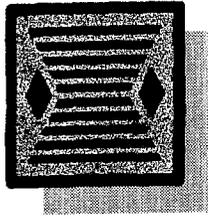


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# LATIN AMERICA AND CARIBBEAN HEALTH AND NUTRITION SUSTAINABILITY:

Technical Support for Policy,  
Financing and Management

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**INCAP INSTITUTIONAL  
STRENGTHENING PROJECT (IISP)**

**TECHNICAL ANALYSIS**

*May 1991*

This contract is implemented by:

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(IISP)**

**TECHNICAL ANALYSIS**

*Guatemala, May 30, 1991*

*Reinaldo Grueso, M.D., M.Sc.*

*Prepared for USAID/ROCAP under  
LAC Health and Nutrition Sustainability  
Contract No. LAC-0657-C-00-0051-00  
International Science and Technology Institute, Inc.  
University Research Corporation  
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**INCAP INSTITUTIONAL STRENGTHENING PROJECT (IISP)  
TECHNICAL ANALYSIS**

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## ACRONYMS

INCAP: Institute of Nutrition of Central America and Panama.

USAID: United States Agency for International Development.

IISP: INCAP Institutional Strengthening Project.

ROCAP: Regional Office of USAID for Central America and Panama.

PAHO: Pan American Health Organization.

TRO: Oral Rehabilitation Treatment for Diarrhea Project.

PROPAG: Food Assistance for Groups Project.

IFPRI: International Food Policy Research Institute.

IICA: International Institute of Agriculture Services.

CATIE: Agricultural Center of Technology, Research and Education.

ORSTROM: Research Scientific French Institute for Development Through Cooperation.

WHO: World Health Organization.

CIAT: International Center and Tropical Agriculture.

CIMMYT: Maize and Wheat Research Mexican Center.

COSUDE: Swiss Cooperation for Development.

## INCAP INSTITUTIONAL STRENGTHENING PROJECT (IISP)

### TECHNICAL ANALYSIS

#### I. SCOPE OF WORK

The terms of reference for this analysis were discussed with Mrs. Sandra Callier, Health and Nutrition Advisor, and were established based on the ROCAP/AID requirements for the preparation of the Project Paper.

The terms of reference are:

- a) Evaluate INCAP's technical capacity in the areas of food and nutrition and according with its responsibilities in the Central American Region.
- b) Determine the institutional strengths and weaknesses in the areas of food and nutrition on the light of INCAP's responsibilities.
- c) Define the areas or technical gaps which should be supported by the IISP ROCAP/AID Project.
- d) Determine the inputs--technical assistance, training activities, economic support for staffing some priority areas, special studies to be financed, which must be included in the IISP Project.
- e) Work jointly with ROCAP/AID to complement the following chapters in the Project Paper:
  - Bilateral USAID Priorities and Strategies
  - Scientific and Technical Capacity
  - Monitoring and Evaluation

## II. ASSESSMENT METHODOLOGY

Methodology was centered in the revision of basic documents and interviews with technical staff at INCAP and ROCAP/AID. Several meetings were held out with INCAP'S Director, Coordinators and Division Chiefs. These meetings included technical reviews to determine the real capacity of INCAP in terms of knowledge, technologies and methodologies to address the food and nutrition problems, and the identification of weaknesses in each one of the areas and sub-areas, with the purpose to define the most appropriate inputs from IISP/ROCAP Project.

On the other hand, ROCAP/AID organized a series of meetings to review analysis made by other consultants. A list of documents reviewed and staff interviewed are included in Annexes I and II.

## III. INCAP'S BACKGROUND

The Institute of Nutrition for Central America and Panama (INCAP) is a scientific-technological institution for Central American Integration, working under the administration of the Pan American Health Organization (PAHO) and the orientation of a Directive Board integrated by the Ministers of Health and Social Assistance of its seven Member Countries (Belize, Guatemala, El Salvador, Honduras, Costa Rica and Panama) and the PAHO/WHO Director.

Since its beginning in 1949, INCAP has been sought scientific

and operational answers to improve the food and nutrition status in its Member Countries, and its activities for 1991-2000 are aimed to obtain, generate, transfer and implement technological knowledge and resources to solve food and nutrition problems found in the population.

INCAP carries out basic activities in research, technical cooperation, human resources development and information and communication in the area of food and nutrition.

INCAP has made a significant contribution to important improvement in the health status of the Central American population. Such improvements are confirmed by the reduction of the prevalence of protein-energy malnutrition in children, the reduction of infant and child morbidity and mortality, and other health improvements mentioned in other papers related to this technical analysis (IISP/PID Document).

INCAP has worked with many institutions to promote the above-mentioned improvements: Ministries of Health, Agriculture and Education in Central American Region, Universities, United Nations agencies specialized in health, agriculture, science and technology and development, and many non-government organizations.

Historically, INCAP activities have received financial support from PAHO and AID. AID/ROCAP has financed approximately 40% of the total budget for INCAP during the last five years.

However, even though INCAP's scientific and technological evolution has been very positive, it has had great difficulties with its financial support and some weaknesses in the management

and in some specific technological areas, which are identified in this technical analysis.

#### IV. BASIC CONCEPT OF INCAP'S TECHNICAL WORK

INCAP has decided to organize its technical work during the decade of the nineties around the concept of food and nutrition security (see Figure 1). This is spelled out in its Strategic Plan for the Period 1992-2000 as well as in other recent documents. Using the concept of food and nutrition security to provide a common objective for a lot of different kinds of activities is a useful step for the organization to take. There are some pitfalls, however, that the institution needs to watch out for in the process of implementing this strategy.

INCAP defines food and nutrition security as a "state in which all people enjoy permanent access to food, in the quantity and quality needed for adequate consumption and biological utilization, in order to guarantee them a general state of well-being that is conducive to their development." This definition includes the two basic elements of food security that are in the definition popularized by the World Bank, that is sufficient food must be available in a country to ensure people an active and healthy life and people must have the ability to acquire it. These two elements are also included in the definition of food security used in the new U.S. Food Aid Legislation. Unlike the definitions used by these two organizations, INCAP's definition also includes specific reference to the biological utilization of food as an important

component of guaranteeing people's well-being, which is not surprising given the nature of its work.

The model that INCAP is using to develop and organize its food and nutrition security work is the "food and nutrition chain." By this it means the sequence of events that occur in relation to food from the time of its production, to its consumption and biological utilization. Included in this concept are activities such as the post harvest handling of food; food storage and conservation; food processing and preparation; food marketing and distribution; and food consumption, with consumption including the biological utilization of food and the effects of food on human health, productivity and development.

**a) Potential problems with the use of the concept**

One problem that INCAP appears to be having in trying to use the concept of the food and nutrition chain to organize its work is that it offers encouragement to those among INCAP staff who believe that INCAP should have activities underway in all areas along the chain. In other words, using the concept of the food chain to organize its activities appears to make it more difficult for INCAP to limit its activities to those areas along the chain where other institutions are not working and where it has a comparative advantage. This tendency can be dealt with by management as part of the negotiations that should take place during the process of developing specific bench marks for each

year's activities. Prior to this, however, management needs to implement a more thorough priority setting exercise in each of the three technical areas.

#### V. ORGANIZATION OF INCAP

INCAP'S technical work is carried out through three Technical Divisions: Food and Nutrition Planning Division, Nutrition and Health Division and Food and Agriculture Sciences Division. The first Division approaches the problem of food security from a social sciences and multisectoral perspective, the second from a health sciences perspective and the third from a food sciences perspective.

These units are complemented by four Coordination Units for the basic functions of Research, Technical Cooperation, Development of Human Resources and Information and Communication.

At country level, INCAP has organized Basic Technical Groups as a strategy to decentralize INCAP, with the purpose to improve the benefits of technical cooperation.

An Administrative Division and a Planning and Development Unit support activities of research, training and technical cooperation. As Figure 2 shows, INCAP has a matrix structure with the purpose to ensure, through Coordinations, the interdisciplinary participation, to promote the innovation and creativity in the solution of problems, and to coordinate the technical cooperation provided to Member countries.

## VI. DIVISION OF FOOD AND NUTRITION PLANNING

### a) Purpose

The stated purpose of this Division is to strengthen the capacity of Member Countries to develop, implement and evaluate food and nutrition policies, plans and projects, through the proper transference of knowledge, strategies, methodologies and techniques.

### b) Organization and staffing

The organizational structure of this Division has been undergoing a revision process since September 1990. It includes a Chief, five sections and multi-disciplinary groups formed to work with specific projects (Figure 3).

The organization of this Division is following a matrix model similar to INCAP'S general structure.

Sections integrating this Division are: Socio-economics and Food Culture; Food and Nutrition Surveillance; Food and Nutrition Policies, Plans and Programs; Development and Training of Human Resources in Food and Nutrition; and Education and Communication to Population Groups.

If present reorganization is approved, section coordinators will have a direct line of coordination with the Division Chief and with other Divisions and Coordinations of INCAP and with Basic Technical Groups in Member Countries.

This Division currently has 36 staff, 18 of which are professionals and 18 support staff. Disciplines represented include nutrition, dietetics, public health, hygiene, education, communication sciences, systems engineering, sociology, anthropology, business administration, psychology and medicine (Table 1).

It is very important to point out that seven professionals, (three in the area of food and nutrition surveillance, one in planning and three in education and communication) are paid by ROCAP/AID under the TRO and PROPAG projects, which will terminate on November 30, 1991. Besides, other professionals in Nutritional Education are being paid by the Government of France under the Food and Nutrition Education Project.

**c. Activities**

This Division undertakes social, economic and cultural studies related with food and nutrition problems, carries out analysis and disseminates information; develops methodologies for planning, implementation and evaluation of food and nutrition interventions; supports the development and training of human resources, designs and implements methodologies for popular education, and designs and promotes institutionalization of systems of food and nutrition surveillance.

Through its work during several years in the Central American region, this Division has developed the technical capacity for implementation of data bases on aspects and factors relevant to the

availability, access and consumption of food and on the nutritional and health status of individuals and populations at national, regional and local disaggregation levels.

With the support of ROCAP, this Division has implemented a project to provide technical and administrative support to food aid programs in Central America and Panama. This support includes assistance in planning and coordination of national strategies and policies related to food aid; in-service training of officials in charge of programs; applied research designed to improve food aid and the development of an information system on food delivery and management logistics.

The staff of this Division also provided support to IFPRI on a research project designed to assess the impact of the development of non-traditional agricultural exports in the Guatemalan highlands on the incomes, food security, and nutrition of small-farm households. This work was completed, and a follow-on research project with funding from the University of Wisconsin is now underway. This latter project will look at many of the same issues covered in the Cuatro Pinos project but with a different group of farmers. It will also investigate the impact of non-traditional agricultural exports on land holdings in the highlands, the distribution of resources within the households and the impact on women's income and employment. Research is also underway on food prices and their relationship to minimum wages in Central America and Panama with the technical support provided by a research associate provided by ORSTOM.

Staff have also been working on the design and implementation of a nutritional surveillance system for countries in the region and have done some initial analyses assessing the effect of the structural adjustment programs being undertaken by the countries in the region on the food and nutritional status of their populations. Both topics are the subject of a proposal for additional financing recently developed by the Division.

In the education area, INCAP has supported the preparation of national food and nutrition education plans, training of personnel in education methodologies and the provision and use of technical messages covering specific food and nutritional topics; the promotion and support of organized community participation; and the development of education methodologies.

**d) Strengths and Weaknesses**

This Division has been working for several years in a direct way with Member Countries of INCAP and, therefore, has a group of experts who have close contacts with PAHO and local authorities. Five professionals in the staff have been working with INCAP for more than 10 years, mainly in processes of diagnoses and analyses of the food and nutrition situations, planning, development and training of human resources and popular education.

In the area of development and training of human resources, this Division has performed an important job identifying deficiencies in knowledge and skills regarding food and nutrition in the personnel of local, regional and national levels of the

education, agriculture and sectors.

Regarding popular education, it has developed several technologies and methodologies which have been implemented in various countries (achieving different degrees of success), especially through the Food and Nutrition Education Project supported by the French Government.

Table 2 shows the level of expertise of this Division, in each one of the pertinent areas.

In terms of weaknesses, this Division, as well as others in INCAP has shown a limited capacity for the transferring some technologies and methodologies to Member Countries.

This is particularly true in processes for systematic analysis of the food and nutrition situation, identification of institutional strengths and weaknesses in each sector, estimates of political and economical feasibility, and definition of plans and programs.

