



MINISTRY OF AGRICULTURE & FOOD  
NATIONAL INSTITUTE OF AGRICULTURAL RESEARCH

# Baseline Study of the Peruvian Agricultural Research, Education and Extension System

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Volume i: Summary

BASELINE STUDY OF THE PERUVIAN AGRICULTURAL RESEARCH,  
EDUCATION AND EXTENSION SYSTEM

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## PREFACE

As a developing nation, Peru has been faced with rising food imports of basic food commodities to meet the demands of its young and growing population and to counteract the effects of malnutrition which compromise the future of the country.

The "Baseline Study of the Agricultural Research, Education and Extension System" has been instrumental in identifying the above problem and in determining that proper utilization is not being made of the national resources so as to achieve a higher production of food commodities through available scientific and technological knowledge.

Agricultural Research, Education and Extension are not operating as a coordinated activity and this is the reason for recommending that a Research, Education and Extension System be established to concentrate the few resources available to meet the farmers' needs as well as to increase food production. Likewise the start of a scientific-technological approach is advisable in the Agrarian Sector to contribute to the solution of the food requirements which mankind will face in the future.

This study has been executed under Agreement No. 527-0166 signed by the Government of Peru and the Agency for International Development of the United States Government. Qualified Peruvian specialists have given their collaboration in the different fields involved and adequate advisorship has been provided by a group of experts of the North Carolina State University Mission who are fully acquainted with the problems of agriculture in Peru.

Considering the magnitude of this survey, a summary has been deemed necessary on the basis of the valuable information gathered by nine work teams. The whole material is being published in three volumes: Volume I containing the summary; and Volumes II and III containing complete data from each work team, including the numerous annexes that support their findings. The outline of a short-, medium- and long-term plan is included within the recommendations as a very valuable contribution by a special group.

Among many other studies conducted in the Agrarian Sector with a similar character, the present one has, over a brief period, succeeded in its attempts at determining problems and formulating the most appropriate recommendations to utilize the resources of different institutions through an integral system and to strengthen those institutions such as INIA, the Universities and the Food and Agriculture Ministry which give support and meet the needs of farmers.

As responsible for the coordination of this study, INIA's Executive Direction deeply appreciates the dedication and efforts of all those who have participated in it. A special recognition is expressed to the coordinating and editing teams for their work in trying to accomplish a final document.

These efforts by specialists from Peru and the United States shall not have been in vain if due attention is given to this study by the top-executive level of the Food and Agriculture Ministry. It contains recommendations that lead towards an

improved utilization of national resources to help solve the  
critical food situation of the country.

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## I. INTRODUCTION

### A. BACKGROUND

The present study was carried out under Agreement 527-0166 signed on September 29, 1978, by the Government of Peru and the Agency for International Development (AID) of the United States Government. Originally expiring on May 30, 1979, the Agreement was extended to December 30, 1979.

Financial support in the amount of \$125,423 was provided by AID. Technical assistance was given by a Mission of the North Carolina State University through a Participating Agency Service Agreement (PASA No. AG/0155-1-79) with the U. S. Department of Agriculture and a Contract (No. 53-319R-9-148) with the referred University

Likewise, the Peruvian Government contributed with the amount of 6,036,000 Soles.\* The responsibility for conducting the study was assigned to the Instituto Nacional de Investigación Agraria (INIA) (National Institute for Agrarian Research) in coordination with the Ministerio de Agricultura y Alimentación (MAA) (Food and Agriculture Ministry) and the Consejo Nacional de la Universidad Peruana (CONUP) (National Council of Peruvian Universities).

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\*In 1978 the average conversion rate was 150 soles per dollar and currently the rate is 250 soles per dollar.

B. IMPORTANCE

The current situation of agriculture in Peru implies the obligation of utilizing the available resources in a rational way in order to strengthen existing as well as to establish additional bases that permit a constant technological progress aimed at the fulfillment of future requirements.

Consideration is given to the fact that the actions of Research, Education and Extension are not an efficient help for increasing the agrarian production when performed in an isolated way; whereas, if they were integrated under a system, they would contribute to the development of the agrarian community in a valuable way.

The above implies a need for knowledge of the country's agrarian situation at present, particularly in the fields of Agricultural Research, Education and Extension, as well as for identification of those priorities that should be backed up by the Peruvian Government.

C. OBJECTIVES

1. General Objectives

- a. To provide the Ministry of Agriculture and Food, AID, and other interested national and international entities detailed data and analyses relative to the capacity of Peru's REE institutions and national systems to provide services of the kind, quantity and quality necessary to development

and sustain growth of the agricultural sector in particular and the rural sector in general. Particular attention will be given to policies and programs within the REE system which promise to benefit Peru's poorest rural groups and regions.

- b. To provide a solid basis for evaluating the magnitude of the institutional development task faced by Peru in order to attain agricultural and rural developmental objectives.
- c. To provide a basis for (a) the objective identification of priority opportunities for national and international programs to strengthen REE institutions; (b) the development of a long-term strategy for an approach to bilateral and multi-lateral assistance for strengthening of the REE system, and (c) the determination of the long-run resource demands on the government of Peru on one hand and the U. S. universities and other development agencies on the other.

## 2. Specific Objectives

- a. To obtain information on the quantitative and qualitative capacity of Peru's educational institutions to train agriculturalists and other rural development specialists at all levels.
- b. To assess the capacity of Peru's research institutions to adapt existing technology or develop new technology and to generate economic

and social information required for improved public and private decision-making directed towards improvements in agricultural and rural resource productivity, income levels and income distribution patterns.

- c. To evaluate the capacity of Peru's formal and informal institutional structures to (a) disseminate technical, economic, social and other relevant information in timely fashion and useful forms to farmers and others in rural areas, especially the poor majority, as well as (b) influence constructively the various other strata of public and private decision-makers in the rural and agricultural sectors.
- d. To determine the general magnitude of services which will be required of this set of institutions if agricultural and general development goals are to be met in the short and medium term.
- e. To provide estimates of the magnitude of gaps that may exist between the current and projected capacity of the relevant institutions to provide services and the nation's agricultural development need for such services in particular, and its rural development needs in general.
- f. To suggest appropriate means by which the host government, AID, U S. universities and other

sources of cooperation might contribute to the development of adequate agricultural education, research and extension capacity in Peru.

- g. To indicate the levels of kinds of investments which will be required to remove such institutional constraints as may be identified.

## II. METHODOLOGY

In order to study the REE System an executive committee was appointed that was in charge of designating nine (9) work teams at the national level. Likewise, a coordinating team from INIA and an advisory team from AID were designated. At the local level, seventeen (17) work teams were named to cover the national territory.

An organization and functions manual was prepared for the executive committee and work teams. Experts under contract with AID served as advisors to the work teams at the national level. A work plan was prepared by each one of the work teams at the national level that included specifications of the universe, scope and sources of information required as well as the methodology and budgets for performing the programmed activities. Also, coordination meetings were held among the work teams with attendance and participation by the advisory team.

The statistical data and general information were compiled by means of questionnaires, forms, pools, meetings and personal interviews. Every group prepared a detailed report based on the qualitative and quantitative analysis of the information as gathered.

Towards publishings these findings, an editing team was named which has produced the present document on the basis of the information supplied by the work teams.

The information contained herein refers to the situation existing in Peru with regard to Agriculture and Food; Physical-Biological Research, Socio-Economic Research; Agro-Industrial Research; Agrarian Education and Training; Technical and Financial Cooperation; and Administration, Organization and Structure of the REE System. The contents also include the identification of problems in every area studied as well as relevant recommendations and several annexes.

Most of the gathered information refers to year 1978 and covers both public and private institutions at a national level.

## II. SITUATION

### A. AGRICULTURE AND FOOD

All of the quantitative information available has been gathered that refers to natural resources, crops and breeds, factors in the crop and livestock production, agro-industries, food consumption and nutrition of the population. Also, global indicators have been gathered that refer to the agrarian sector.

#### 1. Natural Resources

Peru has a total territory of 128,521,560 hectares. The crop and livestock units occupy an area of 18,820,277 hectares of which only 3,691,416 hectares are utilized

for crops and sown pastures. Of the latter, 2,361,581 hectares are harvested land and the remainder is fallow land.

A 35% of the farm land is irrigated as follows: 53% in the Coast, 39% in the Sierra, and 3% in the Jungle.

The largest zones of continuous farming are found throughout 53 valleys in the Coast and their irrigation depends on the irregular discharge of the rivers. Dry farming is distributed as follows: 74% in the Sierra, 23% in the Jungle and 3% in the Coast.

As per Dr. Leslie R. Holdridge's "Sistema de Clasificación de las Zonas de Vida del Mundo", 84 life zones and 17 transitional zones are distinguished in Peru within three latitudinal regions: tropical belt, subtropical belt, and warm mild belt.

In a synoptic way, Peru's Ecological Map shows the intricate biological interrelationships of its eco-systems including man and his cultural, social and economic impacts on the national scene.

## 2. Crops and Livestock

According to the 1972 National Crop and Livestock Census, the percentage distribution of irrigated and dry land by principle crops was as follows:

<u>Crops</u>	<u>Irrigated areas - %</u>	<u>Dry areas %</u>
Rice	80.9	19.1
Barley	15.7	83.3
Corn	48.7	51.3
Wheat	18.0	82.0
Potatoes	21.7	78.3
Beans	57.8	42.2
Coffee	9.1	90.9
Pastures	57.8	42.2

3. Factors in the Crop and Livestock Production

Most of the credit available for the crop and livestock units was provided by the Banco Agrario del Peru. In 1972 this Bank supplied credit worth 44,000,000,000 Soles covering 463,200 hectares.

With a coverage of 94% and 88%, respectively, rice and cotton were the commodities most benefited.

Following in importance were corn, coffee, potatoes and wheat.

The largest credits were granted in the Coastal Region where the utilization of technology determines a higher profitability and assures reimbursement of the loans. The latter are granted on the basis of production costs including input expenses, capital goods and labor. It is estimated that 40% of the crop and livestock units employ paid workers, mainly in a seasonal way, for the attention of 55% of the total area occupied by production units.

