4	30	4	120		X	6	18
PESQ/ALIMENTOS DICB	X			4	50	3	115		X	5	10
U.CONC. - NUTR/ALIMENTOS BIOINGENIERIA		X		1	30	2	20	X		15	6
U.AUSTRII - INST. LACTOLOG.	X			16	260	5	530	X		14	19
U.NORTE - PESQUERIAS.	X				27	1	36	X		7	5
INTEC	X				175	4	226		X	7	14
SAG		X				1	100	X			10
INIA	X				80	2	575		X	7	29
ECA	X			1	30	5	240		X	4	25
C. CHIL. E. NUCLEAR.	X				24	2	70		X	6	11
TOTAL	16	3				62	4253	6	13		



\* Valor estimado

\*\* Estimado como espacio útil por persona con dedicación completa a trabajos de laboratorio. El espacio muerto se supuso en un 40% del total disponible.

\*\*\* Sólo se consideraron los laboratorios centrales en Santiago.



C.5.5.

DISPONIBILIDADES FISICAS PARA TRABAJOS TECNOLOGICOS

CENTROS	PIANTA PILOTO			LAB. CP. UNIT.		LAB. TECN/IND.	
	Nº	ESPACIO (M <sup>2</sup> )	M <sup>2</sup> /PERS.	USO TOTAL E.D.	USO PRECIB.	USO TOTAL E.D.	USO PRECIB.
U.CH - QUIMICA Y T.A.					X		
TECN. QUIMICA					X		
AGRONOMIA	1	1520	57				
NUTRICION NORTE							
NUTR CION SUR							
U.C - QUIMICA							
ING - QUIMICA	2	60	9		X		
FRUT/VINAS . F.A	1	150	13				
ZOOTECNIA . F.A	1	300	15				
U.C.V - ING. BIOQUIMICA					X		X
AGRONOMIA	1	100	15				
RESQ/ALIMENT.	1	400	34				
U. CONC. - NUTR/ALIMENT.							X
BIOINGENIERIA					X		
U. AUSTAL - INST. LACTOLOG.	1	1470	52				
U. NORTE - PESQUERIAS	1	162	24				
INTEC	2	890	33				
SAG						X	
INIA						X	
EGA							
C. CHIL. E. NUCLEAR							X
TOTAL	11	5052					



IMPLEMENTACION LABORATORIOS TECNOLOGICOS

CENTROS PROCESOS Y OPERACIONES													
	QUIMICA Y T.A. - UCH		TECN. QUIMICA - UCH	NUTRICION - INGESTE	NUTRICION - SJR	ING. BIOLG - UCY	NUTR/ALIM - U. COPE	BIO - INGEN. - U. COPE	SAG	INIA	ECA		
MOLIENDA	X			X		X	X	X	X	X	X		X
TAMIZADO	X							X			X		X
SEPAR. CARNES													
MEXCLADO	X							X			X		
FILTRADO	X		X			X		X			X		
CENTRIFUGACION	X		X			X		X					
PASTEURIZACION	X								X		X		
ESTERILIZACION						X	X		X				
REFRIGERACION			X					X	X		X		
CONGELADO									X		X		
SEMI PRESERV									X				
HIDROLISIS	X		X										
EVAPORACION	X		X			X		X					
SECADO			X	X		X		X					
EMULSIONIFICACION													
GELATINIZACION													
EXTRUSION													
PANIFICACION							X				X		X
EXTRACCION						X							
DESTILACION			X			X		X			X		
FERMENTACION						X							
ENLATADO							X		X				
IRRADIACION													
LIOFILIZACION	X				X	X							

CHILE - CURRENT MALNUTRITION PROBLEMS

I. Types of Malnutrition

A. Protein: Very little or almost no consumption of food rich in proteins due to high cost of food.

B. Protein/calories: Consumption of food without nutritive value (17.8% of caloric nutrition in children - preschoolers).

C. Vitamins:

1. Vitamin A: Yes, with alterations of the skin, mucosae, sight and a high susceptibility to infections, especially affecting the population of the northern part of Chile.

2. Vitamin C: Relative.

3. Folic acid: Relative.

4. Others: Avitaminosis is high in Indians of the Altiplano and Lonquimay (50%).

D. Minerals:

1. Calcium: It is not accurate because the National Health Service distributes milk to all children and pregnant women.

2. Iron: It affects 80% of lactating women, also pregnant and lactating women.

3. Iodine: The endemic goiter is limited only to certain areas i.e. the mountains. Since 1973 iodine was added to salt.

4. Zinc: Relative.

5. Others: Fluoride deficiency.

E. Other: There are problems related with excessive consumption of alcohol (alcoholism), sugar (diabetes), excess of calories (obesity), and also problems related with toxicity produced by certain products.

II. Location and Environment of Malnourished

A. Urban (50,000 population and higher)

1. Pregnant and lactating women: Yes.

2. Pre-school children: Yes.

3. Others: School children.

} It is found in sectors with low socio-economic status.

B. Suburban.

1. Pregnant and lactating women: Yes.

2. Pre-school children: Yes.

3. Others: School children.

} Serious because most of the population is from poor sectors.

C. Small cities and population centers (5,000 to 50,000 population).

1. Pregnant and lactating women: Yes.

2. Pre-school children: Yes.

3. Others: School children.

} Less serious than in large cities or suburban centers.

D. Rural and villages up to 5,000 population.

1. Pregnant and lactating women: Yes.

2. Pre-school children: Yes.

3. Others: School children.

} Less serious than in large cities and suburban centers since people of rural area produce a large part of their food, so spend less money buying food.

REASONS FOR MALNUTRITION - CHILE

- I. Illiteracy: Yes (8.2% of illiterates and 36% with only basic education).
- II. Economics: Yes.
- III. Food habits, religious restriction, taboos, etc.: Yes (especially alcoholism), lack of fish consumption.
- IV. Inadequate food supply:
  - A. Production increasing slower than population growth rate: Yes.
  - B. Transportation inadequate: Yes.
  - C. Poor planning:
    - 1. Over-production of some crops: relative.
    - 2. Under-production of some crops: Yes (wheat, soybean).
  - D. Inadequate processing and preservation facilities
    - 1. Refrigeration and cold storage: Yes.
    - 2. Dehydration: Yes, but improving.
    - 3. Canning: In some industries.
    - 4. Others: Poor control of post-harvest sanitary problems.
  - E. Poor marketing practices: Yes, there is a long trade process with a great number of intermediaries.
  - F. Others: The agricultural resources are not used for the proper cultivations. Competition of soils between cultivations.
- V. Non-potable water supply: Yes, in rural areas and in many suburban sectors.
- VI. Wrong kinds of foods available: Bread, and all wheat products.
- VII. Industry not using available technologies.
- VIII. Poor communications between nutritionists, food technologists, industry and government: relative.
- IX. No government food and nutrition policy: No, CONPAN together with the government are working on the nutrition problem.
- X. Others: Changes in lactant nutrition, high natality rate in low socio-economic sector. Inadequate sanitary conditions. Ignorance regarding nutritive foods. Large amounts of food loss.

C.8.1.

POST HARVEST LOSSES - CHILE

- I. What foods suffer such losses: Mainly fruits, legumes, wheat; in general most agricultural products.
- II. Where does loss occur: At orchards or fields, during shipment, during charging and discharging from trucks and trains, at the industry, storage, during the process of trade.
- III. Why does loss occur: Education problem in economics.  
Poor or non-existent technology in the stages listed in II.  
Means of shipment are old and inadequate.  
Congestion of products at the places of sale.  
Both farmer and seller's lack of interest in selling a high quality product.  
A long process of trade with many intermediaries in between.  
Poor quality of adequate infrastructure of storage and preservation  
Poor storage of products, i.e. microorganisms, inadequate maturity index, etc.
- IV. How much loss occur: Approximately 20% of the total production, with larger or smaller percentages during the different stages.
- V. Inadequate or poor storage: Yes, there are only a few adequate infrastructures.  
Ignorance regarding preservation of products in storage.  
Inadequate design of infrastructure of storage and preservation.  
Too much distance between the farm and the storage place.
- VI. What has been done to stop losses and what degrees of success achieved: Apparently a good improvement in quality of canned foods. Also now paying premiums for low-count milk. Good indications of trend.
- VII. Others: Universities have made several studies in order to reduce post-harvest losses but results from said studies have not been passed to the industrialists or the farmers so no improvements have come out of said studies.

HOW CAN FOOD TECHNOLOGY RESOURCES BE APPLIED MORE EFFECTIVELY TOMALNUTRITION PROBLEMS - CHILE

A)

I. Improve communications with nutritionists, policy makers, agriculturists, public health people, economists, etc.: Yes.

II. Food technologists can be of assistance in the development of a national food and nutrition program: Yes.

III. Decrease post harvest losses

What food and how: Fruits, wheat and most part of agricultural products with adequate and appropriate technologies.

IV. Others: To introduce competitive cultivation, especially those with high nutritive value i.e. soybeans, quinoa, lupino, etc.

Introduction of varieties with great high nutritive value.

To supplement foods with low nutritive value with elements of high nutritive value.

To stabilize the prices through an adequate design of infrastructures for storage.

Low grade fruits could be utilized as jams, juices, etc.

Residues of the meat and milk industries could be processed into other products.

Research of toxics and other antinutritive factors of new products

Planning the agricultural programs in accordance with the population's needs.

B) WHAT CONSTRAINTS HAVE DETERRED OR PREVENTED THE FOOD TECHNOLOGISTS AND FOOD TECHNOLOGY INSTITUTIONS FROM USING THEIR RESOURCES MORE EFFECTIVELY TO HELP ALLEVIATE MALNUTRITION PROBLEMS?

Lack of nutritional education.

Lack of interest by producers of obtaining products of best quality, even for export, where standards of quality must be met.

Policies not very clear regarding exploitation of agricultural resources with adequate cultivations.

Difficulty in introducing new cultivations of farm crops.

Lack of communication between the farmer and the industrialist.

No relation between domestic and international prices.

INTERVENTION PROGRAMS - PAST, PRESENT, PLANNED - CHILE

I. What nutritional feeding program has been tried in the past and discontinued.

- A. Product used: Supplementation and fortification of bread, flour and noodles (spaghetties).
- B. What was the make up: Lysine, vitamins, soy and fish protein.
- C. Malnutrition condition intended to be corrected: Avitaminosis, caloric-protein.
- D. Where was program tried and with how many subjects: La Platina, Carozzi, Lucchetti, Curico - 3,000 children.
- E. Was the program a small pilot operation or a more extensive one: Both.
- F. Why was program discontinued: The fortification with vitamins was not discontinued. The research of supplementation of bread was made at a pilot plant only.

II. What nutritional feeding programs are now in progress:

- A. Product being used: Fortesan, Lacto-Da.
- B. What was the make-up: soybean flour, dried milk, wheat flour.
- C. Malnutrition condition intended to be corrected: Caloric-protein.
- D. Where is the program being carried out and with how many subjects: CONPAN, CRAV, INTEC.
- E. Is the program a small pilot project or large in scope: Large.
- F. How long has program been in progress: Over one year.
- G. Degrees of success in correcting malnutrition condition: Good.
- H. Is expanding the program to other regions contemplated: Yes, Fortesan is being distributed all over the country.

III. What nutritional feeding programs are being planned:

- A. Products being used: Potato flour in bread.
- B. What was the make-up: potato flour.
- C. Malnutrition condition intended to be corrected: Caloric-protein.
- D. Where will the program be carried out and with how many subjects: CONPAN, CRAV.
- E. When will program be started:

SOUTHERN COUNTRIES REGION - I.F.T. Nutrition/Food Technology Study

PARAGUAY INFORMATION - Prepared by Nelson de Barros B.

In Paraguay exists several organizations concerned with nutritional and dietetic problems and their influence upon the country's development. The most important organization is the National Nutritional Council (CNN) which is made up of (a) the Minister of Agriculture and Animal Industry (cattle industry), (b) Minister of National Defense, (c) Minister of Public Health and Social Welfare, (d) Minister of Education and Culture (religion), (e) Minister of Industry and Commerce, (f) Minister of Finance, and the President of the Central Bank of Paraguay. This high level organization, with the collaboration of the U.S. Government, made a national survey in 1965 that is considered so far as the most reliable document regarding nutrition.

Later on the Ministry of Technical Planification coordinated the work in this area through the National Social Progress Council. And more recently in collaboration with UNICEF and the national organization, it is conducting a survey based on a questionnaire distributed among 30 villages located in the Orient (eastern) Region of the country. The investigation is carried on among marginal family groups picked up at random from urban, sub-urban, and rural areas. The work encompasses clinical-nutritional, hematological and socio-economic studies. Also, feeding habits, types of food consumed by families, and their sources.

In the educational area, regarding food consumption, there exist an organization named PAEN (Feeding and Nutritional Education Program). This organization is tri-ministerial: Agriculture, Education, and Public Health, and was brought into existence in 1959 in order to coordinate government efforts in the area of nutritional education. Since 1972, it is part of the Integrated Services for Rural Development of Paraguay, which is patronized by the National Council for Social Progress. This program is responsible for organizing courses and projects on Food Education, which includes health services and rural schools with the collaboration of UNICEF, FAO, OMS/OPS, Peace Corps, and PMA. At present, it works very actively on the use of soya in family feeding, and the introduction of opaque corn No. 2 in rural production and consumption.

The national nutrition policy is being outlined (directed) these days by the Ministry of Technical Planification, dependent to the Presidency of the Republic, with the collaboration of related national and international organizations.

PARAGUAY

A. Technological Resources

In the area of Food Technology Education and Research, there are two institutions. The first one is the Faculty of Chemistry and Pharmacy oriented mainly to teaching. The second is the Institute of Technology and Normalization mainly oriented to research and development in food processing and adapted to local conditions.

The Faculty of Chemistry and Pharmacy has started teaching a 3-year career in Food Technology designed for high school graduates from the interior of Paraguay and has emphasized the utilization and preservation of food from rural areas.

The curriculum is based on a publication of the U.S.D.A. titled "Suggestions for a Two-year Course in Food Technology" with adaptations to meet Paraguay needs. The latter publication is included as Annex B.

The technological resources available in the Faculty of Chemistry and Pharmacy are described in Annex A.2, while the one that corresponds to the National Institute of Technology and Normalization is found in Annex A.1.

PARAGUAYB. Current Malnutrition Problems

There is no information regarding the survey being conducted in 30 communities selected in collaboration with UNICEF. The professionals consulted consider that the data found as a result of the survey conducted in 1965 is still valid and do not have to be changed because new massive programs have not been implemented in the area of nutrition since that date.

The general conclusions found in the 1965 survey are as follows:

The nutrition questionnaire of Paraguay (May - August 1965) was made by a group of Paraguayans and North American specialists in Medicine, Odontology, Biochemistry, Veterinary Science, Food Technology, Food Utilization, Agriculture and Economy. In 35 localities distributed all over the nation, 7,440 persons were chosen at random from among 1,424 families. The survey also included two Mennonite colonies, one group of Japanese immigrants and others of natives. In addition, 1,122 young male adults were also contacted as a result of the survey made in the Armed Forces, which has been analyzed separately.

In terms of primary malnutrition, the most evident deficiency is that of iodine, which is manifested by enlargement of the thyroid gland, low iodine excretion index in urine, and exceptionally small iodine present in the diet. Biochemical and food intake data suggest reduced riboflavin levels in the diet. Food consumption studies also indicate low levels of calcium and vitamin A in the diet.

In terms of secondary malnutrition, retarded growth, slow mental development, and reduced height typical of many Paraguayans, suggest the possibility of several diseases that start during pregnancy and continue with ailments in early infancy, childhood and adolescence. This also has adverse influence upon utilization of ingested nutrients, which in the majority of the cases seem to be adequate to guarantee faster growth and development. The possibility does exist that primary malnutrition in children is concealed among the nutritional data submitted by the families. There is no way we can get information that may explain these phenomena in an unequivocal manner.

Anemia, clinically identified and also in the laboratory, is one of the main problems. Since the iron contained in the diet was found inadequate, almost without exception, it seems to be that anemia is the secondary illness, particularly to "anquilostomiasis" infestation. Here also, however, and as a curious case, is the low hemoglobin levels in men, and certain incongruencies among hemoglobin concentration, prevalent parasites and therapy, suggest the necessity to conduct additional studies.

Dental and oral examinations revealed lack of general oral hygiene, progressive tooth decay, and loss of teeth at an early age. The contrast in tooth decay index, losses, and repaired teeth among Paraguayans and the four special groups suggests the importance of environmental factors, personal oral hygiene, and the low availability of odontologists in order to preserve the teeth. Moreover, a definite reduction in tooth decay among school children from Asuncion since water fluoridation was started gives testimony of the importance of fluorine traces to prevent tooth decay.

The studies on food consumption reveal an interesting parallel between dietary sufficiency and degree of urbanization. Dietary sufficiency reflects also the economic level of the family. The average number of calories and nutritive elements consumed was consistently satisfactory. However, among the wide range of values around the average values, the families at the lowest extreme of the scale show the existence of certain sectors with subnutrition and even malnutrition in many places. In general, the nutritional substances less abundant in the Paraguayan diet are riboflavin, vitamin A and calcium. Deficiencies in water supply, cooking facilities and sanitary installations contribute to the difficulties faced by Paraguayans when procuring an optimum diet. Lack of understanding of the nutritional requirements of children among the public in general, and also of pregnant and lactating women, increases the difficulties even more.

Inadequate treatment recommended by quack doctors and empirical midwives frequently worsen the malnutrition secondary to the illness under treatment.

Some recommendations included among the conclusions found in the 1965 survey, and still considered valid, are described below.

The National Nutrition Council of Paraguay should finance investigations correctly programmed and executed, in order to determine the factors responsible for the retarded growth and development of numerous children and the short stature of many Paraguayan adults. These investigations should include individual food consumption studies within each family, and also enumerate the frequency and severity of illness that contribute to secondary malnutrition. Educational campaigns should intensify the great need for adequate nutrition of infants, children, pregnant and lactating women. And if necessary to supply, in the form of direct supplements, those nutritional substances not present in the diet until the deficiency might be corrected by availability of natural foods and awareness of its adequate use by the public.

Endemic goiter can be prevented by consuming iodized salt. In Paraguay, all the salt for human consumption should be iodized. It should be required that all the salt imported in bulk should be iodized before being sold, and that all the pre-packaged salt for direct sale be only imported as iodized form. The implications and the execution of an iodization program are not simple. A salt iodization program in Paraguay cannot be treated with indifference.

The high prevalence of anemia in Paraguay suggests the need for conducting pilot studies directed to find out the most practical and economic methods for its prevention and treatment.

Intensive campaigns should be carried on to stimulate the use of shoes to improve environmental sanitation, to treat intestinal parasitism, and to improve the overall health situation. If by increasing the iron content in the diet one could demonstrate that it is safe and effective, it should be obligatory to enrich with iron all the wheat flour as well as the distribution of supplements containing iron among the vulnerable groups, especially children and pregnant women.

It was not surprising to see the low riboflavin indexes of ingestion and excretion among certain sectors of the Paraguayan population because very few people can obtain dairy products on a regular basis. A larger consumption of dairy products would cause great nutritional benefits to the Paraguayan people, but there is no indication that it can happen in a short time. However, if a flour enrichment program seems to be feasible, one of the other nutritional elements added should be riboflavin.

Water fluoridation has been proved to be an efficient way of decreasing tooth decay. Surveys made in Asuncion by the Ministry of Public Health and Social Welfare have shown drastic reduction in the number of tooth decay, tooth loss, and tooth fillings in school children after five years of controlled fluoridation treatment. It is recommended insistently that all new public water systems built in Paraguay be equipped with addition controlled fluoridation. In the areas where we cannot think of public supply water systems, the possibility of having controlled fluoridation of the water consumed in public schools should be studied. If the fluoride content of the water consumed in homes located in a certain area would be uniform, a formula for adding fluoride to water consumed in schools could be worked out at safe and effective levels.

The most efficient way to reach the rural population is through the school system. Personal hygiene (oral) programs must go into effect in all the nation's schools. Trained teachers and health educators should instruct their students about the adequate oral hygiene procedures. It seems possible to organize oral health training programs for educators, in collaboration with the Department of Odontology of the Ministry of Public Health and with the Faculty of Odontology of the National University. We ought to demonstrate the benefits of professional care. Prophylaxis programs, including topics on fluoridation, can be programmed by trained assistants.

The dental health programs should be enlarged. The services given at the health centers should include prophylactic and restoration care besides exodontia. A dental-health educational program will have greater impact than that of an enlarged services program. There are programs for prenatal babies by means of establishing contact with women from different families. By demonstration to these women the benefits and methods of oral hygiene, and by encouraging them also to instruct their respective families, it might be possible to reach large segments of the population through a few assistants. These efforts will be strengthened by the recently acquired hygienic habits of the recruits when they return home.

Studies about food consumption should continue at regular intervals, and quantification of differences in nutrients ingested among members of different families should be done every day of the week and during each season of the year. All changes in food consumption practices made through the year, and also in environmental and economic conditions should be recorded. Ideally, these studies should be carried on along with clinical and biochemical evaluations regarding the overall nutritional and health aspects.

The present national limitation in milk production, eggs and meat could be improved by providing supplementary foods derived from by-products of the oleaginous seeds, meat, and by gradual introduction of good quality animals and poultry.

Cooking facilities in the rural areas should be improved by introducing more adequate cooking methods under the supervision of extension workers.

Nutrition Education must be intensified in all health and home economic aspects using as vehicle the rural school. Radio and television should be used wherever possible to accelerate the educational process. This action should demonstrate how the Paraguayan diet can be improved by formulating specific and practical suggestions within the economic possibilities of the populations under consideration.

A deliberate and continuous campaign against the causes of secondary malnutrition must emphasize nutrient losses and great need for them as a consequence of illness. The campaign must also stress the danger involved when traditional domestic remedies are used, and when harmful diets or auto-medication is applied to correct an ailment.

