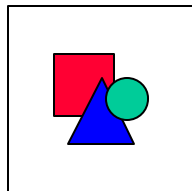


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**THE TASK OF INCAP IN THE GENERATION OF KNOWLEDGE,
METHODOLOGIES AND TECHNOLOGIES IN SUPPORT OF
NUTRITION AND FOOD SAFETY IN CENTRAL AMERICA**

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Guatemala, Guatemala, July 2000

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INDEX

	<u>Págs.</u>
I. INTRODUCTION.....	1
II. EVOLUTION OF FOOD AND NUTRITION RESEARCH OF INCAP.....	1
III. INSTITUTIONAL POLICIES THAT ORIENT RESEARCH IN SUPPORT OF THE NUTRITION AND FOOD SAFETY.....	2
IV. RESEARCH AND MANAGEMENT OF THE KNOWLEDGE IN SUPPORT OF THE NUTRITION AND FOOD SAFETY OF CENTRAL AMERICA.....	4
A. CARACTERÍSTICAS.....	5
B. DESCRIPCIÓN INVESTIGACIONES SEGÚN LÍNEA DE ACCIÓN INSTITUCIONAL	6
C. DESARROLLO DE METODOLOGÍAS.....	12
D. COMPARTIENDO RESULTADOS DE INVESTIGACIÓN/COMUNICACIÓN EN INVESTIGACIÓN.....	15
E. MOVILIZACIÓN DE RECURSOS.....	16

ANNEX 1.

PROPOSAL: THE TASK OF INCAP IN THE GENERATION OF KNOWLEDGE, METHODOLOGIES, AND TECHNOLOGIES IN SUPPORT OF THE NUTRITION AND FOOD SAFETY IN CENTRAL AMERICA

I. INTRODUCTION

From its inception, in 1949, the task of INCAP has been oriented to identifying the food and nutrition problems of the Central American region and searching for its solution. In the beginning INCAP, in collaboration with its member countries (Central America), concentrated on clinical and epidemiological trials about nature, magnitude, distribution, and determinants of food and nutrition problems of the population. This research permitted the detection of most of the prevalent nutritional deficiencies and oriented the application of solution in accordance with the needs and available resources. As reviewed in the following actions of this document, numerous, and valuable contributions were made in these fields.

The Institute, currently and for the past 10 years, has been cooperating technically with the countries in implementing the regional initiative to promote nutrition and food safety, by collaborating in diagnostic studies, and in the design, implementation, monitoring and evaluation of public nutrition programs and projects at municipal, national and regional levels.

The contributions to knowledge carried out by INCAP in the food and nutrition fields, highlighting its contributions in the last 5-years are reviewed below. Furthermore, this document analyzes the lines of policy guiding the generation of knowledge, and the strategies being promoted in support of knowledge administration, one of the pillars in the delivery of technical cooperation to the countries.

II. EVOLUTION OF FOOD AND NUTRITION RESEARCH AT INCAP

In the beginning research in INCAP focused on the clinical aspects of malnutrition, especially in infants and preschoolers, attending the request of pediatricians who did not have methods or standardized techniques for the diagnosis, treatment, and monitoring of those cases that demanded services in the assistance units. Findings of research conducted in pediatric units of hospitals in the region, and at the metabolic unit and laboratories in INCAP headquarters contribute to the knowledge of the varied nature of manifestations associated with nutritional deficiencies, both by macro- and micro-nutrients, as well as to their therapeutic management and monitoring.

Subsequently, after a period of emphasis on clinical nutrition, research at the Institute focused on nutritional epidemiology, directed to knowledge of the magnitude, distribution, and determinants of the principal nutritional problems. It was between the years 1965 and 1969 that the countries of the region, with the INCAP's technical support, conducted the first national nutrition surveys, that today constitute the baseline for estimating changes in the nutritional status at country and regional levels. Also, beginning late in the decade of the 1960s, and especially in the 1970s and 1980s, the practical enforcement of knowledge, technologies, and available methodologies was strengthened. Numerous were the studies of applied nutrition in

which specific or integrated interventions were formulated and tested, with regard to availability, access, consumption, and biological food utilization.

In Table 1 (at the end of the document) information concerning research projects carried out and their principal contributions to knowledge in food and nutrition is presented. These have been compiled in a document celebrating INCAP 50th anniversary.

In the previous decade, beginning with the resolutions of the XLIV Meeting of the INCAP Council and the XIV Central American Presidents Summit, held in 1993, INCAP oriented its technical cooperation, which integrates aspects of research, technical assistance, and human resources development and training, dissemination of scientific and technical information and mobilization of resources, in the issue of Nutrition and Food Safety. INCAP's involvement in this regional initiative, which integrates theme and functional issues of the Institute and of other institutions in the Central American region, is reviewed further down.

