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INTEGRAL PLAN FOR RESEARCH, TRAINING AND TECHNICAL ASSISTANCE
FOR PROTEIN FOOD PRODUCTION IN CENTRAL AMERICA AND THE CARRIBEAN

(Item 8)

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CABLE: IICATURRIALBA

Dr. Peter A. Oram
Secretary
Technical Advisory Committee
(T.A.C.)
Food and Agriculture Organization
of the United Nations (F.A.O.)
Rome, ITALY

Dear Dr. Oram:

I am attaching copies of the revision of the Project submitted to T.A.C. last year, which is going to be considered during our next meeting as established in the proposed agenda.

The new presentation does not involve any basic change. It is the result of a desire to present it in a better way and determine more accurately the objectives of the proposal.

I would appreciate it if you would distribute them to T.A.C. members with this explanation.

Sincerely yours,

Manuel Elgueta

Director

Tropical Training and Research
Center

ME/el

**INTEGRAL PLAN FOR RESEARCH,
TRAINING AND TECHNICAL ASSISTANCE
FOR PROTEIN FOOD PRODUCTION
IN CENTRAL AMERICA
AND THE CARIBBEAN**

Developed by the Tropical Research and Training Center
and the Northern Zone of IICA



IICA

March, 1972

INTEGRAL PLAN FOR RESEARCH, TRAINING AND
TECHNICAL ASSISTANCE FOR PROTEIN FOOD
PRODUCTION IN CENTRAL AMERICA
AND THE CARIBBEAN

Submitted to the

Technical Advisory Committee
of the
Consultative Group for International Agricultural Research

by the

Tropical Center for Research and Training
and the
Regional Office for the Northern Zone
of the
Inter-American Institute of Agricultural Sciences
of the
Organization of American States

Turrialba, Costa Rica

March , 1972

TABLE OF CONTENTS

	Page
Abstract	1
1 Introduction	4
2 Current situation of the problem in Central America	5
2.1 Pulses Program	5
2.2 Beef and Dairy Cattle Program	6
3 Achievements towards the solution of the Central American problem	8
3.1 Pulses Program	8
3.1.1 Research	9
3.1.2 Training	12
3.1.3 Technical Assistance	12
3.2 Beef and Dairy Cattle Program	13
3.2.1 Research	13
3.2.2 Training	15
3.2.3 Technical Assistance	16
4 Operational Plan	17
4.1 Pulses Program	17
4.1.1 Research	17
4.1.2 Training	20
4.1.3 Technical Assistance	20
4.2 Beef and Dairy Cattle Program	21
4.2.1 Research	21
4.2.2 Training	23
4.2.3 Technical Assistance	24
5 Strategy	24
5.1 Pulses Program	24
5.2 Beef and Dairy Cattle Program	26

	Page
6 Instruments	27
6.1 Actual Physical Facilities	27
6.2 Personnel	28
6.2.1 Pulses Program	28
6.2.2 Beef and Dairy Cattle Program	28
7 Expected benefits from the proposed integral plan	28
8 Proposed budget	29
9 Budget summary (tables)	30
9.1 Pulses Program	31
9.1.1 Research	31
9.1.2 Training	32
9.1.3 Technical Assistance	33
9.2 Beef and Dairy Cattle Program	34
9.2.1 Research	34
9.2.2 Training	35
9.2.3 Technical Assistance	35

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INTEGRAL PLAN FOR RESEARCH, TRAINING AND
TECHNICAL ASSISTANCE FOR PROTEIN FOOD PRODUCTION
IN CENTRAL AMERICA

ABSTRACT

Protein consumption per inhabitant in Central America does not meet minimum diet requirements. The production and productivity of the principal protein sources -- beans and beef -- must be increased to make up the actual deficit as well as meet the future demands foreseen by the accelerated population growth of Central America.

To increase the production of beans, and other legumes, it is essential to have complete and efficient technological packages promulgated through the extension services, with adequate financing and an assured market for the product. The required increases in beef production are associated with an increase in pasture production possible through introductions, plant breeding and forage management, adequate physical facilities and machinery, and prices for the product which would be attractive to the farmer.

The Inter-American Institute of Agricultural Sciences of the Organization of American States (IICA)* is presenting to the Technical Advisory Committee (TAC) a plan requesting financial assistance to defray some costs involved in increasing the research, training and

* IICA: Instituto Interamericano de Ciencias Agrícolas.

technical assistance capacity of those aspects related to the increase of production and productivity of beans and beef. IICA has been carrying out research in legumes, predominantly in the common bean (Phaseolus vulgaris) and animal husbandry since 1963, and has trained personnel as well as offered technical assistance to all the countries of the Central American Isthmus and some countries in the Antilles.