The aforementioned campaign must stress that diseases can be prevented by personal hygiene, environmental sanitation, potable water systems, immunization against preventable diseases, use of safe and efficient cooking facilities as well as heating systems, better control of wild and domestic animals, and also insects that transmit diseases.

The present enlargement of silos and warehouses facilitate the marketing of agricultural products. Appropriate farm installations can reduce the large seasonal fluctuations of stored foods. The existing warehouses should be integrated with the new or modified ones that will be built.

It is extremely important to perfect the salt iodization program and its quality control. Also the quality of imported salt that is later iodized in Paraguay must be strictly regulated. Presently, adequate iodization presents numerous difficulties because distribution of the iodized mixture in the raw salt is hard to control. It is indispensable that the iodine content of the salts imported already iodized be analyzed in the laboratories that regulate the iodization process in Paraguay.

In view of the evidence that shows that the Paraguayan diet contains inadequate amounts of iron and riboflavin, the enrichment of wheat flour should be seriously studied. This procedure would make a great contribution to the people's health and welfare. The majority of the flour consumed in Paraguay is produced in central flour mills. Therefore, it is possible to initiate an enrichment program at an extremely reduced cost and with excellent possibilities of success.

In addition to a visit to the Department of Bio-statistics of the Ministry of Public Health and Social Welfare, we also visited the Department of Nutrition and the Department of Regulations of the same Ministry, the expert in pediatrics of the Institute of Social Prevision which includes 500,000 insured people, a nutritionist of the Food and Nutritional Education Program (PAEN), the gynecologists of the Hospital and Clinics annexed to the National University of Asuncion; we worked with a group from the Department of Technical Planification, which is coordinating the development of the latest questionnaire with the cooperation of UNICEF. In other words, we tried to have the best understanding of what is known in the country. Due to lack of time and available means, the two limiting factors, we could not obtain more details.

Data pertaining to mortality during 1974 and 1975 have been annexed separately.

P.7.1.

PARAGUAY

C. Reasons for Undernourishment (See Annex D.)

Among the people interviewed about reasons for undernourishment, it was found that the main cause was economic, although education cannot be overlooked. With respect to the latter, it is important to verify the relationship between workers and other people also who are insured by the Institute of Social Prevision (and therefore, have a stable monthly salary in most cases higher than the minimum) and the people who are cared for at local Health Centers belonging to the Ministry of Public Health and Social Welfare.

While women and children included in the study have practically no deficiencies, the other people show problems already described.

With regard to inadequate food supply, even though we know it exists, it is not the main reason for food deficiencies except milk production, that is known to be deficient.

PARAGUAYD. Post-Harvest Losses <sup>See</sup> (Annex E.)

In the study of Post-Harvest Losses, we have taken into consideration the latest published work available (1), and also the author's estimate based on personal interviews with farmers from the main producing areas and with experts in charge of promoting farm production.

## (1) Project on Grain Storage. 2nd Phase. PIDAP/BID - August 1976

We have found that losses occur mainly by lack of facilities to store the processed product which is directly related to the type of channels of commercialization.

To improve the system of commercialization, the Ministry of Agriculture and Animal Industry with the collaboration of the BID, has started a construction program that includes silos and drying plants for grains (cereals). They will pass into other areas such as legumes, vegetables, meat, milk and eggs in 1978. All of this will be within the global program for marketing of plant and animal products.

In the first phase of the construction project, grain storage for 14,000 tons has been completed, and in a new program being financed at present, 44,000 tons will be added.

INSTITUTO DE TECNOLOGIA Y NORMALIZACION - Annex A.

- I. Name of Organization: Institute of Technology and Standardization  
Department of Food Technology
- II. Address: Ave.Gen. Artigas y Gen. Roa, Asuncion, Paraguay
- III. Mission: Development and Control of Natural Technological Regulations and Investigations of Related Methodology.
- IV. Personnel:
  - A. Administrative and Service
    1. Director: Dr. in Biochemistry specialized in Animal Nutrition.
    2. Does not have a library. Uses the Institute's Central library. This has 3 specialized persons.
    3. Institute's Central Administration: Does not have own personnel.
    4. It has one Secretary and 3 assistants
  - B. Operative Personnel.
    1. Laboratories
      - a) Chemistry
        - 1) Central laboratory  
Industrial chemist (3)  
Biochemist (1)  
Assistants (4) University students
        - 2) Instrumental analysis laboratory  
Industrial chemist (2)  
Assistants (1) University student
      - b) Microbiology
        - 1) Biochemist (2)
        - 2) Assistant (1) University student
      - c) Sensory Evaluation  
None
      - d) Milk and by-products
        - 1) Industrial chemist (1)
      - e) Cereals and by-products
        - 1) Industrial chemist (1)
        - 2) Biochemist (1)
        - 3) Assistant (1) University student
      - f) Legumes, fruits and vegetables
        - 1) Industrial chemist (1)
    2. Pilot Plant Personnel
      - a) Professional. The aforementioned professionals have access to the pilot plant but the person in charge is the professional who works on legumes, fruits and vegetables.
      - b) Operation  
Assistant (1) University student
    3. Design and Engineering  
Engineer (1/4) Part time
    4. Animal Nutrition Laboratory (Feed technology)
      - a) Professional  
Industrial chemist (1)  
Assistant (1) University student
  - V. Facilities and Equipment
    - A. Central Office
      1. 3 x 5 meters
      2. Photocopier, mimeograph, etc. Use the Institute's central equipment. Do not have computer.

**B. Laboratory**

1. Chemistry
  - a. 15 x 6 meters. Used as central laboratory and instrumental analysis.
  - b. Specialized equipment  
IR, UV, Atomic Absorption, gas chromatograph
2. Microbiologia
  - a. 6 x 5 meters. With central and side working tables.
  - b. Litz microscope with microcamera. Continuous fermentator.
3. Sensory Evaluation  
Not available
4. Animal Nutrition
  - a. 6 x 5 meters. It is a new laboratory. It does not have much equipment yet.
5. Cereals and by-products
  - a. 6 x 5 meters
  - b. It has an electric bread oven
6. Fruits, legumes and vegetables
  - a. 40 x 25 meters
  - b. Pilot Plant
7. Milk and by-products
  - a. 6 x 5 meters
  - b. Centrifuge

**FACULTY OF CHEMISTRY AND PHARMACY**

- I. Name: Department of Food Technology. Faculty of Chemistry and Pharmacy
- II. Address: Ciudad Universitaria, San Lorenzo, Paraguay
- III. Mission: Lecture and Research. It started in 1976 as a 3 year career. It is designed to train people in the use and preservation of foods.
- IV. Personnel:
  - A. Administrative
    1. Industrial chemist (1) Food Technologist
    2. It uses the library that belongs to the Faculty and Institute of Technology and Standardization
    3. No.
    4. 1/3 part time secretary
  - B. Personnel of Operation
    1. Laboratory
      - a. Chemistry
        - 1) Biochemist 1/2 time
        - 2) No.
      - b. Microbiology
        - 1) Industrial chemist, 1/2 time
        - 2) Biochemist (1)
      - c. None
      - d. None
    2. Pilot Plant Personnel:  
The Pilot Plant in use belongs to the INTN
    3. None
    4. None

V. Facilities and Equipment

A. Offices

1. They use facilities that belong to the Faculty of Chemistry and Pharmacy and a 50 square meter classroom for lectures.

2. Not available.

B. Laboratories

1. Chemistry

a. 30 square meters.

b. Specialized equipment is available in the Faculty, such as UV, IR, gas chromatograph, and Atomic Absorption. They are used for demonstration. Students do not use them.

2. Microbiology

a. 20 square meters

b. Not available

3. Sensory Evaluation

Not available

4. Animal Nutrition

Not available

5. Pilot Plant

The INTN plant is used and also visit to factories.

**FOOD TECHNOLOGY CURRICULUM - Annex B****First Year**

1. General Chemistry, Inorganic and Qualitative (as practical work for Inorganic Chemistry).
2. Mathematics I (Arithmetic, Algebra, Geometry, Trigonometry).
3. General Physics and Biology (Heat Mechanics, Electricity - Ohm Law and Circuits, Biophysics).
4. Food Resources of Paraguay (Botany and Zoology of Paraguay; with emphasis on industrial varieties).
5. Operations and Processes I; Fermentation (Wine, Bakery, Pickles), and Evaporation-Pasteurization-Concentration.
6. General and Food Microbiology

**Second Year**

1. Organic Chemistry (Aciclica-Ciclica-Biology including hormones and antibiotics).
2. Analytical Chemistry (Quantitative-Instrumental).
3. Mathematics II (Analytical Geometry and Calculus).
4. Industrial Shops and Services (complements of electricity, motors, fluids, quick repair jobs, electrical connections, maintenance, welding).
5. Operations and Process II (Low Temperature in Food Industry, Freezing, Frozen Food Packaging).
6. Quality Control - Sensory Analysis - Statistics.

**Third Year**

1. Food Science (Additives, dyes, antioxidants). All of this in addition to classical Food Science (Bromatologia).
2. Industrial Organization (Accounting, Business Administration and Cooperativism-Fundamental Law).
3. Operations and Process III (Enlatado-Appertizacion - Canning Engineering).
4. Nutrition.
5. Hygiene and Sanitation Technics
6. Specialization and Project.
  - 6.1. Dairy
  - 6.2. Meat and Fish
  - 6.3. Fruits, Vegetables and Legumes
  - 6.4. Preserves, jellies, marmelades, compotes.

These subjects will be given in intense form for one year. At the same time, a project will be worked out based on subjects taken during the first years, which are related to utilization of foods from the student's native area. This may consist of improving a food already in production or to find new systems or new products that can be adapted to our environment.

**OBJECT:** A short career, programmed as directed by the administration of the National University of Asuncion, especially for people from the country's interior who have Bachelor Degrees and wish to return and establish themselves in their native localities. In this way, they can promote the utilization and development of foods, and a better supply for the internal market. This in turn improves people's nutrition and the area's economy, avoids food losses and enhances quality as well as sanitation.

**P.An.B.2.**

Capacitara tambien al que cursa esta carrera para desempeñarse en los mandos medios, de Plantas Industriales procesadoras de alimentos de gran tamaño, con gran empleo de tecnologia, productoras de alimentos, especialmente para el mercado exterior.

**COMMON PROBLEMS OF UNDERNUTRITION OR MALNUTRITION - Annex C****I. Types of Undernutrition**

- A) Protein deficiency
- B) Protein/calorie - The survey has not shown that it exists, but the opinion is that it could exist at the child pre-school level.
- C) Avitaminosis
  - 1. Vitamin A - Severe deficiency
  - 2. Vitamin C
  - 3. Folic Acid - Has not been studied
  - 4. Riboflavin
  - 5. Others
- D) Minerals
  - 1. Calcium
  - 2. Iron - Severe deficiency due to and related to anquilostomiasis
  - 3. Iodine - General
  - 4. Zinc
  - 5. Others

**II. Location of Undernutrition**

- A) Urban (50,000 people or more) - Yes
  - 1. Pregnant and lactating women - No
  - 2. Pre-school children - No
  - 3. Others
- B) Suburban (adjacent to urban centers)
  - 1. Pregnant and lactating women - Yes
  - 2. Pre-school children - Yes
  - 3. Others
- C) Small towns and population centers (5,000 to 50,000 people)
  - 1. Pregnant and lactating women - No
  - 2. Pre-school children - No
  - 3. Others
- D) Rural communities up to 5,000 people
  - 1. Pregnant and lactating women - Yes
  - 2. Pre-school children - Yes
  - 3. Others

REASONS FOR UNDERNUTRITION - Annex D.

- I. Illiteracy (lack of education). Very important to all levels.
- II. Economic: Higher
- III. Habits, religious restrictions, taboos, etc.: Lower importance.
- IV. Inadequate food supply
  - a) Production increases at slower pace than population
  - b) Inadequate transportation
  - c) Deficient planning
    - 1) Overproduction of some crops or products
    - 2) Underproduction of some crops or products: Milk
  - d) Sources of production and preservation: None existent
    - 1) Refrigeration and cold storage
    - 2) Dehydration
    - 3) Packaging including canning
    - 4) Others
  - e) Defective marketing practices: Very important
  - f) Others
- V. Non-potable water sources: High
  - 1 55% of pre-school children live in urban areas that have anquilostomas. 95% of pre-school children in rural areas have the same problem.
- VI. Inadequate foods available (which ones and why).
  - 1 Survey about "anquilostomas" in Paraguayan pre-school children. Ministry of Public Health and Social Welfare. Unpublished work.
- VII. Deficient communication among nutritionists, technologists, industrialists and government officials. Communication does not exist.
- VIII. Official or private nutrition policy and food production: It is being prepared at present and will be in effect as part of the next Quinquennial Development Plan, 1977 - 1981.

POST HARVEST LOSSES - Annex E

- I. Which foods suffer such losses?
  - a. Grains: wheat, corn, soy, rice, beans
  - b. Vegetables: in general
  - c. Meat, milk and eggs
  - d. Fruits: pineapples, oranges, grapefruit
- II. Where do losses take place?
  - a. Before harvesting
  - b. Lost crops in the field
  - c. In storage
- III. Why do losses happen?
  - a. Inadequate storage space
  - b. Lack of food processing or too high processing cost which prevents it.
  - c. Lack of credit at harvesting time
- IV. How much does it represent (tons and percentage of total)
  - a. Grains: 10-15% loss
  - b. Vegetables: 15-25%
  - c. Meat, milk and eggs: 10%
  - d. Fruits: 15-25%
- V. Deficient or inadequate storage. This is the limiting factor.
- VI. What has been done to avoid losses and has it been successful?

The Ministry of Agriculture and Animal Industry with the financial collaboration of BID initiated a grain storage program in 1971 to prevent losses due to storage and grain drying. This first phase has been completed and will continue with a second phase that deals with storage volume increase up to 44,000 tons of grain. In addition, to begin the installation of a cold storage plant for perishable products. The success obtained so far has had a great impact in the commercialization of grains due to a reduction in farm losses and better product price.

- VII. Others.

NATIONAL PROGRAM FOR FOOD AND NUTRITION POLICIES - Annex F

**Objectives -**

This program outlines a comprehensive policy for adequate nutrition by providing food as well as economic and socio-cultural facilities.

This global objective encompasses a series of objectives; components that are inter-related with conditioning factors at the nutritional level of the population:

- Sufficient food supply
- Buying capacity to consume food
- Adequate health to utilize the food consumed.
- Appropriate education and consuming habits to be able to select, prepare and preserve foods.

The definition of global objectives and their components shows the complexity of a nutritional problem. Many factors contribute to it, such as production, food exports and imports, income level and distribution, population size, composition and distribution, education, cultural level and health condition.

To solve nutritional problems, it is necessary to have coordinated policies that involve the action of national, public and private institutions. In the programs and projects included in this outline, particular attention has been given to the necessity for integration. (Reference: Volume related to Programs and Projects).

Specific Objectives

During the 1976-81 period, the national feeding and nutrition policies will be oriented toward the following specific objectives:

- 1) To intensify the eradication of parasitic diseases
- 2) To promote nutritional education by means of strong campaigns that create good nutrition habits
- 3) To promote home food production in the rural areas through the establishment of diversified farms.
- 4) To promote food supply at subsidized prices especially for marginal groups in urban centers that use popular dining places.
- 5) To combat the lack of basic nutritional elements (vitamin A, riboflavin, calcium, iron) by means of supplementing foods with minerals and vitamins, particularly those that are consumed in massive quantities such as wheat flour, sugar, milk, vegetable oils.
- 6) In the nutritional aspect, give priority to the following towns:
  - Laurel Ty, Ricardo Brugada, Villa Hayes, Ayolas, Yabebyry, Cerrito, Liberacion, Yhu, Repatriacion, Hernandarias, Pto. Stroessner y Limpio.

The possibility of combining educational and sanitary assistance for these towns must be studied at diversified farms.

No other objectives to correct national food problems are mentioned. The reason is that in proposals for agricultural, industrial and social areas, we have recommended other aspects such as food, marketing, buying capacity, general education and sanitary assistance.

## National Programs for Food and Nutrition Strategy

The strategy to consider takes place at two levels

- a) Institutional
  - b) Operative
- 1) With respect to institutional strategy, the premise is that the objectives of a National Feeding and Nutritional Program cannot succeed without activating an institutional mechanism specifically involved in food and nutritional problems.

At present, there exists an organism (National Nutrition Council), that is in charge of the study, consideration and solution of national food problems in relation to people's health and product supplies. (Decree No. 26.028 (4-IV-1957) established the National Nutrition Council). This organism is integrated by the Ministries of Public Health, Agriculture and Animal Industry, Finances, Industry and Commerce, National Defense and the Paraguayan Central Bank.

The proposed strategy of the Food and Nutrition Program (1976-81) is to establish an operative plan within its own organization.

- a) Develop studies related to specific foods and nutrition problems in coordination with ad-hoc groups from the Ministries concerned with the problem.
- b) Carry out the control, formulation and adjustment of food and nutrition policies adopted by the government through the National Nutrition Council.
- c) Advise the National Nutrition Council with regard to correct decisions on nutritional policies.
- d) Coordinate the various organisms' efforts, public and private, that are related to food and nutrition problems, but emphasizing the multisectorial nature of these problems, and consequently, the necessity to develop coordinated action in all implicated areas so as to reach integrated and effective solutions.

The establishment of this operative unit will give the National Nutrition Council an active organism needed to execute its purposes. The activation of the National Nutrition Council is the only feasible way to strengthen the decisions on nutritional problems and policies.

- 2) With regard to strategy at the operational level, we should consider the absolute necessity for formulating and executing food and nutrition programs on an integrated, multisectorial basis. All undertakings oriented toward isolated aspects of a food problem (production, consumption, or nutritional utilization) are condemned to failure. The actions will be effective only when they are undertaken together in an effort to attack simultaneously the factors that cause the nutritional problem.

In conclusion, food and nutrition projects must be coupled with integrated programs that mobilize resources in productive and social sectors where a nutritional problem is generated.

- 3) Within the same operational strategy are included some critical problems related to protein-calorie malnutrition in certain social sectors of the population. For instance, vulnerable age groups in areas of the country where diagnostics have shown serious nutritional problems.

Immediate action must be taken in these instances:

- Children below 5 years of age, when 8% have deficiency symptoms
- 5 to 14 year old groups with prevalent goiter (based on statistics from the Ministry of Public Health and Social Welfare, in 1974, 12% of the whole population had goiter. The data belonging to the 5 to 14 year old group is contradictory. Reference: National Health Plan 1976-80, MSP, pag. 53).
- Pregnant women where nutritional anemia reaches 43%
- Marginal groups to urban centers
- Localities where diagnostics have proved protein-calorie malnutrition, intestinal parasites, hypovitaminosis. A listing of these localities is included in the specific objectives of the proposed plan.

#### National Food and Nutrition Policy for the 1976-81 Period

1. Various socioeconomic sectors form the elements of coordination and compatibility of the nutritional objectives. We will not repeat the orientation already explained under sectorial policies that integrate the National Development Plan, except when necessary to add a nutritional connotation to the aforementioned policies.

2. The coordination of policies requires that they be grouped into four large categories:

- a) Policies related to food availability.
- b) Policies related to food consumption.
- c) Policies related to nutritional utilization of foods.
- d) Policies related to the institutional organization that takes care of nutritional problems.

The policy aspects corresponding to each of these groups are as follows:

3. Policies related to food availability. This availability depends on:

- Food production (primary and industrial)
- External food balance (importation and exportation)
- Foreign donations
- Systems of food preservation

Policies entailed to these factors belong to diverse sectors (agricultural, industrial, external and public), therefore, their specific objectives are included in the respective sectorial plans. Their compatibility, through the nutritional objectives, requires additional comments.

3.1. With regard to production, both quality and variety are taken into consideration, at the primary and industrial levels, and also the technology used in order to produce. Briefly, it is of interest to know what, how much, and how the national production of foods take place.

##### 3.1.1. Primary Food Production

The National Food and Nutrition Policy shares its objectives with the Agricultural Plan insofar as to increasing and diversifying national food production, but it adds:

- Give special attention to foods that contribute to improve the popular diet by adding protein and deficient nutrients (calcium, vitamin A, riboflavin). The main foods are as follows: Milk, meat, egg, vegetables, soy, corn, beans and peanuts.
- Promote the construction of diversified farms in order to produce different foods at the family level. To be able to accomplish this,

special funds should be provided, as well as technical assistance and nutritional education. This solution is suggested because malnutrition is not derived from limitation of natural resources, but from sub-utilization of them due to a lack of capital, as well as inadequate consuming habits.

- Insist that studies be made with regard to possible meat substitutes that are nutritionally equivalent to meat, available to low income groups, and with possibilities of being included among consumers' preferred items although it may require the use of special recipes. This is of great importance when dealing with soy, poultry, swine and fish.

- Continue with greater emphasis all research and extension programs in the area of food production so as to obtain a substantial increase in productivity at a reduced cost within a reasonable short time. Also to give greater benefits to those who produce, but without increasing consumer's prices as a mechanism to stimulate production.

### 3.1.2. Industrial Food Production

In addition to the objectives found in the Industrial Plan, the National Food and Nutrition Program puts special emphasis in the following orientations:

- Promote the propagation of home food industries in rural areas so as to obtain better utilization of available foods all year round. This will help to lower seasonal unemployment and will cause a positive change of mentality in the typical producer. The introduction of these new values in the producer's cultural world will reflect in good nutrition, a decrease in habitual idleness and the spontaneous discipline imposed by the work involved in processing foods. Farm products are good for home processing. They can be transformed into sausages, preserves, marmalades, bakery items, and dairy products (cheese and butter).

- Perform exhaustive investigations about the possibility of substituting imported foods of a large consumption type, such as candy, confections, preserves, canned fruits, milk powder, enriched cereals for infants, etc.

Increase research in the industrial food production area by improving quality and reducing cost.

- Direct the research toward finding a type of food technology that is compatible with existing conditions, and always favor the use of items that are abundant, but restrict the use of scarce ones.