III. INSTITUTIONAL POLICIES GUIDING RESEARCH IN SUPPORT OF NUTRITION AND FOOD SAFETY

In order to systematize, prioritize, and respond to the needs of Member Countries, favoring the search for solutions to principal food and nutrition problems, INCAP proposed and achieved approval of the Research Policy from the INCAP Council, at its XLII Meeting, held in Guatemala in 1991. As a part of this policy it was established that all research carried out must:

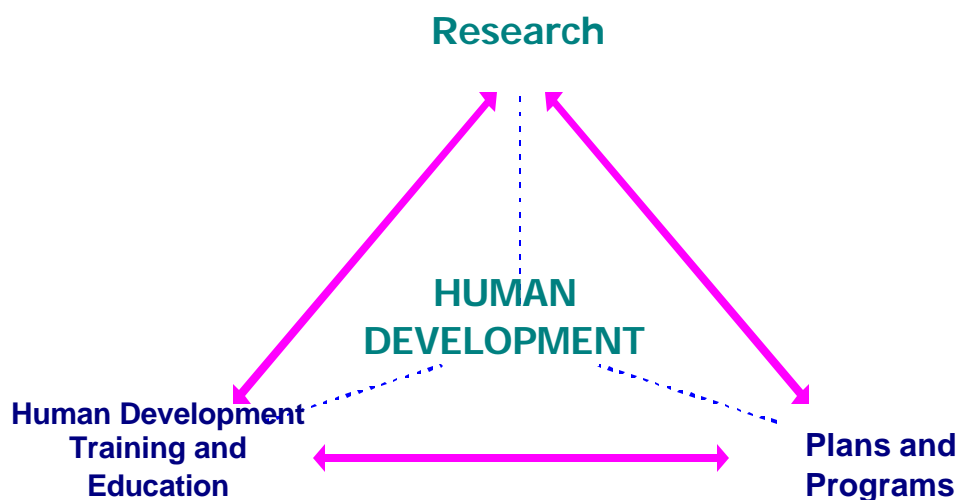
- Respond to priority problems of the Member Countries.
- Take into account:
 - Magnitude of the food, nutritional and health problems.
 - That the problem to be addressed for research should be regarded as priority problem by the Member Countries
 - That the problem being considered must be relevant to the social development of the Member Countries
 - The possibility of finding solutions, knowledge and/or significant technologies feasible to be applied.
 - The availability of researchers, infrastructure, and financing to carry out the research.
 - The involvement of universities and research centers of the countries.
- Strengthen the national research capability, including that of research centers and universities.
- Have seed funds allocated for promoting the development of new research areas.

The proposed strategies to promote research development include:

- ❑ The strengthening of research in the countries by the development of multi-center studies and applied research in addition of research training to personnel involved in the food and nutrition fields, favoring support of research centers and universities.
- ❑ Establishment and maintenance of careers in research and training by offering research residences as well as post graduate human resources education.
- ❑ Improvement of research communication favoring the access to scientific and technical computerized networks; promoting the participation of researchers in scientific forums in the region and abroad, as well as the realization of scientific events for sharing research findings.
- ❑ Balance and development of research areas; by promoting sabbatical and associated researchers, biannual updating of priorities, and granting seed funds for research.
- ❑ Strengthening research support systems.

At later meetings of the Directing Council, the policies that govern INCAP activities in Direct Technical Assistance, Human Resources Development and Training, Communication and Scientific and Technical Information, and Mobilization of Resources were known and approved. All these activities jointly orient INCAP's technical cooperation in support of the initiative to promote Food and Nutritional Safety.

On the other hand, since INCAP has responsibilities in the fields of research, education, and human resources development, and in support of regional, national, and local programs, the integration of these actions into the following triad has been proposed:



The dynamic interaction between the generation of knowledge, the design of public nutrition programs, and human resources education favors the design, implementation, monitoring, and evaluation of plans, projects, and activities on nutrition and food safety. Research findings are utilized as input for the programs and to define the educational contents. This interaction is shown by:

- Programs that benefit from applied research
- Research priorities are identified in the programs context
- Effectiveness of the programs is improved and it benefits from human resources training
- Nature and contents of the training are identified in the program context
- The research findings support the training
- Human resources education and in-service training promotes the “culture” of research.

IV. RESEARCH AND KNOWLEDGE MANAGEMENT IN SUPPORT OF NUTRITION AND FOOD SAFETY IN CENTRAL AMERICA

Despite progress in the search for solutions contributing to the improvement of health, food, and nutrition of the Central American population, manifestations of nutritional deficiencies persist. On the other hand, given the increasing nutritional health problems associated with imbalances and nutritional excesses, the region has been classified as in epidemiological nutritional transition, characterized by an increase in morbidity and mortality attributable to chronic noncommunicable diseases associated to excessive or unbalanced diets, and to a slight reduction in the rate of nutritional diseases. The determinants of this situation can be found in the condition of food and nutritional insecurity in which an important proportion of the Central American population lives, which in turn is caused by low food availability in some groups of the population, economic inaccessibility to the same, lack of food and nutrition, education, and/or inadequate biological utilization of food.