Increases in research, training and technical assistance capacity will be utilized by IICA to strengthen national and regional institutions in charge of research and experimentation with beans, or other legumes, and beef cattle, as well as such aspects related to their promotion, such as extension, credit and commercialization.

To ensure that IICA's actions in the fields of research, training and technical assistance meet the needs of the countries, this plan includes the creation of national advisory committees for each product being worked on, as well as a consulting committee made up of members from all the national committees concerned with the plan, to assist in deciding on the nature and sequence of IICA's support activities.

IICA needs financial assistance to hire additional professional personnel to ensure this support to the countries. Financial assistance is also needed to improve existing laboratories and housing facilities, and to offer intensive short courses, seminars and fellowships for post-graduate education.

Expected beneficial results from the plan will be the strengthening of national and regional research and training institutions, and increase in the production and productivity of beans and beef cattle to

alleviate existing deficits as well as related aspects, such as promotion, extension, credit, and commercialization.

Financial assistance requested from TAC is US\$ 6,523,000 to be distributed over a five year period, calculated as the probable duration of the plan. IICA's contribution to the plan, over the same time period, will be US\$ 5,490,445.

1. INTRODUCTION

The United Nations and its subsidiary international organizations maintain that the principal cause of world crisis of protein production is the fact that the world population is increasing at a much more rapid rate than actual food production. Specifically, the per capita consumption of proteins in the developing countries is considered to be disastrously low.

To make matters worse, protein malnutrition affects principally the child population. The United Nations has stated that there are more than 300 million children who suffer serious growth deficiencies, resulting in retardation due to the lack of sufficient calories and proteins. Many of them are curtailed in mental development, capacity for learning and social fitness, thus becoming a burden to society at large.

In 1935, the League of Nations formulated the protein needs for the world population. Since that time, there has been a constant concern to intensify research and support the training of technical personnel with the aim of promoting the production and commercialization of protein foods.

In concordance with this objective, this project aims to contribute to the production of protein foods by increasing and reinforcing the program which is presently being developed by the Inter-American Institute of Agricultural Sciences of the OAS at the Tropical Center for Research and Training (Turrialba, Costa Rica) and the Regional Office for the Northern Zone (Guatemala) through the following programs:

1. Pulses
2. Beef and Dairy Cattle.

2. CURRENT SITUATION OF THE PROBLEM IN CENTRAL AMERICA

2.1 PULSES PROGRAM

Approximately 33% of the protein consumed is provided by the common bean (Phaseolus vulgaris), which makes this legume the principal and most important protein source in the diet of the inhabitants of this area. In 1969, the bean production in Central America was 186,400 tons for a population of 14,600,000 inhabitants, indicating an apparent availability of 12.7 kilograms per capita per year. Nevertheless, seed stock and natural losses reduce this availability to only 11.1 kilograms per capita per year. In studies on adequate diets at minimum costs, the Nutrition Institute for Central America and Panama (INCAP) recommends an average per capita consumption of 20.4 kilograms per year. This indicates a minimum annual deficit of 142,000 tons.

In Central America, 35% of the farms grow the common bean at least once a year, on approximately 21% of the land utilized for annual crops. The production of beans involves around 284,000 agricultural enterprises in Central America, with an average planting of 1.36 hectares each. Studies carried out by IICA indicate that 26,423,680 man/days are needed to cultivate the common bean annually. As can be seen

from these figures, this crop is of vital importance for the inhabitants of the region from an economic, social as well as nutritional point of view.

Different measures to help solve the deficit of this legume have been taken, especially at the regional level, by the Central American Cooperative Program for the Improvement of Food Crops (PCCMCA), which includes the Central American Project for Production and Improvement of Bean and Other Pulses, with the participation of 14 institutions.

Nevertheless, efforts to date have been insufficient, not only in research but also in projects for production promotion. This would indicate the need to undertake intensive action at national as well as regional levels.

2.2 BEEF AND DAIRY CATTLE PROGRAM

The cattle industry in Central America plays a fundamental role in the general well-being of the population, not only as a source of high quality protein for human nutrition, but also as a means for converting natural resources into capital. It also plays an important part in the employment of labor, on farms as in the cattle and related industries.

In Central America, there are over six million hectares of natural pasture and additional extensive areas suitable for pasture and forage production. The current bovine population in the area has been estimated at 10 million head of cattle. Nevertheless, the per capita consumption of milk and meat products is extremely low. In Honduras,

Nicaragua and Costa Rica there is an availability of boned meat between 2.2 and 9.6 kilograms per capita, per year. This is lower than the estimated domestic demand for 1970 of 5.6 to 14.7 kilograms, and for 1980 of 6.4 and 17.2 kilograms. This compares to an annual consumption of 110 to 120 kilograms of boned meat per capita per year in the United States.

