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**BASELINE STUDY OF
AGRICULTURAL RESEARCH, EDUCATION,
AND EXTENSION IN ECUADOR**

**ECUADORIAN
MINISTRY OF AGRICULTURE
AND
UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT**

**UNDER TITLE XII OF THE FOREIGN ASSISTANCE ACT OF 1975
AND
BOARD FOR INTERNATIONAL FOOD AND AGRICULTURAL DEVELOPMENT**

MARCH 1979

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ECUADORIAN
MINISTRY OF AGRICULTURE
UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT

MARCH 1979

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Orientation Seminar and Contribution of Special Data

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Methodology and Review

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TABLE OF CONTENTS

	Page
TITLE PAGE	1
ACKNOWLEDGEMENTS	ii
TABLE OF CONTENTS	iv
I. INTRODUCTION	1
A. Background	1
B. Objectives	1
1. General Objectives	1
2. Specific Objectives	1
C. Methodology	2
D. Collection and Processing of the Information	3
E. Facilities and Limitations	3
II. DIAGNOSIS OF THE RURAL AND AGRICULTURAL SECTOR	4
A. Description of the Country	4
1. Geography	4
2. Political Administrative Organization	5
3. Demography	5
4. Economy	5
B. Analysis of the Rural and Agricultural Sector	5
1. Population	5
2. Education	12
3. Nutrition	15
4. Housing	15
5. Health	17
6. Electrical Energy	19
7. Means of Communication	21
8. Transportation	21
9. Storage Facilities	25
C. Availability, Distribution and Utilization of Resources	25
1. Land	25
2. Water	33
3. Credit	34
4. Labor	42
D. Changes in Production	44
1. Export Commodities	44
2. Commodities Used as Raw Materials	46
3. Commodities for Domestic Consumption	47
4. Value of Agricultural Production	48
5. Gross Value of Agricultural Production- Composition and Changes	48
6. Agricultural Foreign Trade Balance	51

E.	Structure and Functions of the Public Agricultural Sector	53
1.	Profile of the Sector	53
2.	General Organization of the Ministry of Agriculture	56
3.	Functions of the Ministry of Agriculture	56
4.	Advisement and Coordination Level	57
5.	Organization and Functions at the Operational Level	58
6.	Agencies Attached to the Ministry of Agriculture	66
7.	Agencies Associated with the Ministry of Agriculture	71
8.	Mixed Public - Private Enterprises Associated with the Ministry of Agriculture	73
III.	DESCRIPTION OF RESEARCH, EDUCATION, AND EXTENSION IN THE AGRICULTURAL SECTOR	77
A.	Agricultural Research	77
1.	History	77
2.	The Present Situation in Agricultural Research	77
3.	Plans and Programs	78
4.	Availability of Resources	86
B.	Agricultural Education	94
1.	History	94
2.	The Present Situation	97
C.	Agricultural Extension	104
1.	History	104
2.	The Present Situation	105
3.	Plans and Programs	105
4.	Availability of Resources	108
IV.	ANALYSIS AND RECOMMENDATIONS FOR THE REE SYSTEMS	120
A.	Agricultural Production Constraints	120
1.	Natural Resources	120
2.	Productivity	121
3.	Credit	127
4.	Infrastructure	127
5.	Marketing and Price Policy	128
6.	Human Resources	131
B.	An Overview of the REE System and Strengths and Weaknesses	133
C.	Strengths and Weaknesses of the REE System	134
1.	Research	134
2.	Education	136
3.	Extension	137