- Carry out feasibility studies related to the manufacture of enriched foods of high nutritional value. These foods help to spread out the use of nutrients (calcium, vitamin A, riboflavin) in the diet.

- Guarantee an effective protection to the national food industry during the initial stage of growth and consolidation.

- Increase the use of pasteurized milk as a protection to national health.

- Proceed with studies about utilization of cassava in mixed flours and its enrichment as a substitute for annual wheat imports.

- Control iodization of salt in all industries used.

3.2. The other factor that affects food availability is the external food balance or, in other words, the net balance of exportations and importations. Paraguay is a food exporting country, and has also adopted the "grow toward the outside" strategy. However, this brings the possibility of eventual competition between exportation goals and nutritional goals. Moreover, the high cost of foods due in part to production (primary or industrial) but to exportation too, makes it necessary to give special attention to the possible substitution of manufactured food imports and also to the improvement of those food industries that are oriented toward exportation. These considerations suggest the following policy:

- Continue to back up internal food consumer protection policies, but direct export goals according to nutritional objectives so as to guarantee an adequate availability of people's food needs.

- This implies compatibility between export goals and nutritional goals in the form of a compromising solution that may support export programs without damaging the nutritional level of the population.

- Increase the exportation of better manufactured foods as a means of capturing non-traditional markets. In this manner, the local food industry can make gradual savings in production and also obtain lower cost for local consumption.

This orientation considers the external market as a means instead of an end per se. The export market must serve as a base for evaluating the local food industry and also compensate its insufficiencies. However, the benefits of such an evaluation must be turned into the internal market in the form of greater production, more diversification and lower cost.

- Discourage the importation of non-essential manufactured foods of low nutritional value and high cost such as alcoholic beverages, candies, confections, sauces and spices, etc.

- Carry out serious and continued studies about strengthening food exporting industries that utilize native products and also help to obtain flexible and timely offers capable of sharing the world food supply.

- Replace gradually the importation of manufactured foods in those areas of the country favorably equipped to do it according to specific objectives of the industrial sector.

- Maintain a permanent coordination between the National Nutrition Council and the institutions involved in formulating and executing food importation and exportation policies that can guarantee the success of the objectives described.

### 3.3. International Food Donations

The possibility of obtaining international donations of foods solves short-term problems and also frees productive resources that in turn can be applied to programs and projects that affect the economic development of the country. Tapping of international donations must respond to a systematic policy structured around the following orientations.

- Reactivate institutional mechanisms for obtaining and assigning by centralizing the responsibility at the National Nutrition Council.

- Assign donations that assist vulnerable groups (under 15 year old children, pregnant women, people from areas with severe nutritional deficiencies) as well as agrarian reform and population relocation programs.

- Direct donations to schools, hospitals, health centers, especially those located in critical areas with recently relocated populations.

- Establish an efficient administrative organization, as part of the National Nutrition Council, in order to obtain, transport, store, distribute and control food donations.

- Centralize the administration of the National Nutrition Council so that all of those who distribute donations can render their accounts periodically.

- Adopt special precautions to avoid "malversacion" and other types of spurious manipulations against the aforementioned objectives.

- Submit a list of foods for evaluation by the National Nutrition Council. Keep in mind that the Council must assign priorities every year.

### 3.4. Food Conservation

The important food losses that take place during production and marketing reduce significantly the availability of foods throughout the year. This makes it necessary to coordinate a national food conservation policy that contains the following objectives:

- Promote efficient agricultural practices by teaching improved methods but also show the great losses (in volume and value) derived from inadequate crop production.

- Increase storage and warehousing systems and see that they are fully used by assisting the producer financially while his crops have been stored.

- Improve means of transportation, and the services related to moving foods, especially those that are perishable or those that are too bulky.

- Intensify the programs on nutritional education in rural areas and also in schools located in marginal city districts. This helps to save foods at the family level.

- Promote home use of perishible foods particularly those derived from milk, or transformed into sausages, candies, marmalades, and mixed cereals.

### 4. Policies related to food consumption

Food consumption depends basically on consumers' income, as well as food preferences, habits, price and other items and services that compete for consumers' money. Consequently, these policies must be oriented as follows:

- Increase the income level per capita and improve distribution using government control for this purpose.

- Increase job opportunities

- Decrease seasonal rural unemployment

- Introduce agrarian reforms and "colonization"

- Introduce a reformed taxpayer system

- Orient public expenditure toward social objectives: education, health and housing

- Induce consumer's habits according to food availability and good nutrition by conducting educational campaigns about nutrition. Pass around recipes that use soy and peanuts.

- Stimulate the consumption of nutritive, balanced meals at prices that low-income groups can afford by eating at public dining rooms, or "popular menus" located in schools and commercial places. Low prices may help to form good food habits and teach how to select desirable nutritional diets.

- Proceed with price stabilization policies, particularly on food product matters. For instance, promotion of diversified farms in rural areas can reduce the pressure derived from high world prices. They can also help to suppress the use of mediators in the production-consumer cycle. Mediators' channels are the areas that contribute to high prices. For instance, transportation, storage and losses suffered during marketing. Food production at the family level can alleviate these pressures simply by suppressing intermediary factors.

- Organize nutritional education on solid institutional basis with the help of an adequate budget.

- Operate nutritional education by taking into consideration the type of people who receive the message.

- Nutritional education must take into consideration people's socio-cultural level, capacity to assimilate, resistance to changes, size and composition of families, income level, available foods in the area, predominant diet, sanitary conditions, nutritional deficiencies, weaning practices and cooking facilities.

Housewives and children of school age require preferential attention. Housewives determine lactating and weaning practices, children feeding care and everything else related to selection, preparation and food family distribution. School age children give the opportunity to stimulate new consuming habits as well as removing old feeding practices.

The importance of a scientific and continued nutritional education requires the cooperation of adequate personnel such as dietologist physicians, nutritionist physicians, nutritionists and dietitians, biochemists, dentists, economists, veterinarians, agronomists, teachers, social workers, food technologists, home economists and extension workers, among others.

Human and material resources that demand permanent nutritional education show the necessity of providing an adequate annual budget as one of the priority requirements toward improved feeding of the population.

##### 5. Policies related to nutritional utilization of foods.

The biological utilization of foods depends upon people's health, and this in turn is related to:

- + Income per capita
- + Educational level
- + Sanitary assistance
- + Environmental cleanliness

Matters concerning income and education have already been mentioned; however, they belong also in this group of specific policies. Therefore, this basic orientation follows:

- Improve the income level as a way of helping with expenses involved in health problems.

- Increase the educational level in general, but particularly with regard to women.

Develop a continued sanitary campaign that decreases mortality due to undernourishment and malnutrition. Specific characteristics are shown below.

- a) Control and treatment of undernourished children up to 15 years of age.
- b) Control and treatment of undernourished pregnant women.
- c) Control and treatment of deficiencies in other groups.
- d) Control and treatment of endemic goiter.
- e) Supplemental feeding of pre-school children.
- f) Supplemental feeding of undernourished pregnant women.
- g) Feeding services to people in health centers.
- h) Nutritional education.

- Improve and control the environment in order to eradicate prevalent infections and parasitic diseases (approximately 10% of the mortality cases are caused by deficient sanitation. Close to 55% of infants mortality is caused by contagious diseases, most of them of "hydric" origin).

The environmental cleanliness must cover:

- a) Increase potable water supply
- b) Extend sewage service and trash collection service by furnishing improved municipal services.
- c) Require strict sanitary control of food production to reduce contamination risk.
- d) Control working conditions of people whose occupation represents a potential health hazard.

#### 6. Institutional policies

The National Food and Nutritional Policy for 1976-81 includes the establishment of an operative unit that will be able to activate the National Nutrition Council. The renovation of this group ought to respond to the following orientation:

- To establish a national consciousness about the importance of food and nutrition with respect to human, economic, social and political problems.

- Mobilize every type of massive communication to reach this objective and maintain close contact with institutions (public and private) whose participation is relevant for obtaining the nutritional objectives.

- Develop investigations and formulate multisectorial and integrated projects in coordination with the organisms that are involved.

- Implement a permanent mechanism that follow up, control and adjust the proposed projects, and then adapt them to the dynamic and evolutionary process of the nation.

- Attain a solid budget to be able to fulfill its goals.

- Formulate administrative basis for obtaining, channelizing and controlling international food donations.

- Coordinate all policies related to feeding and nutrition.

**HOW FOOD TECHNOLOGY RESOURCES CAN BE EFFICIENTLY APPLIED TO SOLVE MALNUTRITION PROBLEMS**

A. Food Technologists can contribute to the development of national nutritional policies through the introduction of new matters not included so far.

Large post-harvest losses of fruits, legumes and vegetables are due to their perishable nature. The development of an efficient food processing industry will improve the nutritional level.

The best contribution in this respect is to develop acceptable foods that can solve existing problems without costing too much.

B. At present Food Technologists are interested in applied nutrition with crucial interest. They are not necessarily interested in nutritional aspects related to new foods. For this reason and because of the small quantity of them their contributions have been limited.

C. Food Technology Contribution to Malnutrition

In Annex G a description is made of the areas in which food technologists may contribute with greater impact.

D. Food Program in Development

In the new 1977-1981 Program, which is still under discussion (the rough draft is enclosed under Annex F), gives an idea of things that should be done in the next 5 years.

We consider that the objectives are too extensive and that they should be reduced so that they can have a greater impact over the present situation.

E. Possible Programs to be Undertaken

a. Intensive education program for adults about nutritional aspects of available foods and encouragement with regard to projects being carried out by the PAEN.

b. Encourage improvement of children "homes" which is something obligatory, but it has not been enforced in all the industrial establishments that employ 10 or more mothers.

c. A program on flour enrichment with soy and riboflavin.

d. A program on sugar enrichment with vitamin A.

e. Definition of best vehicle for nutritional improvement with calcium and iron.

f. An intensive program against parasite and specifically designed to eliminate "anquilostoma."

Mortality rate of children under 5 years of age . . . . . 170/1000

The main deficiency cases are caused by enteritis and diarrhea in children under 1 yr. old. In the 1 to 4 yr group avitaminosis represents 9%

Pre-school children:

diarrhea . . . . . 93/1000  
pneumonia and bronco-pneumonia . . . 49/1000  
anemia caused by avitaminosis . . . . 29/1000

Average available proteins per capita . . . . . 65.2 gm.  
Animal proteins available per capita . . . . . 32.5 gm.

**SOUTHERN COUNTRIES REGION - I.F.T. Nutrition/Food Technology Study**

**URUGUAY INFORMATION**

**A. Inventory of Technological Resources. Appendix A.  
Institutions having pilot plants.**

General Observation. In Uruguay there are only two institutions that have installations with pilot plants and which might be used in the manufacture of processed foods. They are:

Institute of Fishery Research of the Faculty of Veterinary Medicine (National University) located in Montevideo.

School of Dairy Technology. University for Applied Studies. Located in the interior of the country. (Nueva Helvecia).

A third institution, the Technological Laboratory of Uruguay (L.A.T.U.) which is an institution connected with the Ministry of Industry and Energy of Uruguay, but with resources and administration of its own will have its first pilot plant within a couple of years, according to reports, and will be for the purpose of working with fruits and vegetables.

Considering that as of today the School of Dairy Science has not responded to our consultations which were done personally by my colleague Dovat, Chief of the Technical Department of L.A.T.U., I will report only that which is related with the Institute of Technological Research.

**B. Current Problems of Malnutrition. Appendix B.**

There is no recent information at the national level. The last questionnaire made by the government of Uruguay and the United States is dated 1962. In summary the conclusions of this questionnaire were:

1. There was no reported lack of protein nor lack of calories due to lack of proteins, neither calcium nor iron nor vitamins.
2. The intake of vitamin B-1 did not reach the standards recommended by the National Research Council of the U.S.A.
3. The trend towards rickets in children was observed.
4. There is endemic goiter in particular in the northern half of the country.
5. With respect to vitamin C there was not found any definite evidence of deficiencies in spite of the extensive pathogenic gingivitis found in the population.

To be able to bring up the information to date it was necessary to then consult with a group of pediatricians and gynecologists and nutritionists of which those who cooperated most were Drs. Caillabet, Gomez, Zabala, Illa, Delfino and Morel who, by their activity (Department of Nutrition of the Ministry of Public Health, School of Nutrition and Dietetics of the Faculty of Medicine and the Gynecological Clinic of the Faculty of Medicine), have a very wide understanding of the problems of malnutrition. Also a nutritionist of the Ministry of Public Health was consulted (Ana Maria Munilla y Hayde Ruvetoni).

As general conclusion and general observation with respect to the adult population it is to be stressed that there seem to be more often cases of obesity than of malnutrition.

It was the clear opinion that in pregnant women no malnutrition cases were observed.

2.

In the country as a whole there are no data in relation to school children. However, the questionnaire of clinical nutrition, in a Montevideo zone where homes for workers prevail, covered examination of 5,000 children who were going to schools in the area. Their physicians monitored: skin, skeleton, weight and height, and oscultations were also done. The Ministry of Public Health participated as well as the Ministry of Culture (Director of National Primary Education) and the Council for the Child.

No cases of malnutrition, either advanced or moderate, were observed, but it was observed that among the children who were characterized by their abnormally low weight or low height there was high incidence of under achievement in school.

Finally, among hospital patients malnutrition of the protein-caloric type (marasmus) was among the first 5 causes of death and among 50% of the persons admitted in hospitals were younger than 1 year of age presented this type of malnutrition. Also, this group shows 60% of incidence of ricketts.

As a general observation it is indicated that the studies related to folic acid deficiency have been made and there are doubts with respect to iron and zinc.

#### C. Reasons for Malnutrition. Appendix C.

Among the questionnaires to report on the "Current Problems of Malnutrition" information was also obtained to find answers for the causes of malnutrition.

#### D. Post Harvest Losses. Appendix D.

The information reported here was obtained from a group of dietitians made up of: Teresa Amestoy, Elizabeth Borda, Elba Crovetto, M. L. Martinez Visca, Rosita Palazzi and Zulema Querol. Those persons made an exhaustive study on the availability of food in Uruguay in 1972.

As this is the most recent and all-inclusive report completed in 1975 the information on the topic that we are concerned with, we have prepared the report contained in Appendix D. based on the work of the dietitians mentioned above.

#### E. Manner in which the resources of food technology can be applied in an efficient manner to alleviate the problems of malnutrition. Appendix E, A-B and Appendix E-C.

The contents of Appendix E or A-B is the result of the interviews and meetings in which all those attending were in agreement as to the responses.

On the contrary, Appendix E-C entitled "Food Technology Curriculum", puts together the opinion of teachers and professionals in the area of chemistry and constitutes the personal opinion of the person preparing this report, which is also the opinion of the associate professor of Food Technology of the Faculty of Chemistry, Teresita Villar Campos; this associate professor did specialized work at the post graduate level in Valencia, Spain, in Food Technology.

Attached to this report besides the plan of studies which was supported by Professor Dr. Victor H. Bertullo, Veterinarian, with the clarification that the plan of this distinguished professor pertains only to the information of technologists for the fisheries industry. But even from this type of food technologists specialized there are divergencies of opinion which are very marked between the plan which was put in effect at the Faculty of Veterinary Science and the plan which was recently approved by the National University for the Formation of Fishery Engineers, (Engineers in fishery methods and in the manufacturing of fishery products), in the preparation of which chemical engineers and an FAO consultant had the most input.

In our criteria both study plans focus only in a particular case on the training of technologists who are specialized in the fisheries industry.

The curriculum that we are submitting for consideration by this committee pertains to the training of food technologists who are not specialized in any field, as we understand that the training they receive will make it possible that they will be able to work efficiently in all fields of the food industry. This criteria is considered by us to be closest to the reality of a medium like ours which is not yet highly specialized as there are not enough industries in any area of food technology to guarantee enough jobs for specialized food technologists.

Our criteria is also in agreement with the view point of the University of Uruguay in so far as food technologists must have a basic training in physics, chemistry and mathematics. Now our University named a commission of five professors to prepare the plan of studies for the new University career of food engineering. The writer of this report is one of the members of this commission that will start its work on the 10th of January 1977.

As a basis for the curriculum that we propose in Appendix E sub C we underline the following principals:

Step 1. Duration: 2½ years

Objectives: To give the student the knowledge at a sufficiently high level in physics, chemistry, physical chemistry, mathematics, biometrics, statistics, and English.

This is considered by us fundamental not only for the knowledge that this program entails but also to develop the mentality that characterizes those people who have been exposed to these disciplines, mentality which is very characteristic of professional food technologists, (engineers of different kinds, chemists). The level will be similar to that of chemical engineers and chemists.

Step 2. Duration: 3 years.

Objectives: The knowledge of the following courses which are needed for food technologists will be based on the following courses:

- 1) General Microbiology and Food Microbiology
- 2) Food Technology including the study of chemical, physical and microbiological and sanitary aspects of foods including toxicology and hygiene of the food industries as well as chemical and organoleptic analysis of foods.
- 3) Nutrition

- 4) Engineering of physical processes such as unit operations.
- 5) Engineering of food processes and bioengineering.
- 6) Toxicology and environmental hygiene.
- 7) Standards and Quality Control.
- 8) Economics and Industrial Design. It includes the study of the feasibility at the technical and economics level of given industries with an industry used as an example, including the design of an industrial plant and a thesis describing the diagrams.
- 9) It is considered important that the students have industrial experience during their studies but in our experience it is not expensible. On the contrary we consider that what was described above was the most important basis of the first step. If no means are available to have practical experience in plants it would be necessary to include and require visits to plants and a critical examination of what was observed during those plant visits.

Additional information on the present teaching of food technology in Uruguay.

Presently an industry in Uruguay that requires the technologists to manufacture foods may use three different types of professional persons.

- 1) Veterinarians or agronomical engineers who have taken courses in their respective faculties on the subject of technologies which are specific such as those of the dairy industry, meats, fishery products, fruit and vegetable products, technology, and fiber manufacture depending on the objective are one or the other profession.

With relation to the studies of the fisheries industry (Faculty of Veterinary Science) a report prepared by professor Dr. Victor Bertullo is attached.

- 2) Chemical engineers that even though they are not specifically taught food technology, because of their basic knowledge in the areas of physics, chemistry and mathematics and on the engineering of processes, are employed by certain industries who instruct them in the technologies which are characteristic of the industry in which they will be employed.

- 3) Pharmaceutical chemists with a technological background who must go to work after obtaining their title of pharmaceutical chemists will take courses in the area of food technology (2 semesters of 30 Hrs./wk) following a plan which takes advantage of their strong background in chemistry, physics and mathematics (which is similar to that of the chemical engineers) and of courses of high level in biochemistry, general microbiology, food microbiology, technology of foods in general, food toxicology and environmental hygiene (which are characteristic of their training as pharmaceutical chemists). They are those at the post graduate level studying engineering, food processing, industrial microbiology, nutrition, and standardization and quality control.

The final result is that approximately similarities in areas, level and time which are characteristic of the Universities of California, Illinois, and MIT, with the exception of the practice in pilot plants which, we repeat, we consider important but not absolutely necessary because of our experience with it.

Finally, it must be underlined that the creation of a career of food engineering in Uruguay will shorten the time necessary to study food technology as the requirement for a previous University degree will not be included.

**F. Programs in the area of Nutrition - Past; present and future.  
Appendix F.**

In the past there have not been activities that could truly be called programs. There have been, however, programs which have served mothers that freely would come with lactating children or somewhat older children; the centers known as "La Leche League." Another positive action was that of "The Cup of Milk" at the school level.

**F. I. "La Leche League"** - In those centers the pediatrician, M.D. examined the infant and gave pilot milk further enriched or modified to make them similar to mothers' milk. La Leche League was very successful during the years 1920 - 1955 approximately. These activities are still going on but as other state services also have similar objectives the activities of La Leche Leagues have diminished.

At the school level and through activities that were almost totally supported by private funds (parents committees) there was a plan to improve nutrition which was called "The Cup of Milk" (1 cup of 200 milliliters of milk that the school child had to drink unless there were contra indications. The program was abandoned some 15 years ago in the city schools.

**F. II. Programs that are now being implemented.**

These, in our opinion, are not programs but they should be described better as services:

- 1) One of them known as "School Dining Rooms" is of particular importance in the country schools and in the suburbs or cities where people of low economic levels live. These plans are supported with state funds and with funds from businesses and persons living in the area. This program substitutes the Cup of Milk program and makes available to the child the daily meal of good nutritional level.
- 2) Another activity is that which is done through the low-cost dining rooms of the National Institute of Nutrition (INDA), which are organized to serve factory workers and employees with low income. Participation in this program is voluntary. The program gives those who participate 1 or 2 meals a day which include all the important nutritional factors.
- 3) There is another active program for premature babies and nursing infants for the purpose of complementing their food intake (in the case of premature babies the program gives all the necessary food). The program uses a food prepared from fish. In respect to that program Drs. Victor H. Bertullo and Aguiles Delfino were consulted as they were those who proposed and studied this product which is prepared in the Institute which was directed by the first named person.

The use of the fish derivative food, as a complement, now is being applied to persons of other ages and is being tested in other cases which are cited in Annex F.II.

**F. III. Other Nutrition Projects.**

A program at the school level has been planned having as some objectives the comparison of results when the following foods are employed:

- a- Milk (300 ml per day)
- b- Fish Derivative Product (3 grams a day)
- c- Milk and the fish derivative, (300 ml and 3 grams per day, respectively).

**G. Possible Programs.**

**a) Of an indirect character.**

- 1) In general and unanimously it is insisted that it must be pointed out that considering our conditions a very positive way to contribute to improved nutrition is to put into effect at a national level a program pursued in nutritional education.
- 2) It is also unanimously recommended that the teaching of nutrition must be incorporated at all levels of education in particular for school teachers, physicians, agriculture engineers, veterinarians and, of course, for food chemists and food engineers.
- 3) Considering that it is a fact that there is an increasing number of mothers who work, and for that reason cannot take personal care of the feeding of their children, it is advised that at the national level nursery programs be implemented.