Costa Rica is considered one of the more efficient milk producers in the Central American area, but available information indicates that the per capita consumption of milk is less than 90 kilograms per year, including considerable quantities of imported powdered milk. This compares to an annual consumption of approximately 318 kilograms of milk and milk products per capita per year in the United States. It is therefore obvious that significant increases in productivity are necessary not only to satisfy the domestic demand, but also to provide income to be utilized in the general development of the countries.

The basic problem of low productivity in animal husbandry at the farm level is frequently associated with the following causes: (1) Overly rudimentary practices in animal management. (2) Poor utilization of existing forages. (3) Little use of records or accounting methods. (4) Credit, technical assistance and marketing deficiencies. Research, training and technical assistance in simple practices, such as adequate use of fertilizers, subdivision of pastures, and weed control, could substantially increase productivity and economic returns.

The governments of Central America and the international organizations maintain programs in animal husbandry development, promotion

and loan projects. The operational total costs for these programs in Central America and the Dominican Republic were over 100 million dollars in 1970.

The success of any program to increase productivity depends largely on the availability of basic information and technical personnel. This, however, is one of the more critical aspects of the program in the development of animal industries. Scientists, technicians and professionals in the fields of production, marketing, and credit, are generally very scarce, or frequently are deficient in training. All these problems demand serious and immediate attention.

3. ACHIEVEMENTS TOWARDS THE SOLUTION OF THE CENTRAL AMERICAN PROBLEM

3.1 PULSES PROGRAM

In 1963, IICA set up a Basic Food Crops Unit at the Tropical Center for Training and Research (IICA-CTEI)* and since that time has been giving priority to research in beans. The Regional Office for the Northern Zone of IICA (IICA-ZN) took charge of the coordination and technical support of the Central American Project for Production and Improvement of Beans and Other Pulses in 1965. Eight IICA specialists participate in the development of the activities in these programs. In addition, eight consultants from the Universities of Costa Rica, El

* CTEI: Centro Tropical de Enseñanza e Investigación.

Salvador and Panama, the Pan American Agricultural School in Honduras, the Ministry of Agriculture in Guatemala, and the U.S. Department of Agriculture, are also participating.

3.1.1 Research

Research is being carried out in the following areas of specialization:

1. Ecology

The localization, quantification and characterization within each country, of the most appropriate areas for growing beans. Zoning maps have been prepared for Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and Panama. The method adopted for this type of study consists essentially in determining the agroclimatological and edaphic indices for this crop.

2. Economics

Studies have been carried out on bean crop production and feasibility in Costa Rica and El Salvador. The adoption of correct cultivating practices has indicated that beans can produce very satisfactory economic benefits.

3. Plant Breeding

Genetic research, especially on the heritability of quality and production characteristics, together with cytogenetic studies related to inducing mutants are areas which received considerable attention.

Fourteen strains of beans have been improved which, under experimental conditions, produce higher yields than the present

Central American average of 500 kg/ha. Results from yield trials carried out each year with approximately 90 varieties or strains of beans, totaling 2,000 entries tested, have permitted concrete recommendations to the Central American countries. A black to white color mutation has been obtained in a good bean variety. In addition to the change in color which is more readily accepted by the people, and a 3% increase in protein content, the mutants preserve all other characteristics of the parental variety.

4. Germplasm Bank

IICA has been collecting population samples native to Central America as well as those introduced from other areas, to improve and enlarge the germplasm bank at CTEI and the Pan American Agricultural School in Honduras. The collection presently contains 3,500 population samples.

5. Production of Foundation Seed

In collaboration with the Pan American Agricultural School in Honduras, IICA has been distributing approximately 2,500 kilograms of improved seed every year.

6. Agronomy

For the past two years, IICA has been experimenting with densities and planting dates in five different localities.

7. Soils

A method has been developed to study total porosity in situ and water retention capacity in bean plots, especially in view of

the fact that this plant is very susceptible to flooding. Advances have been made in the physical and chemical characterization of Central American soils. Responses to N and K applications have been determined in fertility studies. In hydroponic cultures, it has been found that the greatest nutritional requirements in beans occur in the flowering period.

8. Phytopathology, Entomology and Weed Control

Bean disease in Central America have been identified and the geographic distribution determined. In addition, the distribution of races of several diseases has been investigated in certain selected areas, and at the same time an evaluation made of bean resistance. There is also a virology program being carried out. Several viruses have been identified and discoveries were made about means in which they are transmitted to beans.