This also applies to the area of food and nutrition surveillance, where technically well-known methodologies have been used, even though they are too complex to be implemented in Member Countries. This affects the efficiency of GTB's which have to design technical assistance based on the specific problems of each country and the technical and economic resources available at INCAP.

A major weakness for many years has been the lack of a strong economics capability. This expertise is needed throughout the institution to help understand why households and firms behave the

way they do as well as to assess whether new technologies and programs are cost effective. Understanding household food consumption behavior requires the insights of an economist as does identifying appropriate indicators for a food and nutritional surveillance system and providing realistic advice on food and nutrition policies and programs. Developing this capacity is also essential in the event that INCAP wants to do further work on the effects of structural adjustment on poor households in the region.

INCAP's senior management is aware of this weakness. And, in fact, the Institution has made a number of attempts over the years to develop this capability beginning in the late seventies with the addition of a systems analyst and a masters degree level agricultural economist to its multi-sectoral nutrition planning program. For one reason or another, the people that INCAP has managed to hire have not worked out. Sometimes it was because they were not really economists; training in business administration or systems analysis is not really the same as training in economics. In other cases their training was weak or not as relevant as it should have been. In any event INCAP has not yet managed to hire an economist with the ability to develop an effective program of research and technical support in the Food and Nutrition Planning Division or to integrate an economics dimension into the work of the other Divisions.

The person selected for this position needs to be well-trained in economics and with sufficient experience to be able to provide the leadership required to develop an effective research program

(INCAP's plans to assess the impacts of structural adjustment on the poor make sense if it concentrates on assessing the impacts at the community and household level where it has a comparative advantage and leaves the analyses of the impacts of macro and sectoral policies on prices and national level income and employment variables to other institutions with which it might collaborate such as IICA or IFRPI). This person also has to have enough breadth and interpersonal skills to be able to identify the other areas in which INCAP works that need to be viewed from an economic perspective and to develop effective working relationships with the professionals in these program areas. This means that the person selected needs to be well-grounded in neo-classical micro-economics and have considerable experience in applied economic research. Training in agricultural economics would also be useful in that it would provide INCAP with someone who could relate more easily to the agricultural institutions in the region with which INCAP should be working more closely. The person selected should also be willing and able to spend considerable time providing on-the-job training for other INCAP staff.

INCAP's employment policies which favor hiring Central Americans and its salary scale which is considerably below the level of comparable regional institutions such as CATIE have made it difficult to hire qualified economists in the past. INCAP has submitted a proposal to PAHO for approval which would raise the salary scale to levels approaching that of CATIE and would establish separate career paths for scientific, technical and

administrative personnel. If approved, this should make it easier for INCAP to attract well-trained economists in the future.

INCAP still has the reputation of being the main source of expertise on the food consumption patterns in Central America and on the social and cultural aspects of the food behavior of the Central American population. INCAP is looked to as the source of information on these topics. It is also looked to as a source of guidance on how to collect additional information on these topics and has often been contracted with to assist with the design and implementation of community and household surveys to include such information.

The demand for INCAP's services in this latter area, in particular, is likely to grow if INCAP can develop some cost effective methods for assessing the effects of policy reforms on the people in the region. AID, given its interests in development that is broad-based and involves the historically disadvantaged, should be particularly interested in the availability of cost effective methods for assessing changes in the incomes (estimating the expenditures made by poor households usually provides a better measure of their income than attempting to measure income directly) and employment of poor households. The development of rapid appraisal techniques that could be used to assess the effects of program and project interventions on households as part of an evaluation process is another area in which demand is likely to grow.

In reality, however, staff capabilities in this area of expertise are much weaker now than a decade ago. And if steps are not taken soon, INCAP could lose its preeminence in this area completely, even though it is hard to visualize an institution with INCAP's objectives of not having strong capabilities in this area.

**e) Recommendations**

To solve problems in the methodology for the systematic analysis of food and nutrition status in the population, improve identification of institutional strengths and weaknesses in Member Countries to address existing problems and define policies, plans and programs, it is recommended that technical assistance be provided by an expert with a broad experience in strategic planning applied to food and nutrition problems. Through this technical assistance, existing methodology on food and nutrition planning and surveillance can be readjusted and strategies identified for its implementation in Member countries through GTB's, who would be trained in its proper utilization.

The project should fund the costs of an agricultural economist who would have a function as a research associate over the life-of-the-project. INCAP needs a senior agricultural economist on board as soon as possible in order to have sufficient time to develop a program and to provide some on-the-job training for junior staff.

If INCAP is restricted to current salary levels, it may be unable to attract a high calibre economist; it may be preferable in this case, to hire the economist through the project and not

directly by INCAP.

INCAP should be encouraged to hire a junior economist to work with the senior agricultural economist (The junior economist should have a good basic training in micro-economics, not necessarily agricultural economics, some knowledge of applied economics research and be likely to consider making his or her career with the institution). One economist is not sufficient to provide the critical mass needed in this important area. Furthermore, this person would then be available for the INCAP staff member, who is currently enrolled in a Ph.D program in agricultural economics at Mississippi State University, to work with when he returns.

INCAP should also be encouraged to hire two junior to mid-level professionals to work on issues related to household food consumption behavior and surveys of household incomes and expenditures and food consumption. If this step is taken, project funds should be made available for in-service training for these individuals. Funds should also be made available for INCAP to use to acquire some short-term technical advisory services in this important area. More specifically, INCAP would use these funds to obtain guidance on how best to up-grade its expertise in this area and to help design a strategy for developing and testing new indicators and data collection methods.

Finally, the Project should provide funds to hire an expert in food surveillance and other one in programs of food assistance/ The present technical capacity at INCAP lies in two professionals paid through the ROCAP/PROPAG project, which is terminating in

November 30, 1991. If INCAP cannot find the necessary resources to cover these salaries, it would not be able to assist Member Countries in a period in which the food assistance programs are increasing due to the economic crisis and structural adjustments which Member Countries are presently living.

## **VII. HEALTH AND NUTRITION DIVISION**

### **a) Purpose**

The stated purpose for this Division is to assist Member Countries in the reduction of prevalence of the main health and nutrition problems, through the improvement of the quality and efficiency of health services in the areas of nutrition and mother and child care.

This includes basic and applied research, development and training of human resources and transference of technology for the organization and delivery of health and nutrition services.

### **b) Structure and staffing**

The Health and Nutrition Division includes a Chief and four sections, participating through a matrix scheme in seven specific areas of work. The Division structure is in Figure 4.

This Division currently has 127 staff members 30 of which are professionals, 23 technical and 74 field and office support staff. Six professionals have a Ph.D., nine an M.S. and MPH and 15 have a degree in nutrition. Table No. 3.

**c) Activities**

The main areas of work ( Table 4) of this Division relate to:

- Nutrition, infection and immunology
- Metabolism and clinical nutrition
- Nutritional Biochemistry
- Nutritional anthropology and epidemiology
- Development of health and nutrition care systems, including nutritional surveillance
- Applied research

During its life time, INCAP has done excellent work in the various areas of human nutrition. This includes studies carried out to determine nutritional problems; the design and test of methodologies to address their solution; the training of human resources for health services for Central American and other countries in Latin America.

INCAP has made a great contribution to help reduce the prevalence of protein-energy malnutrition and specific nutritional deficiencies such as iodine, vitamin A, and iron. Research activities have also had a positive impact in the orientation and management of treatment of diarrhea and respiratory infectious diseases, and have been useful in the planning and implementation of national strategies and child survival plans, including immunization programs.

In addition, INCAP's work in the area of human nutrition has been supported by prestigious foreign donors, including many U.S.

universities and Latin American teaching and research institutions.

Joint projects involving collaboration with other highly respected scientific group has been a permanent practice. A great amount of candidates for university degrees (Master or Ph.D. degrees) in human nutrition and similar areas have done their thesis and research studies at INCAP.

The Pan American Health Organization (PAHO) -- INCAP's main supporter -- recognized its significant technical capacity in maternal and child health care. Beginning this year, INCAP will be directly responsible for the provision of technical cooperation services in these areas in Member Countries. PAHO/WHO will not hire advisors instead, will transfer this responsibility to INCAP.

With the support of the TRO/ROCAP/AID and other donors, this Division has carried out many analyses and research studies in the areas of food and breastfeeding. For example, clinical tests to measure efficient and safe feeding methods using whole or diluted milk, and the development of vegetal blends for the management of acute diarrhea.

In case of persistent or chronic diarrhea, evaluations have been made on the use of antibiotics and on management of diarrhea with locally accepted common foods.

With respect to breastfeeding mothers, the effect of food supplements in malnourished mothers has been studied. Also, the impact of intestinal infections in levels of antibodies in the mother's milk during breastfeeding.

Studies have also been carried out to determine diseases and factors affecting the nutritional status of general population. For example, the fecal contamination of water and food ingested, the behavior of people being treated for diarrhea in communities with piped water has been assessed in relation to the incidence of diarrhea. Also, studies have been carried out on the effect of malnutrition during early stages of life on the status of health during adolescence and adulthood.

Many interventions or operational research projects have been or are being carried out by this Division. For example: using a prenatal risk approach to increase efficiency of health services; reducing of intra-partum, neonatal and post natal mortality through a program to retrain midwives and the improvement of services provided by health technicians at the rural level in Guatemala.

These are just a few of the many activities of this Division.

**d) Strengths and weaknesses.**

As previously indicated, this Division is the technical unit of INCAP best equipped for the transfer of technology to Member Countries.

Lately, as result of ROCAP projects (TRO/PROPAG), INCAP has been able to study, test, transfer and evaluate technical knowledge, methodology, and guides related to oral rehydration; management and treatment of ARI; growth monitoring and development; and immunization interventions.

INCAP's technical services are in high demand by Member Countries and by PAHO, mainly because it represents a source of knowledge on breastfeeding, pre-natal and peri-natal care, factors of risk, methods to identify groups of higher risk to be benefitted by programs of child survival, primary care and maternal and child health.

In the area of infectious diseases, it has become a reference center in Central America for the diagnosis of poliomyelitis and the control of quality of some vaccinations. This function is basic to epidemiological surveillance systems in various Ministries of Health and for the monitoring and evaluating vaccination interventions for mothers and children.

Through its laboratory activities in Biochemistry, INCAP performs the necessary tests to control and monitor programs of fortification of salt with iodine and sugar with vitamin A and expects to reinitiate activities with respect to iron. INCAP provides Member Countries, with services for the collection of blood samples and other human fluids to measure the effects of specific nutrient fortification. With the exception of Costa Rica and, occasionally Panama, some times, Member Countries do not have the laboratory equipment necessary to determine certain human levels of specific nutrients and to evaluate the real impact of interventions. Therefore, the biochemical laboratory at INCAP represents a technological service capacity needed by countries in the Central American region.

In training of human resources in Member Countries, INCAP has a great capability in tutorial and short and long-term training courses in the areas of clinical nutrition; nutrition in public health; anthropology applied to health; breastfeeding, etc.

In terms of this Division's weaknesses, it is important to mention that there are certain areas which need to be improved; these areas are:

a) Physiological tests on iron. It is important to mention that nutritional anaemias, specially due to the deficiency of iron, are affecting 1/4 of the Central American population.

b) Analysis of carotenoids to identify substances that are precursors of Vitamin A. Their determination and metabolism should be studied in order to better fortified foods with vitamin A.

c) Analysis of amino acids. There are new methods to determine these chemical compounds present in proteins and which determine their biological value. This knowledge can help improve programs to combat protein-energy malnutrition and related nutritional deficiencies.

d) Management of radioactive isotopes. INCAP needs to update its technical capacity related to iodine, iron and other minerals.

e) Quality Control in laboratories. This area is very important for INCAP as it has become a Reference Center for diagnosis of poliomyelitis and other infectious diseases and for fortification of foods programs in Central America.

Previous needs for training were determined by a very careful analysis done by the staff in this Division.

Other areas of some weaknesses include those related to analyzing qualitative data for applied programs in health and nutrition and for the operational testing of new models for the delivery of health and nutrition services.

As indicated by several INCAP's staff members, technical cooperation services sometimes are not successful because inadequate methods for the technology transference. These could be resolved through appropriate applied and operational research. INCAP requires technical assistance and short-term training in this area. Interviews carried out with staff in this Division, identified weakness in the ability to program cost and services or technologies which can be transferred.