4. Agro-Industries

Agro-industries reveal the following characteristics: a strong dependence on imported raw materials; a high

economic concentration with the predominance of foreign capital in the manufacture of dairy and milling products, oils and edible fats in addition to enriched and mixed feeds; also, a high demographic concentration in the Metropolis of Lima; and existence of unused facilities. The progress made by the agro-industries will permit that 50% of the caloric and 30% of the protein in the urban diet can come from processed foods.

5. Food Consumption and Nutrition of the Population

These two aspects have not been adequately studied. However, through pool results it has been acknowledged that the nutrition conditions of the Peruvian population are startling, particularly among the most vulnerable groups which are those of children under 5 years and expectant mothers.

In analyzing the consumption of proteins and calories in the Lima Metropolis, a decrease is noticed from 1972 to the present date.

With the object of reducing the nutritional problems in the vulnerable groups, concrete actions have been considered within a short-term Development Plan. These problems originate chiefly in the low income level of the families and become more pronounced in the cities due to the great migratory flow from rural areas to urban areas that results in food scarcity particularly among the underprivileged groups

6. Global Indicators in the Agrarian Sector

For the last 25 years the Peruvian Economy has been increasing at over a 5% annual rate. During the first decade, agricultural production played a significant role with its commodities for the export trade. When the sixties started, the Gross National Product began receiving larger contributions from the Industrial Sector that took the place of export agricultural production.

From 1960 through 1976, the economy grew at the approximate rate of 5.3% annually accrued as a result of chief contributions from the growth rate attained in the Industrial Sector (7.1%) and the one attained in the Services Sector (5.8%). Meanwhile, the Agrarian Sector only reached a 2.9% rate that was below the rate of population growth (3.1%).

During the sixties and the first years of the 1970 decade, Peru had a favorable balance of trade due to the spectacular rise in the value of its mining and fishery exports.

The growing difficulties in the international markets for raw materials generate a loss in the value of Peruvian exports, particularly of crop and livestock commodities.

B. AGRARIAN RESEARCH

1. Physical-Biological Research

Oriented towards evaluating the capacity of national institutions and towards identifying their requirements, a diagnosis has been made of the research activities performed throughout 1978 on crops, livestock, forestry, wildlife, water and soils.

Prior to 1978, physical-biological research for the purposes of agrarian development, took place in different branches of the Ministry of Agriculture and the Ministry of Food. As of July that year and through the Organizational Law of the Agrarian Sector, these two Ministries were merged under the present Ministry of Food and Agriculture, and the National Institute for Agrarian Research (INIA) was created to be in charge of conducting research on crops, livestock, forestry and wildlife, agro-industries and water and soils resources. In this sense, INIA was assigned the following functions:

- To plan, direct, execute and evaluate research and experimentation on crops, livestock, forestry, wildlife, agro-industries, and water and soils resources, within the Public Agrarian Sector;
- To propose norms as may be necessary in order to promote and systematize the agrarian research and experimentation that private or public persons may carry out;

- To detect the needs for agrarian and agro-industrial research and experimentation;
- To promote and/or execute applied research that leads to the improved utilization, preservation and processing of agrarian commodities; and that leads, also, to the development of agro-industries;
- To supply the findings of agrarian research and experimentation to the agents and media of technology transfer;
- To carry out socio-economic studies aimed at reaching an optimum utilization of the agrarian agro-industrial research;
- To coordinate with other public and non-public agencies the best way of utilizing such resources as are locally available for research, and
- To provide for formation, training and upgrading of personnel in the diverse specialties which fall under INIA's scope.

The Universities with academic programs in agronomy also conduct physical-biological research, in addition to their main function which is that of teaching.

a. Research on Crops and Livestock

This research was formerly conducted by the General Direction of Research (DGI) and now has been undertaken by INIA. At regional level, it was carried out through four Regional Research

Centers (CRIAs), presently called Centers for Crop and Livestock Research (CIAGs). At local level, the research was conducted through 14 Experimental Stations and 29 Experimental Sub-Stations, all of which are under INIA (see map B1).

b. Research on Forestry and Wildlife

Information on research of this type dates back to 1963 when activities were initiated through the Institute for Forestry and Wildlife Research with participation by the Ministry of Agriculture (Forestry and Wildlife) and the National Agrarian University. The activities focused on the formation of personnel, the knowledge of forestry resources, and forestry pathology until 1970 when research was actually developed upon the introduction of species (see map B2).

Similar actions have been carried out in the National Agrarian University since 1976 through the Program of Forestry Sciences. Research of this type has also been conducted by the Ministry of Agriculture, specifically by the former Forestry and Wildlife Direction through its Centers for Forestry Research and Training, located at Pucallpa and Cajamarca and created by the Law of Forestry and Wildlife. The referred Direction

presently operates as the Direction for Forestry and Wildlife Research under INIA and has two Research Centers for Forestry and Wildlife (CIFFs) - one located in the Sierra and the other located in the Jungle - which are considered as the agencies in charge of coordinating forestry research at a national level.

c. Research on Water and Soils

Water and soils resources have been studied for over 40 years in Peru though in a disperse and discontinuous way. The studies have been made by different agencies, many of which received support from foreign organizations.

The research on water resources has chiefly taken place in the Coast and has been oriented to the search of information to improve the efficiency of watering, as well as to studying the water-soil-plant relation, the interaction between water and other elements of production, the drainage of farm lands, and the use and utilization of underground and sewage water.

Insofar as soils research is concerned, this has particularly focused on soil fertility while detecting the reaction of main crops to the use of fertilizers besides evaluating the fertility through chemical analysis.

Studies have also been made on soil morphology and classification. Research has also progressed on the handling of tropical soils. Preference has been given to the conduction of trials for the handling of saline soils and for the control of erosion inasmuch as the latter is a major problem in Peru.

d. Financial Resources

In 1978, the Ministry of Food allocated the amount of 429,850,000 Soles for the activities of crop and livestock research. Said amount represented 8% of the Ministry's budget and a 0.15% of the Nation's Budget. Due to the budgetary cuts, the amount of 370,672,369 Soles was spent during that fiscal period which reduced the above percentage to 0.12%.

During 1978, the Ministry of Agriculture also allocated the sum of 232,407,560 Soles for the activities of forestry, wildlife, water and soils research, as well as for other activities.

Information received from eight Universities indicates that the sum of 503,173,866 Soles was spent from their budgets; however, some of them had included in the research figures the total expenditures corresponding to other activities.

Further, private organizations spend the amount of 86,310,874 Soles for crop and live-stock research.

e. Human Resources

The Ministry of Food (DGI-CRIAs) was staffed with 39 researchers who had high academic degrees: 33 Masters and 6 Ph.Ds.; 218 professionals and bachelors of sciences, 109 technicians, and 302 administrative workers, all of whom represented, respectively, about 6%, 32%, 16% and 45% in the whole number of personnel.

Information is incomplete from the other institutions engaged in research and so cannot be used for comparative purposes.

The following table illustrates the time of service in research activities:

Ministries and Universities	No. of Researchers Percentage	Number of Years
Ministry of Food (DGI-CRIAs)	34 %	0 - 5
	36 %	6 - 10
	11 %	11 - 15
	7 %	16 - 20
	5 %	21 - 25
	5 %	Over 25
Ministry of Agriculture (DIFF-CIFFs) (Sub-Dirección de Investigación de Aguas y Suelos) (Other Branches of the Ministry)	81 %	0 - 5
	100 %	0 - 5
	95 %	0 - 5
Universities	41 %	0 - 5
	20 %	6 - 10
	28 %	11 - 15
	6 %	16 - 20
	3 %	21 - 25
	1 %	Over 25

The table that follows refers to the salaries earned by researchers:

Ministries and Universities	No. of Researchers	Salary in Soles per Month
Ministry of Food (DGI-CRIAs)	44 %	21,000 - 30,000
Ministry of Agriculture (DIFF-CIFFs) (Sub-Dirección de Investigación de Aguas y Suelos)	49 %	Over 30,000
	7 %	19,000 - 20,000
Universities	34 %	Over 30,000
	43 %	21,000 - 30,000
	21.2 %	10,000 - 20,000*

\*Only the basic remuneration has been considered in this particular case.

As regards the knowledge of foreign languages by research personnel, that of English predominates in every institution.

f. Infrastructure

- Trial Fields

A total of 69,712 hectares was used for trial fields. Of these, 3,283 hectares corresponded to CRIAs, 1334 to CIFFs, 3 hectares to the Sub-Dirección de Investigación de Aguas y Suelos, and 415 to other branches of the Agriculture Ministry; while 64,408 hectares corresponded to the Universities, and approximately 267 hectares belonged to private organizations.

- Machinery and Equipment

As per information available, about 50% of the tractors, other machinery and transportation vehicles at the CRIAs and at the Universities were in semi-working and non-working conditions due, chiefly, to the lack of repair parts and maintenance servicing.

- Facilities

In general, the greenhouses, offices, warehouses and stables are run down. The laboratories are in good condition at some of the Experimental Stations and at every University.

Some laboratories are not in use mainly because of the lack of personnel, work material and repair parts.

- Library

Bibliographic material in all of the institutions engaged in research is updated merely in a proportion of 20% and this is due to the lack of financial resources for purchasing books and subscriptions.

g. Interinstitutional Coordination at National (Public and Private) and International levels

Coordination between the national and international institutions has not been adequate to optimize the resources available for the interchange of information.

However, coordination has indeed been more adequate among the researchers through meetings on general subjects, congresses, seminars and meetings on special subjects.

For research on livestock, flour, corn and beans, respectively, actions have been performed under national agreements signed by the General Research Direction, the CRIAs, the Universidad Nacional Mayor de San Marcos, and the Universidad Nacional Agraria Pedro Ruiz Gallo.