**b) Programs of a direct nature.**

- 1) A program that has the objective of enriching milk with vitamin D (in particular milk for children) in the period from March through November.
- 2) Considering that it is understood that the fish protein concentrate offers preferred advantages in relation with regaining of normal health and by nursing children who are dystrophic and premature, it is considered to study actively and in depth the utilization of fish protein concentrate in programs using other forms of the compressed product to make available fish concentrate.

This implies also, necessarily, the establishment of standards of quality (specifications of its characteristics) for the products that will be used for the purpose of comparing the results obtained with those obtained with products which were prepared in other places or with different raw products. Reported by Prof. Bertullo included in Appendix A.

**Appendix A. Inventory of Technological Resources. (Item 5).**

- I. Institute of Research in Fisheries. Faculty of Veterinary Science, University of the Republic.
- II. Tomas Basanez Street No. 1160, corner of Rambla Armenia, Montevideo, Uruguay.
- III. Research and Teaching.
- IV. Personnel.
  - A.1. Director, Veterinarian, Dr. Bertullo, the person who prepared this report.
  2. \_\_\_\_\_
  3. Department in the Faculty of Veterinary Science.
  4. \_\_\_\_\_
  - B. Personnel operating in:
    1. Laboratories
      - a. Of Chemistry
        - 1) Pharmaceutical and Biochemical Chemistry (1)
        - 2) Aid for General Services (1)
      - b. Of Microbiology
        - 1) Veterinarians (2)
        - 2) Students of Veterinary Science (2)
      - c. Organoleptic Evaluation
      - d. Dietitians - Nutritionists (3)
    2. Personnel of Pilot Plant

Investigations are in progress on status of freshness, handling, microbiology, canning, smoking, dry and wet salting, and on the development of a process for the manufacturing of fish protein concentrate which was developed in this institute.

- a. Food Technologists (1)  
Veterinarians who are specialized in foods of animal origins (4)
- b. Technical personnel who are attached to schools of medium level (Technical University) (2)
3. Electronics engineer, consultant (1)  
Mechanical engineer (1)  
Pediatritian, M.D. who controls the human use of fish protein concentrate (1)
4. Research on animal nutrition which is conducted in another department of the faculty, but has 1 chief and 5 veterinarians.

#### V. Facilities and Equipment.

This year the new building with 1100 square meters of area will be built for offices, administration and having a conference room with a capacity of 150 persons, a library with a capacity for 15,000 volumes, a lecture room for 40 persons, facilities for book binding, and archives.

##### A. Laboratories.

1. Chemistry laboratories
  - a. Three laboratories with facilities of 20 square meters each.
  - b. An automatic analyser, Beckman model B.120; an automatic Perkin Elmer spectrophotometer; atomic absorption spectrophotometer made by Sargent for mercury determinations.
2. Microbiology
  - a. Two laboratories with 20 square meters each.
3. \_\_\_\_\_
4. See 2.4 in IV. (above).
5. Food processing at the pilot plant level.
  - a) A chamber at 0° C. with a capacity for 2,000 kilograms; a chamber at -35° C. with a capacity of 2,000 kilograms; a plate freezer at -40° C. with a capacity of 400 kilograms each 8 hours. A canning pilot plant complete with stainless steel equipment with a capacity to prepare 2,000 cans picnic size No. 1 of 400 grams each 8 hours. Smoking equipment of brand "Afos" of Terry Research Station, Aberdeen, with a capacity for smoking food in the amount of 100 to 150 kilograms each 8 hours. A filling machine for sausages with a capacity for 10 kilograms of sausage. A pulper of the brand "Yangan-ika", Japanese, with a capacity of 200 kg. of pulp per hour.
    - b) A fermenter with 250 kg. of capacity for manufacture of fish protein concentrate with a mechanical agitator at 45 revolutions per minute and able to operate at 30° to 32° C. A centrifuge of 3 speeds brand "Titan" (Danish) with 3,000 liters per hour capacity. A dryer, brand "Sprayer" of Niro Atomizer, with a production capacity of 10 kg. per hour.
6. Equipment for drying and salting foods.
 

Two dryers for the manufacture of compressed fish protein concentrate. A machine for making tablets of fish protein concentrate with a capacity of 3,000 tablets per hour. A table for cleaning of fish with a capacity for 10 workers.

Appendix B. (Item 6)

I. Types of Malnutrition.

A. Protein malnutrition. No.

B. Protein and caloric malnutrition. Its existence only proven in nursing children who were in hospitals. It is of the marasmus type. It appears among the five principal causes of death. It is the cause for hospitalization of 50% of children under 1 year of age admitted to hospitals.

C. Avitaminosis.

1. Vitamin A. - No.

2. Vitamin C. - No. (see clarifications on pg. 1, appendices to the report).

3. Folacin. It has not been studied.

4. Others. (see clarifications of this Appendix B on pg. 1).

D. Minerals.

1. Calcium. - No.

2. Iron. There are doubts. This is not well known.

3. Iodine. - Yes. In Uruguay there are zones where goiter is endemic.

4. Zinc. - Unknown.

II. Places and environment where malnutrition exists.

With the exception of the areas where there is endemic goiter, places and environment where malnutrition exists are essentially in the belts of poverty in large but important cities. (see appendices to Uruguay report pg. 1).

Appendix C. (Item 7)

I. Yes. Because of ignorance of the basic principals and elemental principals of nutrition. This happens even among the educated social classes of higher economic levels but logically they exist principally among mothers who have had less than 3 years of schooling.

II. Yes. Among groups with low income.

III. There are in existence poor eating habits. Feeding breast milk of mothers' milk is becoming less common.

IV. No. The balance sheets show an average quantity per capita which is enough.

V. No.

VI. No.

VII. No.

VIII. No.

IX. The government has not implemented the national food policy.

X. An indirect factor is pointed at. Often food transportation becomes too expensive for negative marketing factors. This is a factor in the price of fruits and vegetables in certain regions of the interior of the country; its consequence is a significant reduction of the consumption of fruits and vegetables.

## Appendix D. Post Harvest Losses (Item 8).

## I. Percentage of loss of foods.

Crude sugar .....	1 %	
Oats .....	1.5%	
Wheat flour .....	2 %	
Sunflower .....	3 %	
Wheat .....	3.5%	
Corn .....	4 %	
Rice .....	5 %	
Apples .....	6.5%	
Potatoes .....	9 %	
Corn flour .....	20 %	
Vegetables .....	10 %	(estimated)
Fruits .....	10 to 20%	"
Poultry .....	30 %	"
Fish .....	30 %	
Milk .....	5 %	- This refers to

total losses after milking the cows. This 5% does not include the milk which is used industrially for purposes other than human food and that cannot be pasteurized.

Cheeses ..... There are important losses that cannot be estimated.

II. The losses are spread in the chain that starts at the farm and ends at the retail level.

III. It is due to different causes which are difficult to establish in each instance. Often there is loss of interest or ignorance among producers. Other times it is because inadequate warehousing, such as in potatoes, or because of poor applied technology such as in fish and shell fish, or because of a concentrated seasonal production within a few weeks (such as in fruits) and because of the subsequent saturation of markets. Cold storage is very expensive and at the top of the production season it is so expensive that it costs more than the product. Sometimes it is not economic even to pick the fruit or harvest the vegetables. An Agri-business complex that would make it possible to process the foods which are in abundance in certain seasons is not in existence.

IV.

V.

VI. Losses of grains have been reduced through drying with adequate equipment and through the construction of properly designed silos. The program to irradiate potatoes is being planned.

U.10.

Appendix E. (Item 9)

(A & B) - Make reference as to how the resources of food technology can be applied in an efficient manner to alleviate problems of malnutrition

- I. To improve communication among nutritionists, food chemists, food technologists, executives of firms, farmers, agriculturists, veterinarians, public health service employees, economists, and even lawyers.
- II. Yes. If and when there are food technologists with a good background and not just technicians educated at the middle level or people that have learned techniques of production of foods only through practical experience. (see notes to the report, pg. 2, Appendix E.)
- III. The same indicated under II. applies here.
- IV.
- V.
- VI. Through an information program where through the example given by the industrialists who find that hiring the food technologist with adequate professional background is a good investment that produces profits.

Footnote (1): By the term Bromatologist it is understood that in English is known as a Food Scientist. Obviously a Bromotologist is not simply a food analyst. A food analyst is known by us simply as a laboratory technician.

### Curriculum for the Food Technologist

First Step - Basic Sciences			
Cycle 1 - 14 weeks		Cycle 2 - 14 weeks	
General Chemistry - 8 hrs./week		Mathematics II	9 hrs./week
Mathematics I	11 " "	Quant., Analyt.Chem.	3/4 " "
Physics I	3/4 " "	Physical Chem. I	4 " "
English	3 " "	Physics II	4/4 " "
		English	3 " "
Total hrs./sem. 25/4 Hours.		Total hrs./sem. 23/8 Hours.	
Cycle 3 - 14 weeks		Cycle 4 - 14 weeks.	
Qual. Analyt. Chem.	2/4 hrs./week	Quant. Analyt. Chem.	3/4 hrs./week
Physical Chem. II	4/3 " "	Physical Chem. III	4/3 " "
Inorgan. Chem.	3/4 " "	Inorgan. Chem. II	3/4 " "
Organic Chem. I	5 " "	Organic Chem. II	3/6 " "
English	3 " "		
Total 17/11 " "		Total 13/17 " "	
Cycle 5 - 14 weeks		Cycle 6 - 14 weeks.	
Quan. Analyt. Chem.	3/4 hrs./week.	Instrumental Analy.	3/6 hrs./week.
Organic Chem. III	3/4 " "	Gen. Bio-chem.	12 " "
Electrochemistry	3/4 " "	Process Engineer.	9 " "
Biometry & Statist.	6 " "		
English	3 " "		
Total 18/12 " "		Total 24/6 hours per week.	
Cycle 7 - 14 weeks		Cycle 8 - 14 weeks	
Gen. Microbiol.	11 hrs./week	Process Engineering	9 hrs./week
Process Engineer.	9 " "	Food Microbiology	6 " "
Food Chemistry I	9 " "	Tech. drawing & blue	
(this includes chem. & biochem. of foods)		print interpret.	2 " "
		Plant utilities	4 " "
		Chem. & Bio-Chem. of	
		Foods II	4 " "
		Nutrition	4 " "
Total 29 hrs./week		Total 29 " "	
Cycle 9 - 14 weeks		Cycle 10 - 14 weeks	
Eng. of Food Processes I	12 hrs./wk.	Food Process Engineering II (in-	
Food Chem. & Bio-Chem. III		cluding specif. industries like	
(incl. food law & organo-		dairy fisheries, fruits and vetgs.	
leptic eval. of food	7 " "		22 hrs./week
Toxicology & Environon.		Bio-engineer. & fer-	
Hygiene	5 " "	mented beverages	8 " "
Business Admis.	6 " "		
Total 30 " "		Total 30 " "	
Cycle 11 - 14			
Standardization and			
quality control	4 hrs./week		
Economics	6 " "		
Designing of plants	20 " "		
Total 30 " "			

Footnote: 3/4 indicates: 3 lectures and 4 hours of lab. Each cycle lasts 14 weeks. Among the odd and even cycles there are 8 free weeks dedicated to examinations. Winter. After the even cycles (end of year and summer) there will be 14 weeks of vacation (vacations and exams).

At its last meeting in September 1976, the Southern Countries Committee reviewed all the information in hand and agreed unanimously to recommend to the Coordinator and to the sponsors of this project the three potential action programs outlined on the following pages:

- (1) Development of Specialized Foods for School and Pre-School Children.
- (2) Improved Utilization of Marine Resources.
- (3) Upgrading the Utilization of Staple Regional Crops.

## POSSIBLE ACTION PROGRAMS - SOUTHERN COUNTRIES

The Committee recognizes that the causes of malnutrition are many and varied. The main limiting factor is the low family income. Thus, malnutrition is intimately related with social and economic problems of the region.

The Committee being conscious of these limitations believes that the specific projects could be useful, particularly if there exists a national food and nutrition policy, which adequately recognizes these problems.

### PILOT PROJECTS

1) "Development of Specialized Foods for School & Pre-School Children".  
(Desarrollo de Alimentos Especiales para Escolares y Pre-Escolares).

Under this heading the Committee Members agreed on the need for the following product characteristics:

- Shelf-life under prevalent environmental conditions of between 15 and 30 days up to a year.
- The product to provide at least 25% of all nutrient requirements for children of these ages, when served with or without milk.
- Product must be acceptable to the children's taste and must be processed, packaged and distributed safely and economically in order to preserve its nutritional characteristics and acceptability. The flavor must be acceptable to young children in the different regions, within the four countries.
- Further, the product must be processed at a minimum cost, consistent with acceptable sanitary characteristics. It should use to a maximum degree inexpensive, wholesome local ingredients.
- The product should appeal to the middle class as well as to the lower-income levels. It should avoid the image of a product designed for poor people.
- Food technologists (bromatologists) from the concerned countries should be involved in this project.

2) "Improved Utilization of Marine Food Resources" (Aprovechamiento de los Recursos de Alimentación de Origen Marino).

The countries of this region are well aware that the waters of their coasts contain some of the richest marine food resources in the world. These resources have been heavily exploited for many years by countries including Japan and the Soviet Union, but the countries of Latin America have so far derived little benefit to their food supply from this situation

It may be recalled that considerable efforts have been expended in these countries including the foundation of marine science institutes, departments of fisheries and related activities, and a number of universities making processing and marketing studies as well as supporting research in marine biology. The benefits of all of these activities on the food supply of these countries remains minimal.

Clearly, it is necessary to propose some innovative approaches to break this impasse.

In accordance with the proposed pilot project, the members of the Committee agreed as follows:

- It is recognized that there is a wide reservoir of knowledge in this area. The challenge is to use and adapt this under local conditions in order to make far better use of the marine food potential. Possibly, each country will have a different approach and line of products appropriate to its economy and eating patterns.
- It is hoped that really creative new products will be developed so that good marine products containing foods will get to areas of these countries where today not much fish is eaten. Good sausage can be made from fish.
- Modern de-boning and flesh recovery techniques permit major improvement in economics of fish processing, thus not only recognize table species but also the so-called trash fish which can be used to provide innovative fabricated foods.
- Such developments of this kind must take into account the need to minimize the expense of conventional processing such as canning and freezing. Widely recognized examples of such innovative technology will surely include fish sausage, now widely used in Japan. Minced fish, for example, can also be used in dried products which avoid the need for canning or refrigeration.
- One of the first efforts that needs to be made is to determine why these innovations proposed in some cases a number of years ago have not developed commercially. The Committee requests consideration of a call for comments and suggestions and reprints from Members of I.F.T. with experience in this field to be sent to the Project Coordinator.

3) Upgrading the Utilization of Staple Regional Crops (Mejoramiento y Aprovechamiento de los Productos Primarios Cosechados Regionalmente).

It is recognized that the countries of the region face different problems as regards the production and availability of staple foods such as cereals and root crops. For example, Argentina and Uruguay produce ample quantities of wheat to satisfy their bread and baked goods requirements, whereas Paraguay and Chile must import a large part of their needs. Thus attention should focus on means to reduce this import dependency and a role for innovative technology seems obvious. In the southern part of Chile, for example, there is at times an excess of potato production beyond local needs. Consequently prices are depressed and farmers are not encouraged to produce. At the same time, recent work has shown that one can substitute potato flour for up to 30% of wheat flour used in bread.

Furthermore, by the dehydration one can make root crop food products available for purchase all year round at modest cost even in population centers at a distance from sources of production, thus absorbing temporary excesses in production. It is these local surpluses which have no market at the site of production which cause disastrous price drops.

Manioc (cassava) in Paraguay could also be used to extend wheat flour. The technology is known, yet somehow there has not existed the right combination of food technology, marketing, finance and national nutrition policies necessary to make these things happen commercially in the southern countries. The challenge is to undertake a project demonstration to establish feasibility.

Governments must recognize their responsibilities for defining and establishing the necessary policies and financial support which will stimulate leadership and innovation necessary to deal effectively with these problems.

A challenge to governments seeking to maximize employment opportunities in agriculture is to introduce processing even of a minimal kind immediately when commodities leave the farm gate. Agricultural products resulting from such processing are subject to less price fluctuation than are raw or unprocessed farm commodities. It would be advantageous for governments to foster agro industries in which food technology is a major component in the food processing and distribution chain. The benefits to agricultural employment by hastening transition of subsistence agriculture to a market economy through food technology is obvious.

The projects proposed in this report highlight the need for properly trained and educated food technologists who are given adequate opportunities and incentive to accomplish the objectives of the proposed projects.



RESUME OF LATIN AMERICAN TOUR 12 JANUARY - 5 MARCH 1976Summary of Stops Made During Tour

<u>City</u>	<u>Country</u>	<u>Number of Individuals Visited</u>	<u>Number of Institutions &amp; businesses Represented</u>	<u>Institutions Visited Including Factories</u>
Brazilia,	Brazil	15	6	4
Recife,	Brazil	21	2	2
Salvador,	Brazil	6	2	2
Rio de Janeiro,	Brazil	14	12	1
Campinas,	Brazil	26	4	4
Sao Paulo,	Brazil	26	20	3
Asuncion,	Paraguay	6	6	3
Montevideo,	Uruguay	12	4	2
Buenos Aires,	Argentina	16	10	1
Santiago,	Chile	25	15	10
Valparaiso,	Chile	4	2	2
La Paz,	Bolivia	10	6	3
Lima,	Peru	24	12	5
Guayaquil,	Ecuador	10	6	1
Quito,	Ecuador	10	4	2
Cali,	Colombia	9	6	5
Bogota,	Colombia	22	8	5
San Jose,	Costa Rica	21	12	6
Managua,	Nicaragua	8	5	3
Guatemala City,	Guatemala	18	3	3
	Totals	303	146	67

## Results of Tour

Following is a list of the individuals and institutions visited, with a brief comment concerning each meeting. In all cases we had written a key person at each location giving a brief description of the project, suggesting an appointment date to discuss the study in greater detail, and asking that they invite others who might be interested. At each meeting we explained our reason for asking to visit with them and that the project was designed to try to identify ways in which they could use local food technologies to help alleviate their malnutrition problems. This unusual approach appealed to them and we were rewarded by an excellent reception in virtually every instance.

### BRAZIL

#### Brazilia

12 January 1976

Dr. Bertoldo Kruse, Ministry of Public Health and Director of Instituto Nacional de Alimentacao e Nutricao (INAN), explained to us the National Nutrition Policy and Program plans (PRONAN - see Appendix I).

Group assembled in INAN Auditorium to discuss program included:

Mr. Robert R. Standley - U.S. AID  
Dr. Luiz Eduardo Carvalho - INAN  
Dr. Antonio Frazao - "  
Dr. Joao Sanjolin - "  
Dra. Josefa Claudice dos Santos - INAN  
Dr. Agop Kayayan - SUPLAN/Ministerio da Agricultura  
Dr. Raul Valle - " " " "  
Dr. Jacuie Franklin de Oliveira - SARANDI S/A OUVINFE  
Dr. Jose Deodoro de Oliveira - D.N.S.C./M.A.  
Dr. Hiroshi Arima - " "  
Dr. Luiz Pereira Filho, V.M. - DIPOA  
Dr. Fernando Valadares Novaes - EMBRAPA/Ministerio da Agricultura  
Dr. Enos Vital Brazil - STI-MIC (Sec. Tecnol. Ind.) Salvador  
Dr. Jose E. Dutra de Oliveira, M.D. - Fac. Med. Univ. S.P., Ribeirao Preto  
Dr. Alceu de Castro Romeu, M.D., Brazil School Lunch Program

A great deal of interest was expressed in the Project. Three factors were stressed as causes of malnutrition in Brazil - lack of nutrition information among the poor, low income, and an inadequate supply of protein, especially in the Northeast.

13 January 1976

Ministry of Agriculture Pilot Plant. Dr. Antonio Frazao served as our guide. This facility has the capability for processing soybeans into flour for the fortification of wheat, corn, cassava and fruit products; and also for manufacturing soy milk.

13 January 1976

University of Brazilia, Nutrition research group visited included:

- Dr. Joao Bosco Salomon
- Dr. David Boyanovsky
- Dr. Jose Dorea

This group felt that there is a strong need for nutrition education among the malnourished, that foreign technology should be adapted not adopted, for use in Brazil and that greater stress should be placed on the use of local resources - just as our project proposed. The facilities here were excellent for nutrition but poor for food technology work.

14 January 1976

Supermarket visit. The store had extensive stocks of canned and dry grocery products. However, there were very limited meat, dairy and poultry products and fresh produce. All foods seemed quite expensive, roughly comparable to prices in the United States.

Recife

15 January 1976

Federal University of Pernambuco, Institute of Nutrition.

- Dr. Nelson Chavez, Head Inst. of Nutrition
- Dra. Luci Tojal e Seara
- Srta. Zelyta Pinheiro de Faro
- Dr. Bernhard Wust - Swiss Exchange - Pilot Plant
- Dr. Freddy Rivera Carbajal - Chile Exchange
- Dr. Jose Eulario C. Filho
- Sra. Evelina Linhares
- Srta. Elena Flavia la de Cavalles
- Dra. Lucilla G. de Freitas
- Dra. Norma Lucia Marinho Antunes
- Dr. Ruben C. A. Guedes
- Sra. Eida Omedies Curtilo
- Dr. Marty Baez
- Dr. Malleo Nillio Louis Fajoeiro
- Dr. J. C. Flores
- Dr. Carlos Pires de Freitas
- Sra. Zelia Millet C. de Oliveira
- Srta. Sylvia de Azevedo Mello Romani
- Dr. Francisco Hartius Beois
- Dr. Z. Farah
- Sra. M. Farah
- Dr. Gilbert Cina, Cooperacao Tecnica Suica

Dr. Chavez, the Director, is a world-renowned nutritionist. The institution has excellent nutrition research and teaching capabilities, but they are quite inadequate for food technology. The latter were being upgraded with the help of Swiss aid. In small group meetings those present expressed a desire to assist with our program.