D. Strategies and Recommendations for Development of the REE System	138
1. General Areas and Administration of the REE System	139
Recommendation 1.1	139
Recommendation 1.2	142
Recommendation 1.3	142
Recommendation 1.4	144
Recommendation 1.5	145
Recommendation 1.6	146
Recommendation 1.7	147
Recommendation 1.8	148
2. Research	149
Recommendation 2.1	149
Recommendation 2.2	149
Recommendation 2.3	152
Recommendation 2.4	153
Recommendation 2.5	154
3. Education	157
Recommendation 3.1	157
Recommendation 3.2	158
Recommendation 3.3	159
Recommendation 3.4	160
Recommendation 3.5	162
Recommendation 3.6	163
Recommendation 3.7	164
Recommendation 3.8	165
4. Extension (Technology Transfer) and Agricultural Support Services	166
Recommendation 4.1	166
Recommendation 4.2	168
Recommendation 4.3	169
Recommendation 4.4	170
Recommendation 4.5	171
Recommendation 4.6	172
Recommendation 4.7	173
Recommendation 4.8	174
Recommendation 4.9	175
Recommendation 4.10	175
Recommendation 4.11	177

LIST OF TABLES

Table No.		Page
II.1	Population by Regions, Provinces, and Areas.....	6
II.2	Rates of Population Growth.....	7
II.3	Total, Urban, and Rural Population by Sex and Age.....	8
II.4	Number of Universities, Professors, and Students.....	14
II.5	Housing Statistics, 1974.....	16
II.6	Water Distribution Services by Province - 1974.....	18
II.7	Health Services in the Parishes of Ecuador - 1974.....	20
II.8	Electrical Service.....	21
II.9	Highways by Provinces - 1976.....	22
II.10	Highway Density as a Function of Highway Length and Usable Area to 1970.....	23
II.11	Accessibility of Farm Family Units to Different Means of Transportation.....	24
II.12	Means of Transportation.....	26
II.13	ENAC Storage Capacity - October 1978.....	27
II.14	ENPROVIT Storage Capacity.....	27
II.15	Land Use - 1977.....	28
II.16	Potential of Land Resources, Crops, and Irrigation.....	30
II.17	Number and Area of Farming Enterprises by Size, 1954-1974, with Increases Shown.....	31
II.18	Average Size of Agricultural Production Units, 1954-1974	32
II.19	INERHI Irrigation Projects.....	35
II.20	Credit Granted by the National Banking System.....	36
II.21	Agricultural Credit Through the Development Bank (BNF) by Activity 1970-1976.....	37
II.22	National Development Bank (BNF). Credit Granted by Amount, Purpose, and Term, 1970-77.....	39
II.23	Agricultural Credit Granted by the National Development Bank (BNF) by Amounts in the Period 1970-1976.....	40

Table No.		Page
II.24	Agricultural Credit Granted by the Development Bank (BNF) by Regions.....	41
II.25	Economically Active Population by Type of Activity, 1974.....	43
II.26	Income Distribution in Rural Areas, 1975.....	44
II.27	Yield and Production Trends in Hectares Harvested for the Twenty Crops Considered in the Study, 1962-1977.....	45
II.28	Gross National Product by Type of Economic Activity, 1970-1977.....	49
II.29	Gross Value of Agricultural Production - Composition and Change.....	50
II.30	Area and Value of Agricultural Production by Provinces and Regions.....	52
II.31	Participation of the Agricultural Sector in the Balance of Trade, 1972-1976.....	54
II.32	Agricultural Zone Offices.....	65
II.33	Mixed Public-Private Enterprises Associated with the MAG.....	74
III.1	Tests Performed by INIAP.....	80
III.2	INIAP Field Days.....	82
III.3	Courses Taught by INIAP Since 1962.....	83
III.4	INIAP Publications Since 1962.....	84
III.5	Varieties Released by INIAP.....	85
III.6	Construction Plans of the INIAP-BID Project.....	88
III.7	Distribution of INIAP Personnel by Subject or Discipline - 1977.....	89
III.8	Distribution of INIAP Personnel by Clinetele Group - 1977.....	90
III.9	Training Level of the Personnel of the National Institute for Agricultural Research, 1977.....	91
III.10	INIAP Budget by Clinetele Group, 1971-1975.....	92
III.11	INIAP Budget by Subject or Discipline.....	93
III.12	INIAP Budget by Functions.....	95