INCAP needs to improve staff attitude and expertise in this area. INCAP's limited successes in transferring technology in the area of nutrition and health is often because cost and financial feasibility has not been adequately considered.

As previously indicated, the quality and efficiency of INCAP's work depends on its laboratories. However, the status of the equipment is getting worse every day: many instruments are slow, obsolete or about to break down.

Therefore, the purchase of certain minimum and basic equipment is necessary to support activities for eradication of hypovitaminosis A and substance precursors. Annex III shows a detailed list of equipment needed.

Finally, as in other Divisions, there are five (5) professionals and four technicians and auxiliaries in the Biochemistry laboratory who are being paid with funds provided by the TRO/ROCAP Project, ending on november 30, 1991.

If no other financial source is found to cover the salaries of personnel in the areas of biochemistry laboratory, operational research, anthropology, and program management in health and nutrition and mother and child health, INCAP would be losing its technical capacity in the above-mentioned areas.

Table 5 shows the level of expertise of this Division, in each one of the pertinent areas.

**e) Recommendations**

Based on the previous analysis, IISP/Project should provide financial support in the following areas:

- Training should be provided, through short and tutorial courses, preferably in the united States, on the physiological aspects of iron, in the areas of amino acids and carotenoids analysis; operation research, methodology of qualitative data analysis in health and nutrition program, and methods for estimating costs of programs and services. Provide assistance to determine areas of research and formulation of projects related with iron.
- Support the purchase of equipment for the biochemistry laboratory in the food area as included in Annex III.

## VIII. AGRICULTURAL SCIENCES DIVISION

### a) Purpose

The stated purpose of this Division is to contribute to the promotion of food and nutrition security by improving the availability, access and consumption of high quality foods through improvements in the production, storage, processing, transport and consumption of food.

### b) Structure and staffing

This Division consists of a Chief and six technical sections:

- . Food Chemistry and Biochemistry
- . Nutritional Technology
- . Agricultural Technology
- . Food Technology
- . Transference of Technology
- . Industrial microbiology (Figure 5)

Other resources available to and managed by the Division include: (1) an experimental farm which it uses to develop and test different production techniques, (2) a pilot plant which it uses to develop new food technologies, (3) an analytical laboratory which it uses for analyzing the chemical and nutrient composition of foods and for testing food quality; and (4) an animal lab which it uses to test the nutritional quality and biological utilization

of foods on animals. In 1989, the Division had a budget of a little over U.S.\$ 599,000. Outside sources of project funding have included UNDP, AID, Washington State University, United Nations University, Nestle, the American Soybean Association, Kellogg Foundation. Over time, INCAP has collaborated with other food technology institutes in the region, including CENTA in El Salvador, CITA in Costa Rica, and the University of Leon in Nicaragua. INCAP staff have also collaborated with agricultural research institutes in the LAC region including ICTA and CATIE (activities are currently underway) and CIAT and CIMMYT.

The Division currently has 53 staff members, of which 17 are professionals, 17 technical, and 19 support staff (Table 6).

### **c) Activities**

Division works in five major areas: (1) food production, (2) food processing, (3) the biological utilization of food, (4) the chemical and nutrient composition of foods and (5) technology transfer. Most of the work of the Division has been focussed on the basic foods -- basic grains, legumes, fruits and vegetables -- with some additional attention devoted to expanding the use of agricultural and agro-industrial by-products and animal nutrition. Current areas of interest include: integrated animal production systems; systems for reducing post harvest losses; improved utilization of indigenous foods; improved utilization of agricultural and agro-industrial by-products; development of foods with higher nutritional qualities; food fortification and food

enrichment; the use of biotechnology in the production and processing of foods with higher nutritional qualities; development of technologies appropriate for the conservation of foods in the household; the development of improved systems for storing, conserving and preparing foods at the household level; improving the nutritional quality of diets at the community and household level; developing additional data on the nutrient composition of foods; and supporting the development of systems to improve/guarantee the quality and safety of foods.

Examples of the types of activities currently underway in the Division include the following:

- \* Research designed to improve the availability and biological utilization of nutrients in beans,
- \* Analyses of the feasibility of using locally produced products such as amaranth, corn, soybeans and cow peas in the production of bread and other wheat-based products and the identification and development of investment projects,
- \* Analyses of the post harvest handling of foods in the Central American countries to decrease losses and the development and identification of investment projects,
- \* Work with artisan bakeries to transfer the technology for producing a nutrient enriched cookie for use in school feeding programs.

Proposals have also been developed and submitted to donors on the following research topics:

- \* Utilizing the leaves, seeds and other parts of the amaranth plant for human and animal consumption,
- \* Improving the use of the by-products from municipal slaughter houses,
- \* Developing additional information on the chemical and nutrient composition of roots and tubers and improving their use,
- \* Testing the feasibility of extending the supply of milk using extracts from oil seeds, legumes and cereals,
- \* Increasing the availability of fruits and vegetables in Central America through the development of improved methods of marketing, processing and conservation,
- \* Modifying the genetics of the black bean to increase its protein value,
- \* Testing the feasibility of fortifying tortillas made from corn and beans with iron and zinc,
- \* Stimulating the production and consumption of indigenous vegetables in order to eradicate Vitamin A and other nutrition deficiencies in Central America.

**d) Strengths and weaknesses**

Work in the food sciences area used to be one of INCAP's strengths. Some of the work that is most closely associated with INCAP was an output of the agricultural sciences area. Examples include Incaparina, the Food Composition Table for Use in Latin America and the Table of Nutrient Composition of Pastures and Forages for Central America and Panama. A number of senior

scientists were active in this program in the past, and their work was well-known and respected in the region. These professionals were experienced, they developed many of the collaborative relationships with other institutions in the region, and their work was in demand.

Most of the better known senior staff have left or retired. The current staff are young, and bright, need more experience. Some also could use further advanced training. However, since there is currently little depth in the five program areas that the Division is trying to cover, the departure of any one person for several years of advanced training would, in the short-run, weaken the work in their specific area even further. The total resources available to the Division are much smaller than those in other two Divisions. In 1989, for example, the total resources allocated to this Division were less than twenty percent of the resources made available to the Nutrition and Health Division and less than thirty percent of the resources made available to the Food and Nutrition Planning Division.

Previous links with other institutions in the region also appear to have weakened. Some, such as the links with CIAT and CIMMYT, may have broken down completely. Many of these links appear to have been personal rather than institutional, a situation that has to be dealt with in the event that these links are reestablished. For example, it is not clear whether research currently underway designed to improve the availability and biological utilization of nutrients in beans is being undertaken in consultation with CIAT.

Yet some consultation and collaboration would seem to be essential if INCAP expects the results of its research to be utilized by the plant breeders in CIAT.

Current staff appear to be trying to keep all the old lines of work on-going even though both the staff and the environment in which INCAP works have changed substantially. Current staff would also like to expand their work in the biotechnology area, including by adding another staff member. The Director indicated that he would like to see more concentration in food technology area, and in particular on the development of technologies that (1) can be used by the private sector, (2) make use of the products that do not meet the requirements of the export markets, and (3) enable farmers and others to make better use of farm residues. Staff also indicate that if they are going to be able to work effectively, funds need to be found to up-grade the farm, the pilot plant, and their laboratory. A proposal has already been developed and submitted to the Japanese Government for assistance in up-grading INCAP's pilot plant.

Current thinking within INCAP about future activities and priorities in the agricultural sciences area is an outgrowth of the strategic planning process that INCAP recently completed. These ideas appear to reflect the staff's perceptions of the needs in the region. However, sufficient attention does not appear to have been given to an analysis of: the current strengths and weaknesses of the Division; the likely effective demand for the results of INCAP's research particularly in the private sector; whether there

are areas in which it can expand its services to the public and private sectors in its member countries; and what types of research and technical assistance activities are underway in other institutions in the region, whether INCAP has a comparative advantage vis-a-vis these institutions in certain areas of work and how and in what areas INCAP should work more closely with these other institutions.

**e) Recommendations**

The project should fund the costs of an outside review of INCAP's agricultural sciences program. This review should be undertaken in the first six months of the project. The project should also provide funds to enable INCAP to identify one or two advisors for the agricultural sciences program and to bring these people to INCAP's headquarter for consultation with the staff for one week at least once a year during the life-of-the-project.

A more thorough and careful analysis needs to be made of the strengths and weaknesses of INCAP's work in the agricultural sciences area and its areas of comparative advantage identified before further decisions are made with respect to the future work program of this Division. This review should also be completed before any decisions are made with respect to up-grading the institution's farm, laboratory, pilot plant or animal room.

This review should be conducted by an outside team of senior professionals that have broad experience in the major areas of work of the Division. Members of the team should be knowledgeable about

the state-of-the-art in these technical areas as well as be familiar with the needs of the region and the work that other institutions in the region are doing in related areas. The project design team does not have the time nor the expertise to undertake such a review.

The purpose of the review would be to help INCAP focus its work in the agricultural sciences more narrowly on those areas where it has a comparative advantage and where there is likely to be an effective demand for its work. This team would also provide INCAP leadership with guidance on how to implement its recommendations, including providing guidance on specific lines of research that should be pursued; what actions would need to be taken to increase staff capabilities, including recommendations with respect to staff training, hiring and firing; what types of facilities would be required to carry out the recommended work program, the types of up-grading that would be required and its expected cost.

Specific questions that need to be asked by the team include the following:

- \* What activities, if any, should INCAP undertake related to the production of food on-farm? Should INCAP undertake research on crop and livestock production systems on its own? Or should INCAP staff limit their activities to serving as a member of a team under the leadership of an institution whose primary responsibilities are on-farm research? Should INCAP have a role in on-farm agricultural research in the event that the agricultural research

institutions in the region continue shifting their attention to non-traditional agricultural exports and away from basic foods? What is the likely future for indigenous food crops such as amaranth and what role should INCAP play with respect to these crops in the event they are being ignored by other agricultural research institutions in the region? What use should be made of INCAP's farm, if any?

- \* What role can INCAP play with respect to the private sector? Is it reasonable to expect INCAP to be able to develop food products and technologies that would be in demand by the private sector and for which the private sector would be willing to pay? Or will INCAP's market for new food products and technologies be limited to the public sector as has been the case in the past (for example, Incaparina and the nutritionally improved cookie)? Are there services that INCAP could provide to the private sector (assistance in the area of food quality and safety, for example) for which the private sector might be willing and able to pay?
- \* What are the types of activities in which INCAP should work more collaboratively with other institutions in the region? How should these relationships be developed and managed? As a result of discussions undertaken during the preparation of this project paper, INCAP and IICA staff plan to get together in the near future to brief each other on areas in which the two organizations have mutual interests and to identify specific areas where staff could work together.

Six areas of potential collaboration have already been identified: the effects of structural adjustment on the poor; technology transfer; agro-industrial development; animal health; communications; data bases. Are there types of mechanisms that could be developed to encourage and improve consultation and collaboration? Would it be useful if INCAP would invite senior staff from IICA and/or CATIE to the INCAP Board of Directors meetings, for example? Or would it make more sense to establish a technical advisory committee for the agricultural sciences program composed of scientists and technicians from CATIE, IICA, CIAT, CIMMYT as well as other outside experts?

- \* What has been the experience elsewhere with composite flour programs and the use of Opaque Two corn and what are the implications of these experiences for INCAP's future programs?
- \* Does INCAP's work on the nutrient composition of foods still have utility, and, if so, to whom? Are there options for financing this work other than relying on core funds?

The Food Chemistry and Bio-chemistry Section works closely with the Health and Nutrition Division, involved with the nutritional implications of fiber ingestion. This area is very important with respect to chronic diseases and colon cancer which have a high prevalence in Costa Rica and Panama; and iron and zinc deficiency that affect the population of Honduras, Guatemala and El Salvador.

Technicians are hampered by obsolete equipment, and urgently need a filtration system for the analysis of dietetic fiber and an automatic oil extractor (Soxhlet).

As the chief of this section indicated, there is a great demand from the private sector for the laboratory tests performed by this section. If it had the necessary equipment, it could generate funds through the sale of services.

## **IX. DEVELOPMENT AND TRAINING OF HUMAN RESOURCES**

### **a) Purpose**

The purpose of this area is to improve food and nutrition in the Central American population, through the development of strategies, plans and projects with to develop excellent human resources, with the technical capabilities and skills to solve problems found.