Afterwards we visited a new, large wholesale market nearby for fruits and vegetables where farmers sold their produce to retailers.

4.

Salvador

16 January 1976

Federal University of Bahia - Dept. of Home Economics

The following persons were present:

Professora Edith Vicire, Dept. Nutrition  
Professora Yolanda Pondi Senna

Mr. G. W. Hope of FAO served as our interpreter. The group appeared to be only mildly interested in our project; however, a month later we met again, quite by chance, Prof. Vicire in Colombia who expressed more interest in our project and asked about its progress to that time.

Centro de Pesquisas e Desenvolvimento (CEPED). Among those visited were:

Mr. G. W. Hope, FAO representative  
Eng. Jose Luciano Ferreira da Fonseca

This is a relatively new and modern facility, well equipped with pilot plant processing and canning equipment and supporting laboratories for experimental work with processed fruits and vegetables. This facility would be suitable for limited production of food products for intervention programs established in Brazil.

Rio de Janeiro

19 January 1976

Conference Room - San Francisco Hotel

The group assembled to discuss our project included:

Dr. Walter Santos, Cook Industria e Comercio de Alimentos, Ltda.  
Mr. Thomas B. Jordon, " " " " " " " "  
Dr. Jose Luiz Barreto, BRASCAN  
Dr. Roberto Rezende, Coca-Cola Industria, Ltda.  
Dr. Jose Joao Barbosa, S.B.N.  
Dr. Alberto Carvalho da Silva, Fundacion Ford  
Dr. Altinar J. Gava, Coca-Cola & Univ.Fed.Rural do Rio de Janeiro  
Dr. Adao Jose Rezende Pinheiro, Univ.Fed. de Vicosa  
Dr. Celso Colombo Filho, Luducteia Products Alimenticos Pucique S/A  
Dr. Leo Engel Pagetti, I.F.F.  
Dra. Alba Maria P. Gallotti, Instituto Nac. de Tecnologia  
Dr. Luiz A. Cardaso Piragibe, Lab. Bromatologico Comissao Nac. Norm.  
Padroes para Alimentos  
Dr. Robert H. Cotton, Dir. Gen., Fundacion Chile

This group represented a wide spectrum of food and nutrition interests from Industry, University and Government. Excellent and frank discussion followed our presentation and much interest was shown in the project. Safe water supply was high-lighted as a great need in Brazil (72 deaths of mal-nourished infants and very young children due to dehydration had been reported that morning in the local papers). Also, we were told that the Brazilians who had been attempting to produce a soy milk-cows' milk combination product

had been stifled in their efforts due to donations of large quantities of dry milk by the U.S. Government. The conflicting interests between the programs had resulted in cessation of the mixed milk development and eventually of a powdered milk business itself. Unfortunately the cost of powdered milk in Brazil is about twice that of liquid milk on a solids basis. Industry interests expressed the desire to become involved in our project.

Campinas

21 January 1976

Universidade Estadual de Campinas, Faculdade de Engenharia de Alimentos e Engenharia Agricola (UNICAMP) - personnel included:

Dr. Andre Tosello, Food Science & Technology Dept. Head  
 Dr. Ottilio Guernelli  
 Dr. Valdemiro Carlos Sgarbieri  
 Dr. Roberto H. Moretti  
 Dr. Yong K. Park  
 Dr. Chin Shu Chen  
 Dr. Fumio Yokoya  
 Dr. Spiros M. Constantinides, Visiting Prof. from Rhode Island  
 Dr. John K. Sieth, MINASA S/A

The Department has excellent teaching and research and development facilities. It is not strong in nutrition resources but does offer some instruction in nutrition. Graduates, numbering some 30 to 40 per year, find jobs primarily in industry due, especially, to the energetic efforts of the staff to train for industrial application and to help place the graduates in such jobs. As a result of this program the quality of industrial food production in Brazil seems to be improving rapidly. The Department has extensive capabilities and would serve as an excellent food product research and development center for food intervention programs that might be developed in Brazil.

22 January 1976

Instituto de Tecnologia de Alimentos (ITAL). Those with whom we discussed the project included:

Dr. Cyro G. Teixeira, Dir. Food Processing Div.  
 Eng. Odette de Toledo Lattimer, Ass't. Dir.  
 Dr. Decio Dias Alvim - Eng. & Planning Div.  
 Dr. Joao Shojiro Tango - Food Science Div.  
 Dr. Sebastiao Irineu da Costa - Lipids & Proteins  
 Dr. Policarpo Vitti - Cereals & Bakery  
 Dr. Mauro Faber de Freitas Leitao - Food Microbiology  
 Dra. Emilia Emico Miya - Quality Control  
 Dr. Decio Antonio Travaglini - Food Dehydration  
 Dra. Ligia Pereira - Product Development  
 Dr. Nabih Kallil Sabbagh - Chemistry  
 Dr. Dietrich Gerald Quast - Unit Operations & Eng.  
 Dr. Ernesto Walter Bleinroth - Post Harvest Physiology  
 Dr. David Arkcoll - Proteins  
 Dr. Oloisio Jose Antune - Soybean Processing  
 Miss Angela Pompeu - Information Services  
 (Dr. Agide Gorgatti Neto, Director, was not present - he was attending a Mgt. School in Rio)

This is an excellent applied food research organization with the mission of assisting in the transfer of science and technology to Brazilian industry. ITAL has excellent pilot plant facilities with supporting laboratories, manned by 78 scientists qualified in quality control, microbiology, biochemistry, chemistry, statistics, lipids, protein, etc.; 84 in the processing of vegetables and fruits, meats, wines and liquors, milk and dairy products, marine products, etc.; and 49 in engineering including unit operations, equipment design, storage, packaging, post-harvest handling, marketing, etc. It has extensive soybean processing facilities which are being used to develop processes for its utilization in human foods. ITAL also has excellent facilities for the production of test quantities of foods for food intervention programs which may be developed in Brazil.

22 January 1976

Savoy Hotel. Dr. Wilson Sichmann, Extension Services, Oil Crops, Coordenacao de Assistencia Tecnica Integral (CATI) - Ministry of Agriculture, offered to assist in the assessment of agricultural production, post-harvest losses and other information on the storage, handling and transport of agricultural products in Brazil

23 January 1976

Food Industry Foundation visit and UNICAMP tour. We visited the Foundation with Dr. Tosello who described the organization as one supported by some 25 to 30 food industry members and engaged in the publication of information bulletins and research and development reports of interest to the food industry. We then toured the University campus, which has departments in Food Engineering, Medicine, basic Engineering, Mathematics, Biological Sciences and Human Relations. Prof. Zeferino Vaz, M.D. and Rector was quite articulate in his support of the Food Engineering Department and invited us to participate in the graduation exercises for that department that very evening. It was quite an impressive ceremony followed by a reception where we were able to meet and talk with graduating students and faculty.

24 January 1976

Tour of agricultural area and food factory near Campinas. Dr. Tosello and key members of his staff escorted us on a tour of nearby farming areas where we noted the growing of such crops as soybeans, corn, wheat, grapes, coffee and tomatoes. We also toured the Etti Company food processing factory which produces tomato juice, paste, and catsup and also conserves, both for domestic and export markets. Product quality and quality control are sufficiently good at this plant to permit export to the U.S. and European markets. However, we felt that the sanitary conditions in the factory could be improved. They were producing their own metal containers from imported tin plate, quite a sophisticated operation.

UNICAMP graduates are employed at Etti for product development, quality control and for engineering functions.

#### SAO PAULO

26 January 1976

Assoc. Brazileria das Ind. da Alimentacao (ABIA) Conference Room. The following were in attendance:

- Dr. Paulo A. L. Aguiar, Nestle (Pres. ABIA)
- Dr. Filipe R. Silva, Nestle
- Sr. Leo Bick, Kibon (Dir. ABIA)
- Dr. Horst Beck, Refinacoes de Milho Brasil
- Dr. Claudio Roberto Christ, CICA
- Dr. Joel Zukovski, SUPERBOM
- Dr. Kasumo Yokobatake, Laboratorios Miles do Brasil
- Dr. Carlos Pavan, Laticinios Mococa
- Sra. Zarife Nacle, Nutritional
- Dr. Cesario Kovalhuk, Supergel
- Dr. Humberto del Nery, Produtos Roche Quimicos e Farmaceuticos
- Dr. Danilo Badolato, SANBRA
- Dr. Roberto Garcia Coscia, SAN-Co
- Dr. Mario Caxambu Filho, TODDY
- Dr. Sadao Iizaki, YAKULT
- Dr. Walter Lorena Ferreira, Swift
- Dr. Kleber Lobas Dos Santos, SANBRA
- Dr. A. Secundino Sao Jose, Sementes Agroceres

This Brazilian Food Industry group, at first skeptical, was finally convinced that our ultimate objective is a viable one - an attempt to identify an intervention program using food products which would eventually become commercially feasible, even though initially their use would require subsidy. They felt that the lack of food transportation services is a major cause of malnutrition in Brazil, i.e. inability to transport the protein food products of Southern Brazil to the protein-deficient areas in the North-east. Also, they felt that there is a great need to provide potable water to the large population centers. Food factories have had to install their own water purification systems to assure sanitary food processing operations.

27 January 1976

Visit to Kibon and a supermarket. Kibon has one of the more advanced food factories in Brazil. Being a subsidiary of General Foods Corporation it has been able to import and adapt some of the more advanced technologies and business management principles used in the U.S. Their ice cream operations in São Paulo, Rio de Janeiro and Recife provide a safe, highly acceptable, nutritious food to all segments of society in the area, including the target group of concern to this project.

A nearby supermarket was found to be well stocked with canned foods, dried items, bakery goods and a limited supply of dairy, poultry and meat products; however rather poor quality fruits and vegetables were found there. Prices were generally comparable to those in the U.S.

27 January 1976

ABIA/SAPRO (Sociedade Algodaoira do Nordeste Brasileiro) Conference Room. Those in attendance included:

- Dr. Roberto F. Kohlmann, Vice-Pres. ABIA/Coord. SAPRO ( SANERA)
  - Sr. Leo F. Bick, Dir. ABIA (Kibon)
  - Dr. Gustavo Fereira Leonhardt, Inst. de Tecnologia MAUA
  - Dr. Waldemar F. Almeida, Inst. Biologico
  - Dr. Urgel Almeida Lima, Escola Superior de Agricultura "Linj de Queirz"
- U.S.P. Piracicaba

8.

Dr. Mark B. Wood, Bank of America

Dr. Yaro Gandra, Faculdade Saude Publica, Universidade de São Paulo

Dr. Franco Lajolo, Depto. de Alimentos e Nutricao Experimental, Univ.  
de São Paulo

Sra. Barbara Regina Lerner, Dept. Nutricao, Secretaria da Saude de  
Sao Paulo

Dr. Durval Mello, Inst. Biologico São Paulo

This group was keenly interested in our project, quickly understood our mission and objectives and offered to help wherever possible. They felt that we should attempt to integrate any action programs into the Brazilian government's feeding program designed to supply lunches for 22 million school children. They recognized the desirability of also supplying foods to pre-school children, but had no suggestion of just how it might be done. They did feel that the philosophy and rationale of our study were sound and should lead to worthwhile intervention programs.

#### General Observations, Impressions and Suggestions relating to Brazil.

Economic development in this country appears to be among the highest in Latin America. Everywhere, especially near the large cities, there was evidence of rapid industrial growth. This has obviously led to the creation of many jobs and an emerging middle class. In spite of this there remains a large amount of poverty, especially near the large cities like Sao Paulo and Rio de Janeiro. In addition the whole Northeast sector of Brazil remains poor and the prospects for much improvement do not seem very good at this time. A combination of poor soils and a lack of water and energy will thwart rapid development there, we believe.

Malnutrition continues to plague Brazil, especially on the fringes of the large cities and in the rural areas, such as the Northeast. We noted that malnutrition problems are being studied intensively in this country by at least three strong medical research groups - one in Brazilia, one in Recife and one in Ribeirao Preto. These groups have identified the nature and extent of malnutrition in these areas and are making pilot studies of determining best ways and means for remedial and preventive actions.

The government of Brazil has developed a national food and nutrition policy (PRONAN), see Appendix I, and an organization (INAN) has been established to initiate some broad action programs aimed at solving the malnutrition problems.

Food resources in Brazil are varied and appear to us to be plentiful. Among the basic food crops only wheat production lags behind demand. However, other food energy sources such as rice, cassava and corn can be produced easily and cheaply and may substitute for some of the wheat in the diet, if education programs can be made to succeed.

Food Science and Technology is advancing rapidly in Brazil. Many students have been trained abroad and have returned here to practice their profession. In addition the universities, especially UNICAMP, are turning out sizeable numbers of graduates in Food Technology and Food Engineering. Increasingly these graduates are finding jobs in the food industry where their impact is beginning to be felt.

There are excellent facilities at ITAL and UNICAMP and CEPED for food research and development. Somewhat poorer facilities were found in Brazilia (the Department of Agriculture facility operated for the Army) and Recife (Institute of Nutrition).

An active food industry organization (ABIA), headquartered in Sao Paulo, is specifically interested in protein malnutrition. And also there is an active food technology society in Brazil which is affiliated with IFT and with the International Union of Food Science and Technology (IUFoST).

Of the few industrial contacts made only Kibon (a General Foods affiliate) appears to have product development capabilities. It is probable, however, that other multi-national firms have such capabilities in Brazil. The local firms appear to depend mainly on organizations such as ITAL and UNICAMP for their food research and development.

Brazilian Committee:

Chm. - Dr. J. E. Dutra de Oliveira, M.D., U. Sao Paulo, Ribeirao Preto

Dr. Luiz Eduardo Carvalho, INAN, Brazilia  
 Dr. Ottilio Guernelli, U. Campinas, Campinas  
 Dr. Roberto F. Kohlmann, SANBRA/ABIA, Sao Paulo  
 Dr. Cyro G. Teixeira, ITAL, Campinas

North American Advisors for Brazilian Committee:

Dr. Harold E. Calbert, Univ. Wisconsin  
 Dr. William H. Stahl, McCormick & Co. (Recently Retired)  
 Dr. Herbert Weinstein, (Mexico), Currently with Kibon, Sao Paulo

10.

SOUTHERN COUNTRIES REGION

PARAGUAY

Asuncion

29 January 1976

Meeting Room, Gran Hotel del Paraguay - the following persons attended our meeting:

Dr. Anthony Stanley, Instituto Nacional de Tecnologia y Normaliacion (INTN)  
Dr. Jose Lisandro Velazquez, " " " " " "  
Ing. Nelson de Barros B., Ministerio de Agricultura y Ganaderia  
Mr. Theodore Cook, Fundacion para el Desarrollo Internacional  
Sr. Jose E. Fernandez, Bank of America  
Dr. Carlos J. Ardissonne, Intl. Products Corp. (Meat Packing)

U.S. AID representative David Peacock was very helpful in getting interested people to our meeting even though he was unable to attend himself. All attending the meeting were interested in the project and contributed freely to the discussion. There is malnutrition in Paraguay; however the government has been successful in encouraging a good deal of the urban population to move back into the rural areas by offering free land and an option to buy more at a modest cost. Thus more people will be able to produce their own food and as a result some of the urban-oriented severe malnutrition will thereby be eased. There is still some goiter to be found in rural areas, vitamin A deficiency and calorie/protein malnutrition in the poorer suburban areas.

Beef is an important agricultural commodity and in the past Paraguay enjoyed a sizeable export market in Europe for beef and beef products. However, recently this has been curtailed by European Common Market policies. This means that beef is plentiful on the domestic market and at very reasonable prices at the present time.

There is some production of canned pineapple and grapefruit for export. Export of food from Paraguay is important to maintain a good balance of trade. It also tends to improve the quality locally, a much needed attribute, not only in Paraguay but in Latin America generally.

The Universidad Nacional de Asuncion has recently introduced curricula and courses leading to degrees in food technology, engineering, and nutrition. Also the Instituto Nacional de Tecnologia y Normaliacion has initiated a program for training technicians in fruit and vegetable processing.

30 January 1976

Visits to

- Inst. Nac. Tec. y Norm. (INTN - Min. of Interior)
- Open Market
- Supermarket
- Dairy Processing Plant

INTN has the only food pilot plant with supporting laboratory control facilities in Paraguay. Its primary function is to develop standards for foods for the export market. There are also limited facilities for product development and nutrition research. The facility could serve as a base

for a food intervention program requiring the need for small scale production and quality control.

We visited an open food market where farmers sold their produce and meats. Prices were quite reasonable, quality was fair to poor, and supply and variety were quite limited. Nearby we found and visited a supermarket. It had quite a wide selection of canned and dry foods, both of imported and domestic origin. The quality of the fresh fruits and vegetables was very poor; the meat section was well stocked with a variety of items, but dairy and poultry products were quite limited. Prices appeared to be lower than in the U.S., but still high considering local income levels.

We also visited a small dairy plant; as we surmised, it is one of the few in Paraguay. The plant produces sterilized milk in bottles and pasteurized milk in plastic bags. Also a limited amount of ice cream mix, cheese, butter and buttermilk are produced. Most of the equipment is of relatively modern, stainless steel design; however, the sanitary conditions in the plant appeared rather poor to us.

#### General Observations on Developments in Paraguay, including Agriculture and Food Supply.

Economic development in this country has been slow. Basically the problem is that Paraguay is small, lacks variety in its natural resources (agriculture and forestry predominate) and is without an ocean port and thus has to depend on its river system for foreign trade. However, it does have a great hydro-electric power potential which is just being developed and mostly exported to Brazil and Argentina.

Paraguay has surplus agricultural land and so is currently encouraging its development by attracting people from the cities. This is an encouraging trend in that it should avoid the problems created by the reverse direction in many other Latin American countries.

Malnutrition does not appear to be a serious problem at first glance. However, the Minister of Public Health and Social Welfare has stated publicly that about 11% of the children under five are malnourished to some degree. Still the average caloric intake in Paraguay is 2500 and the consumption of protein is 66 grams, of which about half is animal protein. The national program for settlement of the rural areas, referred to above, should have a positive effect in improving the nutrition of the people involved.

Paraguay has a national food and nutrition program (PAGIN), the main purpose of which is to improve the nutrition of rural people, especially by encouraging vegetable and wheat production and consumption.

Food resources in this country are varied and plentiful. Only wheat and vegetable production lag behind, and as just noted efforts are being made to remedy this situation. Large quantities of meat products have traditionally been exported to Europe, but recent EEC regulations have cut off much of this market. The total impact of this change is not yet clear, but there are large quantities of beef available in Paraguay without an obvious market outlet. Perhaps they could be used in intervention programs for the malnourished.

Food Technology seems to be moving ahead slowly in this country. As indicated we did visit a relatively new food research and development center near Asuncion (INTN) which has reasonably good laboratory facilities and a fairly well-equipped pilot plant.

There are meat packing plants and dairy products manufacturing units in or near Asuncion. However, the canned fruits and vegetables we found in the supermarkets came largely from Argentina and Brazil.

Final Comment. Paraguay appears to have great potential for agricultural development; however it will be slow in its industrialization - it reminded us of the western part of the United States fifty years ago.

The country has the highest literacy rate and longest life span of any Latin American country, interesting and provocative attributes.

## URUGUAY

### Montevideo

2 February 1976

Hotel America meeting attended by:

Dr. Victor H. Bertullo, V.M., Dir. Inst. de Investig. Pesqueras  
 Dr. Cayetano Cano-Marotta, Fac. Quim., Univ. Montevideo  
 Q.F. Isabel Busca Ferrero, Servicio de Intendencia del Ejercito  
 Q.F. Tertestia Villar Campos, Prof. Adj. de Brom. y Tec. Alim., Fac. Quim.  
 Q.F. Maria Lacano de Olivera, Asst. de Brom. y Nutri., Fac. de Quim.  
 Dra. Maria D. Zabala de Baotorelli, M.D., Dir. Escuelade de Nutricion  
 Dra. Rosina Albisetti Testoni, Fac. de Quim., U. Montevideo  
 Q.F. Lilian Troche, Fac. de Quim., U. Montevideo  
 Dr. Maria V. Gomez, M.D., Ministerio Salud Publica, Dept. Nutric.  
 Dr. Alfredo M. Dovat, Jefe del Depto. Tecnico del Lab. Tecnol. del Uruguay  
 Dr. Osiris Paez, Laboratorio Tecnologico Uruguay  
 Dr. Nelson M. Ehrhardt, FAO, Officer in charge URU 71/517

This group appeared quite interested in our project. We had an excellent and extensive discussion of how action programs might be organized and whether or not there would be one for Uruguay. There seemed to be a strong desire by all to assist us. There appears to be a close working relationship among university, government and industry personnel in food related activities. This situation was in contrast to what we found in several other Latin American countries. Although the research and development capabilities are relatively limited they have adapted imported technologies rather well. They are cooperating with Brazil in training needed technical personnel.

3 February 1976

Meeting at Laboratorio Tecnologico del Uruguay (Ministerio de Industria y Energia) with:

Ing. Ind. Enrique D. Bia, Presidente  
 Dr. Alfredo M. Dovat, Jefe del Laboratorio  
 Others - Dept. Heads

This is a four-floor laboratory facility (recently built by the renovation of an older building) with considerable new equipment and is fairly

well staffed. It appears to have good capabilities for food product development and quality control. Primary emphasis is in the development of standards for food products for export. Such efforts should also improve the quality of domestic food products. Increased exports will enhance the natural economy, improve the standard of living and thus ease malnutrition problems there. We were told that there is only minimal malnutrition in Uruguay, principally goiter and vitamin A deficiency in some of the more remote rural areas. However, there was some evidence of poverty in the urban area we saw and with it, no doubt, malnutrition.