Table No.		Page
III.13	INIAP Budget by Regions, 1971-1975.....	95
III.14	Budget Used by INIAP, 1977.....	96
III.15	Student Information, 1978 - Secondary Education.....	98
III.16	Student Information, 1978 - Higher Education.....	102
III.17	Number of Graduates by University and Major Field Between 1970 and 1976.....	103
III.18	Number of Professionals and Technicians on January 1, 1973, Ecuadorian Ministry of Agriculture.....	109
III.19	Number of Professionals and Vacancies in the Ministry of Agriculture, October 12, 1978.....	110
III.20	Number of Technicians and Vacancies in the Ministry of Agriculture, October 12, 1978.....	111
III.21	MAG Professionals.....	112
III.22	Allocation of Professionals by Zones with Proportions of Professionals per 1000 Producers per Millions of Sucres of Production.....	113
III.23	Classification of Personnel by Categories, Comparing 1973 with 1978.....	115
III.24	Status of Budget Disbursement, 1973-1977.....	116
III.25	Budgets Approved for the Ministry of Agriculture and Associated Agencies for Financial Activities, 1973-1978.....	117
III.26	Percentage of Total Budget Distributed by Quarters, 1977.....	118
IV.1	Comparison of Experiment Station Yields and National Average Yields.....	122
IV.2	Total Number of High Schools (Colegios) by Region and Number per 10,000 Producers.....	132
Figure IV.1	Multi-Discipline Approach to Crop Improvement	150
Figure IV.2	Multi-Discipline to Farming Systems and Production....	151
Graph I	Priorities and Timing of Activities For the Recommendations.....179, 180, 181, 182	

LIST OF APPENDICES

Appendix No.		Page
II.1	Percentage of Change in the Proportion of Urban and Rural Population by Provinces - 1950-1962, 1962-1974.....	187
II.2	Rate of Migratory Change by Province.....	188
II.3	1972 Indicators of Health Services.....	189, 190
II.4	Accessibility of Farm Family Units to Different Types of Communication Routes.....	191, 192, 193
II.5	Means of Transportation.....	194, 195, 196
II.6	Number of Farm Family Units According to Size Classification by Provinces From 1954 to 1974.....	197
II.7	Change in Agricultural Production from 1970-1977....	198, 199
III.1	Job Categories.....	200, 201
III.2	Specialized Services and Technical Support Services by Zone Offices.....	202, 203, 204, 205
IV.1	Example of an Administrative Internship with Emphasis on Administration of Research and Extension Programs...	206
IV.2	Example of an Administrative Internship with Emphasis on Administration of Extension and Vocational-Technical Programs.....	207, 208

I. INTRODUCTION

A. Background

The Famine Prevention Program, known as Title XII, with the participation of the Universities and other U.S. institutions, is an amendment to the United States Foreign Aid Program by means of which U.S. research, education, and technical assistance are involved in assisting in the world production of foodstuffs.

This program was instituted as a response to the alarming situation which a great many countries are enduring, especially the so-called developing countries, in which population is increasing faster than the production of foodstuffs. Many world programs have been established to contribute to a temporary solution to this situation; however, they do not bring about a change in knowledge or techniques which would enable the farmer and farm worker (campesino) in these countries to produce enough for their own needs as well as a surplus to be sold through national and international markets.

Ecuador is still one of the countries which receives the benefits of food assistance offered to the world through various international programs. Nevertheless, Title XII, offers the possibility of more solid and long-term assistance to developing countries, through the development of human resources and the dissemination of scientific advances; this would give the agriculture of these countries a technological basis and to make the use and conservation of natural resources more efficient. As a consequence, the Ecuadorian National Government, through the Ministry of Agriculture, in order to strengthen and improve the institutional management of the agricultural sector, requested assistance from this Program. For this purpose, the Project for Technical Implementation of Services (Proyecto de Implementacion Tecnica de Servicios) was signed on 10 July 1978 with AID Ecuador in order to carry out a base line study on Agricultural Research, Education, and Extension.

B. Objectives

1. General Objective

The study of the Research, Education, and Extension systems describes the present situation, identifies the limiting factors, and makes recommendations to improve the type, quality, and quantity of services necessary for the rural and agricultural development and growth of Ecuador.