INCAP has defined human resources development as the activity performed by those Institutes of Research and Teaching, Technical Schools, and High-School, Primary and Pre-Primary Schools, where education in food and nutrition is provided within an academic program. For INCAP, training includes introduction, updating and improvement in food and nutrition knowledge, for people from the health, agriculture, education, labor and other sectors, with the objective that the personnel (whether volunteer or with a salary), as well as people from government or non-government institutions related perform a better job. Usually, this training job is done at the local level.

b) **Structure and Staffing**

INCAP has a Coordination of Training and Human Resources Development, whose main job is to design policies in this area and to coordinate and advise other central Technical Units and Basic Technical Groups in the formulation and development of plans, programs and projects for the development and training of human resources.

The professional staff in this Coordination includes a Nutritionist with an MS in Educational Methods and Evaluations who is the head in this area and a Psychologist with an M.S. in Management of Human Resources. Support personnel includes two secretaries and an administrative assistant.

In addition, the Coordinator also obtains support from personnel located, administrative and physically in the Divisions of Food and Nutrition Planning, Nutrition and Health and Agricultural Sciences.

The Food and Nutrition Planning Division, is responsible for the training of human resources in the areas of health, education, labor, agriculture and other areas. This is done with the professional help of a Nutritionist specialized in Educational Technologies, a technical assistant and two secretaries.

A professional is in charge of these training and education activities in The Divisions of Nutrition and Health and Agricultural Sciences.

**c) Activities**

During 1988-1990, INCAP implemented educational activities and processes covering a total of 22724 persons in the sectors of agriculture, health , education sectors and educational centers in Member Countries.

Areas of activities included the determination of needs and priorities for human resources; development of food and nutrition components in academic programs in formation institutions and in training programs for in-service personnel in different sectors; and the development of specialized programs in food and nutrition.

Another important activity performed was a program of continuous education, through residencies or tutorial courses in the areas of clinical nutrition, food technology, development of new models of service delivery and others, depending on the priority areas established in each country.1

Presently, the program for development and training of human resources in Member Countries receives financial support from the Swiss Government through a Subregional Project, COSUDE. INCAP has submitted an application for the extension of this project which, if approved, would provide the necessary financial support to continue this activity.

The Post-degree program in food and nutrition at INCAP is presently undergoing revision. One alternative might be to offer a program for professionals from various disciplines and sectors. These professionals would follow a basic program in food and nutrition and then specialize in one of three areas: nutrition and

health, education and food technology.

This revision is being analyzed by INCAP with assistance from PAHO/WHO. One of the objectives is to increase the future availability of inter-disciplinary specialists for Member Countries, who are able to apply food and nutrition perspective within the different development sectors.

**d) Strengths and weaknesses**

During 42 years, INCAP has been identified as a specialized center in the area of food and nutrition as well as an organization for the Central American integration. Its existence during this long period of time has been appreciated by different countries and its contribution to the training of most specialists working presently in this field, provide INCAP with the prestige of a very strong organization in the training and development of human resources in the Central American region.

Another strength showed by INCAP's technical capacity to determine the needs and priorities of human resources in the areas of food and nutrition, and its broad experience and technical knowledge to formulate, develop and evaluate academic programs as well as in-service training programs for personnel at different levels and within the different sectors of development.

Even though the analysis on information management capabilities (see Annex E.3), identifies some weaknesses in this area, it is important to point out that INCAP's bibliographic sources and educational materials represent an important asset.

Another example of INCAP's strengths are the self-instruction modules for personnel in health services on the monitoring and evaluation of growth which were developed with the support of the ROCAP/AID Project. These make possible a system of long-distance education and have had a great acceptance and impact. Based on information provided by INCAP, approximately 500 doctors in the Region have finished this course on this area.

Even though its current monitoring and evaluation methodologies for development and training activities are appropriate, INCAP could, with technical assistance improve and perform and strengthen its activities in this area.

Based on the list of strengths previously mentioned, the question is: Which are INCAP's weaknesses in this area? This has a very pragmatic answer: Its major weakness is a lack of financial resources to pay the salaries of the staff in charge of this work.

Most of the personnel are financed with funds provided by projects having a short term duration. Therefore, when projects terminate, INCAP loses the professionals, technicians and support personnel financed by these projects.

Another important requirement at INCAP is the organization of Academic Advisory Committees, made up of experts in the region, who must support the analysis of educational programs (proposed and in operation), participate in its evaluation and determine priority areas of development and training of human resources.

INCAP should establish advisory committees for post-degree programs, in continuous education and for the training of human

resources at country levels. These should be formed by experts from the Central American Region.

The work initiated by the Human Resources Coordination Human to build a basis of data to be used for the academic registry and assignment of certifications for trained persons in various programs (not only at the Institute but also at the level of the Basic Technical Groups) has not been finished and requires to be incorporated as an element or activity to be strengthened by the information systems included in the IISP/Project.

**e) Recommendations**

As indicated in the description of strengths and weaknesses, the major problem in this area is the procurement of financial resources for payment of personnel salaries of those in charge of development and training of human resources.

It is recommended that the IISP/ROCAP provides funds to pay a professional in charge of the program of post-degree course in food and nutrition. Also, it should provide funds for the payment of some teachers and advisors for this program as well as to finance some operational expenses for this activity.

Teachers to be contracted would develop academic contents for specific areas of post-degree course.

Of course, support for the post-degree program requires that Member Countries and donor agencies provide the financial support for scholarships.

The IISP Project should provide necessary financing to perform the training of INCAP personnel through nine tutor courses in specific subjects related with operational research; methodologies for qualitative data analysis; analysis of amino acids; physiological tests on iron, management of radioactive isotopes; analysis of carotenoids; and control quality in laboratories. Similarly, funds should be provided for the training of personnel at the Institute within the Basic Technical Groups in methodologies for food and nutrition planning and basic courses on food and nutrition.

Finally, the Project should provide funds to carry out educational activities for the Basic Technical Groups related to transfer the technology obtained through research studies and complement or help correct gaps in technical knowledge found during the monitoring, evaluation and supervision of INCAP staff in Member Countries.

## **X. COMMUNICATION AND INFORMATION AREA**

### **a) Purpose**

Since its foundation as a research organization, INCAP has recognized the importance of disseminating scientific and technical information especially through journals and publications to the scientific world, and mainly at the international level. Additionally, professionals have participated at meetings, conferences, and workshops, facilitating the exchange of

information. However, it was not until 1985 that the Board of Directors recognized and established Dissemination of Information as one of its four basic areas.

**b) . Organization and staffing**

Presently, INCAP has a coordination office for this activity whose main purpose is to design communication and information policies, advise and coordinate technical units and Basic Technical Groups in the development, implementation and evaluation of programs and plans for scientific information dissemination.

The basic personnel for this Coordination includes a professional and two secretaries. This personnel is supported by two professionals who are located in the Food and Planning Division and are currently paid by the ROCAP/TRO project.

**c) Activities**

With the support of ROCAP/TRO and PROPAG Projects, emphasis was placed, during the last five years, on provide information mainly in the areas of child survival and food and nutrition programs, providing newsletters, technical documents, translations, support meetings, and to a lesser degree producing educational materials as well a supporting some documentation centers in the Region.

**d) Strengths and weaknesses**

From the scientific perspective, INCAP has one of the best libraries in the Central American Region. In the area of food and nutrition, it is probably the most complete in Latin America.

Besides generating scientific information from research studies and other activities performed by INCAP which is later disseminated, this library is very large and permanent.

However, a technical analysis showed that INCAP has various limitations to perform efficiently work in this area.

Probably, the major weakness is the limitation in human resources, especially when the two professionals working in this area finish their contracts on November 30, as a result of the termination of the ROCAP/TRO Project.

On the other hand, there is a great amount of very important scientific material which was not designed for dissemination.

Even with continual efforts are made permanently, in the area of communications, the institutionalization of the creation of inter-disciplinary work groups is very weak and building appropriate of a team work attitude and skills is difficult. Finally, there are inadequate material produced especially for the radio, television and other mass media.

**e) Recommendations**

Basic on consultation the Coordinator of this Unit, it is considered important that the IISP/ROCAP project finances the addition of a professional in communications who can and also

support and training headquarters and GTB personnel. The project should also finance the purchase of certain basic equipment to be used for communication and training activities.

Training would be improving knowledge of communications among INCAP seniors managers and members of GTB's. Also educational activities would promote work teams and better internal communication at INCAP.

In addition, it is recommended that the Project supports the production of summaries and bibliographic packets, translation of scientific material and the purchase of basic books in food and nutrition. Finally it should finance a short course for an INCAP professional, in some foreign country, in the use and production of materials for the radio, television and other mass medium.

## **XI. SUMMARY OF INCAP CAPABILITIES AND PROGRAM PROFESSIONAL NEEDS**

### **a) Methodology for Analysis**

In previous discussions, we have analyzed INCAP strengths and weaknesses using INCAP's technical divisions as our frame of reference. However, it is still necessary to integrate the information on INCAP skills presented in previous sections to present an institutional picture of strengths and weaknesses, and compare them to the professional training, experience and/or areas of specialization needed to carry out INCAP's Food and Nutrition Security Program as contemplated in its Strategic Plan and other related documentation. Accordingly, the following analysis was

designed to integrate skills information and compare INCAP skills to Program needs.

In its strategic plan and other planning documentation, INCAP had divided its food security program into four components: Institutional Development; Strengthening Food and Nutrition Policies, Plans and Projects; Increasing the Availability, Access and Consumption of Food; and Improved Health and Nutrition. Each of these components were further broken down into six or seven activity focus areas. In Tables 7A, 7B and 7C, the Project Paper team took the last three components, broke them down into their individual focus areas (excluding Technology Transfer as a focus area because of its being nearly everyone's responsibility) and, from a list of 26 professions or areas of specialization and/or experience, determined which of these professions/specializations were needed as a minimum to carry out the probable activities of each focus area. The team then matched INCAP individual staff experience and professional training to the needs of the focus areas, and developed the three tables.

**b) Results**

1. In most areas, INCAP has most or all of the requisite capabilities. There are, however, areas where one necessary capability is lacking or where INCAP has someone with the required training and/or experience who is not specifically assigned to the focus areas and question, or would be overloaded if he/she were.

2. In the component Strengthening Food and Nutrition Policies, Plans and Projects, nearly all of which will be carried out by the Food and Nutrition Planning Division, INCAP has the required capabilities in the following focus areas:

- a. Human resource development at headquarters.
- b. Human resource development in the countries.
- c. Production and dissemination of information on food and nutrition directed to different population groups.

In the latter, however, while INCAP has anthropologists, none appears to be specifically assigned to this area.

INCAP lacks the following capabilities in the indicated focus areas:

- a. Food and Nutrition Planning - microeconomist, food marketing specialist.
- b. Food and Nutrition Surveillance--microeconomist.
- c. Monitoring and Evaluating Food and Nutrition Interventions--microeconomist, evaluation specialist.

3. In the component Increasing the Availability, Access and Consumption of Food, which Food and Nutrition Planning and Agricultural Sciences will share, INCAP has the required capabilities in two of the focus areas:

Post Harvest Food Handling, Storage; and Food Processing. They lack the following capabilities in the indicated focus area:

- a. Food Production--microeconomist.
- b. Food Marketing--microeconomist, macroeconomist, food marketing specialist.
- c. Effects of Different Programs and Projects of the Access to, and Consumption of Food--microeconomist, macroeconomist, evaluation specialist.
- d. Nutrition/Consumer Education--microeconomist.

4. In the component, " Improving the Biological Utilization of Food and its Contribution to Improved Health and Nutrition", which will be largely implemented by the Nutrition and Health Division, INCAP has all the capabilities needed in all of the focus areas excepted one: Aspects of Nutrition and Health Associated with Pregnancy, Prenatal Care and (the team suggests) Maternal and Child care. INCAP would need an evaluation specialist to complete this core technical group. In addition, the anthropological, public health administration and operations research capabilities are considered weak because capable individuals now on staff who could fill these roles are either not specifically assigned to this focus area or are so busy with other activities that they would be overloaded if required to become involved in activities in this focus area. This is especially true for the one Operations Research Specialist who serves the entire Institute.