There is strong government support for this organization. Several hectares of land have been purchased in suburban Montevideo where they plan to construct an expanded facility soon. Considerable pilot plant and laboratory equipment are being acquired for the new facility. It, therefore, appeared to us that the government is quite serious about upgrading and modernizing its food technological resources. The emphasis will be on fruit and vegetable products, meat and dairy products, and their rather considerable marine resources.

General Comments on Developments in Uruguay, including Agriculture and Food Supply.

Economic development in Uruguay appears to have been slow, although no recent figures were made available to us. The country is very small and its natural resources are almost totally agricultural. Its foreign trade is largely in wool and meat products, and these markets have been reduced recently due to EEC policies. Efforts are being made to diversify agricultural production, especially toward milk and food crops.

Malnutrition probably exists in this country although we did not learn of any recent surveys. Also to the best of our knowledge no national food and nutrition policy has been developed.

Food resources are plentiful, although agricultural production is largely concentrated on wool and meat. There is probably good opportunities for better diversification and it probably will be encouraged, especially since the world market for wool and meat are likely to be depressed for a while.

Food Technology seems to be on the move here. As indicated above, we visited a very modern, well-equipped food laboratory (LATU), which we understand is a joint venture between government and industry. A small pilot plant for fish work was included. A somewhat larger pilot plant for processing other foods is being planned and will be constructed outside the city of Montevideo in the near future.

Some food technology subjects are taught at the national university in the chemistry curriculum. Advanced students may undertake research at LATU.

ARGENTINA

Buenos Aires

4 February 1976

Group meeting at Club Americano with the following:

Dr. Marcial Gambaruto, Asso. de Tecnol. Alimen., Lab. Tec. Carnes  
 Dr. Jorge A. Miller, Coca-Cola Company  
 Dr. P. Cattaneo, Univ. of Buenos Aires  
 Dr. Juan Claudio Sanahuja, Univ. of Buenos Aires  
 Dr. Roberto E. Halbinger, " " " "  
 Dra. Maria E. Rio, " " " "  
 Dra. Mirta Valencia, " " " "  
 Lic. Carlos Galli, Tec. de Alimen., Univ. Arg. de la Empresa  
 Dr. Francisco C. Gonzalez, Univ. Agr. de la Empresa  
 Ing. Enrique Alberto Iglesias, Univ. Agr. de la Empresa  
 Dr. Ernesto E. Girardi, Univ. Nac. Litoral  
 Dr. Perez Felipoff, Univ. Nac. Salta  
 Ing. Ernesto Gunther Kasdorf, Kasdorf, S.A. (Dairy)  
 Lic. Julio E. Roncaroli, Sec. Assoc. Arg. Tec. Alim.  
 Sr. Nestor E. Galibert, Editora de Tecnologia Alimentar Ltda.  
 Gerente Sr. Habsuda, President Club Americano  
 Srta. Maria L. de Guy, Secretary Club Americano

The political unrest continues to be a deterrent to industrial development in Argentina; however, it was quite apparent that food technology is quite advanced here and that there is only a minimum of malnutrition. We did learn that there is an OAS-supported program in Salta for the development of protein-enriched foods for the malnourished in that area.

All those present at the meeting were interested, in fact enthusiastic, about our project and offered to help in the development of information which would lead to possible action programs. Unfortunately, apparently because of the political situation in the country, we did not meet any government people.

General Comments on Developments in Argentina, including Agriculture and Food Supply.

Economic development in Argentina has been quite variable over the years, even though the country has some of the best natural and human resources in Latin America. It is rich in agricultural lands, minerals and has considerable oil. This spotty performance seems to derive largely from continued political turmoil which seemed to have found no solution at the time we were there.

Malnutrition. Apparently there is some malnutrition in this country, especially in the northwest part, and as already noted there is an ongoing project aimed at helping to solve this problem.

A national food and nutrition policy has been developed but has not been implemented due to a change in government. No government representative attended the group meeting and thus we have not received any official input from this source.

Food Resources in Argentina are varied and plentiful. As a matter of fact food is a major export from the country. There should be no problems in the future in supplying its citizens with the food they need.

Food Technology is well advanced in Argentina. There is an active food technology society which is affiliated with IFT. There appears to be a variety of research and educational institutions that are active in the

field but we did not visit any of them. Also there are numerous food processing plants, but again we did not visit any.

CHILE

Santiago

6 February 1976

Meeting at Fundacion Chile with:

Dr. Jorge Orellana, Tecnologiade Alimen., Univ. Tecnica del Estado  
 Dra. Sonia Estay, " " " " " " " "

This group expressed great interest in our program and a willingness to help us. Concerning technical education in Chile we were told that, although many students receive classroom instruction, they get very limited or no pilot plant experience. Accordingly, there is little interest in the food technology graduate by the food industry in Chile. As an example, only about 10% of the flour mills there employ food technologists. This situation is being alleviated somewhat by an exchange training program with the University of Campinas in Brazil where excellent pilot plant facilities are available and used in student training.

Dra. Sonia Estay has developed a nutritious, low cost food for the school lunch program but it lacks adequate financial support, has no pilot plant or kitchen facilities to prepare the food. The program is intended to supply, not only a nutritious lunch for children, but also, instruction in nutrition education.

We met also with Dr. Max Rutman, INUAL Ltda. (Ingerieria en Nutricion y Alimentos, Ltda.) who has conducted a survey of the food technological resources of Chile and made his report available to us. (Much of the information concerning Chilean food technological resources to be reported herein was taken from this publication).

Later in the day the following group of Chileans met with us at Fundacion Chile:

Dr. Ricardo Villegas  
 Dr. Hector Covacevich, Inst. Tecnol. de la Leche, U. Aus. Chile  
 Dr. Jose Valladares, Univ. de Concepcion  
 Dr. Claudio Romo, Univ. Catolica de Valparaiso  
 Dr. Pablo Herrera, " " " "  
 Dr. Alfredo Cea, Univ. del Norte  
 Dr. Fernando Monckeberg, M.D., Univ. de Chile (INTEC)  
 Dr. Horacio Dell'Orto T., Inst. de Investig. Agropecuarias  
 Dr. Isidro Planella, Sociedad Chilena de Tecnologia de Alimentos  
 Dra. Prof. Lilia Mosson, Univ. de Chile  
 Dr. Hernan Gouet, M.D., Univ. Catolica, Talcahuano  
 Dr. Homero Larrain, Vice Dir. Gen., U. Catolica de Chile, Talcahuano  
 Dr. Fernando Sanchez, Univ. de Chile  
 Dr. Robert H. Cotton, Fundacion Chile  
 Dr. Lawrence Beaugard, " "  
 Dr. David Owen, " "  
 Mr. Theodore Kendall, " "  
 Mr. George Brown, " "

This group had previously been briefed by Dr. Cotton and his staff about our mission. As a result we immediately entered into a discussion of malnutrition problems in Chile and some of the corrective measures they are attempting to apply. It was said that there are a very large number of malnourished children in Chile who could be benefited by a suitable food intervention program.

Calorie/protein malnutrition is the most prevalent problem in Chile, with vitamin A, iron and calcium deficiencies also being quite prevalent. We were told that 50% of the calories in Chilean diets comes from wheat. Unfortunately wheat has to be imported and as much as 30% of that is lost due to poor storage conditions. Attempts are being made to increase wheat production in Chile and to prevent such losses. Potatoes are being used as a partial replacement for wheat, particularly in bread-making. Lack of dehydration facilities and transportation costs from the potato growing area in southern Chile to population centers are deterrents to their wider use.

It is felt that a greater use should be made of the abundant grape harvest in Chile for combatting malnutrition; however, such products would be of only minimal value for this purpose. Marine resources are also very abundant but are little used except in coastal areas. Development of this resource could provide much of the needed protein for the malnourished.

#### Valparaiso

7 February 1976

We met at the Universidad Catolica de Valparaiso with:

Dr. Pablo Herrera, Head Dept. Food Tec			
Dr. Claudio Romo	"	"	"
Dr. Ismael Kasahara	"	"	"
Dr. Paul G. Miller	"	"	"

This is one of the most active groups in marine food technology in Chile. The pilot plant and laboratory are small and rather poorly equipped, but the staff is serious and enthusiastic in their efforts to develop stable, inexpensive marine food products. Plans call for expanding the product development facilities and the quality control laboratories. Much of their effort, currently, is in the utilization of krill as a protein food source.

Graduates from their food technology curriculum seem to be readily placed in industry jobs. However, little has been done so far to commercialize the new marine foods developed by the group.

#### Santiago

9 February 1976

At the University of Chile we met with:

Prof. Dr. Herman Schmidt-Hebel  
Dra. Lilia Mosson

They first gave us a tour of their laboratories and pilot plant. The latter was being rebuilt and so, at the time of our visit, it was almost completely inoperable. Some unit operation equipment was in evidence,

but little of it would be suitable for food processing. The laboratories were generally not well equipped; however, they did have such specialized equipment as infra-red spectrometers and gas chromatographs. There appears to be a lack of training in practical applications which, obviously, is why it is difficult for their graduates to find jobs in industry.

At the FAO Regional Office we met with:

Dr. Gustavo Contesse  
 Dr. Franz J. Peritz  
 Dr. A. de Visscher

This group was currently assembling information on food technological resources in Latin America and offered to send us the information when it is completed.

At the WHO Regional Office we met with:

Dr. Jaime Ariza

This gentleman along with Dr. Javier Toro are coordinating an effort supported by several international organizations to develop guidelines for national nutrition policies applicable to Latin American countries. Chile has taken the lead in developing such a national nutrition policy (CONPAN) which is currently being implemented and which apparently will serve as a model for other Latin American countries.

At the University of Chile, South (SEDE, Santiago Sur) we met with:

Dr. Fernando Monckeberg

Dr. Monckeberg, an internationally known pediatrician, gave us a tour of his excellent nutritional research and teaching facility. It included a small, in-patient hospital, just being completed, together with an out-patient capability and back-up clinical laboratories. It is an excellent facility for studies in human nutrition.

Dr. Monckeberg explained that he also has a product development facility and pilot plant capable of food product development and small-scale production work. His group developed a product, FORTESAN, which is composed of wheat and soy flours fortified with milk solids, vitamins and minerals and which is used for the feeding of infants and preschool and school children. The product is produced locally and has a limited distribution in Santiago. Some of it is sold and some donated to the poor through a government subsidy. We were able to visit the factory where FORTESAN is being produced and packaged, a small but quite efficient operation.

10 February 1976

We visited food processing operations in the Los Andes area, including fresh fruit packing and fruit dehydration. The top quality fruit is prepared for export while the remainder is dried, either by sun drying or by tunnel drying. We visited, also, one of Chile's largest fruit and vegetable canneries nearby. The equipment is quite old; however, it was in good operating condition. Since much of the production is for export

a fairly rigid quality control program is followed even though under somewhat poorer conditions than are found in the United States.

General Comments on Developments in Chile, including Agriculture and Food Supply.

Economic Development in Chile has been poor in recent years, especially when one considers its varied and rich natural resources. The ill-conceived policies of the Allende government and the country's almost total reliance on copper to earn foreign exchange have contributed to this problem. It is the challenge to the new Junta government to reverse these policies and make Chile the modern industrial country it deserves to be. Fundacion Chile, jointly sponsored by ITT and the Chilean government, is trying to help in this effort.

Malnutrition is a problem in Chile, not only in the fringes of its cities, but also also in the isolated hinterlands. The pioneering work of Monckeberg and his colleagues has detailed the nature and extent of malnutrition here. They have also carried out pilot intervention programs to show how malnutrition can be remedied or prevented. A very significant contribution of the Monckeberg team has been to show that simple feeding programs are not enough to bring the malnourished into the main stream of society. In addition there must be other efforts made that will provide health, education and training and jobs - all pointing to opportunities for a decent standard of living and a share of the "good life."

Chile has developed a national food and nutrition policy (Conpan). We were told it is being implemented. It appears to have good possibilities.

Food and agricultural resources in Chile are vast and varied, at least potentially. Only wheat is apt to be in short supply, but other energy sources could make up part of the difference - e.g., potatoes, rice and corn. Chile also has an enormous potential for producing food from the sea, thanks to its long coastline and the productive Humboldt current which provides the nutrients and environment for marine food raw materials.

Food Technology could blossom in Chile. Several university groups have initiated programs to turn out food technologists and engineers. And special attention is being given to training marine food technology in Valparaiso. Industry must be encouraged to make use of this valuable resource.

Research and development in foods is being carried out in several universities and government laboratories. Rutman has catalogued the institutions in a special report. Fundacion Chile hopes to construct a pilot plant for food research and development soon which, along with a technical assistance program, should be very useful to the country in advancing agriculture and food technology.

A special blending and packaging facility has been constructed at a local sugar factory (GRAV) to produce special foods for the target group.

Suggestions: 1) Monckeberg's book "Checkmate to Underdevelopment" should be read by all persons interested in development projects around the world. It is the most perceptive and persuasive piece that we have read

on the problems of development and the role that food science and nutrition should play in finding solutions to these problems; 2) There is a regional office of FAO in Santiago. Active collaboration with the group there should be sought as they have the interest and the talent to help with our Study. Also FAO is making a catalog of food research and development organizations for all of South America. This will be a valuable asset for our Study; and 3) There is a special FAO/UNICEF/UNESCO/WHO group in Santiago working on food and nutrition policy problems for the Andean Pact Nations. This group could also be helpful to the Study because of their interest in the nutrition and food technology problems of the area and their connections with high governmental personnel.

Southern Countries Region Committee

Chm. - Dr. Jorge A. Miller, The Coca-Cola Co., Buenos Aires,  
Argentina  
Dr. Fernando Monckeberg, Univ. Chile, Santiago, Chile  
Dr. Cayetano Cano-Marotta, Univ. Montevideo, Montevideo,  
Uruguay  
Dr. Nelson de Barros B., Min. Agr. y Ganaderia, Asuncion,  
Paraguay

North American Advisors for Southern Countries Committee

Dr. Robert H. Cotton, ITT & Fundacion Chile, Santiago  
& New York  
Dr. John Liston, Univ. of Washington  
Dr. Anthony Lopez, Va. Poly. Inst. & State Univ.  
Dr. Max Milner, Retired, Scarsdale, N. Y.

NORTHERN COUNTRIES REGIONBOLIVIALa Paz

12 February 1976

A group meeting was held at the Crillon Hotel with the following:

Dr. Cecilio Abela D., Ministerio de Salud Pub., Dir. Nutri.  
 Lic. Maria Inez de Castaños, Min. Planning & Coordination, CONEPLAN  
 Dr. Miguel Tennaidey, " " " " "  
 Dr. Alberto Crespo R., Univ. Mayor de San Andres  
 Dr. Arsenio Gonzales, Corp. de la Fuera Armadas para el Des. Nac.  
 Dra. Bertha Rios Iriarte, Jefe del Dept. de Nutri., Univ. Mayor  
 Dra. Teresa Caldaron, Dept. Socio Economico  
 Dr. Jose Pacheco Alcocer, Direccion General de Normas y Tecn.  
 Dr. Carlos Garvizu T., " " " " " "  
 Dr. Emilio Rivero, " " " " " "  
 Dr. Freddy Quezada R., " " " " " "  
 Dr. Oswaldo Cuevas Rea, " " " " " "  
 Dr. Jose Riera, Ministerio de Agricultura  
 Mr. Jean D. Brault, Bank of America

These Bolivians appeared interested in our study. They expressed the opinion that their malnutrition problems are different from those in other Latin American countries, thus they felt that special attention should be paid to these problems. (As the discussion developed, it became evident, actually, that the nutrition problems in Bolivia are quite similar to those in the other countries.) A program has been recently initiated by the Ministry of Health (called Mothers Clubs) in which the better educated mothers and the leaders in small communities are supplied with nutrition education material and special foods for distribution to the needy. It is hoped that this will provide a mechanism, not only of supplying foods to the malnourished, but also for teaching them the nutritive value of foods, especially those locally produced.

At a later meeting with Dra. Bertha Rios Iriarte at the University Mayor de San Andres we found that they have a fairly good, but understaffed, nutrient analysis facility. It has collected a voluminous file on the composition of the foods of Bolivia. She expressed a desire and willingness to assist us in any way possible.

At the Ministerio de Industria, Comercio y Turismo we met with:

Ing. Carlos Caceres Machicao, Director General  
 Dr. Freddy Quezada, Food Technologist  
 Dr. Oswaldo Cuevas Rea, Food Technologist  
 Dr. Carlos Garvizu T.  
 Dr. Jose Pacheco Alcocer

Almost all of this group we had met earlier. Quezada and Rea expressed a wish to assist us in any way they could. They can help particularly in supplying information on agricultural production, exports, imports, and food crop losses.

13 February 1976

Meeting at the Ministry of Planning & Coordination with:

Lic. Maria Inez de Castaños

Dr. Cecilio Abela D.

Mr. Emilio Klein

We discussed the activities of the Ministry and its potential interest in our project. Lic. Maria Inez de Castanos was very much interested and hoped that any action program developed through our project would be integrated with others in effect or planned for Bolivia.

We later met with Sr. Arsenio Gonzales of Corp. de las Gueras Armadas para el Desarrollo (COFADENA). He claimed that his company had developed a food product made from quinoa which, although lacking in protein, had a "fantastic" caloric content - said to be 10 to 15 times that of rice - a claim we found impossible to accept. However, quinoa is used extensively as a food in Bolivia; it does contain a significant protein content of high quality.

A final meeting was held with Miss Nancy Ruther of U.S. AID who had been very helpful to us in our contacts and she agreed to help us with further follow-up contacts and efforts in Bolivia.

General Comments on Developments in Bolivia, including Agriculture and Food Supply.

Economic development in Bolivia currently is enjoying an upsurge, thanks to excellent natural resources (agriculture, abundant minerals and energy sources - gas and oil). This growth has been substantial even though the country is small and land-locked. Nonetheless, there seems to be pockets of poverty at least around La Paz and in certain remote areas.

Malnutrition exists in this country but has not been well documented. There is in development a national food and nutrition project which AID will probably finance. The exact nature of the project was not disclosed and we judge that there are still some differences of opinion within government circles as to its nature and scope. AID personnel seem to be pushing for pilot programs which could test certain concepts before making any of them national in scope.

Food resources are good in Bolivia. A variety of food commodities for good nutrition seems plentiful, except for wheat. Potatoes, corn, cassava and quinoa are available as energy sources and the latter is being partially substituted for wheat in the bread flours manufactured there.

Food Technology seems hardly to exist in this country, except for sugar manufacture and cereal milling. We did not learn of any academic programs for training in this field, and only small laboratory was found where food composition studies are being carried on. Experimental animal nutrition facilities are apparently non-existent.

We visited a person from the largest flour mill in Bolivia. He claims to have perfected a commercial method for completely removing the saponin layer from quinoa. We did not see the plant, as it is in Santa Cruz, but we did see a sample of the product. Interesting and novel development, if proved out.

PERU

Lima

16 February 1976

At La Universidad Nacional Agraria de La Molina we met with:

Dr. Juan Herrera

Dr. Hugo Lastarria

They gave us a tour of the facilities and discussed the curriculum in food technology. They have rather limited classroom and laboratory facilities, but a large pilot plant which was relatively sparsely equipped. They have a cooperative program with the Instituto Investigaciones Agro-Industriales nearby for instruction and, therefore, have a good capability for training food technologists. Apparently, however, the graduates are reluctant to go into industry, or industry is reluctant to hire them. It appears a better rapport is needed between the universities and the food industry.

At the Instituto de Investigaciones Agro-Industriales we met with:

Dr. Hector Pimentel, Director

Dr. Juan Carlos Roessl L.

They expressed a desire to be involved in our project and especially with any action program which might result. The Institute has extensive pilot plant facilities for the processing and preservation of agricultural products, including an excellent bakery. This facility is supported by a small but excellent quality control laboratory. Finished products from the pilot plant are sold, which helps to support the entire operation.

We visited the International Potato Center with:

Dr. Richard Sawyer, Director

Dr. William A. Hamann, Asst. Director

Dr. O. T. Page, Research Director

The activities of the International Potato Center include agronomic studies, product development and nutrient quality studies. They feel, obviously, that the potato is a very important food crop and should be considered as a raw material in any product-oriented action program.

17 February 1976

At the U.S. Embassy Conference Room in Lima we met with the following:

Dra. Bertha Rios de Riboty, Min. de Salud, Dir. Div. Applied Nutri.

Dr. Hector Pimentel, Instituto de Investig. Agro-Industriales

Dr. Juan Carlos Roessl L., " " " " "

Mr. Charles Mettam, Food for Peace - AID

Dr. Juan Herrera R., La Univ. Nac. Agraria de "La Molina"

Dr. Hugo Lastarria, " " " " "

Dr. Fernando Hurtado, " " " " "

Dra. Zelmira Reynoso, " " " " "

Dr. Jose Telles, " " " " "

Dr. P. G. de Balogh, FAO

Srta. Carmen I. Podesta, Librarian, Int. Potato Center (CIP)

Dr. Fernando N. Ezeta, International Potato Center

Dra. Ursula Gross, Instituto de Nutricion/Conv. Per. Aleman.

Dr. Nelson Carpio, Ministerio de Alimen. Dir. Gen. de Investigacion

Dr. Guillermo Lopez de Romana, M.D., I.I.Nutri.Clinica Anglo Americana  
 Dr. Jose Sanchez Torres, Instituto del Mar  
 Dr. Marco Antonio Campos, CARE  
 Dr. Teofilo Jorge Aliaga Osorio, Univ. Nac. Agraria  
 Dr. Alex Trier, Junta Acueido Cartagena  
 Dr. Carlos Heredis Pinedo, Institutos Nac. de Salud  
 Dr. Mariano Segura, Director Gen. de Inv. Minal.  
 Dr. Augusto Montes Gutierrez, Univ. La Molina, Dpto. de TAPA

This was a rather unsatisfactory meeting. There were too many present for a good discussion and arrivals at the meeting continued over a two hour period necessitating a lot of repetition of our presentation. There appeared to be some resistance to the concept of the project, some wondering about "what they would get out of the program." However, interest in it was aroused and several of the participants stayed after the meeting to ask more questions and to offer help, notably Dr. Guillermo Lopez de Romana, a research nutritionist-pediatrician, who invited us to visit his facility.