In 1964, taxonomic and bionomic studies were initiated with several insect genera of economic importance in the region, such as Empoasca, Diabrotica and Ceratoma. Progress has been made in the study on bean resistance to Empoasca. Work with herbicides has been limited but results have been satisfactory.

9. Research Publications

Since 1963, bean research at IICA has contributed 117 publications to the literature. A bibliography on the Phaseolus genus has been compiled, and presently contains 5,736 references.

3.1.2 Training

To increase the production efficiency in pulses, it is necessary to have adequately trained personnel in each country. Aware of this problem, IICA has been offering training at three levels: Short courses (short-term), in-service training (medium-term) and graduate level education (long-term).

Seventy-one technicians from El Salvador and Panama and 12 from the Dominican Republic, have been trained to date, within the short courses program. Seventeen technicians from the five countries in Central America, and Panama, have received in-service training. The Graduate School at IICA -CTEI has granted the Magister Scientiae degree to six Central American technicians, who did their research work on some aspect of pulses production. A total of 167 professionals have received the M.S. degree in different specializations in the basic fields within this program. The thesis research of these 167 scientists forms a basis for the development of future research.

3.1.3 Technical Assistance

IICA has given technical assistance to each country in Central America, carrying out research within the Central American Bean Pulses Program. These research activities include variety testing, studies on agronomic aspects, pest and disease control.

IICA also provided assistance to some of the countries in the area in the elaboration and execution of national bean production promotion programs. Special note is made of the work being carried out in El Salvador.

In El Salvador, the 'technological package' applied was based on results from research being carried out in the area. Research, credit and extension efforts were coordinated. Production and productivity increases have been substantial and were maintained over the past two years. The success of this program, it is expected, will permit El Salvador to be self-sufficient in bean production next year, instead of having to import a large percentage of the product annually.

Technical assistance is also provided to Honduras and Costa Rica in their promotional plans. However, this activity is far more recent and results are not yet as clearly evident as in El Salvador.

3.2 BEEF AND DAIRY CATTLE PROGRAM

At present there are numerous research projects and experiments in animal production being carried out in animal nutrition, animal breeding, and also in pasture. One hundred and eighty-five scientific papers, 66 M.S. degree theses, 3 textbooks and 30 other miscellaneous publications related to various aspects in animal production have been published.

3.2.1 Research

1. Animal Nutrition

The animal nutrition program has been intensively developed along two convergent lines to maximize production in terms of more economic cattle feeding through the utilization of tropical forage and of agro-industrial by-products. Numerous experimental

results indicate that tropical pastures, adequately managed, are suitable for cattle and moderate milk production. The most critical component is the supply of energy. Various products considered as agro-industrial waste have been tried out to make up this energy deficiency. Of special interest are those products which do not compete with human food sources, such as sugar cane molasses.

There also has been intensive work on methodology to improve estimates on food consumption by animals on pastures. Considerable information on the nutritive value of a number of tropical forage species has been achieved.

2. Pastures

Some experimental results related to the effects of fertilization on the production of some tropical grasses are available. New information was obtained on the chemical composition of various forage species as a function of their age. Introduction and distribution of new species have been carried out. There are some preliminary results available on pasture-legume mixtures.

3. Management

Some work on the effect of stabling as a means of reducing the adverse effects of heat has been carried out. These studies include controlled environment experiments in a climatic chamber. Useful results were obtained related to the control of ovulation by means of exogenous hormones. A study on the control of mastitis in the dairy herd is in progress.

4. Animal Breeding

A long-range program has been maintained on selection and cross-breeding, with emphasis on Criollo cattle. The Criollo and other breeds have been evaluated with respect to various characteristics of economic value in dairy as well as beef cattle. These studies indicate that Criollo, as a pure breed, is a mediocre producer. Nevertheless, it has proved to be excellent genetic material for cross-breeding. The utilization of hybrid vigor (3 to 15% in double and triple crosses) promises to be a rapid and practical system to improve beef or dairy production under tropical conditions. The research carried out at IICA-CTEI has contributed largely to the basic information available on the genetic and environmental parameters, data which is scarce under tropical conditions.

3.2.2 Training

Sixty-six technicians from Guatemala, El Salvador, Honduras, and the Dominican Republic, have been trained for technical assistance on national livestock development programs through one national (the Dominican Republic) and one international (Guatemala) short course.

Fifteen Magister Scientiae degrees in animal husbandry have been granted to students from Central America and the Caribbean area, the majority of whom now hold key positions in their countries of origin. Short courses, informal training through seminars and in-service training, have also played an important role in the efforts towards the improvement of the general level of animal husbandry personnel.

At this time, a graduate studies program is offered through annual intensive short courses. Students can complete the program in four years, attending classes on an intensive basis for eight weeks at IICA -CTEI every year. Their course work is complemented by research which can also be carried out in their own country.