Insofar as international projects are concerned, a pattern has not existed to set out coordinated, well-defined goals benefiting the country.

h. Findings

Results of research programs are available for the following commodities: rice, corn, wheat, sorghum, beans, soybeans, potatoes, sweet potatoes, yucca, bananas, cotton, alfalfa and tropical pastures; and also in the breeding of guinea pigs, cattle, poultry, alpacas, sheep, etc. These findings can be used by the producers.

i. Experiments Conducted during 1978

Emphasizing agricultural activity, the Public Sector was the largest contributor to the 1,693 experiments that were performed during 1978.

- The major part of the research work took place in the Coastal Region with the Sierra and Jungle Regions following.
- Most of the experiments relating to agro-industrial commodities were conducted by the Public Sector while the Private Sector gave a preference to industrial crops: sugar cane, and cotton.

- The following is a summary of the number of projects for the most important commodities:

Cereals	Tubers and Roots	Legumes	Oil Crops	Industrial Crops
Corn : 164	Potatoes: 113	Beans : 66	Soybeans: 46	Cotton*: 102
Rice : 106		Lima beans : 12		Sugar cane* : 148
Wheat: 98		Lupine: 8		

\*The Public Sector gave a preference to cotton while the Private Sector gave its preference to sugar cane.

- The majority of livestock research was conducted by the Public Sector (Universities and CRIAs) mainly on pastures and fodder, and on cattle, sheep, alpacas and guinea pigs.
- The line of improvement of crop protection, cultural practices and fertilizers predominated among the agricultural research made by the Public Sector.
- Forestry research has been conducted solely by the Public Sector, with an emphasis on silviculture.

j. Improved Seeds

Seeds were produced and distributed by the Public Sector (CRIAs and a few Universities) as well as private enterprises and self-producing farmers. The highest quantities of tuber and root seed (potatoes) and cereal seed (rice, wheat and corn) were produced and distributed by the CRIAs.

k. Planting Stock

Such stock was produced and distributed by both public and private sectors on a limited scale. Led by the CIEFs and the Centro Nacional Vitivinícola, the major production was that of forestry seedlings. In their turn, the Universities produced most of the fruit seedlings.

l. Livestock

Cattle, sheep, pigs, quinea pigs, rabbits and poultry were mainly produced and distributed by public organizations but the latter did not fulfill the enormous demand of the livestock raisers.

m. Dissemination of Findings

Research findings have not been disseminated at the corresponding levels quickly or in sufficient proportion due to the unavailability of specialized personnel, equipment and financial resources.

Hence, because of the lack of an information system, the results of research have not reached the farmer.

2. Socio-Economic Research

Research of this type consists of studies which deal with agrarian and rural problems, date back to the late part of last century and share the characteristic of lacking in systematization.

The boom of socio-economic studies started in 1969 upon implementation of the Agrarian Reform Law. A number of official and private organizations emerged then with the intention of analyzing the agrarian problems, while some of the Universities established programs and conducted events with a similar purpose. Later on, the socio-economic studies focused on the subjects of physical-biological research on crops and breeds and gave a greater emphasis to the factors limiting production and productivity as well as to the optimum use of factors for crop and livestock production, the identification and assessment of technological levels, and the creation and adoption of a crop-livestock technology.

At present, the socio-economic studies on agrarian problems are conducted by a number of official and private institutions, national and or/private universities, and individual researchers. The orientation of these studies depends on the type of institution involved as well as on its set objectives and the particular interest of its own researchers.

At all institutions, during the 1968-1974 period, priority was given to the analysis and interpretation of the agrarian problems. Public institutions were the ones that gave highest priority to this line of research in view of the need for diagnoses in order to enforce the Agrarian Reform Law.

During the 1975-77 period, the above priority was kept up at the level of private institutions while at the Universities other studies were initiated such as those on migration, crop and livestock production, marketing, rural activities, and income.

Since 1973 the institutions have become interested in studying the planning and development of rural areas as well as the agrarian production and economic indicators.

Throughout the 1968-78 period, 364 studies were carried out in the following proportion: 72.3% by official institutions, 11% by private institutions, 15.6% by national universities, and 1.1% by private universities.

In conducting socio-economic studies in the Agrarian Sector, the lack of qualified personnel has been a limiting factor that contributed to reduce the number of research activities. Other limiting factors have been those of the lack of dissemination of findings and the lack of an information system.

As verified, the personnel in charge of performing the socio-economic studies have been mainly composed of technicians in different specialties and in this proportion: Agronomists: 35%; Economists: 21%; Sociologists and Anthropologists: 25%; and Teachers, Lawyers and Psychologists, etc.: 19%.

### 3. Agro-Industrial Research

The efforts to carry out agro-industrial programs were initiated in 1965 with the "Programa de Alimentos Populares" (Program for Popular Food) at the Universidad Nacional Agraria. The General Law of Industries and the legal provisions supplementing it assigned a first priority to the Empresas Productoras de Tecnologia Industrial for the conduction of programs of industrial research and development, while assigning a second priority to the industries that were engaged in producing essential popular goods related with food.

The work done refers to the part of agro-industries that is related to the manufacture basic food products; the development and implementation of which was given priority.

The development of agro-industries is considered to be not only advisable but also necessary in this country because it stands for more job opportunities and for a better standard of living among the rural population. There is a broad potential for developing the food industry that, if exploited, would permit overcoming current limitations such as the demographic and economic concentration existing in metropolitan Lima; the predominance of foreign investment in the manufacture of dairy and milling products, oils and edible fats, and mixed feeds; and also the increasing use of imported raw material.

For the past 25 years, a series of actions have taken place through the Universidad Nacional Agraria and the Instituto de Investigaciones Agro-Industriales that chiefly comprises the following:

- Basic and applied research on a laboratory and pilot plant scale for the utilization, preservation and processing of agricultural, livestock, forestry and fishery commodities;
- The study of new procedures and methods to make a rational utilization of the Agrarian Sector resources; and
- A Plan for professional formation and training in the food industry to manage, study and develop such technology as may suit the local reality.

To develop their projects of technology research, some enterprises and institutions are using the amount of 2% from their net income. In accordance with legal provisions, every industrial enterprise must deduct such amount and establish with it a research fund. The latter is to be directly managed by the Institute de Investigación Tecnológica Industrial y de Normas Técnicas (ITINTEC) if the enterprise does not make use of it.

According to the General Law of Industries, whether individually or jointly, enterprises can execute programs of technology research utilizing either their own research services or similar services

of other public and private organizations engaged in this type of work, the requisite being that they must have ITINTEC's approval and supervision.

C. AGRARIAN EDUCATION AND TRAINING

1. Agrarian Sciences and Social Sciences Education

Higher education in the agrarian sciences and social sciences is included within the Peruvian Education System since the latter comprises three levels: primary, secondary and higher education.

Higher education consists of three types that are closely interrelated for the educational task although each one is complete by itself with its own objectives. A brief description is offered below:

- The first type, imparted at the Escuelas Superiores de Educación Profesional (Higher Schools for Professional Education), leads to a Bachelor's degree;
- The second type, imparted at the Universities under the Peruvian University System, leads to either a License or a Professional Title; and
- The third type, which according to the existing legislation is to be imparted at the Instituto Nacional de Altos Estudios (National Institute for Advanced Studies) and Universities under the Peruvian University System, leads to either a Master's or Doctor's degree.

The Peruvian University System is composed of 33 Universities (23 public and 10 private), one directing and coordinating Agency (Consejo Nacional de la Universidad Peruana-CONUP), and several Regional Councils.

The Universities, public and private, are distributed throughout five Regions: 6 in the Northern Region; 16 in the Central Coast; 4 in the Central Sierra; 2 in the Eastern Region; and 5 in the Southern Region (see map B3).

In 1978 there were 212,924 students enrolled. Included in this figure were 42,087 new students from a total of 196,367 applicants. The number of faculty members was 13,384.

a. Education in Agrarian Sciences

a-1. Higher Level: University Education

This level is represented by the Academic Programs (Faculties of Agronomy, Animal Science, Veterinary Medicine, Forestry Engineering, Agricultural Engineering, Food Industry, and Agricultural Economics). Further information is offered in the following table:

Total Number of Programs for Agrarian Sciences  
Education at University Level, 1978

<u>Academic Program</u> <u>Number and Name</u>	<u>Number of</u> <u>Students</u> <u>Enrolled</u>	<u>Number of</u> <u>Graduates</u>	<u>Number of</u> <u>Professors</u>
14 * Agronomy Programs	7,109	662	446
7 Animal Science Programs	2,552	116	172
5 Veterinary Programs	1,305	112	149
2 Agricultural Engineering Programs	1,759	70	106
3 Forestry Programs	1,336	39	90
4 ** Food Science Programs	912	33	58
7 *** Fishery Programs	2,764	229	

- \* Of the 14 Programs, 12 are operating and 2 are being implemented.  
\*\* Of the 4 Programs, 3 are operating and 1 is being implemented.  
\*\*\* Of the 7 Programs, 3 are dedicated to Fishery Biology.

In all of the Academic Programs for Agrarian Sciences, studies last 10 cycles and average 200 credit hours. Upon completion of these cycles, a Bachelor's Academic Degree is granted mentioning the specialty. After presentation and approval of a thesis, an Engineer's Professional Title is conferred mentioning the specialty as well. Professional Titles of Veterinarian and Fishery Biologist are granted in the respective cases of Veterinary and Fishery Biology studies.

Under the Peruvian University System only one Academic Program exists for post-graduate studies that confers a Master's degree in diverse specialties and is located at the National Agrarian University.

a-2. Middle Level: Technical Education

As a result of additions made in the Educational Reform Law in March 1972, most of the Institutos Nacionales Agroupecuarios (INAs) (National Institutes for Crops and Livestock) that trained Technicians at a middle level have disappeared. Some of these Institutes have been turned into Centros Educativos de Básica Regular (Centers for Secondary Education) while just a few of them have become Higher Schools for Professional Education (ESEPs). Relevant information is given below:

- Prior to 1978 there were 20 INAs (during that year practically none of them operated). There were 6,260 students and 226 professors. Number of graduates was 718 Technicians. Complete studies lasted 5 years.
- There are 13 ESEPs which confer a Professional Bachelor's degree mentioning the specific specialty. Complete studies

last 3 years throughout six cycles.