Dr. Romana is working in a local hospital with many poor and malnourished patients, including pregnant and lactating women and infants. His work relates directly to the objectives of our project and he expressed a keen interest in assisting us in any way possible.

#### General Comments on Developments in Peru, including Agriculture and Food Supply.

Economic development in Peru has shown a mixed record even though it has some excellent natural resources (a variety of minerals, oil, fisheries, and agriculture). This seems to be due to a lack of a stable and responsive government. We would say that the future is not as promising as it should be, given the rich resources of the country and the needs of its peoples.

Malnutrition exists around the cities and probably in some remote sections of the country. We had a chance to visit the Nutrition Research Institute (a private organization) where much of the work has been done in collaboration with nutritionists at Johns Hopkins University.

To the best of our knowledge no national food and nutrition policy has been formulated for Peru.

Food resources are somewhat limited in this country, notwithstanding their large agricultural and fisheries bases, as most of the products are for non-food uses, e.g., cotton, wool, and fishmeal. Wheat is being imported in increasing quantities, aggravating the problem.

Food Technology seems to be on the move in Peru. There is an academic program at the national university in La Molina which emphasizes engineering. A major government technological institute also at La Molina is devoted to agro-industry products, especially food. It has excellent laboratory facilities, a large pilot plant and a small bakery. The facilities are roughly equivalent to those at ITAL and UNICAMP in Brazil.

Final Note. An unique organization "International Potato Center" near Lima was visited and found to be impressive, especially the facilities and the concern of its staff for nutrient composition.

ECUADORGuayaquil

18 February 1976

At the Fundacion para la Education y el Desarrollo we met with:

Francisco Huerta Montalvo, M.D., Director Ejecutivo. He was very much interested in our project and offered help. He has already collected considerable information on the nutritional status of children, particularly the malnourished, in the Guayaquil area.

19 February 1976

At the Palace Hotel we met the following:

Dr. Prof. Rafael Enderica, Universidad de Guayaquil  
 Dr. Luis Pactong Asan, " " "  
 Mr. Lloyd Feinberg, Foster Parents Plan  
 Mr. John F. Wall, Jr., Meals for Millions  
 Mr. Robert V. Caruso, " " "  
 Mr. Reinaldo Aillon, Manager Bank of America  
 Dr. Hernan Rodriguez Pico, Instituto Nacional de Pesca  
 Dr. Luis Miranda Sanchez, " " "  
 Dr. Sergio Minelli, Politecnica Litoral Guayaquil  
 Dr. E. Marian, " " "

All present were interested in our project and expressed a willingness to help. Food technology resources seem minimal at both of the universities represented at the meeting. Dr. Marian (a retired Chemical Engineer from U.C. Berkeley) now with the Peace Corps, felt that his work on banana products should be a part of any intervention program in Ecuador. Foster Parents and Meals for Millions representatives also expressed a desire to help out. We are not sure how they might fit in. All present seemed somewhat apprehensive that tropical Ecuador (i.e. the Guayaquil area) might be ignored by others in the country since almost all government activities are headquartered in Quito with a quite different attitude about needs and priorities.

Quito

19 February 1976

Meeting at the Intercontinental Hotel with:

Dr. Marcelo Coronel S., Escuela Politecnica Nac.  
 Ing. Lilia Proano de Benitez, Escuela Politecnica Nacional

Both expressed great interest in our project and invited us to visit the local university next day.

20 February 1976

At Escuela Politecnica Nacional (Instituto de Investigaciones Tecnologicas) we met with:

Ing. Lilia de Benitez, Chief Mixed Flour Program  
 Ing. Oswaldo Proano Borja, Director  
 Ing. Jorge Davila  
 Ing. Bolivar Izurieta  
 Dr. Pablo Martinod  
 Ing. Pablo Polit

We were given a tour of their excellent pilot plant facilities for mixed flours research and development work which included modest supporting quality control laboratories. The group has an intensive research and development program on mixed flours (Note: wheat production is limited in Ecuador). They have been able to replace up to 50% of the wheat flour in mixtures with potato, rice, cassava, corn, quinoa and/or soy flour. Processes are also being developed for the production of soy milk and full-fat soy flour. Increased soy production and usage in Ecuador should help to relieve the large importation of fats and oils and will supply needed protein.

The University also has fairly good facilities for training food science and technology students.

Later at Hotel Colon International, we met with:

Dr. Manuel Arias, Junta Nacional Planificacion, Dir. of Food Policy

He explained that Ecuador is developing a National Food and Nutrition Policy which will embrace Agriculture, Education, Public Health (including foods and nutrition) and be coupled with the development of its natural resources. He was very much interested in our program and offered to be of assistance. He also told us that the Ministry of Health has developed a product consisting of 70% oat flour, 15% soy flour and 15% milk solids which is used in a food intervention program in Quito for needy infants and pregnant and lactating women. All raw materials are imported but it is hoped that they will be able to convert to domestic raw materials in the future.

22 February 1976

At the Intercontinental Hotel we met with:

Dr. Alberto Di Capua, Representante Gen., Banco de Credito del Peru  
Dr. Jose M. Portilla, M.D., Retired Pediatrician

Both men were much interested in our project and offered assistance. We understand that Dr. Capua carries considerable weight in the Ecuadorian Government, banking and educational organizations. Dr. Portilla is a physician and has done considerable work with malnourished children. He felt that we had an unique and viable approach to the malnutrition problems in the country and wants to help in any way possible.

General Comments on Developments in Ecuador, including Agriculture and Food Supply.

Economic development seems barely underway in this country even though it has abundant natural resources (petroleum, fisheries, forests, agriculture and hydroelectric power). We sensed a tremendous push for development in Ecuador, particularly in the Guayaquil area. There the Foundation for Education and Development seems to be exerting a strong influence and has received wide support from national and multinational organizations. Its programs stress food and nutrition in particular and science and technology in general.

Malnutrition exists in Ecuador, but we did not get a good feel for its nature and extent. However, there are a number of foreign agencies working on food and nutrition programs in the Guayaquil area. For example,

we met people from Meals for Millions, Care and Foster Parents working together to develop a multidisciplinary program extending from the farm to the consumer.

Food Resources are abundant in the country although most of the wheat must be imported. Ecuador has the world's largest production of bananas and has one of its richest fisheries. Agricultural resources are said to be poorly developed and land reform has only recently been initiated.

Food Technology is moving ahead in Ecuador. Training and research are carried out in both Guayaquil and Quito universities. We visited the latter and found the laboratories to be fairly well equipped and a pilot plant under construction.

There is a food technology society in the country which is affiliated with IUFoST.

## COLOMBIA

### Cali

23 February 1976

We met with Dr. Leonardo Sinisterra, Director General of Fundacion de Investigaciones de Ecologia Humana. He is particularly interested in working with malnourished children and is now expanding his facilities for the training of instructors in food technology and nutrition to assist these handicapped and malnourished children. He would like to assist in our program in any way possible.

Later the same day we visited Universidad del Valle with:

Dr. Luis F. Fajardo )  
Dr. Dean Wilson ) Co-directors Nutrition Program

This group is very much involved in the supplemental feeding program in the State of Cauca under the auspices of the Instituto Colombiano de Bienestar Familiar, the key welfare agency of the Federal Government. They are collecting biomedical data on the population of Cauca and will monitor the health status of those receiving supplemental foods. They have good laboratory facilities and an active teaching program for the training of food technologists and nutritionists.

24 February 1976

At Hotel Intercontinental we met:

Dr. Farzam Arbab, Rockefeller Foundation  
Dr. Guillermo Valencia, Univ. del Valle, Div. Eng.  
Dr. Joseph Cortez, " " " , Food Tec.  
Dra. Ilda de la Calle, Centro de Invest. Multidisciplinicas el Desarrollo Rural

This group appeared interested in our project and offered to be of help. We learned here that the Rockefeller Foundation is funding a cooperative program among the University del Valle, the Foundation for the Application of Engineering and Science, the Foundation for Higher Education, and the Multidisciplinary Center for Investigation and Rural Development. Renre-

representatives from these agencies met with us to explain their respective roles in the Colombian Food and Nutrition plan and particularly the supplementary feeding program being initiated in the State of Cauca. This project is quite extensive and should be considered in any possible action program which might evolve from our project in Colombia.

In the afternoon, at the International Center for Tropical Agriculture (CIAT), we visited with:

Dr. Charles Frances, Agronomist

CIAT is a non-profit organization with research devoted to the agricultural and economic development of the low-land tropics. The government of Colombia provides some support (as host country) and furnishes land near Cali for its headquarters and experimental plots. Collaborative work with the Instituto Colombiano Agropecuario (ICA) is carried out mainly at its experimental centers in Turipana and Carmagua. CIAT is also financed by a number of other organizations, including U.S. AID, Rockefeller Foundation, Ford Foundation, Canadian International Development Agency (CIDA), W. K. Kellogg Foundation, the International Bank for Reconstruction and Development (IBRD) - through the International Development Association (IDA) - Interamerican Development Bank (IDB), International Development Research Centre (IDRC) of Canada, and the governments of the Federal Republic of Germany, United Kingdom, Netherlands and Switzerland.

We saw experimental plots on which the "two-crop" system of growing corn and beans together is being tested. It is hoped that not only would this system increase yields (tons of total food and/or feed) but also would encourage the combined utilization of the two crops as foods, thus improving the nutritional value of the diet. This is an excellent facility for carrying on crop research and training for tropical areas of the world.

Later in the afternoon we saw Alex Cobo, M.D., Director  
Dept. Research & Education, Fundacion para la Education Superior.

Dr. Cobo is a practicing physician who treats many malnourished patients; he was very much interested in our project. His Foundation is unique in that it supports research and development as well as training projects in institutions throughout Colombia. The funds are derived from interest obtained by the shrewd investment of donations and grant monies made to the Foundation, an unique concept that appears to be working.

### Bogota

25 February 1976

We met at U.S. AID with:

Dr. David Denman and others - U.S. AID Colombia  
 Dr. Norton Young Lopez, Inst. de Investig. Tecnologicas  
 Dr. Teresa Salazar de Buckle, Inst. de Investig. Tecnologicas  
 Dr. Guillermo Varela Velasquez, Depto. Nac. de Planeacion  
 Dr. Guillermo Benitez Bejarano, Instituto Nac. de Salud (Alimentos)  
 Dr. Camilo Roza, Inst. Colombiano de Bienestar Familiar  
 Dr. Omar Patiano H., Univ. Nac. de Colombia, Inst. Cie.y Tec.Alim.  
 Dr. Alejandro Uribe, " " " " , Dept. Animal Prod.  
 Dr. Manuel Jose Torres A., " " " " , Fac. de Vet.  
 Dr. Antonio Bacigalupo, " " " " , FAO Coordinator  
 Dr. Guillermo Rubiano, CICOLAC, Nestles

Dr. Hugo Pardo C., CICOLAC, Nestles  
 Dr. Reinaldo Grueso, CARE/Colombia  
 Dr. Douglas Atwood, " "  
 Dr. Stephen C. Ryner, Consultant, Ind. Mgt. Contract with AID

Attendance was a little too large for the most effective discussion of our project; however it served the useful purpose of describing to all present our project. Later on we met the key people at the various institutions we visited in and near Bogota. Mr. Denman (AID - Colombia) asked that any of our action programs involving Colombia should be integrated with other programs there. We assured him they would. Also he asked how local nationals would be paid for participating in the study. We explained that this is a voluntary effort, that we were seeking help from those who are sufficiently interested and who have some time to donate to the cause. Also it was pointed out that our final report would be available to those who participated, and that our Colombian cooperators would have the opportunity to exchange ideas with representatives of other Latin American countries in food technology and nutrition and related disciplines in the course of the study.

25 February P.M.

Universidad Nacional de Colombia - we visited with:

Dr. Omar Patino H., Dir. Inst. of Sci. & Tech. of Foods  
 Dr. Antonio Bacigalupo, FAO, Coordinator of Project with Inst. Sci. & Tec. of Foods  
 Dr. Attila Stersky, Visiting Canadian Technologist from IDRC

These men appeared to be interested in our study and offered to help out. They first gave us a tour of their well-equipped pilot plants for: (1) handling fluid milk and manufacturing dairy products, (2) slaughtering and processing of beef, (3) slaughtering and processing of poultry, and (4) processing of fruits and vegetables. The facilities are used for instruction as well as for production of finished food products in the pilot plants. These products are sold at retail and to the institutional trade, thus helping to support the operation.

26 February A.M.

Instituto de Investigaciones Tecnologicas (IIT), we met with:

Dr. Norton Young Lopez, Director (since retired)  
 Dra. Teresa Salazar de Buckle, Planning Coordinator  
 Dr. Jaime Ayala, (now, 1977, Director)  
 Others as we toured facilities.

We were given enthusiastic encouragement for our project and an offer to be of assistance in any way possible. The Institute is responsible for most of the food product development work of the various government agencies in Colombia. It has a very active composite flour program, the most extensive we had seen in Latin America, with excellent milling capabilities, a full-scale bakery, pasta-making equipment, and with supporting quality control laboratories. The latter possessed a considerable amount of sophisticated equipment such as gas chromatographs, atomic absorption, and flame spectrophotometer. The fruit and vegetable processing pilot plant is being phased out since the Universidad Nacional will have one. Such cooperative attitude was a most significant aspect of their working relationship.

26 February P.M.

Instituto Nacional de Salud, where we met with:

Dr. Luis J. Villamizar Herrera, Director  
 Dr. Guillermo Benitez Bejarano, Dir. Dept. of Nutrition  
 Dr. Jesus Maria Afanador Plata, Planning Officer  
 Dr. Leonardo Bolivar, Dir. Analysis Dept.  
 Dra. Carmen Cecilia Becerra  
 Dra. Emma Irma Rodriguez  
 Dra. Margot Julia

This group was much interested in our project and offered their cooperation. The Institute has quite extensive capabilities in chemistry and microbiology as well as in the biological evaluation of products using laboratory animals. They have the responsibility for establishing quality standards for Colombian food and drug products. They will monitor the intervention project planned for the State of Cauca, mentioned above. The Institute should be involved in any action program planned for Colombia.

Later in the afternoon we met with Mr. Wolfgang W. Klein of Corn Products International (CPC) who was very much interested in assisting us with any action program which might involve the utilization of corn flour or other products CPC produces. He apparently works closely with the Colombian government on food quality standards and is a Latin American representative to Codex Alimentarias.

27 February A.M.

Instituto Colombiano de Bienestar Familiar (ICBF), where we met with:

Dr. Franz Pardo, Director  
 Dr. Camilo Rozo, Subdirector

This group was very much interested in our study and offered to be of assistance. The Ministry has the responsibility for administering the supplementary feeding programs which are designed to reach one million needy, malnourished preschool children and 1.5 million pregnant and lactating women in the State of Cauca. Support for the project will come from the Colombian government, U.S. AID, Catholic Church, and a few other smaller donors. The food product to be used will consist of a mixture of wheat flour, soy flour, milk solids, and supplemental minerals and vitamins. It is being produced in a small pilot plant now (5000 metric tons over a three month period and 14,000 metric tons by the end of the calendar year). Later a production facility will have been completed to produce the product commercially (30,000 metric tons per year) and will be operated by a commercial firm. Eventually there will be a system developed for a subsidized food stamp program for the poor and a commercial distribution of products for those who can afford to buy them.

Palatability is the most serious problem for the product developed so far but no one seems to be working on means to improve it. Also, it was not clear exactly how the new production facility would be offered to industry management. Nonetheless, this is by far the most advanced and ambitious program for supplemental feeding of the needy, malnourished that we encountered in Latin America.

27 February P.M.

Departamento Nacional de Planeacion, we met with:

Dr. Guillermo Varela Velasquez, Director

Dr. Tomas Uribe

This group appeared very much interested in our study and offered their help. This agency is an arm of the President's Executive Office and is considered one of the most important of the Colombian government. It is concerned with the planning of all industrial, economic and social development in Colombia. A National Food and Nutrition plan has just recently been developed and is being implemented by the Institute of Family Welfare (Ministry of Health). Under the plan there would be free food stamps for children up to 2 years of age, and others (to be purchased) for children of 2 to 5 years of age. As a beginning, lowest income families for the program would be chosen in both rural and suburban areas of Cauca. After the first year the most successful components of the program would be expanded to other areas.

General Comments on Developments in Colombia, including Agriculture and Food Supply.

Economic development in Columbia is going full-speed ahead. This is the natural result of the country's having excellent natural resources (agriculture, varied minerals, energy - oil, gas and coal - and semi-precious stones) and a stable and responsive government. Prospects look even more promising to us than those in Brazil, largely because of careful planning efforts for development and a more realistic approach in finding solutions.

Malnutrition exists in this country and has been extensively studied by medical nutrition groups, especially those in the Cali area. Pilot intervention programs have been tried and some are in progress.

Like the Chilean approach, Columbian scientists have discovered that good nutrition is but one facet of providing for human development. In fact we think that the Columbians are further along in their thinking and planning in that the Columbian Food and Nutrition Plan is part of an overall economic, social and regional development plan.

There is a unique private agency in Columbia called the "Foundation for Higher Education." This organization serves as a "bank" for grant and contract funds used for university-based research and action programs. It also provides administrative support for such projects and even carries out projects of its own. It has obviously had profound influence in promoting research and education related to health, especially human nutrition and food technology.

As already indicated there is a national food and nutrition program in Columbia and implementation has taken place. Component parts of the program deal with safe water supplies and environmental sanitation which are lacking in some of the other Latin American plans. This is an important aspect of any action programs which are proposed, as without a safe water supply and adequate sanitation, feeding programs are very apt to fail in overcoming malnutrition.

Food resources are excellent in Columbia although wheat is in short supply. Bananas, corn and rice are plentiful and possibly could replace some of the wheat in the diet.

Food Technology looks to be advancing rapidly in this country. The national university in Bogota is just completing facilities for meat processing, dairy products manufacture and fruit and vegetable canning/freezing. They are first class.

There is a government food technology research and development laboratory as part of a national institute of technology (IIT) which has excellent laboratories, pilot plants, and a grain milling and cereal products pilot plant. These facilities are as good or better than those in Campinas, Brazil and seem somewhat more flexible.

We learned here of a loose, collaborative set-up among research workers at IIT, ITAL, IAA, ICAITI and a similar group in Mexico. Seminars and cooperative studies have been sponsored by this group. OAS has been involved in sponsoring this activity.

The food industry of Columbia seems pretty well developed although we did not visit any plants.

Final Note. Since Columbia is so far advanced in their nutrition-food technology activities one wonders whether the Study has anything to offer. But, as in Brazil, perhaps we can act as a catalyst in moving things along faster and maybe also we can help improve communications among industry, government and university personnel.

## COSTA RICA

### San Jose

1 March 1976 A. M.

University of Costa Rica where we met with:

Dr. L. Fernando Arias, Director CITA (Food Tec. Lab.)  
 Dr. R. Acuna  
 Dr. Leonardo Mata (recently from INCAP in Guatemala)  
 Dr. Ricardo Valerin  
 Dr. Eduardo del Barco  
 Dr. Ronald Echandi  
 Dr. Robert P. Bates, Visiting Prof. Univ. Florida  
 Dr. Richard Young, " " Reading, England

This group expressed great interest in our project and a desire to be of assistance. It works closely with government agencies and with U.S. AID and obviously should be involved in any action program planned for Costa Rica. We had a tour of the pilot plant which, although small, has a wide variety of flexible equipment - much of it donated by the University of Florida. Dr. Bates, on loan from U. Florida, deserves much credit for developing this facility.

We also met at AID offices with Mr. J. Sconce, AID Director, Ana Sayaguez, AID Nutrition Officer, T. King, T. McKee and R. Kreitman. They seemed to appreciate our visit and posting them on our project.

We later met with Mr. K. Bachmann of CARE. Its program in Costa Rica is designed to develop means for using locally grown soybeans for products to help alleviate local malnutrition problems. Any action program which might evolve from our study should avoid duplication of their efforts and possibly might involve their cooperation.

1 March 1976 P.M.

Visit to food factories in San Jose

Mr. A. Pozuelo, Jack's Snacks, gave us a tour of the facility. This is a modern snack manufacturing plant using mostly North American equipment and technology. They were making such products as corn curls, cheese puffs and potato chips at the time we were there. Pozuelo was interested in and had plans to fortify these snacks with protein, probably with soy flour. Apparently snacks are a popular food product in San Jose.

Numar - Fats and Oils. R. Johnson and Dr. Vatrex Jurin served as hosts. This is a United Brands Company subsidiary. It has modern oil extraction and refining equipment. It produces various types of edible fats and oils, hydrogenated oils for margarine, soap stock and feed supplements from press cake.

Mussmani Bakery. F. Pacheco served as host. This is an old but efficient bakery, produces most of the commercial bread, cookies and cakes consumed in San Jose. The products were of surprisingly good quality considering the age of the bakery. It was relatively clean with no evidence of rodents or roaches as is so common in the tropics.

1 March 1976 - Evening meeting.

Food Industry Association (ACIA) - those present:

Ernesto Ruiz Aviles, President ACIA  
 Andres Pozuelo, Secretary General ACIA  
 Gunther Peters, Member Board of Dir. ACIA  
 Juan Jose Odio, " " " " "  
 Jorge Vazquez, " " " " "  
 Fernando Villalobos, " " " " "  
 Dr. R. P. Bates, CITA, Univ. of Florida  
 Dr. L. Fernando Arias, CITA, Univ. Costa Rica  
 Ana Sayagues, U.S. AID Nutrition Programs  
 Travis A. King, U.S. AID Rural Development

This group was interested in our project, offered to help, and wanted to hear of our impressions of the food industry in Costa Rica. They obviously want to keep abreast of developments in food technology and innovate by adapting such technologies as could be applied under Costa Rican conditions. We were impressed with the cooperative and progressive spirit in this industry association group. A key question was asked: "Can our project identify a minimum curriculum for the food technologist in Latin America so that he can be effective as he goes into industry"? We hope this study will help to answer the question.