3.2.3 Technical Assistance

Technical assistance in pasture and livestock production has been given to national institutions of almost every country of Central America and the Dominican Republic.

Such assistance has been requested to:

1. Elaborate national plans or projects in training, research and extension.
2. Interpret and implement plans or projects already approved.
3. Evaluate and reorganize training and extension programs.

A strong effort for coordination of activities and interchange of knowledge and personnel is being made through the National Offices of IICA's Northern Zone.

Contact has been established with almost every program or institution related to animal and pasture production in the area. A technical meeting sponsored by IICA -ZN, Managua, Nicaragua, 1969, with representatives from every country resulted in proposed actions which are being implemented at national levels to solve technical problems affecting livestock production.

4. OPERATIONAL PLAN

4.1 PULSES PROGRAM

General Objectives

Strengthen national research, extension and promotion institutions to increase the production of tropical pulses and thus augment the available vegetable protein in the Central American Isthmus and the Antilles.

4.1.1 Research

Specific Objectives

Assist national institutions to develop or improve 'technological packages', to achieve required production increases. Develop technological skills which will permit efficient high quality production of pulses.

Projects

1. Variety improvement

Goal: Obtain high yielding varieties for use in promotional programs in suitable production areas.

Activities

1. Introduction and testing of varieties for adaptation and production.
2. Develop high yielding varieties.
3. Incorporate such characteristics as resistance or tolerance to adverse environmental factors, i.e., pests, diseases, drought, water excesses, deficiency or excesses of nutrients, high temperatures.

4. Produce varieties with higher protein content, lower toxicity levels, and good tasting quality.

2. Crop management

Goal: Develop and evaluate crop management systems to achieve greater production efficiency.

Activities

1. Develop and evaluate cultural practices to obtain maximum yields, i. e., planting density and dates for planting, manner and optimum time for fertilizer application, weed control.
2. Develop and evaluate planting systems, i. e., single crop, mixed crop, rotational crops.

3. Soils management

Goal: Determine the most suitable systems for soils management to achieve higher production efficiency for the common bean and the cowpea (Vigna sinensis) in the area.

Activities

1. Standardize methods for chemical analysis of soils.
2. Determine deficiency and toxicity limits of soil nutrients with respect to plant development and production.
3. Determine fertilizer requirements.

4. Develop methods to increase availability of soil nutrients to plants.
5. Evaluate soils management systems in relation to maximum plant production.
6. Determine the role of nitrobacters and other microorganisms in plant production.

4. Crop protection

Goal: Counteract or reduce diseases and pests which limit crop production.

Activities

1. Identify and determine the geographic distribution of viruses, bacteria, fungi, nematodes, insects, and other important diseases and pests.
2. Make an economic evaluation of the levels of infection or infestation.
3. Study prevention and control measures.
4. Study systems for the preservation of stored beans.

5. Socio-economic studies

Goal: Study human nutrition levels, crop economics and organizational systems for small farmers.

Activities

1. Study production costs, economics and marketing.
2. Evaluate the factors that influence food habits, and develop systems to improve them.

3. Study the organization of small farmers.

4.1.2 Training

Specific Objective

Strengthen national research and development of institutions responsible for promotional projects by training scientific and specialized personnel at different levels in fields related to pulses production.

Activities

1. Postgraduate courses

Goal: Train 15 technicians at the Magister Scientiae level in fields related to pulses production who, thereafter, will be able to carry out the national programs.

2. In-service training

Goal: Train 30 Central American technicians to implement the pulses program.

3. Short courses

Goal: Offer approximately 10 short courses in the region.

4.1.3 Technical Assistance

Specific Objectives

Promote the establishment and/or development of national pulses production projects, coordinating the efforts of training, research, technical assistance, credit, and marketing institutions, to achieve the required increases in production and productivity.

Activities

1. Provide technical assistance to promote production of the common bean in a pilot country of Central America, during the first year of the program.

Goal: Increase bean production through the application of an integrated 'technological package' in a pilot country in Central America. This will serve as an example of technology as well as for training personnel of the host and other countries.

2. Technical assistance in production of the common bean and cowpea in other countries of the Central American Isthmus in the second year of the program.

Goal: Extend to one or more countries of the area the experience gained in the pilot project.

1.2 BEEF AND DAIRY CATTLE PROGRAM

General Objectives

Strengthen national research, extension and promotion institutions, to promote the increase in production and availability of animal protein in Central America.

4.2.1 Research

Specific Objectives

Assist national institutions to obtain qualitative and quantitative information on the factors affecting cattle production and to develop methods to improve the efficiency of cattle production.