Taking into account the foregoing, during the XLII Meeting of the INCAP Council, held in Panama in August 1996, the programming lines for the delivery of technical cooperation by INCAP to the Member Countries, including research, were defined as follows:

- Harmonization of food regulations
- Production of nourishing foods
- Nutrition and food safety in local development processes
- Education and training of human resources in food and nutrition
- Community food and nutrition education
- Prevention and control of micronutrients nutritional deficiencies
- Health and nutrition of women and child
- Prevention of chronic noncommunicable diseases
- Nutritional surveillance, monitoring, and evaluation

The principal research projects, progress, and achievements in each programming line between 1994-1999 are described below:

A. Characteristics

During the period 1994-1999 applied research for the Nutrition and Food Safety issue was carried out, including the implementation of multi-center studies with participation of universities, research centers both from the Central-American region and abroad. In addition, an endless number of qualitative ethnographic researches for understanding the problems of nutritional food insecurity were carried out. Results of these researches permitted the development of educational interventions and of communication to promote healthy lifestyles and an adequate diet, including nutritional guidelines, promotion of the SAN at local level, and favoring actions directed to woman and child.

Research was also carried out at the laboratory level particularly linked to issues of nutrition-infection and food protection. Table 2 presents the proposals produced, according to the institutional action line.

Table 2. Research Projects according to Line of Institutional Action

LINE OF ACTION	YEAR					
	1994	1995	1996	1997	1998	1999
A. Proposal Production						
Formulated/Processed	17	1	14	5	11	6
Approved	5	2	8	4	7	3
Previous Under way	36	24	26	7	13	12
B. Projects according to Subject						
Food Protection	6	3	3	2	2	1
Prevention and Control Micronutrients Deficiencies	5	4	10	2	4	
Production Food Nourishing	5				1	2
Food and Nutrition Education	2	5		1	1	
Chronic Noncommunicable Diseases				1	1	2
Health and Nutrition of Women and Childhood	14	10	15	5	6	4
Surveillance, Monitoring/Policies		3	4		3	2
Nutrition and Food safety Local Level	2		2		2	3
Human Resources Education	1					
Food Systems	3	1				1

For the development of this research, alliances were forged with academic and research centers, friendly countries, NGOs and foundations. The sources of financing that made it possible to conduct research are shown in Table 3; while Table 4 shows the financial amounts that were available for execution of research.

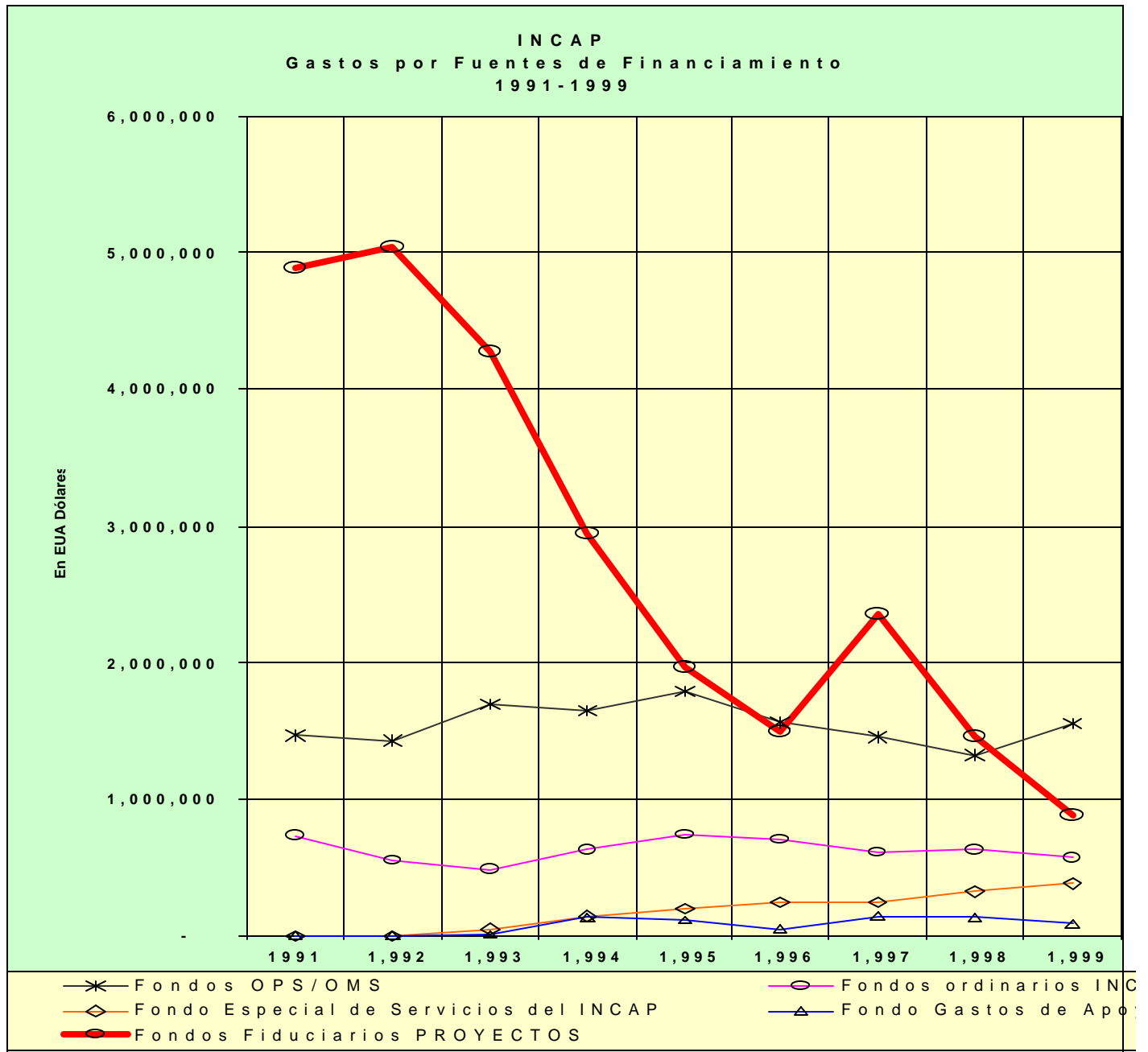
Table 3. Source of Financing in Support of Research by Year