2 March 1976

Visit to food factory operations near San Jose

Pronutre - Corn and Bean Mill. Mr. D. Clark was our host. This small plant manufactures a partially precooked corn flour mix for making tortilla. They have a special process for soaking, steaming, and grinding the corn such that they claim to be able to produce a product of excellent

quality which will undersell the products of other mills. We sampled tortilla made from the product and found them to be excellent.

INCOVAC - Textured Soy Products. Dr. F. Drachenberg was our host. This factory was set up by Drachenberg, a German Seventh Day Adventist, to serve the needs of those people of that faith in the area. There was a small extruder and other equipment to make soy sausages and other meat-like products. This is a very modest factory but could well be the beginning of a significant source of vegetable protein foods in Costa Rica.

General Comments on Developments in Costa Rica, including  
Agriculture and Food Supply.

Economic development in Costa Rica has been sustained over a period of years notwithstanding its small size, thanks to good natural resources (agriculture, minerals, forestry and hydroelectric power) and a responsive and stable government. Its active participation in the Central American Common Market promises to further expand this development.

Malnutrition probably exists in this country in the fringe areas around its cities and also in remote rural areas. However, nutrition surveys have not been extensive. Very recently there has been formed a national institute of nutrition (INISA) which will have the responsibility of determining the nutritional status of Costa Ricans in various parts of the country.

An elaborate national food and nutrition policy has been developed but has not yet been implemented.

Food resources seem to be fairly adequate in Costa Rica.

Food Technology is beginning to take a hold in Costa Rica. There is under development a university training program involving the faculties of agronomy, microbiology, chemical engineering and chemistry. A pilot plant has been completed which will be used for teaching as well as research. Although small, great ingenuity has been shown in equipping this pilot plant so as to provide great versatility and flexibility.

Costa Rica has a food science society which is affiliated with IUFOST.

A food industry association (ACIA) is active in Costa Rica and appeared to be much interested in our Study. They seem somewhat skeptical of the government's ambitious food and nutrition policy proposal.

NICARAGUA

Managua

3 March 1976

At the Laboratory of Banco Centro de Nicaragua we met with:

Dr. Mario Solorzano M., Banco Centro Nicaragua, Food Tec. Lab.  
Dr. Ariel Espinoza, " " " " " "  
Dra. Carmen Valle de Bonilla, Min. de Salud Publica, Dir. de Serv.  
de Labs.

Lic. Isolda Burey R. Min. de Salud Publica, Nutricionista  
 Dr. Yves G. Chaix T., Agroindustrias "La Borgona" S.A.  
 Dr. Hector Pedraza Bernal, Quaker de CentroAmerica

Our presentation was received most favorably by this group. Most of those present expressed sincere interest and a willingness to help. This relatively new laboratory was built after the almost complete destruction of Managua by the 1972 earthquake. It is located about 10 miles south of the city to avoid severe damage from future earthquakes. It is rather modest in space and equipment with some laboratory equipment even set up in the hallways when we were there. They were busy developing food standards and servicing food industry clients. The Banco is essentially a funding organization for the development of the Central American food industry. The Laboratory was established to assist in the technical development of the industry. Dr. Solorzano appeared to have the confidence of the government and its regulatory bodies. He helps with the establishment of standards, and is relied upon to help police the industry.

We also visited a dairy plant - Eskimo S.A. - which had ultra-modern equipment and very efficient, sanitary operations. Besides fluid milk and ice cream, their specialty is yogurt. The president and owner, Mario Salvo Horvilieur, is obviously well-trained in dairy products technology and appears to have the highest quality standards for the products he produces.

We visited a local supermarket which is operated in connection with a meat products business. The owner, Julio D. Morales P., has enough business acumen to have parlayed his original meat business into one of the most successful supermarket businesses in Managua. One interesting sidelight - he was critical of his government's shortsightedness in imposing a 38% tax on canned Vienna Sausages (which he produces) while canned meat pet foods go tax-free. As a result he is shipping most of his sausage production to Panama. His question to us - "How can we overcome protein malnutrition with such stupid regulations?" This is an astute observation by an ordinary businessman.

#### General Comments on Developments in Nicaragua, including Agriculture and Food Supply.

Economic development has been reasonably good in recent years despite the country's small size, relatively poor natural resources (agriculture, forestry and fisheries) and a disastrous earthquake in Managua in 1972. The economy has benefited from a receptive and stable government.

Malnutrition probably exists in the country but its nature and extent have not been well documented. Attempts have been made to develop a national food and nutrition policy but planning has been delayed by the 1972 earthquake in Managua and by the recent earthquake in Guatemala (where INCAP is assisting in the planning effort).

Food resources would appear adequate in this country, although we did not get a real feel for what energy foods are produced in quantity.

Food Technology is advancing in the country, thanks to the assistance provided by the Central Bank of Nicaragua. This unique organization has a technical assistance program for the food industry whereby

it provides quality control and research and development services. This is a very interesting setup and is one, we would predict, will do much to advance food technology in Nicaragua.

## GUATEMALA

### Guatemala City

4 March 1976

Meeting at Instituto de Nutricion de Centro America y Panama (INCAP), Division of Agricultural and Food Sciences, with:

Dr. Carlos Tejada, Director  
 Dr. Ivan Beghin, M.D., Chief Applied Nutrition  
 Dr. Ricardo Bressani, Head Div. of Agricultural and Food Sciences  
 Dr. Mario R. Molina, Food Technologist  
 Dr. Luiz G. Elias, Food Science & Nutrition  
 Dra. Delia A. Navanete, " " "  
 Dra. Maria Teresa Huego, " " "  
 Dra. Leticia Almengor, " " "  
 Dr. J. Edgar Braham, Agricultural Chemist  
 Dr. Roberto Gomez Brenes, Biochemist  
 Dr. Roberto Jarquin Richeme, Animal Nutritionist

Our presentation at INCAP was enthusiastically received. All present had already been briefed by Bressani and were ready and willing to assist in any way possible.

It was explained that this Division consists of four activities - Food Technology, Nutrition Science, Food Science, and Animal Nutrition. Each Department Head gave us a tour of his facilities, with a detailed explanation of its activities. Operations consist primarily of laboratory work and pilot plant applications. Fire destroyed their extensive library during the recent earthquake and considerable damage was also suffered by the loss of much sophisticated equipment. It has been replaced gradually. Bressani and his group collaborate with the medical and clinical divisions in supplying special food products and analytical services.

This group is probably the most knowledgeable and experienced of any in Latin America. It would be invaluable to any action program planned for Central America and Panama.

5 March 1976

Meeting at Instituto Centroamerica de Investigacion Y Tecnologia Industrial (ICAITI), with:

Ing. Francisco Aguirre B., Deputy Director  
 Dr. W. Ludwig Ingram, Jr., Jefe Div. Serv. Tec. Ind.  
 Dr. J. Fernando Mazariegos, Jefe Div. Anal.  
 Dr. Carlos Rolz, Jefe Div. Investig.  
 Dr. J. Joaquin Bayer S., Jefe Div. Normalizacion  
 Mr. James B. Riley, Reg. Dev. Officer/ROCAP AID

As at INCAP, our presentation was well received. Again all had been previously briefed and offered any assistance possible with the project. The local AID officer was also impressed with our project.

Ing. Aguirre explained their mission as a technical assistance program to industrial development (including foods) in Central America and Panama. Financial support comes from local governments (18%), U.S. AID,

U.N., and other organizations; plus service charges to industry for services rendered. The latter include economic surveys, technical assistance, quality standards development, research and development, quality control, science policy, information services, and market surveys. They have made a complete survey of the food industry in Central America. Samples of their projects include: analysis of products for quality, transfer of technology, work shops on special subjects (such as sanitation in the food industry), short courses, seminars, and post-graduate study. (About 15 students take advantage of this special training program each year.) A recent project involved the establishment of the Food Research Institute in the Dominican Republic (INTOTEC). They have an extensive library, modern, well-equipped laboratories and excellent pilot plant facilities. Earthquake damage was quite serious to the facility but has been gradually repaired.

5 March 1976

We visited Productos de Maiz y Alimentos, S.A. with:

Ing. Emilio Corredoira

Ing. Rodolfo V. Olavarri

They gave us a tour of their modest factory where Maizina is produced and packaged. Although the product (for infants) is largely starch they have plans to develop additional products containing protein and fortified with minerals and vitamins.

Later we visited a supermarket which was found to be well stocked with a wide variety of processed food products, fresh fruits and vegetables, dairy products, and meats and poultry products. We found packages of Incaparina, a supplemental food product developed several years ago for infant feeding, also in stock. Prices of the food items were not greatly different from those in the U.S.

#### General Comments on Developments in Guatemala, including Agriculture and Food Supply.

Economic development in Guatemala has been reasonably well sustained in recent years. The recent disastrous earthquake will surely slow things down for a while. The country's development is conditioned by its small size but it does have good agricultural resources, forestry, and fisheries. Recently some key minerals have been discovered.

Malnutrition exists in the country, both in the fringes of the cities and in the rural areas. INCAP has studied these problems for many years. In fact INCAP is the "dean" of the research institutes studying malnutrition in Latin America and especially in Central America. Incaparina, a product designed for alleviating malnutrition among the poor was first made and tested by INCAP. While it has enjoyed only limited success, it was the pioneer product developed to provide low cost, good nutrition for the poor.

Food resources in Guatemala are varied and adequate to meet the needs of the country. They could probably be expanded.

Food Technology has advanced in this country thanks to the presence of both INCAP and ICAITI. The former is devoted primarily to research

and education related to nutrition (including food science and technology) while the latter is devoted to research and education in food technology generally). Both serve all Central American countries and Panama.

Final Comment. The idea that the committee representatives for Central America will include key people from INCAP and ICAITI is a good one. They have good contacts in Central America and Panama and are well aware of the malnutrition problems there as well as the food technology capabilities for helping to solve the problems.

Northern Countries Region Committee

- Dra. Teresa Salazar de Buckle, Inst. Inves. Tec., Bogota,  
Colombia
- Dr. Ricardo Bressani, INCAP, Guatemala City, Guatemala
- Ing. Francisco Aguirre, ICAITI, Guatemala City, Guatemala
- Dr. Mario Solorzano M., Banco Cen. Nic., Managua, Nicaragua
- Dr. Jose M. Portilla, M.D., Coruna 1082, Quito, Ecuador
- Dr. Guillermo Lopez de Romaña, M.D., Inst. Inv. Nac.,  
Lima, Peru
- Lic. Maria Inez de Castaños, Min. Econ. y Plan., La Paz,  
Bolivia

North American Advisors for Northern Countries Region Committee

- Dr. Horace D. Graham, Univ. of Puerto Rico
- Dr. Miguel A. Jimenez, Reynolds Metals Co.
- Ing. Eduardo R. Mendez, Jr., Fries & Fries Int'l., Mexico

- TABLE 1. Food Technology Resources in Brazil
- TABLE 2. Food Technology Resources in Northern Latin American Countries
- TABLE 3. Food Technology Resources in Southern Latin American Countries
- TABLE 4. Industrialization in Latin America
- TABLE 5. Reasons for Industrialization in Latin America
- TABLE 6. Underdevelopment Causes
- TABLE 7. Characteristics of Food Technologists
- TABLE 8. How Constraints can be Overcome
- TABLE 9. Action Program
- TABLE 10. Recommendations







TABLE 4. MALNUTRITION IN LATIN AMERICA

Country	Area Mi <sup>2</sup> & Population.	Area Concerned				Protein	Calorie Protein	Vitamin A	Vitamin C	Vitamin D	Folacin	Other Vitamins	Iron	Iodine	Calcium	Zinc	Trace Minerals	Other-Fluoride
		Urban	Suburban	Small City	Rural													
Argentina	1,072,158 26,000,000		X		SW													
Bolivia	424,162 5,500,000		CW	CW	CW		XX	XX		X		XX	X	X				
Brazil	3,286,473 110,000,000		X	X		NE	X	XX	XX			XX	XX					
Chile	292,257 11,000,000	X	XX	X	X	XX	XX	XX	X	X		XX	X	X				Also FI
Colombia	440,000 26,000,000	C	C	C	C		XX	XX				Rib <sub>o</sub>	XX	X	X			
Costa Rica	19,575 2,000,000	W	W	W	SW		XX	XX				B <sub>2</sub>	XX	X				
Dom. Republic	18,816 5,200,000	C	C	C	C	X	XX	X				B <sub>6</sub>	XX	X	XX			
Ecuador	109,483 7,200,000	CW	ew	ew	CW	XX	XX	X					XX	X	X			
El Salvador	8,260 4,200,000	W	W	W	CW	X	CA	XX	XX				B <sub>2</sub>	XX	X			
Guatemala	42,042 6,200,000	W	W	W	W	X	XX	XX					B <sub>2</sub>	XX	X			
Guyana	83,000 800,000	X			X		X	X					XX	X	X			
Haiti	10,714 5,300,000	X					XX	X					XX	X				
Honduras	43,277 3,000,000	W	X	X	XX	X	Cr	XX	X				B <sub>2</sub>	XX	X			
Jamaica	4,232 2,000,000	C				X	XX	X					XX	X				
Nicaragua	50,193 2,300,000	W	W	W	CW		XX	X					B <sub>2</sub>	XX	X			
Panama	29,208 1,800,000	W	W	W	ew		XX	X					B <sub>2</sub>	XX	X			
Paraguay	157,047 2,800,000		X	X	X		X	X		?		Rib <sub>o</sub>	X	XX	X	X		FI
Peru	496,222 15,000,000	C	C	C	C		XX	XX				XX	XX	X	X			
Trinidad	1,864 1,000,000	X					XX	X					XX	X				
Uruguay	68,563 3,200,000		X		X		X						B <sub>1</sub>	?	X			?

C = Pre School Child  
W = Pregnant & Lactating Women



TABLE 6. POST HARVEST LOSSES

Country	Corn	Rice	Wheat	Manioc	Soy	Other Cereals	Potato	Tubers	Milk	Meat	Eggs	Fish	Fresh Vegetable	Fresh Fruit	Beans
Argentina	10 RFS		10 RFS			10 RFS		15 FP					P	P	
Bolivia			30 FTS			30	30 FTS	30 TSP	30 TSP				FSTP	30 FSTP	
Brazil	40 FS	3 FS	3 FS	10 FS	3 FS	FS	8-10 FS			10 FS			10-15 FSP	10 FSP	35 FS
Chile			20 FS			20 FS					20+ PF&T	20+ PF&T	20+ PF&T	FS	
Colombia	20 FTSR	20 FTSR	20 FTSR		20 FTSR	20 FTSR	10 FTS	8 PS					FTSP	20 FTSP	
Costa Rica															
Dom. Republic															
Ecuador	TSR	TSR	TSR		TSR	TSR							FSTP	FSTP	
El Salvador															
Guatemala	FTSR	FTSR				7-10 FTSP								20-25 FTSP	
Guyana															
Haiti															
Honduras															
Jamaica															
Nicaragua															
Panama															
Paraguay	FS		FS		FS	FS		PS	PS	S			PS	PS	
Peru															
Trinidad															
Uruguay	4 FS	5 FS	3-5 FS				9 FTS	5 TS	30 Poultry ST		30 PST	10 FT	10-20 FT	FS	

Code: Digits = % Loss

F = Loss at Farm

S = Inadequate Storage

P = Inadequate Processing &amp; Preservation Technology

R = Rodents &amp; other pests

T = Transport Loss

TABLE 7.

WHAT CONSTRAINTS HAVE DETERRED OR PREVENTED THE FOOD TECHNOLOGISTS AND FOOD TECHNOLOGY INSTITUTIONS FROM USING THEIR RESOURCES MORE EFFECTIVELY TO HELP ALLEVIATE MALNUTRITION PROBLEMS?

- a) A modest food industry and inadequate technologies in use.
- b) Lack of government and private sector planning.
- c) Lack of communication among various sectors, particularly research and teaching institutions with the food industry.
- d) Lack of promotional methods such as financial aid and tax incentives.
- e) Lack of collaboration with the packaging industry and with the marketing and distribution sectors.
- f) There is little interchange of information within the industrial sector.
- g) Lack of nutrition education among Food Technologists.
- h) Lack of interest by industry to produce products of best or appropriate nutritive quality.
- i) Policies vague regarding exploitation of agricultural resources.
- j) Difficulties in introducing new varieties or types of farm crops with higher nutritive value.
- k) Lack of communication between farmer and food processor.
- l) No relation between domestic and international prices.
- m) Full time of Food Technologist demanded by employer to complete day to day tasks.
- n) Reluctance of Food Technologist to urge employer to set higher standards of nutritive quality in the company products.
- o) Practical extension work following research studies has been deficient.
- p) The Food Technologist has an inadequate understanding of marketing, distribution, consumer acceptance and pricing.
- q) The Food Technologist has had little or no communication with the consumer.

TABLE 8.

**HOW CAN FOOD TECHNOLOGY RESOURCES BE APPLIED MORE EFFECTIVELY TO HELP ALLEVIATE MALNUTRITION PROBLEMS.**

- a) Promote closer relations among regional food technology institutions through:
  - 1) greater exchange of information, plans and results
  - 2) initiation of more joint research and development projects
  - 3) greater interchange of research associates, particularly from the emerging countries to the lesser developed countries.
- b) Encourage increased application of appropriate regional Latin American Technology by:
  - 1) identifying extension mechanisms for the dissemination of research study results such as protein enriched foods, composite flours of higher quality protein value, simplified packaging technology, modest cost extrusion techniques to produce textured protein products, fish dehydration and rehydration techniques, etc.
  - 2) stressing the philosophy that research topics should be related to specific nutritional problems
  - 3) developing objectives and budgets for support which are directed to a specific end result and requirement of interim performance reports justifying support to conclusion of project.
  - 4) identification of type of technology which is most important for each region
  - 5) evaluating mechanisms and materials for technical services concerning handling, storage and conservation of foods in all channels of distribution: urban, suburban, and rural.
  - 6) searching for non-superfluous and appropriate technological alternatives applicable to a given region or regions, and applying these technologies
  - 7) utilizing food technological human resources by encouraging their participation in the development of National Food and Nutrition Programs
  - 8) encouraging further development of institutional infrastructures and specialized areas of research and instruction.
- c) Expand and encourage the closer cooperation of Food Technologists with personnel in government agencies concerned with food regulations, quality standards development, and food intervention programs.
- d) Improve communications with nutritionists, policy makers, agriculturists, public health personnel, economists, marketing specialists, and warehousing and distribution operations.
- e) Require a course in basic nutrition in all food technology curricula.
- f) Encourage food technologists to apply their expertise for the prevention of post-harvest losses.
- g) Help to introduce the growing and processing of crops with higher nutritive value, such as soybeans, quinoa, lupino, opaque-2 corn, etc.
- h) Through product development, to enrich the normal foods with ingredients of high nutritive value.
- i) Stabilize prices through an adequate design of infrastructures for storage.
- j) Utilize low grade fruits for jams, juices and jellies.
- k) Convert milk and meat waste products into acceptable foods or food ingredients.
- l) Consider consumer needs in working with agriculturists in the planning of agricultural production.
- m) Research of toxins and other non-nutritive components of new foods.
- n) Convince industrialists that the employment of competent food technologists is a profit making venture.
- o) Involve themselves with planning and execution of food intervention programs.
- p) Create new product concepts which utilize the principles of high nutritive value at minimum cost.

TABLE 9. SUGGESTED ACTION PROGRAMS

1. To integrate applied nutrition and food technology in a small Brazilian community (representative of many small communities throughout Latin America).
2. To teach food technology at intermediate levels and establish extension courses in food technology and nutrition for academic training in professions such as agronomy, medicine, and infirmary.
3. To promote among industrialists the production of balanced foods (calorie/protein, vitamin, mineral) within the concept of high nutritional value and low cost products.
4. To study and quantify post-harvest losses and to develop practical and economic methods for preventing those losses.
5. To study packaging materials and designs used at present for different food handling operations in order to recommend those that will give maximum protection at minimum cost.
6. To establish prototype collection centers for agricultural products within the concepts of simplicity, low cost and efficiency.
7. To establish a pilot operation for the marketing of high nutritional/low cost foods in order to select more adequate strategies for their introduction to low income groups.
8. To study the most appropriate vehicles, processes and ingredients for fortification of foods with the vitamins A, B<sub>2</sub> and with the minerals Fe and Ca.
9. To develop integrated systems for crop exploitation within the agro-industrial concept.
10. To teach food storage, handling and preservation at the home level with emphasis on low income families in rural areas and areas surrounding large cities.
11. To promote, after careful agro-economic studies have shown their profitability, the cultivation and use of local agricultural products with high nutritional value such as quinoa or others that contain important sources of fat, protein and vitamins.
12. To develop specialized foods for school and preschool children.
13. To improve utilization of marine food resources.
14. To upgrade the utilization of staple regional crops.

TABLE 10. RECOMMENDATIONS

1. Four pilot projects designed specifically to overcome constraints identified previously as having hindered food technology resources from effectively helping to alleviate malnutrition conditions:
  - A Model Integrated Nutrition and Food Technology Program for Priority Groups in a Brazilian Community
  - Teaching Food Science and Technology as a Component of Education for Rural Development
  - An Agro-Industrial System Integrated with Public Health Nutrition, for the Improvement of the Socio-Economic and Nutritional Status of Rural Communities
  - Utilization of Marine Resources to Combat Malnutrition in Chile
2. An in-depth study should be made of post-harvest losses in Latin America.
3. There should be an increase in intra-Latin American training programs in Food Science and Technology, and in Nutrition.
4. Basic Food Science and Technology courses should be included in all Nutrition curricula, and basic Nutrition courses should be included in all Food Science and Technology curricula.