In addition, in four of the focus areas, while INCAP has all of the needed capabilities, a few area considered weak for various reasons, as follows:

a. Infectious Diseases and Nutrition -- The microbiology capability is considered weak largely because the laboratory needs strengthening, both in equipment and procedures.

b. Specific Nutritional Deficiencies -- INCAP has the food technology capability, but no one with this specialization appears to be assigned to this area. INCAP also has biochemists, but they appear to be quite busy with other activities, and are working with lab equipment and procedures that need strengthening.

c. Problems of Nutrition and Health Associated with Changes in Life Styles -- The anthropological capability is perceived by the team as being weak because, as discussed above in relation to another area, qualified anthropologists are on staff but are extremely busy with other activities and are not specifically assigned to those under this focus area.

d. Nutritional Quality of Food -- Qualified microbiologists are on staff but, as discussed previously, are working with laboratory equipment and procedures that need strengthening.

**c) Conclusion**

INCAP currently lacks a microeconomist, a macroeconomist, an evaluation specialist and a food marketing specialist. The lack of these economists affects three of the six focus areas in the component Strengthening Food and Nutrition Policies, Plans and Projects; and four of the six focus areas in Increasing the

Availability, Access and Consumption of Food. However, only five of the total nineteen focus areas analyzed are affected by the lack of the evaluation and food marketing specialists. Consequently, it appears that economics is a vital area to strengthen, whereas the other two specializations may not be as critical at this time.

## XII. RECOMMENDATIONS FOR THE ALLOCATION OF AID/ROCAP INPUTS

Based on the previous analysis, and especially due to the weaknesses identified in INCAP's technical capacity, the following are suggestions for allocations inputs for the IISP/ROCAP project:

### a) Technical Assistance

#### Planning and Decentralization

- Methodologies for assessing the food and nutrition status, institutional strengths and weaknesses in the countries, and processes for technical cooperation.  
2 months
- Implementing the above methodologies at the country level.  
1.5 months
- Evaluation of the results using the new methodologies and processes of supervision, monitoring and evaluation of technical cooperation.  
1 month

### Health and Nutrition Area

- Operations research methodology, including a determination of research areas and formulation of projects in the area of iron.

3 months

### Agricultural Sciences Area

- Determination of strengths and weaknesses at INCAP in this area; identification of priorities and formulation of an action plan.

2 months

### Information and Communications Area

- Design of material for mass media and for the development of training courses on the area of communications technology.

1 month

### Area of Development and Training of Human Resources

- Integration of Advisory Academic Committees - Three committees composed of six members each one (will meet three days during each year - estimated in men-months).

2 months

#### **b) Training**

- One course with a duration of five days on the methodologies of planning and programming, reviewed in Technical Assistance (15 people from the central level and 24 BTG).
- Three seminars with a duration of five days (one/year) to

update of knowledge of the GTB's, and evaluate of decentralized management.

- One course with a duration of five days on the basic food and nutrition for GTB's (25 people).
- Training for nine members of the Food and Nutrition Division, through short courses with a duration up to six weeks, in the following areas: amino-acids analysis, carotenoids analysis, physiological tests of iron, isotopes radioactivity, quality control of laboratories, operational research, methodologies for qualitative data analysis and cost analysis of programs and services.
- Training in communication techniques for decision makers at INCAP (Coordinators, Division Chief)(a three-day course during the first year).
- Training, abroad, of a member of INCAP, in communication and mass media areas. (Short course with a duration of one month.)

**c) Payment of Salaries of Priority Personnel**

**Food and Nutrition Planning**

- An agricultural economist
- An expert in food surveillance
- An expert in food assistance programs
- Two scholarships in the area of food consumption (first year, scholarship supplement; 2 and 3 year, salary supplement)

#### Health and Nutrition

- An expert in biochemistry (fortification of iron, etc.)
- An expert in operational research
- An expert in anthropology applied to health and nutrition
- An expert in health and nutrition programs and services
- Two assistants for the laboratory

#### Agricultural Sciences

- A technician for the laboratory - one year  
(biotechnology of iron, fiber and lipids)

#### Communications and Information

- One communications specialist

#### Development and Training of Human Resources

- One professional to supervise the post-degree course
- Some professors for specific areas  
(per diem, transportation, salary)

#### Strengthening of technical cooperation, at country level

- 7 coordinators, BTG
- 7 technicians in priority areas
- Operations, expenses and office supplies

A phasing-out strategy for support of above personnel and operating expenses should be strongly recommended.

**d) Laboratory Equipment**

See Annex III

**e) Production of Educational Material**

To update central staff and GTB

**f) Other**

Procurement of bibliographic material and audiovisual equipment for post-graduate course

Procurement of materials and equipment for communication technology courses

**g) Technical Assistance for the Administrative Support of Technical Areas**

The Project should also support the following activities through technical assistance:

- Design and implementation of a system of maintenance for bio-medical equipment, laboratory equipment, and procurement and management of laboratory reactive and other materials.

**INCAP INSTITUTIONAL  
STRENGTHENING PROJECT  
(IISP)**

**TECHNICAL ANALYSIS**

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**FIGURE 1  
THE ORGANIZATION OF INCAP'S WORK PROGRAM  
USING FOOD SECURITY AS AN OBJECTIVE**

<b>COMPONENTS</b>	<b>WORK AREAS</b>
Institutional development	<ol style="list-style-type: none"> <li>1. Leadership and administration</li> <li>2. Planning and programming</li> <li>3. General coordination for the development of the program</li> <li>4. Monitoring and evaluation</li> </ol>
Strengthening food and nutrition policies, plans and policies	<ol style="list-style-type: none"> <li>1. Food and nutrition planning</li> <li>2. Food and nutrition surveillance</li> <li>3. Monitoring and evaluating food and nutrition interventions</li> <li>4. Technology transfer</li> <li>5. Human resource development at headquarters</li> <li>6. Human resource development in the countries</li> <li>7. Production and dissemination of information on food and nutrition directed to different population groups</li> </ol>
Increasing the availability, access and consumption of foods	<ol style="list-style-type: none"> <li>1. Food production</li> <li>2. Post harvest food handling, storage</li> <li>3. Food processing</li> <li>4. Food marketing</li> <li>5. Effects of different programs and projects on the access to and consumption of food</li> <li>6. Nutrition/consumer education</li> </ol>
Improving the biological utilization of food and its contribution to improve health and nutrition	<ol style="list-style-type: none"> <li>1. Protein-energy malnutrition</li> <li>2. Infectious diseases and nutrition</li> <li>3. Specific nutritional deficiencies (Iron, Vitamin A, Iodine, Fluoride)</li> <li>4. Aspects of nutrition and health associated with pregnancy and prenatal care.</li> <li>5. Problems of nutrition and health associated with changes in life styles</li> <li>6. Nutritional quality of foods</li> </ol>