	1994	1995	1996	1997	1998	1999
Bilateral Countries and Subcontractors	10	10	5	4	7	2
Research Centers and Universities	7	2	20	5	10	8
System United Nations	15	13	7	1		1
NGOs/Foundations	4	1	1	1	2	4
Private Sector						
Regional Organizations	2		1		1	

B. Research Description according to Institutional Line of Action

1. **Socioeconomía Alimentaria**: This line of action was carried out with a view to strengthening knowledge of the socioeconomic interrelationships that affect nutrition and food safety, as well as to promoting the analysis and use of this knowledge in the decision-making. Like in the rest of the Latin American countries, in CA, the stabilization economic policies and structural adjustments are affecting the SAN one way or another. The research conducted made it possible to determine the effect that various socioeconomic factors have on the SAN at the family level and showed the evolution of the purchasing power –e.g. minimum wage with regard to the basic food basket, family income of participants, in agricultural exports and effects on nutritional status – in the purchase of food by the Central American people. On the other hand, an econometric analysis of corn production and consumption was made, permitting the development and enforcement of a model that can be applied to other basic grains. The study “Appraisals on the effect of household water availability on women’s time utilization in the rural homes of the Guatemalan Western High Plains”, showed the positive aspects of introducing water in the homes and the opportunity that women have to participate in productive activities for improving her income, thus permitting her also to have more time to be with her children.
2. **Nutrition and Food Safety at Local Level**: Its purpose is to provide work strategies to the Central American peoples and governments that will facilitate SAN insertion as an axis for integrating activities in plans, programs, and projects to help human development at municipal and local levels. Its operation has been aimed toward: a) the development of instruments to enhance the institutional, governmental and non-governmental management capacity in postponed areas, as well as to develop processes for technological and methodological transfer in food and nutrition related areas. The operational and formative research done to support the SAN development at the local level are described below:

Table 4



As shown in **Table 4**, trust fund raising for direct support of research has been diminishing since 1992; since that date, other financing sources of the Institute have been supporting the institutional task of providing technical cooperation, including domestic research.

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- Ethnographic studies in border communities of Central America (Tri-border El Salvador-Guatemala-Honduras; Costa Rica-Nicaragua border and Costa Rica - Panama border) for preparing descriptive maps and problem trees of local issues. This will allow to prioritize needs, to determine prospects for action and to take into account the local resources for the design of interventions that will help promote the SAN.
 - Characterization of Non-governmental Organizations related to the SAN.
 - Study on adaptation and acceptability of new food crops in semiarid areas of CA, thus making it possible to offer alternate food sources in semiarid areas.
 - Diagnosis of women's share in food agroindustry, the results of which made it possible to determine the small entrepreneurs' knowledge/qualifications, to consider demand aspects, as well as market opportunities. Based on these results a training program geared to the food industry entrepreneur was defined.
3. **Nutritional Deficiencies Prevention and Control**, oriented to the search and application of permanent control measures for the principal nutritional deficiencies (e.g. anemia, vitamin A, and iodine); the monitoring and epidemiological surveillance of nutritional deficiencies, the support of a campaign for developing preventive micronutrient supplementation, as well as, to the development and transfer of technology for improving food fortification. Research projects done during the period 1994-1999 were related to:
- The development of an epidemiological surveillance system of nutritional deficiencies in CA that takes into account food patterns, epidemiological profiles of anemia, and vitamin A, and iron deficiencies. Diagnostic surveys were also conducted for determining the magnitude and distribution of the principal micronutrients nutritional deficiencies.
 - Status assessment of policies and programs for food fortification with micronutrients, with emphasis on wheat and corn flour fortification with iron.
 - Research on the advantages and disadvantages of daily and weekly iron supplementation of schoolchildren, infants, and childbearing age women.
 - Study for determining iron bioavailability in Central American food using experimental animals, likewise for the determination of sugar retinol stability during production of soft drinks, sweets, and bread-making, shelf life of vitamin A in fortified sugar, and a study on of brown sugar paste fortification with vitamin A and iron, thus making it possible to initiate the brown sugar paste fortification process with these micronutrients.
 - Evaluation of provitamina A in six musaceous varieties in CA.