There are 3,140 students and 118 professors. The number of graduates from 3 of these ESEPs is 108 Bachelors.

b. Education in Social Sciences

The following information refers to the Academic Programs (faculties) for Social Sciences Education under the Peruvian University System. In all of these Programs studies last 10 cycles. Upon completion of the latter, a Bachelor's Degree is granted mentioning the specialty.

In addition the preceding, other aspects have been examined such as the following:

- Academic Level of the Professors

Studies made by the Professors, i.e., their degrees and titles, serve as the yardstick for measuring their academic level. Accordingly, only 260 Professors are post-graduates among the group of 1,684.

There are 106 post-graduates (Master's and Ph.D's) in a total of 446 Professors at the Agronomy Programs; 9 post-graduates in a total of 172 Professors in Animal Science Programs; and 28 post-graduates in a total of 263 Professors at the Economic Programs.

- Academic Experience of the Professors

The number of years in teaching is another yardstick for measuring academic experience. Among the group of 1,684, experience rates as follows: 731 Professors, 0-5 years; 426 Professors, 5-10 years; and 527 Professors, over 10 years. In the Agronomy group of 444 Professors, 158 shows 0-5 years; 122 show 5-10 years; and 164, over 10 years.

- Knowledge of Foreign Languages by the Professors

Of the 1,684 Professors, only 264, i.e., 15.7% have foreign language capacities.

- Economic Standing of the Professors

Up to 1978, Professors at the Agrarian and Social Academic Programs in Peru were paid according to a promotion and incentive structure. The latter oscillated between 11,800 Soles per month, at its lowest point, and 29,400 Soles, at its highest point.

Finally, additional information was obtained on opinions of University teachers and authorities with regard to the following: number of Universities; types of professionals; infrastructure requirements; equipment, library, human and financial resources; curricula; extent of involvement in politics among the students and its effects on the institutional work; and needs for training professionals at a middle-level.

Total Number of Programs for Social Sciences Education at University Level, 1978

Data referring to the Academic Programs in general			Data referring to the Academic Programs surveyed			
Name of the Academic Program	Professional Programs	Titles granted	Programs surveyed	Number of Students	Number of Graduates	Number of Professors
ECONOMIC PROGRAMS						
	18	Economist				
	2	Economy Licentiate				
	2	Engineer-Economist	8	6,884	531	263
POST-GRADUATE PROGRAM						
	1	Master in Agricultural Economics				
SOCIOLOGY PROGRAMS						
	10	Sociology Licentiate				
	2	Sociologist	5	2,701	138	100
ANTHROPOLOGY PROGRAMS						
	7	Anthropology Licentiate Anthropologist (Title includes specialty)	5	1,234	72	92
SOCIAL SERVICE PROGRAMS						
	5	Social Worker				
	1	Social Service Licentiate				
SOCIAL WORK PROGRAMS						
	3	Social Work Licenciante	4	1,855	168	41

2. Rural Education for the Producers

For the purpose of evaluating rural education for the producers, data were gathered from the 13 Zonal Offices of CENCIRA - Centro Nacional de Capacitación e Investigación para la Reforma Agraria (National Center of Training and Research for Agrarian Reform) throughout the country.

Questionnaires were used in this attempt. Also, informal interviews were held with Directors of CENCIRA, and with beneficiaries of the educational services as well as with members of the Educational Committees in the associated crop and livestock Enterprises.

The information obtained refers to institutions that served as observation units in the following proportion: 401 Enterprises and 1 Public Agency, in the Agrarian Sector; 1 General Direction, in the Educational Sector; 1 Program in the Health Sector; 1 National Commission in the Social Property Sector; and 15 organizations in the Private Sector.

Most of the financial resources available to CENCIRA are provided by international organizations. However, limitations in the national counterpart have restrained the major significance of these contributions.

Audio-visual aids and a closed television circuit are used in the training activities. Towards this end, CENCIRA has six audio-visual production units in

different locations throughout the country, and also 35 modules for audio-visual utilization in the rural areas.

At the time of the survey, there were 19,790 direct beneficiaries of these educational services who represented 5.4% of the rural producers benefited by the Agrarian Reform Law.

The main lines of training were those of farm management, crop and livestock technology, planning and development, and training methods and techniques. The most important among these lines was that of crop and livestock technology with a 35.7% in the number of events conducted. Peasants made up 92% of the participants at these programs.

The following are included among the private institutions that have supplied educational services in addition to CENCIRA's: Instituto de Educación Rural (Institute for Rural Education), Acción Comunitaria (Community Action), Fondo de Fomento de la Ganadería Lechera (Fund for Development of Milk Cattle), Instituto Peruano de Estudios Cooperativos (Peruvian Institute for Cooperative Studies), Instituto Peruano de Fomento Educativo (Peruvian Institute for Educational Promotion), Instituto Internacional de Investigación y Acción para el Desarrollo (International Institute of Research and Action for Development), etc.

Educational Committees had been established in just 73% of the 401 Associated Enterprises where their existence is a legal obligation. On the other hand, only 17% of such Enterprises performed educational actions for the farmers which may be a reflection of the limited support given to the Educational Committees by other departments in the enterprise.

D. AGRICULTURAL EXTENSION

In order to evaluate the capacity of the Food and Agriculture Ministry in relation to Agricultural Extension activities, an analysis has been made of 1,047 questionnaires that were answered by personnel working at the regional, zonal and local levels. The three groups surveyed include 13 Regional Deputy-Directors, 304 university graduate professionals, and 730 mid-level technicians.

This evaluation covers the 13 Agrarian Regions which divide the country's territory. It also covers 95% of the personnel currently engaged in the Crop and Livestock Production System (Decree-Law No. 21169) who are directly responsible for assisting the producers in the efforts to increase both production and productivity.

1. Survey Analysis: Regional Deputy-Directors Group

- The position of Regional Deputy-Director is held by professionals who have an academic degree. The

majority of these professionals have served over 10 years in the Ministry but some of them have neither previously performed jobs relating to Extension nor have received Extension training and/or guidance.

- Depending on the possibilities existing at each Agrarian Region, short technological courses have been carried out to train the personnel on crops programmed by the Crop and Livestock Production System. The training in Agricultural Extension has been merely collateral and confined to serve as a refresher of Extension methodology within the curricula.
- A coherent method is not applied in the process of technological transfer in which those surveyed participate. This work is done under the false premise that all of the personnel have full command of Extension methodology.
- Extension work is not likely to make a significant contribution in disseminating new techniques without substantial support from complementary actions such as credit, machinery, seeds, etc.
- Answers from the Deputy-Directors are very positive when pointing out that the farmers do participate in setting crop priorities as well as in planning and conducting the Crop and Livestock Production System.

- The Regional Deputy-Directors maintain relationships with the Experimental Stations to secure the use of improved seeds as well as the participation of specialists in preparing technological packages and in training those technicians who handle Extension actions.
- The Crop and Livestock Production System is erroneously thought of as "Agricultural Extension System."
- The personnel who handle the Production System are over-utilized in other activities alien to the formal programming, to completion of crops and livestock plans and Extension activities.
- All of those surveyed state that the Extension activities can be substantially strengthened by providing the personnel with training and guidance for the use of technological packages and Extension methods.
- The Crop and Livestock Production System does permit a prioritization of the crops and a rationalization of the use of scarce public resources. Nevertheless, a need exists for providing the involved institutions with an adequate implementation, and also for strengthening the producers organization to attain better participation from them.

2. Survey Analysis: University Graduate Professionals Group

- This group is composed of Agronomists, Veterinarians, and Livestock Technicians who have served in the civil service a number of years varying from 3 to 25. Their experience prior to their current positions refers to functions as Production Agents, Specialists on specific crops, Chiefs of Rural Agencies, and Managers of Agrarian Cooperatives. The highest percentage in this group applies to those having under 10 years experience.
- The number of mid-level technicians working under these professionals is not rational and presents extreme fluctuations. Likewise, the salaries of the latter do not bear any relation to the concept of equal pay for equal work.
- The official capacity for supplying Extension services is quite limited in comparison with the public's demand and requires a strong implementation to cover the geographical scopes and large number of producers involved.
- The farmers are greatly interested in every technological innovation or use of resources which might permit them to obtain higher yields and profits.
- Work in the field is faced with limitations that originate in the following ways: administrative centralization, lack of transportation, insufficient

credit assistance, lack and shortages of communications media, lack of personnel training, and unavailability of equipment, pamphlets or brochures, audio-visual aids and other resources to put Extension methodology into practice when there are high rates of illiteracy.

- In performing the transfer of technology, Extension methods are used in a casual form without following a logic in strategy or procedure; they do not realize that such methods can be effective tools in changing farmer attitudes.
- The majority in this group have not received Extension training and neither do they receive any on-the-job-training. A need is expressed by them for training in Agricultural Extension and in crop and livestock technology.
- A high percentage maintain contacts with the researchers and Experimental Stations, and the knowledge thus acquired has useful application in their operations. Technical information is collected by them mostly through magazines, radio and newspapers; and on a very limited scale through pamphlets, bulletins or other means.
- There is no programmed or particular work with the rural youth and homemakers. Nevertheless, a high percentage mentioned that the work with rural youth is necessary.

- These professionals work with "born leaders." However, utilization of the latter is neither systematical nor permanent, and they do not receive adequate training.
- The administrative support is neither adequate nor timely for the field actions but rather a constraining factor.
- Most of them says that the Extension activities should be located within the General Agricultural and Livestock Direction of the Food and Agriculture Ministry.

3. Survey Analysis: Mid-Level Technicians Group

- The components of this group are those who work as assistants to the university graduate professionals and who work directly with the farmers. Their education ranks at a middle level with a predominance of crop and livestock technicians. The majority in this group have less than 10 years in the civil service.
- A great variability exists in the number of production units and areas under the care of each one of these technicians, depending on the regions, the crops and the livestock involved. The attention they supply is limited by the lack of transportation as well as the lack of equipment, in addition to the scattering of production units, the predominance of small holdings and the deficiencies of communications media.