FIGURE 2  
 INCAP STRUCTURE

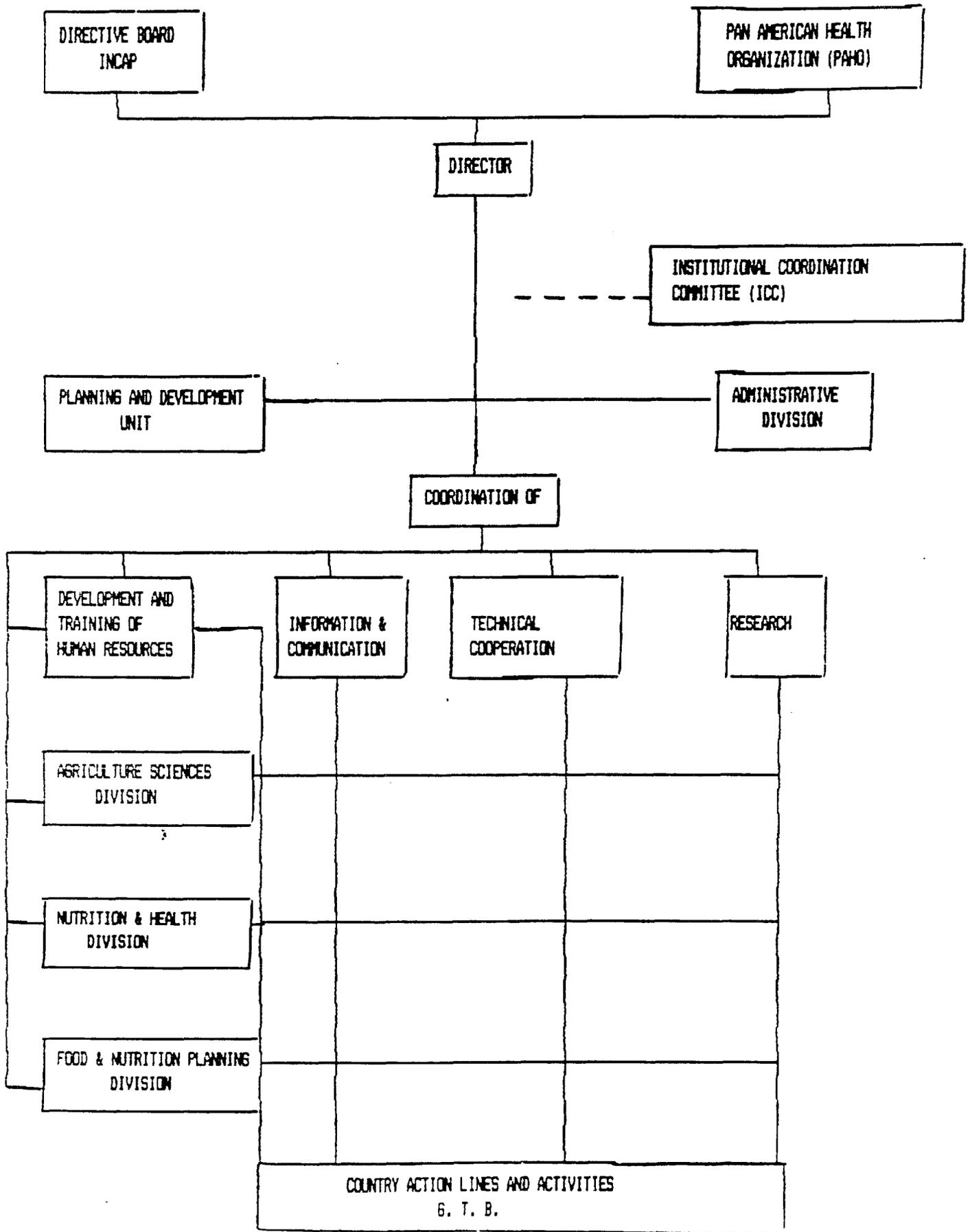


FIGURE 3

FOOD AND NUTRITION PLANNING DIVISION

STRUCTURE

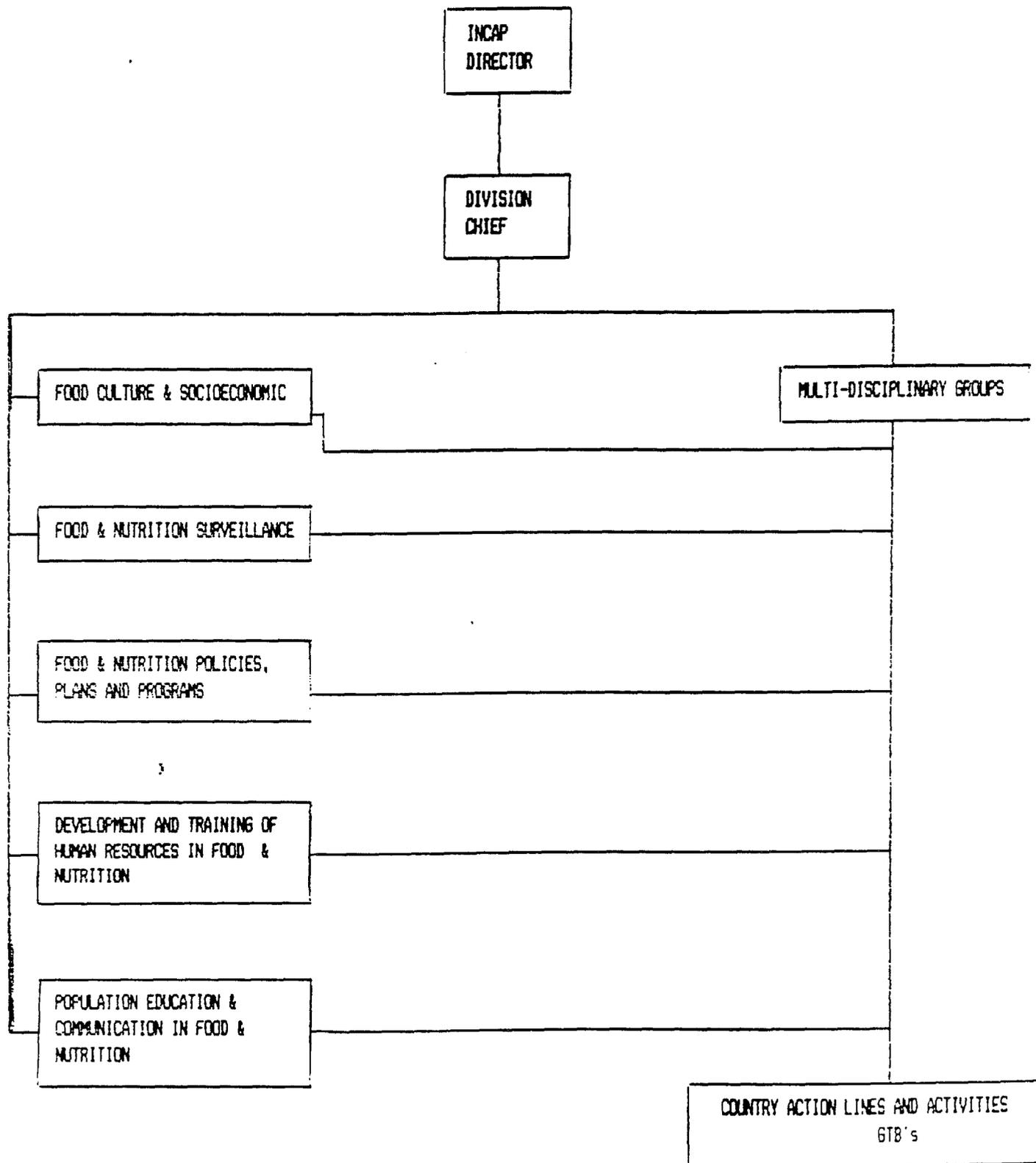


FIGURE 4

Nutrition & Health Division Structure

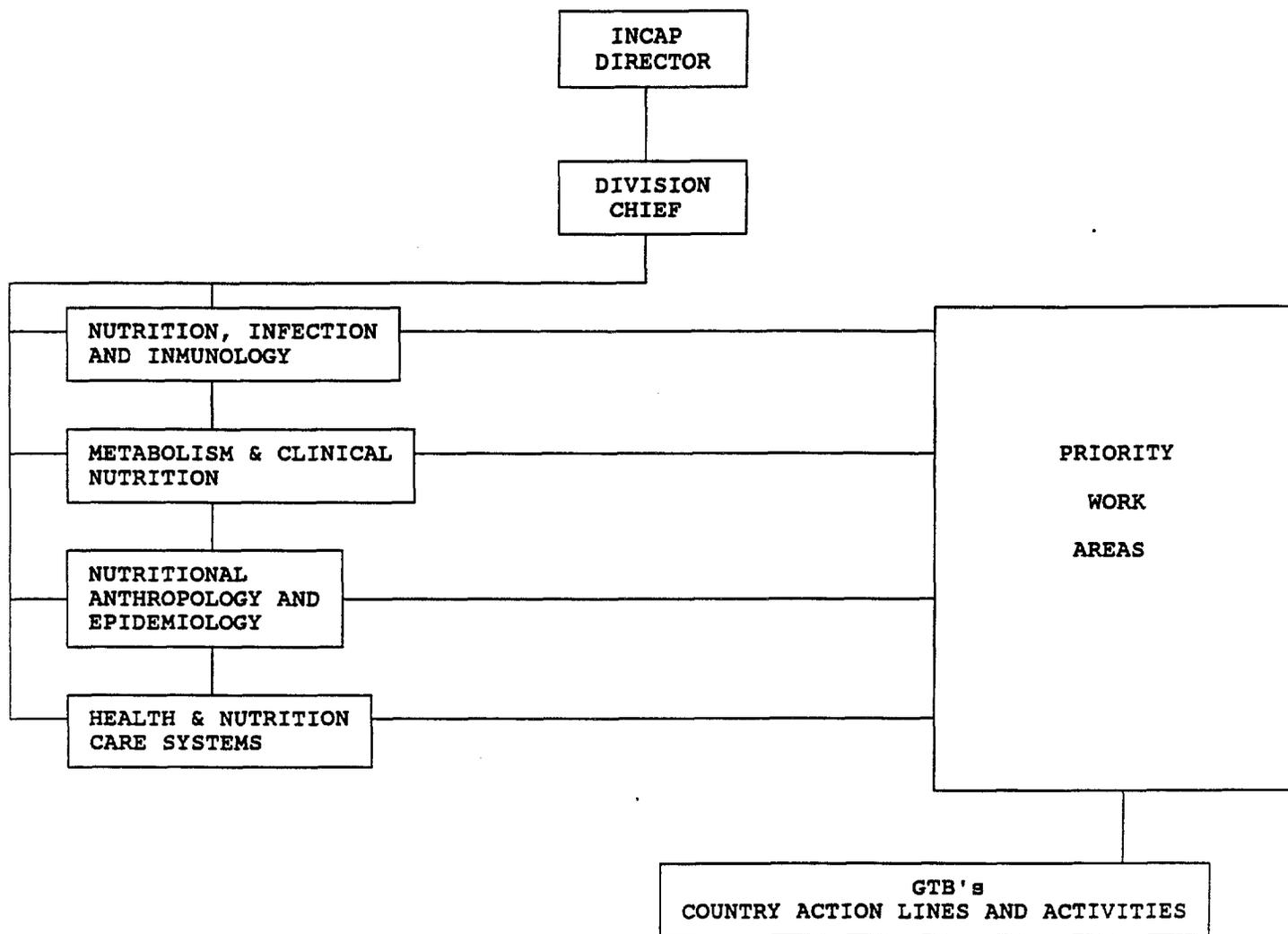


FIGURE 5

Agricultural and Food Sciences Division Structure

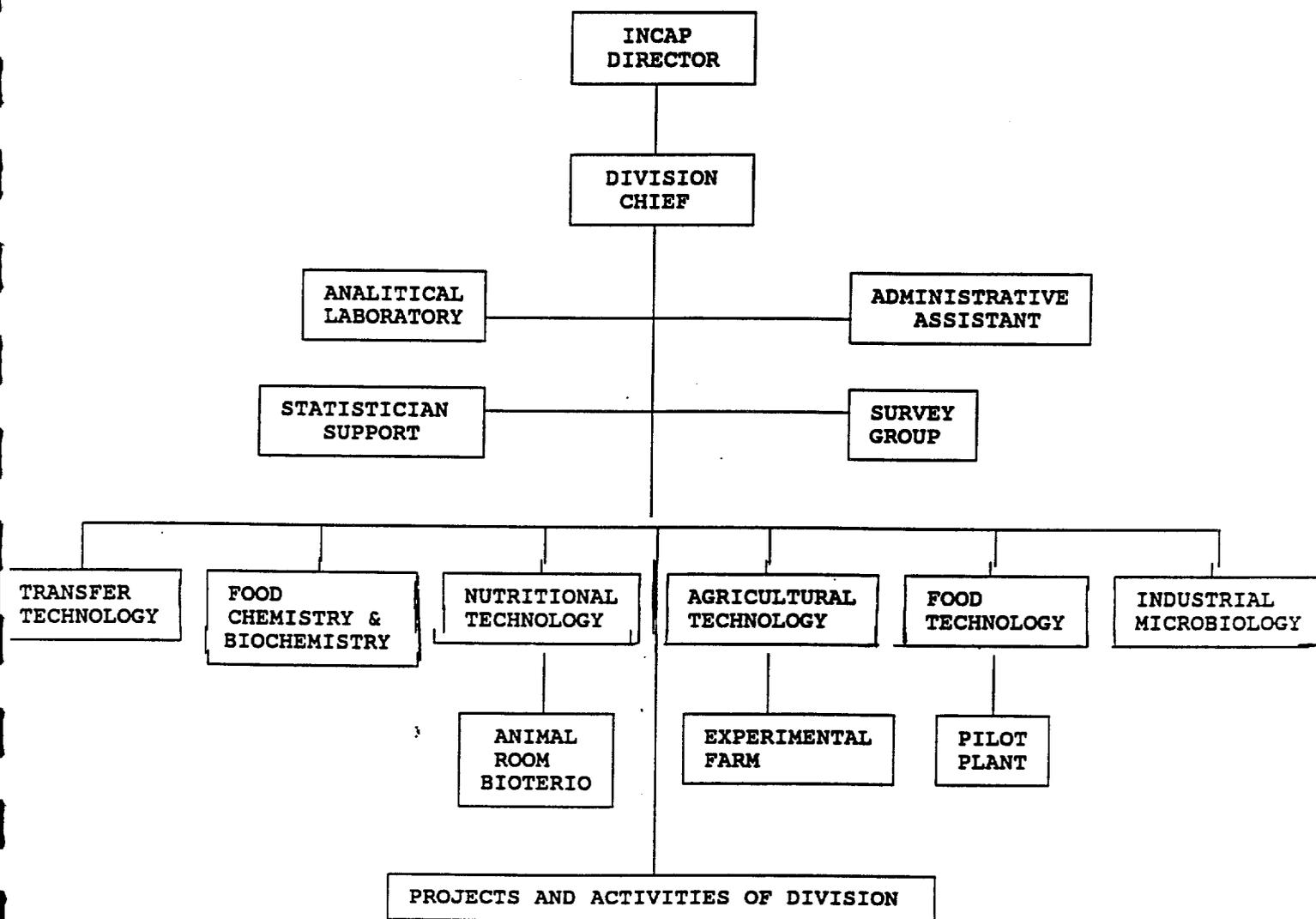


TABLE 1

## FOOD &amp; NUTRITION PLANNING DIVISION STAFF BY AREAS OF WORK

TYPE OF PERSONNEL	DIRECTION & ADMINISTRATION	FOOD CULTURE & SOCIO-ECONOMY	FOOD & NUTRITION SURVEILLANCE	FOOD & NUTRITION POLICIES, PLANS & PROGRAMS	DEVELOPMENT & TRAINING OF HUMAN RESOURCES	POPULATION EDUCATION *	TOTAL
M.D. WITH MSC. IN PUBLIC HEALTH NUTRITION	1			1			2
NUTRITIONIST WITH MSC IN PUBLIC HEALTH NUTRITION		1			1	1	3
NUTRITIONIST		2				2	4
ECONOMIST		1		1			2
EPIDEMIOLOGIST			1				1
SYSTEMS ENGINEER			1				1
SYSTEMS AND PROGRAMMING			1				1
ANTHROPOLOGIST				1			1
COMMUNICATION EXPERT						2	2
STATISTICIAN	1						1
SUPPORT PERSONNEL (BILINGUAL SECRET, ADMINISTRATIVE ASST AND OTHERS)	6	-	1	3	3	5	18
TOTAL	8	4	4	6	4	10	36

**TABLE 2**  
**LEVEL OF EXPERTISE**  
**FOOD AND NUTRITION PLANNING DIVISION**

AREAS AND COMPONENTS	LEVEL OF EXPERTISE		
	STRONG	MEDIUM	WEAK
<b>I. ACCESS AND CONSUMPTION OF FOODS</b>			
. Diagnosis on patterns & factors affecting access and consumption		X	
. Methodologies to measure the effect of interventions on access and consumption		X	
. Methodologies to formulate and implement programs on education and orientation for consumers		X	
. Methodologies to carry out transference of technology		X	
. Staffing (number and stability) <sup>(1)</sup>		X	
<b>II. FOOD ASSISTANCE PROGRAMS</b>			
. Development of strategies and policies	X		
. Design of programs	X		
. Organization and management programs			
. Information systems <sup>3</sup>	X		
. Evaluation for MCH feeding programs		X	
. Cost-effectiveness studies of programs			X
. Methodologies for transference of knowledge and technologies	X		
. Staffing (number and stability) <sup>(2)</sup>		X	
<b>III. FOOD AID NUTRITION PLANNING (Policies, Plans and Programs)</b>			
. Knowledge for multisectoral national strategies and policies		X	

**TABLE 2**  
**LEVEL OF EXPERTISE**  
**FOOD AND NUTRITION PLANNING DIVISION**

AREAS AND COMPONENTS	STRONG	LEVEL OF EXPERTISE MEDIUM	WEAK
. Design of multisectoral programs			x
. Organization and management of multisectoral programs			x
. Methodologies for transference of knowledge and technologies			x
. Staffing (number and stability) (2)		x	
<b>IV. FOOD AND NUTRITION SURVEILLANCE</b>			
. Design of information and surveillance systems		x	
. Implementation of information and surveillance systems			x
. Methodologies for transference of knowledge and technologies			x
Staffing (number and stability) (2)		x	
. Food and nutrition surveillance		x	