4. Human Nutrition, with emphasis on Women and Children: This line of action developed research based on:

- a) *Growth, development, and human reproduction*, carrying out research projects related to health-and maternal nutrition that included:
- Applied research for development of intervention focused on the leading causes of maternal and perineonatal morbidity and mortality, in order to strengthen the local capability of public and informal health sector and to offer neonatal maternal health services.
- b) *Health and Pre- and Post-natal Growth*: On this line research was developed for generating information on the pre- and post-natal determinants of growth. Research carried out includes:
- Generational and long-term effects of nutritional supplementation on newborns weight: for analyzing the long-term effect that, improving the nutritional status of children born during the Longitudinal Growth and Development Study had in their adult reproductive life, those, today adolescent and young adults, that had pregnancies during 1991-1996 were monitored during their prenatal and childbirth periods. The results being obtained are important for demonstrating the long-term effects of nutritional improvement on fertile, infant, and preschool life for achieving better birthweights, which in turn have direct effect in the survival, growth and development of the next generation.
 - Multicenter Study on the relationship between fetal maternal nutrition and the development of hypertension in infancy and preschool age, proposed in the “programming” hypothesis postulate that nutritional deficiencies during fetal and childhood are risk factors for chronic diseases.
 - Health, nutrition, growth, and postnatal development during the preschool period: These studies were conducted for the purpose of knowing the determinants of postnatal growth, identifying possible actions for promoting growth and preventing malnutrition in preschool children. The projects included: a) Effect of zinc supplementation to preschool children, on growth, dietary intake morbidity, physical activity and appetite. b) Community nutritional therapy: implementation and evaluation of educational intervention aimed at improving eating habits of children between 6-24 months of age by means of communication and educational programs. c) Promoting the human potential in vulnerable children: from research to practice.
 - Studies to determine the interventions impact in reducing household air pollution on low birthweight, child morbidity, and physical retardation of children of the Guatemalan High Plains. The ethnographic study made it possible to determine acceptability of the improved stoves (plates and of propane gas); evaluate their efficiency in diminishing household contamination. The study was also conducted

to determine if there is a link between nutritional iron status and the levels of household contamination.

- ⊖ Formative research to establish the factors determining feeding practices of infants less than six months old, finding great variability in the feeding practices.
- c) *Health, Nutrition and Growth of the Schoolchild and the Adolescent; that included:*
- ⊖ Determination of energy expenditure and requirements of adolescents who are growing adequately.
 - ⊖ Development of a method to evaluate programs for feeding schoolchildren.

5. **Promotion of healthy lifestyles and of an adequate diet:** This line of action was oriented to the determination of risk factor for chronic noncommunicable diseases associated with feeding as well as the design of interventions to help and contribute to healthy lifestyles. The operational and formative researches were carried out in Guatemala, Costa Rica and Panama, focused on:

- ⊖ Multicenter study on Diet and Health in the Region of the Americas, coordinated by INCAP and conducted with institutions of the Regional Operational Network of Food and Nutrition Institutions --RORIAN, which made it possible to determine that:
 - The problems of nutritional deficiencies (DPE, vitamin A, iodine and iron) are in process of diminishing.
 - The problems associated with imbalances and excesses, e.g.: Chronic diseases are increasing.
 - In most of the countries the problems coexist because of excesses or imbalances with nutritional deficiencies.
- ⊖ Study for determining the prevalence of chronic non-communicable diseases and risk factors (obesity and cardiovascular diseases) in Costa Rica, Guatemala, and Panama. The results have been used for developing educational interventions oriented to promote healthy lifestyles and diet.

6. **Food protection:** Research carried out was focused on:

- ⊖ Generation of knowledge, diagnosis, control, and prevention of infectious diseases that affect nutritional status of Central American populations; by implementing ethnographic studies, for the management of acute respiratory infections at household level, carried out in four communities in Guatemala, El Salvador, Nicaragua, and Panama; as well as for determining knowledge of factors susceptible to interventions for Control of Diarrheal Infections and Cholera:

- Studies were also conducted to determine the possibility of using solar energy and radiation for disinfecting water polluted with the cholera causative agent. The results showed that in direct exposure to the sun, a reduction was obtained of coliforms contamination in the water, while in the solar light absorber box a total elimination of contamination (coliforms and *Vibrio cholerae* 01) was observed.
- Degree of contamination of vegetables that are consumed raw with irrigation waters contaminated with *Vibrio cholerae* 01, the results indicate that the continuous irrigation with waters polluted with *Vibrio cholerae* results in a high degree of external contamination of vegetables. In none of the vegetables was found any internal contamination. The implications of the study make it possible to determine the importance of the sanitary quality of irrigation waters.
- Repeated infections by *Campylobacter Jejuni* in children: recurrence or reinfection? The results show that infections by *C. Jejuni* in the rural community of Santa María de Jesús, Guatemala, are caused by reinfections and not by recurrence of one single strain and that the *C. Jejuni* does not cause persistent diarrhea in children.
- Operative research on water disinfection and storage at the workplace, and for hand washing with application in sanitary improvements of street food vendors (CDC and Guatemalan Ministry of Health). The principal objective of this project was to evaluate introduction and use of a plastic drum (developed by the CDC) adequate for safe water storage. This information will support the design and evaluation of interventions for reducing microbial contamination in street vendor stands.
- Purification of *Campylobacter jejuni* antigens. This research supported by the Academy of Sciences for the Third World was carried out to determine the importance that three *Campylobacter jejuni* antigens have in the prevention of diarrheal diseases by *Campylobacter*. The three antigens were characterized and chromatographic affinity columns that made it possible to purify and biochemically characterize these molecules were prepared. In the future it will be evaluated among workers of chicken-coops, in whom we hope to observe high titers of antibody due to their exposure to *C. jejuni* because of their work.
- Isolation and characterization of *Helicobacter pyloria*. This study was conducted in order to characterize in terms of biochemical tests the causes of active chronic gastritis and duodenal ulcer and stomach cancer. Virulence factors will be also compared by genetic methods and will be sought in collaboration with the University of San Luis Missouri.
- Study on corn contamination (University of Emory). The *fumonisin*s are *mycotoxin*s produced by the fungus *Fusarium moniniforme* in corn, which have been associated with chronic diseases in animals and humans. Based on the knowledge that the *fumonisin*s are destroyed by calcium hydroxide, it is reasonable to postulate that they

could be destroyed in the process of *nixtamalization*, depending on the concentration of lime utilized in that process. With that purpose corn samples were obtained before, during and after the nixtamalization process in two indigenous communities in Guatemala.

- ➊ Study on effectiveness of a sulfonamide, the oral *cotrimoxazole*, as ambulatory therapy in infants younger than three months. Study conducted at the Hospital San Juan de Dios in Guatemala, in collaboration with the University of Helsinki. The results will be especially applicable to populations with limited resources, for whom hospitalization is not possible.
- ➋ Study on the effect of the *Giardia lamblia*, and on the intestine bacterial growth by absorption of vitamin B12, nutritional status of iron and folates in schoolchildren of Guatemala.

7. **Food and Nutrition Education:** This line of action oriented to promote knowledge, favorable practices on SAN at community level, made the risk factors related to chronic non-communicable diseases diagnostic evaluation at a Guatemalan company. Based on the results, an educational intervention aimed at improving the diet and increasing regular physical activity was designed. Furthermore, ethnographic studies have been conducted as input for the preparation of nutritional guidelines as an educational tool for promoting lifestyles.

C. Development of Methodologies

During this period INCAP also promoted the development and validation of methodologies and technologies related to:

- Updating database on food composition for CA, which has been expanded (1134 foods) and documented. In addition, the review of the Nutritional Value Table of Foods of Greater Use in CA was started, expressed in average domestic measures.
- Description of the method for the apparent control of food consumption at household level, suggested for food and nutrition surveillance and for conducting quick food consumption studies.
- Design and test of a questionnaire to measure the usual diet of adult populations.
- Methodological proposal for the definition of the basic food basket.
- Definition of a methodology to estimate income of rural homes.
- Preparation of guidelines for the implementation of height census in schoolchildren as a part of the food and nutrition monitoring at community level.
- Preparation of a database with information on combinations of food crops, exporting crops and experiments in poly-cultivation in CA.
- Development of a nutritional evaluation method among schoolchildren.

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- Development of technologies for porcine production, pig management, and hygienic processing of its meat.
 - Development of analytical methods for determining urinary iodine by using the microplate kinetic method, successfully used in national micronutrients surveys in Honduras, Belize and Guatemala.
 - Development of analytical method by means of high-resolution liquid chromatography for determining the stability of retinol in foods.
 - Development and validation of analytical methodologies for monitoring water.
 - Use of irradiation as a method for conservation and improvement of sanitary quality of shrimp.
 - Potential for a traditional technology to improve children feeding and nutrition using paps with higher nutrients density.
 - Assessment of technologies and vehicles for iron fortification and supplementation.

In addition, during this period a review of Institute generated technologies was performed understanding as technologies those procedures organized on the basis of scientific principles to modify individuals and/or population status. Under this concept, included as technologies were:

- The scientific knowledge applied to the definition of a model or explanatory conceptual framework of the organization and the operation of health or food and nutrition services (e.g. of oral rehydration units) or of a working area (e.g. food and nutrition surveillance).
- The integration and application of medicines or food, and the use of medical equipment and professional skills in methods and techniques for the diagnosis of health or food and nutrition problems of the population, and for their care.
- The combined application of methods and techniques for managerial diagnosis and for the development and test of comprehensive solutions that will allow improvement in the organization and operation of health, food and nutrition services, or else, of a program or a specific service.
- The application of knowledge (methods and techniques) of equipment and professional capabilities to produce, store, prepare, distribute, or maintain an industrializable good or product (e.g. the nourishing cookie).
- The combined application of methods and techniques both in health, food, nutrition and administrative, human resources education and training and of food and nutrition education.