To solve the problems in beef and dairy production, research will be integrated to include agronomy and pasture management, animal nutrition, sanitation and disease prevention, animal physiology, animal breeding, cattle management and farm economics and rural administration.

Projects

1. Cattle improvement in the tropics

Goal: Improve production and reproductive efficiency of cattle in the tropics.

Activities

1. Selection of characteristics of economic value in dairy and beef cattle.
2. Cross-breeding in beef and dairy cattle.
3. Rearing methods for herd replacement in the tropics.
4. Reproductive efficiency in beef and dairy cattle.
2. Utilization of tropical pastures and agro-industrial by-products by cattle.

Goal: Develop feeding standards for cattle in the tropics.

Activities

1. Develop methods to evaluate efficiency of pasture utilization by cattle.
2. Study factors which influence pasture utilization by cattle.
3. Utilization of agro-industrial by-products for cattle feed.

3. Pasture management

Goal: Improve management techniques for pasture production and utilization.

Activities

1. Development of pasture and forage management techniques.
2. Study tropical legumes and legume-pasture associations.

4.2.2 Training

Specific Objectives

Strengthen national educational, research, extension, and promotion institutions, increasing the number and quality of professionals and technicians working on national projects.

Activities

1. Postgraduate training

Goal: Train 50 specialists at the Magister Scientiae level in animal production.

2. In-service training

Goal: Train 100 technicians from Central American institutions to implement national animal husbandry plans.

3. Short courses

Goal: Up-date specialized training of personnel in animal husbandry by training 25 specialists at the Magister

Scientiae level through annual intensive short courses and to train 100 or more technical staff specifically for financing and technical assistance in livestock development.

4.2.3 Technical Assistance

Specific Objective

Provide technical assistance to member countries and strengthen national animal production plans.

Activities

1. Technical assistance to help elaborate national extension programs in animal husbandry.

Goal: Provide technical assistance as required to help elaborate and evaluate integrated development plans for livestock production.

2. Technical assistance to national institutions.

Goal: Provide technical assistance to national education, research, promotional, and extension institutions in animal husbandry to improve their plans.

5. STRATEGY

5.1 PULSES PROGRAM

1. The program will be organized on the basis of national advisory committees, a research support center, IICA-CTEI, and a

technical assistance unit, IICA-ZN. A consultant committee consisting of coordinators of the national advisory committees will be formed.

2. The establishment and strengthening of national bean or other legume and livestock committees will be promoted in each country within the area. Ideally, each committee should be made up of representatives from institutions working in related fields, and will act in an advisory capacity for each program.

3. Initially, work will be concentrated in countries selected as having ecologically suitable zones and which are presently important pulses producers. At a later date, the program could be extended to other potentially productive zones.

4. Two pulses species of high consumption in the region will be selected, the common bean (P. vulgaris) and cowpea (V. sinensis). Work with the common bean will be extended to the whole region, while the cowpea will be tested in Panama only, in accordance with the food consumption patterns of these countries. Initially, greater effort will be given to the common bean. Work on cowpea will be carried out at a later date.

5. All efforts will be coordinated with those of other international and regional centers actively engaged in research, training or promotion on pulses production, such as INCAP, ICAITI, and others.

6. Program activities will be oriented towards three inter-related aspects:

1. Reinforcement of basic and applied research.
Applied research will be directly related to the short-term development and application of

available knowledge, to permit an immediate increase in pulses production. Basic research, on a medium and long-term basis, will attempt to solve the problems which influence crop production.

2. Reinforcement of training at different levels: graduate training, in-service training and short courses. Training at all three levels will prepare the needed personnel to implement national plans.
3. Reinforcement of technical assistance in research, training, promotion, and programming, at national and regional levels.

5.2 BEEF AND DAIRY CATTLE PROGRAM

1. The geographical area for the initial phase of the program includes Central America and Panama, with the option of including countries from the Caribbean area at a later date.
2. The program will include activities at national and regional levels. At the regional level, activities will be handled directly by IICA -CTEI and IICA -ZN, while activities at the national level will have national institutions as operative units.
3. Priority will be given to aspects of beef and dairy production through utilization of pasture and legume.
4. The operational structure to achieve the objectives will include research, training and technical assistance.

6. INSTRUMENTS

6.1 ACTUAL PHYSICAL FACILITIES

The Inter-American Institute of Agricultural Sciences of the OAS (IICA) has the Regional Office for the Northern Zone in Guatemala City, Guatemala, and the Tropical Center for Training and Research (CTEI) in Turrialba, Costa Rica.