- Some methods of Extension are used but without the systematical order that is required for achieving the desirable results. Also, they spend a large portion of their time in other actions noncompatible with Agricultural Extension.
- The majority of these technicians identify the Crop and Livestock Production System as an "Agricultural Extension System." There has not been appropriate training on the philosophy, objectives and methodology of Extension.
- The majority of them do not maintain any relationship with the researchers and do not know the Experimental Stations. They do not receive technical information to be applied in their work and just a few become informed through magazines, radio and pamphlets.
- To improve field operations, higher salaries are required for these technicians along with training in Extension and in Crop and Livestock Technology in addition to the need for equipment, travel allowances, transportation means and pamphlets or brochures.
- They mention that they work sporadically with rural youth and never with rural homemakers.

- In their operations they utilize "volunteer leaders" but the methodology to work with these lacks continuity.
- Most technicians point out that Agricultural Extension should be located within the General Agricultural and Livestock Direction.
- Salaries are insufficient and have not kept up with costs of living over the last 10 years for professional, research, teaching, technical and administrative personnel engaged in developing agriculture. This is an impediment in retaining them and also in compensating and encouraging them adequately for their work.

F. TECHNICAL AND FINANCIAL COOPERATION

1. International Technical Cooperation

In Peru, international technical cooperation (ITC) is regulated by Decree-Law 18742 of January 1971 which defines it as a complement for the national efforts as well as responsive to the country's needs and interests in accordance with Governmental policies.

The agencies responsible for ITC operations are the Ministry of Foreign Affairs, at the international level; the National Planning Institute, at the national level; and the Sectoral Planning Offices in the Ministries, at the sector level.

In 1978 within the non-university Agrarian Sector, 63 Projects were carried out with help from 20

international sources; and, in 7 Universities, 10 Crop and Livestock Projects were conducted with help from 6 international sources. These sources contributed, in the first case, 3.173 million Soles, and, in the second case, 235 million Soles while the Peruvian contributions were, respectively, 1,579 million Soles and 148 million Soles.

At present, 26 Projects are being negotiated on technical cooperation from 9 sources. As estimated, their contributions will amount to 2,325 million Soles and that of the national counterpart will amount to 1,102 million Soles.

Upon analyzing the information that refers to ITC Projects, the following is determined:

- The number of these Projects is considerably high and most of them do not have a priority. For this reason, proper attention cannot be given to them through the existing capacity of the institutions involved.
- Reasons for this high number are, among others, the inadequate coordination at the Agrarian Sector which results in duplicate actions and the lack of a Project-evaluation.
- Likewise, other problems derive from the above such as: lack of dissemination of the ITC results; in some cases, presence of experts in the country who do not meet the necessary conditions; monitoring of

national projects by ITC; inconsistency between the destination of resources and the Government's policy for development of the underprivileged zones; and lack of attention to the agrarian research since a mere 15% of the ITC resources has been allocated to it while the remaining 85% has been allocated to education and extension.

- Technical cooperation provided by some of the Western countries is non-reimbursable. Some 60-70% of it is utilized for paying the personnel who come to Peru while the remaining 30-40% serves for training and grants.
- Technical cooperation as provided by other countries is reimbursable and its cost is quite high. Little utilization is made of such sources in Peru due to lack of knowledge and experience in their technology.
- Diverse ITC sources offer scholarships which are not utilized into a great extent due to their untimely publicity and the long bureaucratic procedure involved in approval. Despite this, during 1978, 99 professionals of the Agrarian Sector were trained as follows: 67% in the American Continent, 19% in the European Continent, 13% in the Near East, and 1% in the U. S. S. R.

- A long-term program for technical training is missing in the Agrarian Sector. Neither do attractions or incentives exist to retain professional personnel that is highly qualified.

## 2. International Financial Cooperation

The legal base for external borrowing conducted by the public entities in Peru is Decree-Law 18281 of March, 1970, and the agency responsible for approving every program is the Ministry of Economics and Finances.

In the Agrarian Sector, 20 existing projects amount to 157 million Soles that have been financed by countries such as Holland, People's Republic of China, Switzerland, Yugoslavia, United States (AID) and the Federal Republic of Germany; by international organizations such as BID and World Bank; and by multinational consortiums and Soviet enterprises.

Upon analyzing the information that refers to IFC Projects, the following is determined:

- Of the above sum, 77.6% has been allocated to conduct 8 irrigation projects and 22.4% has been allocated to promote and develop crops and livestock. This cooperation will permit the following: to enlarge the agricultural frontiers by 303,000 hectares; to improve irrigation in another 313,000 hectares; to finance a milk-plant program; to import dairy cattle; and to establish rural settlements in the Central Hualлага area.

- External indebtedness of the Agrarian Sector is mostly oriented towards irrigation. The latter is chiefly located in the Coastal Region where farm land is limited and where the use of existing technologies and the adaptation of new technologies are feasible.
- In contrast, IFC attention has not yet been given to regions that have a rich potential of natural resources, as occurs with the Jungle that has over 60 million hectares.
- Procedures for the approval of international financial cooperation are long, troublesome and last no less than 3 years.

3. Cooperation between the National Institutions

Aimed at obtaining technical cooperation and/or supply of services in the areas of agriculture, livestock, agro-industries, forestry and wildlife, the official entities, Universities and Higher Schools for professional education (ESEPs) sign agreements and contracts among them and also with Agrarian Production Cooperatives and private agro-industrial and agrarian enterprises.

This important pattern of inter-institutional cooperation is becoming more and more popular in Peru and it indicates that Agrarian Sector development is being accelerated for better utilization of available resources.

F. ADMINISTRATION, ORGANIZATION AND STRUCTURE OF THE  
AGRICULTURAL RESEARCH, EDUCATION AND EXTENSION (REE) SYSTEM

Support received by the institutions that are engaged in agricultural research, education and extension has been traditionally small; during the last ten years, the Peruvian Government has been intent on consolidating the Agrarian Reform Process as one of its priorities.

A common characteristics in the referred institutions is the loss of qualified and experienced members of their personnel due to the fact that they look for better-paying positions in other Sectors and in other countries. Other common characteristics are their lack of infrastructure to become more functional and the scarcity of financial resources to improve their performance and services.

Maximum advantage is not taken of the international technical cooperation in the sense of technology and information available. On the other hand, international institutions and agencies whose technology requires adaptation to the local conditions are willing to cooperate with the national programs. Rapid results can be demonstrated by many of the technological advances of an international dimension if these are adapted to local conditions.

Based upon the diagnoses made by the work teams of the "Baseline Study of the Agricultural Research, Education and Extension System," an outline has been developed for the implementation of a 10-year Program including strategies

to change the present situation through actions and programs of high visibility. The mentioned outline is part of the recommendations chapter in this document.

### III. MAIN PROBLEMS

#### A. AGRARIAN RESEARCH

##### 1. Physical-Biological Research

- a. Appropriate mechanisms did not exist prior to 1978 for the integration of physical-biological research carried out by the DGI, Universities and private entities.
- b. There is a permanent exodus of highly qualified personnel due to the restrictions in research support, due to budgetary limitations and the absence of incentives for specialization.
- c. There are limited numbers of personnel with academic training and experience in research. Their salaries, also, are extremely low. The proportion is not significant of those professionals who have foreign language capability.

The researchers, in a considerable number, perform functions that are alien to their vocation and/or training as happens to be the case with the few of them who have advanced degrees yet perform administrative tasks.

- d. The majority of the Experimental Stations and Sub-stations, lack the total support system to conduct research.

- e. Some of the laboratories are not being used due to the lack of personnel and research support.
- f. Services rendered by the libraries are not adequate because the bibliographic material is outdated.
- g. No system exists for transmitting verified findings of research to the producers.
- h. The sectorial office for agricultural planning (OSPA) seeks to maximize production based on current consumption problems. The research entities seek improvements or alternatives to current practices. Therefore, there exists a conflict in the allocation of financial resources for research and support of research capacities.
- i. Proper support has not been given to the use of indigenous species in the Sierra and Salva, studies in soil and water conservation, and socio-economic problems.
- j. Moreover, existing knowledge on range management in the Sierra has not been put to use and no work is currently underway.
- k. Forestry research is not provided with sufficient financial support by the Government and is maintained with the help of international technical cooperation sources. Further, no research is conducted on wildlife at the national reservations and hunting grounds.

2. Socio-Economic Research

- a. There is a shortage of economic resources impeding the conduct of most studies. Also, a lack of specialized personnel and difficulties exist to form new researchers as well as to disseminate and systematize the research information.
- b. There exists a need for coordination and implementation policies to conduct studies in the socio-economic area.
- c. There is an absence of incentives in the salaries of the personnel.

3. Agro-Industrial Research

- a. There is no strong relationship between the objectives of applied public research and the evolution of private industry, and probably this is due to the lack of coordination between private industries and official institutions.
- b. A change has been made in the obligation of all industrial enterprises to apply to the research projects on industrial technology, the 2% deducted from their income prior to taxation. This percentage is currently deducted from the net income after taxation, which implies a reduction in the economic resources for technology research.
- c. Through technical and/or advisory assistance, a limited transfer is made of the agro-industrial technology.

- d. There is a limited amount of economic and financial resources at the official organizations to carry out research actions on agro-industrial technology.
- e. Due particularly to economic expectations, there is an exodus to foreign countries of technicians who are specialized in the technology of food commodities.