(1) Problem of limited number in economy

2) Present staff paid by ROCAP/PROPAG Project

TABLE 3

Nutrition and Health Division Staff By Sections

Type of Personnel	Direction and Administration	Nutrition Infection & Immunology	Metabolism & Clinical Nutrition	Nutritional Anthropology & Epidemiology	Health and Nutrition Services	TOTAL
M.D. Specialist	1	1	2	2	4	10
M.D./General Practitioner	--	--	1	4	2	7
Nutritionist Ph.D.	--	--	1	1	--	2
M.D. Public Health Spec.	--	--	--	--	1	1
Biochemistry Specialist	--	--	1	--	1	2
Laboratory Technician	--	4	5	--	--	9
Laboratory Auxiliar	--	5	2	--	--	7
Anthropologist	--	--	--	3	--	3
Auxiliar Nurse	--	--	1	3	--	4
Assistant Researcher	--	--	--	1	--	1
Microbiologist	--	2	--	--	--	2
Biologist	--	2	--	--	--	2
Statistician	1	--	--	--	--	1
Office Support Personnel	3	--	1	5	5	14
Field Support Personnel	--	--	8	40	13	61
Administrative Assistant	1	--	--	--	--	1
TOTAL	6	14	22	59	26	127

TABLE 4  
SECTIONS IN THE FOOD AND NUTRITION DIVISION

AREAS OF WORK	NUTRITION, INFECTION & IMMUNOLOGY	METABOLISM & CLINICAL NUTRITION (BB)	NUTRITIONAL ANTHROPOLOGY & EPIDEMIOLOGY	HEALTH AND NUTRITION CARE SYSTEMS
I. PROTEIN-ENERGY MALNUTRITION (PEM)				
A) FEEDING AND BREASTFEEDING	x	xxx	xx	x
B) DISEASES WITH NUTRITIONAL EFFECTS	xxx	xx	xx	
C) GROWTH AND EVALUATION OF THE NUTRITIONAL STATUS			xxx	
D) LOW WEIGHT AT BIRTH, PERINATAL AND NEONATAL MORTALITY			xxx	
E) TREATMENT FOR SEVERE MALNUTRITION	x			
G) EFFECTS OF PEM			xx	
II. SPECIFIC NUTRITIONAL DEFICIENCIES				
		x	x	x
III. NUTRITION AND HEALTH IN THE SCHOOL CHILD, ADOLESCENCE AND ADULTHOOD				
A) MOTHER AND CHILD NUTRITION AND HEALTH	x		xx	
B) EVALUATION OF NUTRITIONAL STATUS		x	x	
IV. NUTRITION AND HEALTH IN TRANSITION (FENOMENOS)				
		x		
V. NUTRITION AND HEALTH IN				
		x		xxx
VI. NUTRITIONAL SURVEILLANCE				
				x
VII. TEACHING				
	x	x	x	x
LEVELS OF EFFORT				
HIGH	xxx			
MEDIUM	xx			
LOW	x			

**TABLE 5**  
**LEVEL OF EXPERTISE**  
**NUTRITION AND HEALTH DIVISION**

AREAS AND COMPONENTS	LEVEL OF EXPERTISE		
	STRONG	MEDIUM	WEAK
<b>I. DISEASES AFFECTING NUTRITIONAL STATUS</b>			
a. Diarrhea-infectious diseases			
. Diagnosis on problems and determinant factors	X		
. Formulation of solutions	X		
. System of service delivery		X	
b. Chronic and treatment diseases			
. Diagnosis of problems and determinant factors			X
. Formulation of solutions			X
. System of service delivery			X
<b>II. PROTEIN-ENERGY MALNUTRITION</b>			
. Diagnosis on problems and determinant factors	X		
. Formulation of solutions	X		
. System of service delivery	X		
<b>III. SPECIFIC NUTRITIONAL DEFICIENCIES</b>			
a. Vitamin A and iodine			
. Diagnosis on problems and determinant factors	X		
. Formulation of solutions	X		
. System of service delivery	X		
b. Iron			
. Diagnosis on problems and determinant factors			X
. Formulation of solutions			X
. System of service delivery			X

TABLE 5  
LEVEL OF EXPERTISE  
NUTRITION AND HEALTH DIVISION

AREAS AND COMPONENTS	LEVEL OF EXPERTISE		
	STRONG	MEDIUM	WEAK
<b>IV. CHILD FEEDING AND BREASTFEEDING</b>			
. Diagnosis on problems and determinant factors	x		
. Formulation of solutions	x		
. System of service delivery	x		
<b>V. NUTRITION AND HEALTH IN THE SCHOOL CHILD, ADOLESCENCE AND ADULTHOOD</b>			
. Diagnosis on problems and determinant factors		x	
. Formulation of solutions			x
. System of service delivery			x
<b>VI. NUTRITION AND HEALTH SERVICES-MCH and PHS</b>			
Maternal and child			
. Definition and organization--functional and structural		x	
. Design and implementation of management systems selected		x	
. Cost-effectivity analysis			x
. Use of operational research for it strengthening			x
<b>VII. STAFFING--AMOUNT AND STABILITY</b>			
. Nutrition, infections and immunology		x	
. Clinical nutrition		x	
. Nutritional anthropology and epidemiology			x
. Organization and management of MCH and nutrition services			x
. Applied research to orient programs and services			x

TABLE 6  
 Agricultural and Food Sciences Division Staff  
 by Sections

Type of Personnel	Transference of Technology	Chemistry & Biochemistry	Nutritional Technology	Agricultural Technology	Food Technology	Industrial Microbiology
Food Technologist Specialist	--	--	1	2	2	1
Chemical Engineers	5	--	--	--	2	--
Chemical Specialist	--	2	1	--	--	--
Technicians	2	3	7	2	2	--
Farm Workers	--	--	--	14	--	--
Secretarial Support	1	1	1	1	1	--
TOTAL	8 <sup>3</sup>	6	10	19	7	1

One statistician and one administrative assistant give support to all sections

TABLE VI: INCAP CAPABILITY AND PROGRAM PROFESSIONAL NEEDS

1. Essential for Activity Area  
 2. (X) has, Minus (-) weak area.

Strengthening Food and Nutrition Policies, Plans and Projects

Profession/Specialization	Food and Nutrition Planning	Food and Nutrition Surveillance	Monitoring/Evaluating Food/Nutrition Interventions	Human Resource Devt.: (M/F)	Human Resource Devt.: Countries	Productn./Dissemin. of Info. on Food/Nut. for Specific Pop.Grp.
Public Health/Epidemiology		X Y				
Nutrition/Health Education Specialist				X Y	X Y	
Consumer Education/Information Specialist					X Y	X Y
Nutritionist	X Y	X Y	X Y			X Y
Micro Economist	X	X	X			
Macro Economist	X					
Systems Analyst/Engineer		X Y				
Computer Programmer		X Y				
Anthropologist/Sociologist			X Y			X Y-
Communications Specialist				X Y		X Y
Statistician		X Y	X Y			
Food Handling/Management Specialist						
Food and Nutrition Planner	X Y				X Y	
Public Health Administrator						
Microbiologist						
Food Technologist						
Food Chemist						
Medical Doctor/Specialist						
Pharmacist	X Y					
Education Specialist			X			
Training Specialist				X Y	X Y	
Instructional/Training Materials Specialist				X Y		X Y
Food Marketing Specialist	X					
Food Chemist/Engineer						
Food Quality Research Specialist						

30.

TABLE 18: INLAP CAPABILITY AND PROGRAM PROFESSIONAL NEEDS

\* Denotes for Activity Area

|| If/If has. Minus (-) weak area.

|| Increasing the availability, access and consumption of food

Profession/Specialization	Food Production	Post Harvest Food Handling/Storage	Food Processing	Food Marketing	Effects of diff. progs./projs. on access to/cons. of food	Nutrition/Consumer Education
Nutrition/Health Education Specialist						X Y
Consumer Education/Information Specialist						X Y
Nutritionist	X Y		X Y	X Y	X Y	
Micro Economist	X			X	X	X
Macro Economist				X	X	
Systems Analyst/Engineer						
Computer Programmer						
Anthropologist/Sociologist				X Y-	X Y-	
Communications Specialist				X Y-		X Y-
Statistician						
Food Handling/Management Specialist		X Y				
Food and Nutrition Planner						
Public Health Administrator						
Microbiologist			X Y-			
Food Technologist			X Y			
Biochemist						
Medical Doctor/Specialist						
Archeologist	X Y					
Evaluation Specialist					X	
Training Specialist						X Y
Educational/Training Materials Specialist						X Y
Food Marketing Specialist				X		
Food Scientist/Engineer		X Y	X Y			
Operations Research Specialist						

TABLE 3: INAF CAPABILITIES AND EDUCATION PROFESSIONAL NEEDS

X = Good for Activity Area

- = Fair, Minus (-) weak area.

	Improving the biological utilization of food and its contribution to improved health and nutrition					
	Protein	Infectious	Specific	Aspects of Nut.	Probs. of Nut. & Hlth.	Nutritl. Quality
	Energy	Diseases &	Nutritional	& Hlth. rel. to	rel. to Changes in	of Foods
	Malnutrition	Nutrition	Deficiencies	Pregnancy, Pren	Life Styles	
				Care & MDH		
Transmission/Specialization						
Public Health/Epidemiology	X Y	X Y	X Y	X Y	X Y	X Y
Nutrition/Health Education Specialist				X Y		
Consumer Education/Information Specialist						
Nutritionist	X Y	X Y	X Y	X Y	X Y	X Y
Microeconomist						
Microeconomist						
Systems Analyst/Engineer						
Computer Programmer						
Anthropologist/Sociologist				X Y-	X Y-	
Communications Specialist						
Statistician						
Food Handling/Management Specialist						
Food and Nutrition Planner						
Public Health Administrator				X Y-		
Microbiologist		X Y				X Y-
Food Technologist			X Y			
Biochemist	X Y	X Y	X Y-		X Y	X Y
Medical Doctor/Specialist	X Y	X Y	X Y	X Y	X Y	
Apportionist						
Evaluation Specialist				X		
Insuring Specialist						
Instructional/Training Materials Specialist						
Food Marketing Specialist						
Food Chemist/Engineer			X Y			X Y
Food Science Research Specialist				X Y		

***INCAP INSTITUTIONAL  
STRENGTHENING PROJECT  
(IISP)***

***TECHNICAL ANALYSIS***

***ANNEX I***

***LIST OF DOCUMENTS REVIEWED***

ANNEX I

LIST OF DOCUMENTS REVIEWED

1. INCAP Institutional Strengthening Project. PID.
2. INCAP Administrative Analysis.
3. INCAP Strategic Marketing and Business Planning.
4. Plan Estrategico Institucional 1991-2000 del INCAP.
5. Technical Support for Food Assistance Programs. PROPAG /Project.
6. Quehacer del INCAP en la Formación y Capacitación de Recursos Humanos en Alimentación y Nutrición. INCAP, 1990.
7. Avance en la Ejecución de Acciones de Formación y Capacitación de Recursos Humanos en Alimentación y Nutrición. INCAP, 1990.
8. Educación Popular, Formación de Escolares, Técnicos y Universitarios y Capacitación en Servicio de Alimentación y Nutrición. INCAP, abril de 1991.
9. La Gestión Descentralizada de la Cooperación Técnica del INCAP.
10. Condiciones de la Reestructuración de la División de Planificación Alimentaria Nutricional. INCAP, septiembre de 1990.
11. Propuesta para racionalizar los Equipos de Cómputo de la División de Planificación Alimentaria Nutricional.
12. INCAP - Information Management Capabilities Analysis.
13. Seminario Taller sobre Grado de Avance del Proceso de Implementación de la Estrategia de Descentralización.

Guatemala 23-25 de mayo de 1991. INCAP.