The area of activity covered by the Northern Zone Regional Office includes the countries of the Central American Isthmus and Mexico. The Regional Office for the Northern Zone in Guatemala and the National Offices provide office and transportation facilities for the technical personnel. Through this structure, IICA maintains close contacts with national institutions and agricultural technicians.

IICA-CTEI, in Turrialba, Costa Rica, has the following facilities:

1. Laboratories with basic equipment for studies in the following fields: soils, plant breeding, plant physiology, plant pathology, entomology, animal physiology, animal nutrition, radioisotopes.
2. Adequate classroom facilities with basic education equipment.
3. A library specialized in tropical agricultural sciences, with about 28,000 books, 50,000 brochures and 3,000 journals.
4. Living quarters and a dining room for technical staff and students.

5. A 1,200 hectare farm of which approximately 600 hectares are utilized for experimentation in animal husbandry and crops.
6. Germplasm bank and legume collection, as well as beef and dairy herds.
7. A Statistics and Computer Center equipped with an 1130 IBM computer and peripheral equipment.
8. A printshop.
9. A mechanics shop and services.

6.2 PERSONNEL

IICA technical personnel from the Northern Zone and CTEI already working in research, education and promotion of the programs is distributed in the following manner:

6.2.1 Pulses Program

Seven technicians at the Ph.D. level and one at the M.S. level.

6.2.2 Beef and Dairy Cattle Program

Six technicians at the Ph.D. level.

7. EXPECTED BENEFITS FROM THE PROPOSED INTEGRAL PLAN

The main benefits resulting from the plan are the strengthening of institutions and the increase in production of basic protein food products for human consumption in the Central American Isthmus and the Caribbean area.

The strengthening of institutions will be achieved through training of personnel and technical assistance for national promotion plans. Various organizations will be involved in the latter process, and should coordinate at least part of their activities toward common objectives.

Increases in production of basic protein foods depend mainly on the action of the countries involved, which is difficult to quantify. The primary goal, amongst others is, for example, to increase bean production from 588 kg/ha, present average for Central America, to approximately 800 kg/ha, the present production obtained in El Salvador. This increase could make up the current production deficiency and lower prices to levels which consumers are able to pay.

Another primary goal is the increase in live weight of animals to be slaughtered, from about 390 kg to approximately 460 kg, or an increase from 200 to 600 kg/ha per year; considering that the cattle population of Central America is approximately 10 million head, an increase in productivity would mean greater availability of beef cattle for national consumption as well as for export.

8. PROPOSED BUDGET

To estimate personnel costs, IICA utilized a so-called 'technical unit', which includes the salary of the senior expert, secretarial help, field and laboratory assistants, field labor, equipment, supplies, transportation and other costs. The unit total comes to US\$ 40,000 per year.

Junior personnel costs of US\$ 15,000 per year include only the salary and that of laboratory or field assistants. Other costs are included in the corresponding senior unit.

9. BUDGET SUMMARY

	<u>Research</u>	<u>Training</u>	<u>Technical Assistance</u>
I. <u>Presently Available - IICA</u>			
A1 - Physical Facilities (buildings, laboratories, residences, fields, cattle, library, computer)	\$ 1,434,227	\$ 956,218	-----
A2 - Personnel			
Pulses Specialists	750,000	50,000	580,000
Bovine Specialists	1,560,000	60,000	100,000
A3 - Budget	3,744,227	1,066,218	680,000
II. <u>Requested</u>			
A11 - Physical Facilities (dormitory space and nutrition laboratory)	20,000	40,000	-----
A21 - Personnel			
Pulses Specialists	1,525,000	450,000	1,000,000
Bovine Specialists	1,835,000	138,000	1,575,000
Budget	3,380,000	628,000	2,575,000
TOTAL COST	\$ 7,124,227	\$ 1,694,218	\$ 3,255,000

BUDGET

9.1 Pulses Program

9.1.1 Research

TECHNICAL UNITS/YEAR	Year					TOTAL	IICA	OUTSIDE SOURCES
	1	2	3	4	5			
SENIOR STAFF								
Plant Breeders	2	2	2	2	2	\$ 400,000	\$ 200,000	\$ 200,000
Plant Pathologist	1	1	1	1	1	200,000	---	200,000
Entomologist	1	1	1	1	1	200,000	---	200,000
Biochemist	1	1	1	1	1	200,000	---	200,000
Nematologist	1	1	1	1	1	200,000	---	200,000
Soil Chemist	1/2	1/2	1/2	1/2	1/2	100,000	100,000	---
Soil Microbiologist	1/2	1/2	1/2	1/2	1/2	100,000	100,000	---
Soil Fertility Specialist	1/2	1/2	1/2	1/2	1/2	100,000	100,000	---
Soil Physicist	1/2	1/2	1/2	1/2	1/2	100,000	100,000	---
Plant Physiologist	1/2	1/2	1/2	1/2	1/2	100,000	100,000	---
Biometrician	1/4	1/4	1/4	1/4	1/4	50,000	50,000	---

(cont.)