Table 5 shows the distribution of generated and/or adapted technologies by the Institute by subject. It shows, that the greatest number of technologies was concentrated on food technology and human nutrition. Examples of developed technologies include a kit for detection of *V. Cholerae*, composed flours with high nutritional value and low-cost, salt fortification with

iodine, and sugar with vitamin A, and the treatment of malnourished children at hospital level. Of these technologies, 64% have been validated at applied level, 33% have been validated at experimental level (Laboratory, Pilot Plant, Pilot Study), being the area of food technology the one to have had this level of development and 77% has been applied in the Central American region.

Table 5. Technologies/Methodologies generated or captured by INCAP, by subject, 1995

Subject	Frequency	Percentage	Reached Development						
			Validated			Applied		Evaluated	
			VA	VE	NV	YES	NO	YES	NO
Food Technology	29	21.32	8	20	1	7	22	8	21
Human Nutrition	26	19.12	18	7	1	20	6	20	6
Agriculture, Food, Nutrition, and Health Integrated Systems	20	14.71	19	-	1	19	1	13	7
Food Socio-economy	17	12.50	15	2	-	17	-	9	8
Infectious Diseases that Affect the Nutritional Status	17	12.50	12	5	-	17	-	17	-
Education and Training of Human Resources and Health Education	11	8.08	9	1	1	11	-	5	6
Food Protection and Consumer Orientation	9	6.62	3	5	1	7	2	6	3
Micronutrients (Specific Nutritional Deficiencies)	7	5.15	4	3	-	7	-	4	3
TOTAL	136	100	88	43	5	105	31	82	54

Source: Institute of Nutrition of Central America and Panama (INCAP), Pan American Health Organization (PAHO/WHO). Database on Health Technologies Report, Feeding and Nutrition Generated, Captured, or Evaluated by INCAP and Registered in Documentos. 1982-1992.

VA: Validated

VE: Validated and Evaluated

NV: Not Validated

As a result of the technology review, an inventory was prepared, which has been widely distributed to INCAP counterparts and partners and is available at the institutional Web page.

D. Sharing Research Results /Communication in Research

During the last decade INCAP has placed special emphasis on the need for promoting the use and transfer of knowledge, technologies, and methodologies generated as a result of research. To this end it has decentralized its technical cooperation and is developing the Virtual Library, with intentions to facilitate access to the generated and available information. In Table 5 the scientific and technical output is reflected in terms of written publications and the participation of professionals in forums and scientific and technical events. The forums were organized by INCAP, having a broad participation of professionals involved in the SAN. These three international events were:

- XVII International Vitamin A Consultative Group Meeting “Virtual Elimination of Vitamin A Deficiency: Obstacles and Solutions for the Year 2000” Guatemala, March 1996
- XI Latin American Congress of Nutrition “Promoting Nutrition and Food Safety in Latin America” Guatemala, November 1997
- Scientific Meeting “INCAP 50th Anniversary: Nutrition and food safety in the 21st Century” Guatemala, September 1999

Table 5. Dissemination of research findings through the participation of professionals in scientific and technical events and publications

	YEAR					
	1994	1995	1996	1997	1998	1999
Participation in Scientific Fora						
1. Central America		5	13		3	17
2. The Americas		2	10		4	2
3. Europe		1			1	
4. Others			1			
Scientific Publications						
Spanish	18	6	1	8	1	
English	10	7	7	4	7	7
Periodicals	5	3	11	8	4	1
Monographs	19	9	7	7	4	10
Thesis	1	2	1	6	5	4
Collaborative Documents	8	8	13	23	11	4
Official Documents	26	13	10	3	1	4
Conferences	20		20	16		8

E. Resource Mobilization

In order to diversify the extra-budgetary financing sources of the institute and favoring the capture, management, and negotiation of technical cooperation projects, including of research, INCAP has been promoting actions related to resource mobilization. To this end it has proposed the following strategies:

- Approximation to cooperation agencies (bilateral, multilateral, NGOs, foundations and universities)
- Promotion of institutional task at scientific and technical fora
- Reactivation of the Foundation for Food and Nutrition of Central America and Panama–FANCAP, as a financial arm for capturing funds in support of the SAN.
- Creation of a trust fund
- Sale of services primarily to the food industry

A Plan of Marketing and Institutional Promotion was recently prepared, which was presented and approved by the Advisory Committee in 1999 at a meeting held in El Salvador. This plan is aimed at favoring, promoting, and involving the participation of different actors and sectors in construction of the SAN in the Central American region as part of the strengthening process of Central American integration. Furthermore, INCAP has been participating actively in fora that the Central American Integration System–SICA promotes in order to attain support from friendly countries. The institute is currently participating in the formulation of megaprojects that the Social Integration Secretariat is formulating to be presented before the international community at the Madrid 2001 Meeting.