## B. AGRARIAN EDUCATION AND TRAINING

### 1. Agrarian Sciences and Social Sciences Education

#### a. Higher Level: University Education

- There are too many academic programs in Agronomy and related disciplines.
- There are too many academic programs in the Social disciplines.
- An excessive number of students exist in these programs.
- The level of academic training for Professors is minimal.
- High level scientific and pedagogical training for Professors is lacking.
- Deficiencies exist in the curricula program.
- Adequate buildings, equipment and libraries are needed.
- Salary policies are deficient at the Universities.
- There is a need for economic incentives and employment options for University Graduates.

b. Middle Level: Technical Education

- Most of the institutes for agricultural education at a middle level have disappeared.
- Middle schools for professional education in Agriculture have been created without curricula on technical subjects.
- There is a need for adequate buildings, equipment and libraries.
- There is a low academic level among teachers.
- There is a need of economic incentives and employment options for middle school graduates.

2. Rural Education for the Producers

- Coverage of these educational services is currently minimal in spite of efforts made by public and private organizations and by the rural enterprises themselves.
- Integration and coordination is scarce in the educational actions which are carried out at the rural areas.
- Proper arrangements are missing with regard to common priorities, joint budgets and work teams of a multi-sectoral and multidisciplinary nature.
- The scope and effectiveness of educational actions have been curtailed by the limitations of human and financial resources, particularly in the public organizations.

C. AGRICULTURAL EXTENSION

1. There is no agency in charge within the Agrarian Sector to develop Agricultural Extension programs.
2. The personnel involved have not received training in Agricultural Extension.
3. Salaries earned by those surveyed are not consistent with the costs of living nor with the functions performed by them for crop and livestock production.
4. The field operations of these personnel are restricted by the lack of transportation; equipment, publications, and also by budgetary reductions and administrative procedures which delay actions in the rural area.
5. Neither the limited relationship between researchers and personnel conducting the technology transfer in the rural areas, nor the research findings are propagated with the necessary clarity.

D. INTERNATIONAL TECHNICAL COOPERATION

1. Numerous projects exist on international technical cooperation. However, adequate attention is not given to them due to lack of coordination and, insufficient personnel and economic resources of indigenous institutions.
2. Research activities of international financial cooperators are not appropriate to short-term increases in production and productivity.

3. Projects and financial resources involving international technical cooperation are not prioritized and reveal a need for socio-economic studies.

#### IV. RECOMMENDATIONS

##### A. GENERAL RECOMMENDATIONS

1. Establish the necessary facilities for integrating Research, Education and Extension under a coherent System that focuses on the production of food commodities and the solution of producer and consumer needs.
2. As part of the System, the existing producer organizations, and similar future organizations, must participate jointly in actions on Research, Education and Extension.
3. An administrative capacity must be developed to manage public and external resources in a timely, dynamic and flexible way, acting as a supporter of actions for the success of the REE System.
4. The components of the REE System must provide personnel with adequate preparation and training in the respective disciplines. They must also organize teams appropriate to the solution of production problems that will arise in the future.
5. Establish an attractive salary structure giving emphasis to field personnel and aiming to retain specialized manpower while motivating them for an integration that should achieve the broad objectives of national development.

6. Establish those incentives and services that will render economic, social and cultural benefits to enhance morale within the system.
7. Provide the REE System with needed infrastructure and services that enable it to accomplish a medium and long-term plan through joint and coordinated actions.
8. All of the technical cooperation that is given to the Agrarian Sector by foreign sources must be evaluated in terms of supporting the REE System.
9. Support the Universidad Nacional Agraria in order that the Graduate Academic Programs may render efficient professional education in those disciplines which national development requires. Also, create and implement post-graduate programs in other universities to carry out in-depth studies of specific lines of knowledge that are of socio-economic importance in selected zones of the country.
10. Provide the data bank of the Instituto Nacional de Investigación Agraria with all the necessary information, including a compilation of the social-economic studies produced in the country, so that it may give efficient support to the System.
11. To set the System into effect, it is advisable to formulate a short, medium and long-term plan in accordance with a national development plan and following the general pattern of this study.

B. SPECIFIC RECOMMENDATIONS

1. AGRARIAN RESEARCH

a. Physical-Biological Research

- a-1. The Agrarian Sector must consider physical-biological research as the basic component for developing agriculture, livestock, forestry, water and soils that should be equipped with every needed resource in order to participate through adequate technology in the Agrarian Sector Development Plans.
- a-2. Classify and select the Experimental Stations and Substations that will be in charge of the priority research programs. Also provide them with highly qualified personnel and with the required infrastructure and services; particularly, laboratories, equipment, vehicles, and libraries.
- a-3. In the research programs priority attention should be given to products in short supply or substitutes for imports.
- a-4. Establish Experimental Stations and Sub-Stations for specific research. Implement same with a qualified staff and an adequate infrastructure. Multidiscipline teams should be organized with well-trained specialists available in the country.

b. Agro-Industrial Research

- b-1. Determine the real potential of agro-industrial research throughout the country in order to issue adequate policies and to establish devices for bringing together the efforts of the public and private institutions that are doing agro-industrial research.
- b-2. Bestow more importance on the subsidies that are contemplated under the General Law, Regulations and Norms of Industry. Towards this end, the terms for the calculation of such subsidies should be reviewed.
- b-3. Develop mechanisms aimed at promoting agro-industrial research. For this purpose and with a preference on the substitutes for imported raw products, integral research programs should be established at a regional and national level under the Government and private institutions.
- b-4. Coordinate concrete actions of agro-industrial research between INIA, Instituto de Investigaciones Agro-Industriales, ITINTEC and the Peruvian Universities. Also, develop agro-industrial extension mechanisms in order to promote the small and medium-size agro-industrial enterprises.

b-5. Capture financial help from internal and external sources to conduct an integrated activity in agro-industrial research. Such an activity must be coordinated among all sectors of the economy.

b-6. Promote the creation of Government and mixed agro-industrial enterprises on the basis of appropriate feasibility studies.

## 2. AGRARIAN EDUCATION AND TRAINING

### a. Agricultural Sciences and Social Sciences Education

a-1. The creation of any new academic program of agricultural sciences or social sciences should be justified by appropriate studies of the needs of the country.

a-2. The administrations of the Peruvian small Universities must plan rational systems of admissions for their academic programs.

a-3. The training of university instructors should be performed in two ways as described below:

- Through reinforcements in the infrastructure, equipment, library and human resources of the Graduate Academic Program at the Universidad Nacional Agraria, enabling this Program to supply appropriate services to the requesting Universities; and
- Through the creation and implementation of graduate programs that offer in-depth

studies in specific lines of knowledge of socio-economic importance in selected zones of the country; and also, through the interchange of specialists between the Universities.

- a-4. Utilize post-graduate programs existing in foreign countries in those cases which demand a higher specialization.
- a-5. At the middle level, reinforce the curricular content on crop and livestock production in the Escuelas Superiores de Educacion Profesional (ESEP), including therein an adequate knowledge of communication techniques, in order to assure appropriate training of professionals.
- a-6. Create agrarian education institutions and provide them with physical, human and financial resources permitting them to shape up mid-level, well-trained technicians.
- b. Rural Education for the Producers
  - b-1. Through an adequate allocation of resources, expand the coverage and efficiency of the educational services that are supplied by institutions with a nationwide scope.
  - b-2. Develop rational efforts and resources in the institutions that supply educational services; and strengthen coordination, integration, supervision, and control activities.

- b-3. Improve the existing relationships between the institutions that supply educational services and the departments of beneficiary enterprises which specialize in training.

3. AGRICULTURAL EXTENSION

- a. Organize Agricultural Extension within the Food and Agriculture Ministry as a line Service operating at national, regional and local levels; and provide it with the required implementation so that it may either operate on its own or be transferred to another institution.
- b. Integrate into one agency the services offered by the state which gives support to agrarian production. Also, those services which are not located within the system must be coordinated.
- c. Research and Extension must achieve integration at the field level, thus procedures and strategies to this end must be devised.

4. INTERNATIONAL TECHNICAL COOPERATION

- a. Carry out a review, prioritization and adaptation of the projects that exist with International Technical Cooperation to fit in the System of Research, Education and Extension. Also, new projects of this type must be priority-rated to support the REE System.

V. MAIN FEATURES OF A PLAN OF ACTION FOR THE AGRICULTURAL RESEARCH, EDUCATION AND EXTENSION SYSTEM

A. OBJECTIVES

For the rebirth of Research-Education-Extension Institutions supporting Peruvian Agriculture the following objectives are planned:

1. Structure and expand institutional capacity to impact on agricultural production and development.
2. Structure the foundations for the continuous flow of different levels of agricultural technology that meets the needs of small and medium farmers, as well as those of the cooperatives.
3. Structure the foundations for enhancing human capacity for Agricultural Research-Education-Extension.

B. STRATEGIES

1. Actions which can produce high visibility in a short time

The current low level of investment can only be increased in a substantial amount if the involved institutions are capable of providing high impact results in a short time that justify future investment of scarce resources. Therefore, the first step in the overall strategy is to find a way to attract public attention and restore political support by high visibility in the next two years.

2. The available resources must be used with high degree of efficiency and concentration

The human resources available for research, extension and higher education have been reduced to alarmingly low levels, although a few competent individuals are still to be found in each of these areas. The strategy to be developed must make maximum use of these scarce professionals. It is particularly important that the more skilled persons join efforts in a small number of impact programs concentrating the current scarce resources of all the government agencies in order to try to satisfy producer and consumer demands.

3. The actions must be oriented on the Peruvian agricultural products that are the most serious and politically sensitive

The concentration on a small number of impact programs must obtain consensus among the participating agencies; agreement among them is essential.

4. The number and level of capable technicians to efficiently take care of the sustained growth of the programs

A coordinated approach to this problem between the Food and Agriculture Ministry, INIA, CENCIRA, Universities and other Development Regional Agencies will be essential. The maximum of appropriate evaluation procedures and university short courses is essential.

5. A higher level of capability among researchers, educators and extensionists must be developed through the strengthening of the current infrastructure of the graduate school at UNA and/or the use of international research centers or of external universities.
6. The proposed system in addition to being acceptable to the government of Peru should also prove to be fundable by International Technical Cooperation assistance and financial agencies interested in helping in Peru's development. For this purpose, the plan must exhibit the capability of maintaining a permanent staff and continuous services in order to guarantee economic impact within a reasonable period of time.