TECHNICAL UNITS/YEAR	Year					TOTAL	IICA	OUTSIDE SOURCES
	1	2	3	4	5			
JUNIOR STAFF								
Plant Pathologist	1	1	1	1	1	\$ 75,000	\$ ---	\$ 75,000
Virologist	1	1	1	1	1	75,000	---	75,000
Entomologist	1	1	1	1	1	75,000	---	75,000
Plant Breeder	1	1	1	1	1	75,000	---	75,000
Agronomist	1	1	1	1	1	75,000	---	75,000
Soil Fertility Specialist	1	1	1	1	1	75,000	---	75,000
Soil Microbiologist	1	1	1	1	1	75,000	---	75,000
						2,275,000	750,000	1,525,000

9.1.2 Training

TECHNICAL UNITS/YEAR	Year					TOTAL	IICA	OUTSIDE SOURCES
	1	2	3	4	5			
Education Specialist	1	1	1	1	1	\$200,000	\$ ---	\$200,000
Consultants	3	3	3	3	3	75,000	---	75,000
Fellowships, post-graduate level	10	10	10	10	10	150,000	50,000	100,000
Fellowships for Short Courses, Seminars	15	15	15	15	15	75,000	---	75,000
						\$ 500,000	\$ 50,000	\$ 450,000

9.1.3 Technical Assistance

TECHNICAL UNITS/YEAR	Year					TOTAL	IICA	OUTSIDE SOURCES
	1	2	3	4	5			
Regional Coordinator	1	1	1	1	1	200,000	200,000	---
Official Representatives for IICA	1/2	1	1	1	1	180,000	180,000	---
Production Specialist	3	3	3	3	3	600,000	---	600,000
Economist	1	1	1	1	1	200,000	200,000	---
Sociologist	1	1	1	1	1	200,000	---	200,000
Extensionist	1	1	1	1	1	200,000	---	200,000
						\$1,580,000	\$580,000	\$1,000,000
GRAND TOTAL						\$4,355,000	\$1,380,000	\$2,975,000

9.2. Beef and Dairy Cattle Program

9.2.1. Research

Technical Units/year	Year					TOTAL	IICA	OUTSIDE SOURCES
	1	2	3	4	5			
SENIOR STAFF								
Animal Breeders	2	2	2	2	2	\$400.000	\$400.000	\$ ----
Nutrition specialist	2	2	2	2	2	400.000	400.000	----
Production specialist	2	2	2	2	2	400.000	200.000	200.000
Physiologist	1	1	1	1	1	200.000	----	200.000
Animal Health specialist	-	2	2	2	2	320.000	----	320.000
Economy and Rural Administration specialist	1	1	2	2	2	320.000	160.000	160.000
Agrostologist	2	2	2	2	2	400.000	400.000	----
Ecologist	-	1	1	1	1	160.000	----	160.000
JUNIOR STAFF								
Agrostologist	-	2	2	2	2	120.000	----	120.000
Production specialist	6	6	6	6	6	450.000	----	450.000
Nutrition specialist	2	2	2	2	2	150.000	----	150.000
Physiologist	1	1	1	1	1	75.000	----	75.000
SUB-TOTAL						3,395 00	1,560.000	1,835.000

Scholarships or Grants/year	Year					TOTAL	IICA	OUTSIDE SOURCES
	1	2	3	4	5			
Postgraduate Studies (\$3000 each)	10	10	10	10	10	\$150.000	\$ 60.000	\$ 90.000
Short Courses and Seminars (\$5000 each)	16	20	20	20	20	48.000	----	48.000
SUB-TOTAL						198.000	60.000	138.000

9.2.3 Technical Assistance

Technical Units/year	Year					TOTAL	IICA	OUTSIDE SOURCES
	1	2	3	4	5			
Extensionist	2	2	2	2	2	\$ 400.000	\$ 100.000	\$ 300.000
Production specialist	1	2	2	2	2	360.000	----	360.000
Rural Construction and Equipment specialist	-	1	1	1	1	160.000	----	160.000
Animal Health	-	1	1	1	1	160.000	----	160.000
Education specialist	2	2	2	2	2	400.000	----	400.000
Junior Extensionist	1	2	2	2	2	135.000	----	135.000
Junior Rural Construction specialist	-	1	1	1	1	60.000	----	60.000
SUB-TOTAL						1, 675.000	100.000	1, 575.000
TOTAL						5, 268.000	1, 720.000	3, 548.000