14. Programas del Proyecto sobre Alimentación y Nutrición del INCAP. Mayo de 1991.
15. INCAP Family Health and Nutrition Strategy. Putney, J. Pamela and Griffiths, Marcia.
16. Resumen Ejecutivo. XIL Reunión Consejo Ejecutivo del INCAP. Septiembre de 1990.
17. Informe Anual 1989 del INCAP.
18. Política de Información y Comunicación del INCAP, 1990.
19. La Investigación de Operaciones a Nivel Estratégico. INCAP, Guatemala, junio de 1990.
20. Plan de Organización y Desarrollo de la División de Planificación Alimentaria y Nutricional.
21. Guías Metodológicas para Investigación de Operaciones en Programas de Alimentación a Grupos. INCAP, 1989.
22. La Evaluación de Dos Proyectos del INCAP/ROCAP: TRO, Control de Crecimiento y Educación en Atención Primaria de Salud (596-0115) y Proyecto de Asistencia Técnica para Programas de Alimentación a Grupos (596-0115) JSI. ROCAP/Guatemala.

*INCAP INSTITUTIONAL  
STRENGTHENING PROJECT*

*(IISP)*

*TECHNICAL ANALYSIS*

ANNEX II

LIST OF PERSONS INTERVIEWED

ANNEX II

LIST OF PERSONS INTERVIEWED

ROCAP/AID

1. Sandra Callier. Health and Nutrition Advisor.
2. Joseph B. Coblentz. Program Technical Advisor for Food Assistance Programs.
3. Jeffrey Goodson. Project Development Officer.
4. Jack Galloway. Marketing Advisor.
5. Jude Pansini. Marketing Advisor.
6. John Rigby. Financial Advisor.
7. Roberta Van Haeften. Food Security Advisor.

INCAP

1. Dr. Hernán Delgado, Director.
2. Dr. Rafael Flores. Research Coordinator.
3. Lic. Ernestina Ardón. Training Coordinator.
4. Lic. Magda Fischer. Information and Communication Coordinator.
5. Dr. Enrique Rodríguez. Technical Cooperation Coordinator.
6. Dr. Arnulfo Noguera. Food and Nutrition Planning Division Chief.
7. Dr. Juan A. Rivera. Nutrition and Health Division Chief.
8. Dr. Luis Elías. Agriculture Sciences Division Chief.

FOOD AND NUTRITION PLANNING DIVISION:

9. Lic. Alexandra Praun.
10. Lic. Hedi Deman.
11. Lic. Verónica de Palma.
12. Lic. Isabel de Nieves.
13. Dr. Edmundo Alvarez.

NUTRITION AND HEALTH DIVISION:

14. Dr. Francisco Chew.
15. Dr. José Cruz.
16. Dr. Carlos Samayoa.
17. Dr. Omar Dary.
18. Dr. Alfred Bartlett.
19. Lic. Elena Hurtado.
20. Lic. América de Fernández .
21. Lic. Amilcar Beltetón.

AGRICULTURE SCIENCE DIVISION:

22. Ing. Arnoldo García.
23. Ing. Roberto Cuevas.
24. Ing. Enrique Acevedo.

OTHER PROFESSIONALS:

25. Lic. Myriam Ruiz. Planning Coordination Unit.
26. Lic. Luis Estrada. Planning and Development Unit.

***INCAP INSTITUTIONAL  
STRENGTHENING PROJECT***

***(IISP)***

***TECHNICAL ANALYSIS***

***ANNEX III***

***LIST OF LABORATORY EQUIPMENT TO BE FINANCED***

STRENGTHENING OF THE LABORATORIES OF CHEMISTRY AND BIOCHEMISTRY  
OF INCAP FOR IMPROVING THEIR FUNCTIONS AS CENTERS OF  
REFERENCE, RESEARCH, AND TEACHING IN THE CONTROL  
OF MICRONUTRIENTS DEFICIENCY

Many of the activities of research, formation of human resources, and food and nutritional interventions that the Institute of Nutrition of Central America and Panama (INCAP) has performed during its life have been originated from activities carried out in its laboratories. Among the achievements is worth to mention the invention of the vegetable mixture with high nutritive value named as INCAPARINA.; the implementation of salt and sugar fortification with iodate and vitamin A, respectively; the improving in the production and nutritional value of corn and bean through genetics and good practices of processing and storage; the introduction of the use of oral rehydration salts; and the biochemical support for national surveys in nutrition.

The laboratories of Chemistry and Biochemistry of INCAP are playing a decisive role in the control of nutritional specific deficiencies, such as vitamin A, iodine, iron, zinc and others. It is foreseen that their work will continue having impact in improving the life quality of the Central American people (including Belize and Dominican Republic). These laboratories are the places where human resources are formed, and where advice is looked for with the purpose of performing supplementation and fortification programs, quality control of fortified food, search for new natural products, and the nutritional evaluation of the implemented measures.

The fulfillment of all the activities included in the previous paragraph depends on the accuracy and efficiency of the work accomplished in the laboratories of INCAP. However, those attributes are being very difficult to attain because most of the actual equipment is obsolete, slow, close to reach the end of the useful life and with very small probabilities of being fixed. Therefore, the acquisition of new equipment is an urgent need to be satisfied.

The equipment that is requested is indispensable to continue and extend the work actually done in the control of micronutrient and other deficiencies in the Central American region. The equipment will be utilized in analysis of biological fluids (spectrophotometer, fluorometer, lipid extractors, e.g.), in studies of association between micronutrients and pathological manifestations (microplate reader, microscopy, respirometer, cell counter, e.g.), analysis of food quality (amounts of fiber, macro- and micronutrients), and the preparation of samples and reagents (balances, pH-meters, stirring machines, mixer devices, ice-makers, etc.).

BUDGET		
TYPE OF EQUIPMENT	APPROX. COST (\$ U.S.)	RATIONALE
Magnetic Stirrer (2)	400.00	For preparation of all type of solutions.
Anaytical Balance **	3,000.00	For preparation of reagents and samples . Balances in use are in very bad conditions.
Single plate Balance	1,500.00	For preparation of reagents and samples when high precission is not required.
Vacum Pump	1,700.00	Useful for performing filtrations and extractions.
Extraction Pump	5,000.00	Needed for working with substances that have toxic vapors. The laboratory lacks this kind of device.
Effendorf Centrifuge *	2,000.00	For assays with microsamples.
Computer and Printer **	3,000.00	Useful for analysis, storage and report of results.
Conductivitimeter *	1,500.00	For measuring of conductivity for water quality control and determination of salts during purification experiments.
Cell Counter **	30,000.00	For automatization of hematological analysis. Required for epidemiological studies in nutritional and infectious disease surveys.
Chronometer	250.00	Useful for experiments that require strict control of time

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TYPE OF EQUIPMENT	APPROX. COST (\$ U.S.)	RATIONALE
Ladder.	300.00	Useful in the laboratory and store-room.
Spectrophotometer ** (including recorder and circulating-bath)	24,000.00	This is the apparatus most useful in clinical chemistry and in other chemical and biochemical applications. It will substitute old equipment for the analysis of enzymes, and chromogenic assays of vitamins and metabolites.
Fluorometer **	15,000.00	Useful for the determination of certain metabolites such as vitamin A and protoporphyrins.
Power Source *	2,000.00	Useful for electrophoresis and blotting.
Microplate reader **	20,000.00	Useful for immunological tests, and very practical for chromogenic assays of metabolites and enzymes. The laboratories do not have this apparatus.
Blender (2)	300.00	Useful for the preparation of homogenates of all types.
Horizontal Shaker	1,000.00	For continuous shaking in certain assays.
Microscope	5,000.00	For improving the analytical capacity of the Microbiology and Infection-Disease Section.
Ice-Maker Machine (2)	1,000.00	For the production of ice in cubes and crushed. There is not an ice-maker machine in INCAP.
Osmometer	4,000.00	For research with diets and their digestive effects.
Multiple-tip Pipettes.	1,200.00	Required for assays performed in microplates. The sections of Nutritional Biochemistry and Food Chemistry lack of this instrument.

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TYPE OF EQUIPMENT	APPROX. COST (\$ U.S.)	RATIONALE
pH-meter* (2)	2,000.00	Determination of pH, ions, y preparation of buffers. The equipment in use is in bad conditions.
Respirometer (2)	8,000.00	For physiological studies associated with nutritional defficiencies.
Large Rotor for Sorval Centrifuge	1,000.00	To complete the capacity of the Sorval centrifuge.
Fiber Analyzer	10,000.00	To study association among micronutrients, chronic diseases, and fiber.
Aminoacid Analyzer	50,000.00	To study of essential amino acids in the Central American diets, and the requirements associated with micronutrients deficiencias and malnutrition.
Lipid Extractor *	20,000.00	Isolation and study of fatty vitamins and other liposoluble nutrients.
Ultrafiltration System.	500.00	For sterilization and concentration of solutions.
Vortex Mixer (4)	400.00	Shaking of test tubes. Curret apparatus are in very bad conditions.
* Electric Protector (5)	500.00	Protection of electronic equipment against abrupt changes in the electrical current.
** Voltage Regulator (8)	4,000.00	Secure good performance of electronic equipment.
TOTAL	218,550.00	

It will be convenient to add \$10,000 to the Total amount indicated above, for the purpose of repairing the equipment that might be use for additional years such as Atomic Absorption Spectrophotomer, Gas Chromatographs, High Performance Liquid Chromatograph (HPLC), Preparative Centrifuges, and minor equipment.

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***INCAP INSTITUTIONAL  
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(IISP)***

***TECHNICAL ANALYSIS***

***ANNEX IV***

***LIST OF INCAP PROJECT AREAS***

-INCAP PROJECT AREAS

1. 0014-670/PM ORT Research for PHC Applications
2. 0014-670/PM Growth Monitoring for PCH Applications
3. 0014-670/PM Health Ed. for PHC Applications
4. 0029- Comparative Research for Assessing Incidence of Morbidity in Children 6 to 36 Months. Re: Vit. A Therapy
5. 0050-930 PN Shigelosis Research
6. 0070-025 PN Diarrhea Morbidity Research; Impact of Piped Water in Rural areas for Behaviour Modification
7. 0071- Food Security/Diarrhea Research
8. 0075-095 PN Relationship of Breastfeeding and Infections Disease
9. 0085-120 PN Relationship of Food Supplements to Malnourished Lactating Women and Amt of Milk Produced
10. 0087-150 PM Design and Implementation of Project to Prevent Princ Courses of Pre, Neo and Post Natal Morbidity and Mortality
11. 0088-205 PN Feeding Practices and Food Therapy During Diarrhea Episodes
12. 0088-205 PN Design of Health Ed. (rel. to above)
13. 0088-205 PN Evaluation of Effects of Food Therapy
14. 0089-170 PN Research on Mgt. of Severe Diarrhea
15. 0091-210 PM Research on Maternal and Neonatal Health
16. 0099 R&D: Design of HC for Mgt. of High Risk OB and Neonatal Cases in Health Centers and Hospitals and by Midwives
17. 0099 Development of Diagnostic Criteria (for above)
18. 0099 Development Midwife Training Program for OB cases
19. 0099 Development of Research Methodology for Project Implementation process and Evaluation
20. 0087-210 PM Prevalance and Risks Asso. & Oxitoxim Use by Midwives

21. 0096-135-PN Effects of Reversing Policy of Free Formula
22. Proj. HOPE Serum Retinol Level Analysis/Guatemala
23. VITAL Serum Retinol Level
24. SIMAP Software Development
25. MAP MAKER Software Development
- Research in School-age Health and Nutrition needs.  
(Theoretical)
26. 022-823 PN Early Malnutrition and Effects in Adolescence
27. 0043-811 PN Long Study: Duration of Amenorrheal Lactation/Impact
28. 0101-225 PN Material and Cultural Determinants of Water Usage for  
Personal and Domestic Hygiene
29. 0095-185 PN Effects of Food Supplements to Mothers on Birth Weight of  
Succeeding Generations of Children
30. 0111- Immuno Analysis/CJA cells in Mother's Milk
31. 0002 Secondary Analysis: Maternal Anthropometric Data
32. 0004-670 PN Risk Indicators for Retarded Fetal Growth
33. 372-PN Bean Research: Effects of Polifenols and Other  
Anti-nutritional factors for digestibility of Bean Proteins
34. Effects of Nutritional Feeds for Increasing Animal Milk  
Production
35. 0001- Impact of Non-traditional for-X crops on Highlanders
36. 0019-710 PN Mgt. and TA for food development and assistance
- 0067 Macro Eco. Review of Food, Demographic and Socio Ec.  
Variables
- 0103-710 PN Effects on Comm. Participation with MCH Food Supplement

(0049g)