C. THE REE SYSTEM: COMPONENTS AND ELEMENTS

The strategy described above requires the implementation of a system which coordinates the resources of the various institutions which have responsibility to supply certain needs of the farmers.

The system will combine and coordinate the resources of the several institutions that have responsibilities in the agricultural field. The system is portrayed graphically in Figure 1 to show how the various components and elements within the several institutions focus sharply on the needs of the farmer.

The nine basis components of the system, and the elements within each, are described below. The various public institutions are coordinated into a single system

without losing their identities or their independence. The proposed strengthening of the various components are designed, therefore, to complement rather than duplicate the resources provided from public funds. The strategy provides for gaining maximum impact from existing scarce human talents and financial support and using the results to justify increased investment in this area. The system is to be strengthened on a highly selective basis in order to achieve maximum efficiency from the investments.

Figure 2 illustrates the present status of these scarce resources and the relative rate at which they will be strengthened over the next 10 years.

1. National Commodity Programs

The nature of the National Commodity Programs will be to take existing technology and to adapt it and combine it with the local agricultural systems. The National Commodity Programs should be based at a Center chosen on the basis of the following:

- Major production area;
- High development potential for the commodity;
- Availability of resources;
- Three or four satellite operations.

Thus, a Commodity Program should receive coordinately the resources of INIA, CENCIRA, the Extension Service, Agricultural Development Agencies,

Universities and other Institutions. Each program would be served by a technical advisory committee including representatives of producer groups. The technical personnel might involve, for example, five-six researchers for each program, four-five extension specialists and twenty-five-thirty para-professionals.

The extension specialists will have the responsibility of analyzing local production problems, of advising and participating with the researchers in the synthesis of the technology packages for use at the field level, and of follow-up on the development of said use. Simultaneously, the para-professionals will take the technology to the farmers by means of technological packages prepared with the assistance of researchers and extension specialists in coordination with the producers. They can help in modifying these packages when research advances are required.

Training will have high priority with all personnel of the system. This training will be both short-and long-term. Personnel of the Ministry of Agriculture, INIA, CENCIRA, Universidad Nacional Agraria, and other universities and institutions will form the training teams.

Adequate support should be given to all personnel of the programs. Such support should include: vehicles, greenhouses, farm equipment, office equipment, visual aid equipment, reference books, extension publications, salary supplements, demonstration and research materials, etc.

2. Regional Research Centers: (CIAGs, CIFFs)

At selected regional CIAGs, discipline-research teams must be developed in support of commodity programs. Such regional research teams could be structured in areas such as: plant protection, irrigation and drainage, micro-economics, agro-industrial, soil management, etc.

A possible structure would be to have a regional research center serve several commodity programs. Such teams must include personnel from INIA, universities, and other development agencies. The teams would focus on providing applied technology packages for the commodity programs.

A program of research support, training, laboratory equipment and transport must be built for each selected agricultural research center. In each component of the system, a salary supplement schedule should be established in order to attract and motivate selected personnel.

3. Regional Service Laboratories

In support of commodity programs, several service centers would be essential. Such centers would include facilities for soil testing, water analyses, disease analyses, statistical services, etc.

The support program for each service center would include laboratory equipment, transport and training. As in all components of the system a salary supplement element must be structured.

4. Graduate School

The major contribution that the Universidad Nacional Agraria can and must give to this strategy is through their graduate school. The National Agrarian University in cooperation with selected personnel from other universities, extension and CENCIRA would develop training programs to serve all components in the system. Such an effort would require training at all levels:

- a. Short-term and non-degree extension training in relation to national commodity programs.
- b. Short-term and non-degree research training in relation to national commodity programs.
- c. Academic degree training for extension and research personnel at all levels.
- d. Academic degree training for staff members of other universities.

- e. Academic degree training for the graduate school staff in sites external to Peru.
- f. Strengthening of the staff of graduate programs with visiting professors from other national and external institutions. Such an expanded training program would require the strengthening of selected disciplines. Such support elements would include laboratory equipment, research and library supplies, field research, salary support schedules and internal/external scholarships.

5. National Research Support

At the national level, research capacities would be developed for more advanced work and towards technological self-sufficiency. Initial efforts would focus on staff training and move towards the establishment of such national level programs.

Such programs would include plant and animal protection, irrigation and drainage, macro-socio-economic, agro-industrial, soil science, natural resource management, etc. Researchers would be from INIA and selected members from university staffs.

This component of the system is critical to serve the new knowledge needs of established commodity programs and providing for the expansion of commodity programs.

The essential support elements would include laboratory facilities and equipment, library support,

transport, salary incentives and particularly a strong internal and external scholarship programs.

6. National Administration

There has to be national coordination by means of an executive committee that would be the body that assures that scarce resources are appropriately assigned so that the production program component can be started in a relatively short time.

The basic rule in operation of a commodity program is that if insufficient resources are allocated to a particular program it will not succeed and, therefore, should not even be started. This is a management problem that does not require a large number of persons, but it does require a strong management skill.

Functions of the national administrative structure would include:

- a. Coordination of system components at local, regional and national levels;
- b. Coordination of training elements;
- c. Responsibility for support elements.

7. International Research Centers

Maximum advantage must be taken of the technology and information available in the International Research Centers. They are all eager to cooperate with national programs and they have much technology and information that requires adaptation to local

situations. Much of the technology which they have can show quick results if adapted by knowledgeable persons to local conditions. More specifically the linkages might include the following:

- a. Readily available information in support of commodity programs;
- b. International Center Personnel in support of system components such as national commodity programs, regional research centers, national research programs and graduate school programs;
- c. Scholarships for personnel in all components of the system.

8. International Technical Cooperation

This component can be grouped into three activities that serve specific components of the system:

- a. All existing external assistance programs that are involved with components of the system should be reviewed and modified to conform with this plan;
- b. Any new external programs to the extent possible should be specific and in direct support of the established system to the end that counterpart personnel and available resources are not spread too thinly. Possible mechanisms might include long-term technical assistance in administration

and system components as well as short-term, highly specific linkages into extension, research and educational project components;

- c. Scholarships for personnel within all components of the system.

#### 9. Caretaker Operations

Because the commodity programs will be highly selective of both personnel and facilities, some gainful use must be made of the remaining research resources.

Several possibilities come to mind. The use of research stations as production-demonstration facilities is one and another is their use for farmer training. This alternative suggests that many of the stations not directly involved in commodity research should be used as satellites of the high-visibility, quick impact programs. The technology packages proposed for farmer use would be applied at these stations. This would provide (1) for close control and evaluation of the package, (2) for quick identification of production problems, and (3) for ready modifications of undesirable aspects of the technology.

Such production-demonstrations should provide some income to the system also, but a more important

advantage is the training aspect. Many of the current research and extension staff have had little practical field experience. Temporary use of research stations for production-demonstrations would provide on-hand experience for all involved personnel; they would learn the real problems of producing a commercial crop using the same technology that will be recommended to the farmers. Then, when these people move out into the system, they will be able to "sell" their knowledge with the confidence gained from such experience. Further, the time spent in this activity will provide the administration with another opportunity to evaluate staff performance and potential.

Another alternative use for such facilities would be a "fomento" type of operation. The stations, and personnel, will be gainfully employed in producing seed, planting stock, improved breeds of livestock, etc. This, too, would provide inexperienced staff an opportunity to learn the practical aspects of production. It will provide income to the station and will serve as an evaluation mechanism for the personnel involved.

Therefore, though all stations and all personnel cannot be involved in the early stages of the new system, certainly all can be put to good use. And, as the system gains strength, these facilities and staff can be incorporated as their performance indicates and as the site becomes appropriate.

VI. APPENDICES

APPENDIX A

PARTICIPANTS IN THE BASELINE STUDY OF THE AGRICULTURAL  
RESEARCH, EDUCATION AND EXTENSION SYSTEM

I. EXECUTIVE COMMITTEE

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Agron. Pompeyo Díaz Zevallos	MAA
Agron. Gonzalo Silva Santisteban	MAA
Agron. Máximo Urbina Gutiérrez	CONUP
Dr. Klaus Raven Buller	UNA
Dr. José Estrada Ancajina	UNA
Agron. Luis Paz Silva	INP
Agron. Efraín Palti Solano	INP

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Dr. Flavio O. Vargas González  
Agron. Eduardo Grillo Fernández

III. AID (NCSU AND OTHER) CONSULTANTS

Dr. Arthur J. Coutu	NCSU
Dr. Jackson A. Rigney	NCSU
Dr. J. Lawrence Apple	NCSU
Dr. H. Douglass Gross	NCSU
Dr. Herbert T. Scofield	NCSU
Dr. Donald C. Galvan	Texas A & M Univ.
Agron. Alphonse Chable	USAID
Dr. Gene A. Mathia	Texas Tech. Univ.
Dr. Jane Vella	NCSU

Dr. Robert L. Moxley	NCSU
Dr. James Seagraves	NCSU
Dr. Richard A. King	NCSU
Dr. Stephen W. Bogyo	Private Consultant
Dr. R. L. Sawyer	Int. Potato Center
Econ. Orlando Olcese B.	NCSU

#### IV. WORK TEAMS AT NATIONWIDE LEVEL

##### A. Agrarian Research

##### 1. Physical-Biological Research

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Agron. Robert Hooker Leguía	INIA
Agron. Miguel Garmendia Santisteban	INIA
Agron. Julio Lozano Matienso	INIA
Agron. José del C. Huro Castro	INIA
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Dr. Klaus Raven Buller	UNA
Agron. Ignacio Lombardi	UNA
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##### 2. Socio-Economic Research

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Agron. Renán Ochoa Escalante	INIA
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Dr. Stephen W. Bogyo	Private Consultant
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Dr. Klaus Raven Buller	UNA
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Dr. Herbert . Scofield	NCSU
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2. Rural Education for the Producers

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Dr. James Seagraves	NCSU
Dr. Robert L. Moxley	NCSU