ANNEXES

Annex 1. Contributions of research conducted by INCAP in food and nutrition.

Area	Contribution
Human Nutrition	<p>Clinical, epidemiological and biochemical trials to determine the magnitude, distribution, and determinants of the problems of food and nutrition that affect the Central American population.</p> <p>Corporal composition of children and adults in diverse nutritional status.</p> <p>Validity and reliability of biochemical, physical and anthropometric indicators of the nutritional status.</p> <p>Development of the creatinine-size index as indicator of proteinic nutrition.</p> <p>Definition of biochemical indicators for the determination of the nutritional status of the Central American population.</p>
	<p>Epidemiological and clinical trials to determine the nutritional status (Anthropometric, Dietary and Clinical Surveys)</p> <p>Determination of immunological response in malnutrition and during its recovery.</p> <p>Studies on the influence of nutritional status on infections and vice versa.</p> <p>Epidemiological studies and their relation to social, cultural, and economic determinants.</p> <p>Anthropological studies to determine knowledge, attitudes, and practices that affect the situation of food and nutrition of groups at risk, particularly the maternal and child group.</p>
	<p>Nutritional Requirements of Preschool Children</p> <p>Determining requirements of proteins, essential amino acids, and energy in children.</p> <p>Use of vegetable mixtures to fulfill proteinic requirements.</p> <p>Determining the capability of common foods in Central America and Panama to meet the proteinic and energy needs of preschool children.</p>
	<p>Physiology, diagnosis, and treatment of proteinic-energy malnutrition (PEM)</p> <p>Metabolic differentiation of kwashiorkor and marasmus.</p> <p>Study of corporal composition during proteinic-energy malnutrition and its recovery.</p> <p>Establishment of dietary and therapeutic regimes for the treatment of malnourished children.</p> <p>Studies about interrelationship of nutrition, physical growth, and mental development.</p> <p>Study of the etiology and food-nutrition treatment of acute and persistent diarrhea.</p>
	<p>Nutritional Deficiencies</p> <p>Methodological development for the biochemical and anthropometric diagnosis of various nutritional deficiencies.</p> <p>Establishment of hematological standards to diagnose anemia in Central America.</p> <p>Identification of iron salts bio-available in the Central American common diets.</p> <p>Effects of chronic energy deficiency in the productivity of farmers and their socioeconomic impact.</p>

Area	Contribution
Foods	<p>Determining the chemical composition of food consumed in the Region and identifying dietary alternatives.</p> <p>Development of low-cost and of high nutritional value foods (e.g. INCAP flours, as the INCAPARINA)</p> <p>Development of genetically improved varieties, e.g. NUTRICTA Corn.</p> <p>Soybeans supplement for enrichment of the tortilla.</p> <p>Production of the nutritionally improved cookie.</p> <p>Evaluations of grain legumes (common beans, gandul), including production, processing and storage factors.</p> <p>Utilization of sorghum and evaluation of new options, such as sarracen wheat and amaranto.</p> <p>Studies on the nixtamalización process of corn and other grains, and their effect on the nutritional value.</p> <p>Development of knowledge on new food resources</p> <p>Development of early weaning systems in calves.</p> <p>Utilization of cotton flours for feeding monogastric animals.</p> <p>Identification of new or potentially genetic resources (vegetables, fruits, plants).</p> <p>Food Fortification</p> <p>Studies leading to eradication of endemic goiter, through the development of a practical fortification method of salt with iodine, utilizing potassium iodate.</p> <p>Research for the prevention and eradication of injury due to severe deficiency of vitamin A, by means of sugar fortification with retinol.</p> <p>Tests of simple and practical methods for the monitoring and quality control of salt fortification with iodine and sugar with vitamin A.</p> <p>Chemical and nutritional food evaluation</p> <p>Evaluation of the biological quality of new proteins sources or combinations.</p> <p>Studies on food composition at Central American level.</p> <p>Table of Food Composition for use in Latin America.</p> <p>Table of Grasses and Forage Composition for Central America and Panama.</p>
Animal Nutrition.	<p>Animal Nutrition</p> <p>Production of calves with minimum milk consumption.</p> <p>Utilization of coffee pulp in animal feeding.</p> <p>Studies on unconventional potential foods.</p> <p>Agro-industrial by-products (coffee pulp, rubber seed, and lemon tea bagasse).</p>
Intervention Monitoring and Evaluation	<p>Intervention monitoring and assessment.</p> <p>Delivery systems of agricultural, health, food, and nutrition services utilizing the primary health care strategy.</p> <p>Development of methodologies: a) quantitative morbidity, socioeconomic and cultural, censuses and dietetic anthropometric surveys in the field; b) anthropological for the design, evaluation, and improvement of health and nutrition intervention programs.</p> <p>Information presentation systems with maps, e.g. SIMAP and for decision makers.</p>

(My documents\Año 2000\Relaciones Externas\documentos\EL PAPEL DEL INCAP EN L generación de conocimientos.5 29/6/2000)