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Agron. Carlos Farromeque Duenas	D.G.A. y C.
Agron. Néstor del Río Ganoza	D.G.A. y C.
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Dr. Federico Anavitarte	UNA
Dr. Klaus Raven Buller	UNA
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Dr. Jackson A. Rigney	NCSU
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Agron. Germán Valdivia	D.G.A. y C.
Agron. Luis Astengo	D.G.C.
Agron. Luis Fernández	Banco Agrario del Peru (Peruvian Agrarian Bank)

Agron. Luis Garnica	ONERN
Agron. Luis Rivas	SENAMHI
Agron. Segundo Ortega	SENAMHI

#### V. WORK TEAMS AT LOCAL LEVEL

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Agron. Francisco Delgado de La Flor	UNA
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Agron. José Luis Rodríguez V.	A.Z. Ica
Agron. Gilberto Alcántara D.	CENCIRA
Agron. Julio Alcántara A.	U.N. San Luis Gonzága
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Dr. Américo Díaz C.	A.Z. Tingo María
Agron. Pedro Córdova Alva	U.N.A. Selva

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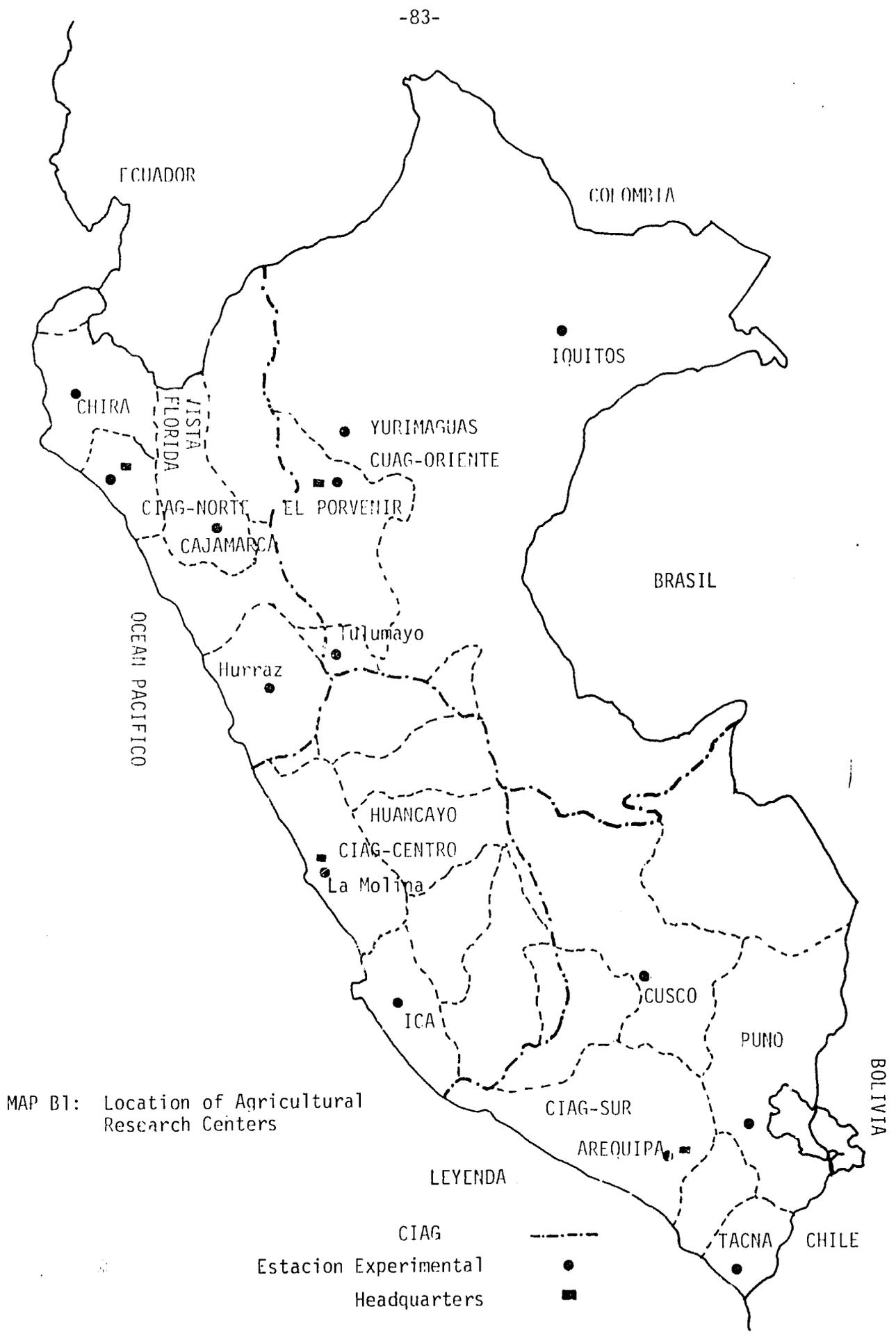
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MAP B1: Location of Agricultural Research Centers

LEYENDA

CIAG ●

Estacion Experimental ■



MAP B2: Location of Forestry and Wildlife Research Centers

LEYENDA

- Centro de Investigacion Forestal y Fauna
- ▲ Estaciones Experimentales Forestales

MAP: B3: Location of Public and Private Universities by Regions

REGION NORTE

- 1. U.N. de Truillo
- 2. U.N. Tecnica de Piura
- 3. U.N. Tecnica de Cajamarca
- 4. U.N. Pedro Ruiz Gallo
- 5. U.N. Santiago Antunez de Mayolo
- 6. U.P. de Piura

REGION COSTA CENTRAL

- 7. U.N. Mayor de San Marco
- 8. U.N. de Ingerieria
- 9. U.N. Agraria
- 10. U.N. federico Villarreal
- 11. U.N. de Educacion e.G.V.
- 12. U.N. Tecnica del Callao
- 13. U.N. Jose Faustino Sinchez Carnon
- 14. U.N. San Luis Gonzaga
- 15. P.U. Catolica del Peru
- 16. U.P. Peruana Cayetano Heredin
- 17. U.P. del Pacifico
- 18. U.P. de Lima
- 19. U.P. San Martin de Porres
- 20. U.P. Femenina del Sagrado Corazon
- 21. U.P. Inca Garcilaso de la Vega
- 22. U.P. Ricardo Palma

REGION SIERRA CNETRAL

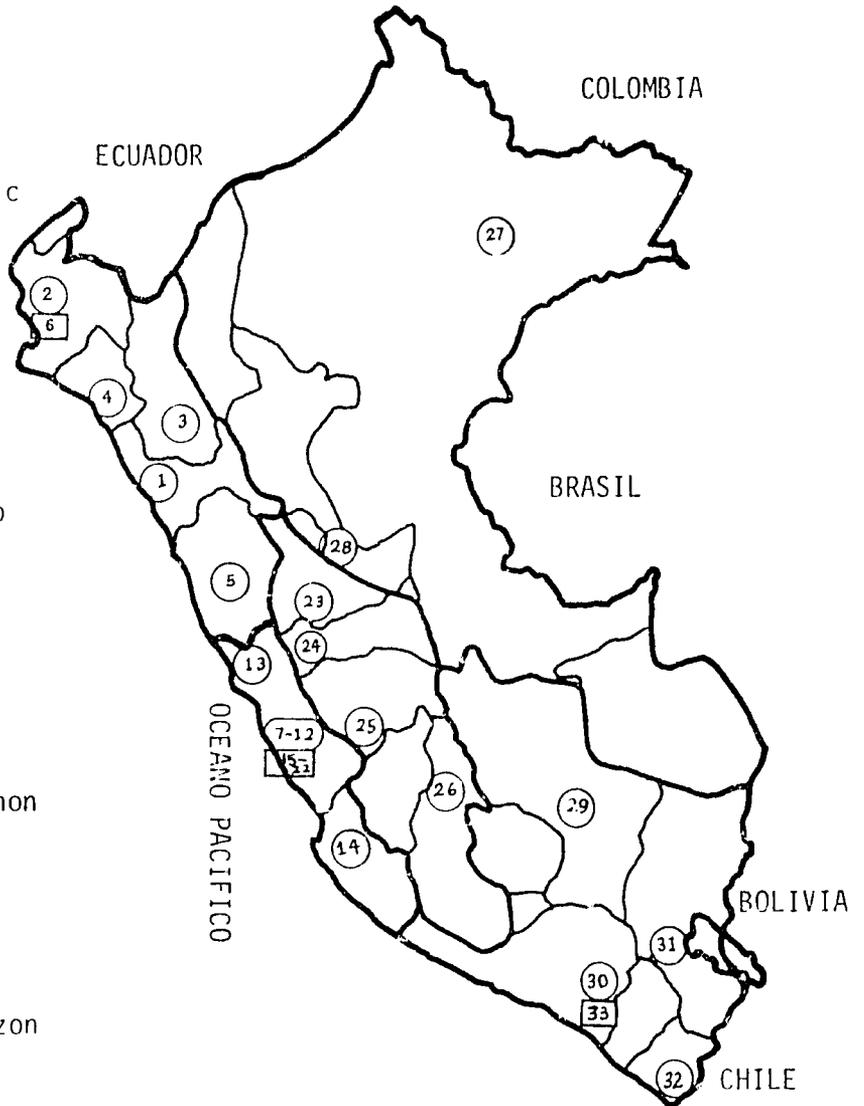
- 23. U.N. Hermillo Valdizan
- 24. U.N. Daniel Alcides Carrion
- 25. U.N. del Centro del Peur
- 26. U.N. San Cristobai de Huamanga

REGION ORIENTE

- 27. U.N. de la Amazonia Peruana
- 28. U.N. Agraria de la Selva

REGION SUR

- 29. U.N. de San Antonio Abad
- 30. U.N. de San Agustin
- 31. U.N. Tecnica del Altiplano
- 32. U.N. de Tacna
- 33. U.P. Catolica Santa Maria



②③ Universidades Estatales

⑩ Universidades Particulares



Figure 2. Present status and rate of strengthening of human and financial resources required by the System of Research, Education and Extension.