2. Specific Objectives

a. To measure the capacity of the research institutions to develop packages of technology which can be put into practice in Ecuador, especially by the small and medium-sized farmers; to measure these institutions' capacity to prepare and disseminate technical, economic, and social information.

b. To obtain quantitative and qualitative estimates of the capacity of the Ecuadorian educational institutions' professional and technical personnel to work in the research, education, and extension services, and in rural development, as well as to determine the best levels of specialization and training for professionals and technicians for the fulfillment of their functions.

c. To determine the administrative and distribution capacity of the extension services to disseminate technical, economic, social, and other information to farmers, especially small and medium-sized ones, in a useful and timely way.

d. To determine the physical, economic, and human requirements which the research-education-extension systems require for the fulfillment of the agricultural and rural development goals which may be established.

e. To design strategies to coordinate and integrate planning, implementation, and administration of the research-education-extension systems.

C. Methodology

To analyze the rural and agricultural sector, the study group had to deal with a multitude of aspects connected with research, education, and extension, relating them with the overall context of society in general, which marks its development in accord with the necessities of its structure.

The methodology employed in the present study is directly related to its objectives. Given the limitations involved, it was necessary to adopt flexible techniques.

Because of the size of the agricultural sector, a list was drawn up of the public and private institutions of the research-education-extension subsectors; from that list, areas and representative institutions were chosen according to their importance, based upon the knowledge and judgment of the study group. In these institutions, the following aspects were checked:

a. In Research: The organization, functions, availability of personnel; their level of preparation, budget, equipment; research plans and programs; the academic level of the professionals; and, social and economic aspects. In addition, special emphasis was given to the analysis of the social and economic research, since it is considered that these aspects are fundamental in the process of technology transfer.

b. In Agricultural Education: Plans and programs of study were analyzed on their four levels: the level of knowledge of the professors; the origin and destination of the students; physical and budgetary availability; availability of laboratories and libraries and the type of instruction given (theoretical-practical).

c. In Extension (technology transfer): The most relevant aspects subject to further analysis were the following: the agricultural extension services with their methodology, structure, administration and regulations; the policies and programs for action; the human, physical, and economic resources; the type of clientele; the facilities and operational limitations; the organizational forms for the farm worker (campesino).

The study is divided in two parts: a) the first part is made up of three chapters which provide the background, the description and analysis of the agricultural and rural sector, and the description and analysis of the systems of research, education, and extension (REE) within the agricultural sector of Ecuador; and, b) the second part, Chapter IV, concerning the analysis and recommendations for the REE systems within the country.

The Ecuadorian study group participated in the compilation and treatment of the information as well as in the creation of the first part of the study which consists of the three chapters previously mentioned. The study group from the United States assumed complete responsibility for the development of the second part. It was felt that this division of responsibility was necessary to insure the objectivity of the analysis and recommendations.

D. Collection and Processing of the Information

For the collection of data and for the U.S. Study Team to become acquainted with the situation in Ecuador, the following were arranged: seminars; meetings with high level officials; review of studies, monographs, reports, statistical data, official declarations, and other materials. In order to complete the information, questionnaires were prepared for administration in the country.

Once the primary and secondary information was gathered, it was submitted to the group for discussion in order to put together explanations and suggestions, and to formulate and defend the recommendations in accord with the judgment and professional experience of the group.

E. Facilities and Limitations

The facilities were ample. There were transportation facilities for the different teams which worked together; easy access to each and every source of information; availability of physical space and materials; and secretarial services. Time of the Professional team allocated to the study limited the level of achievement of the objectives.

Statistical information came to be the principal limiting factor in the development of the study, due to the variability of the data as well as the absence of incompleteness of data.

II. DIAGNOSIS OF THE RURAL AND AGRICULTURAL SECTOR

A. Description of the Country

1. Geography

The republic of Ecuador, located in the northwest of South America, has an area of 272,258 Km². It is bordered on the north and northeast by Colombia, on the south and the southeast by Peru, and on the west by the Pacific Ocean. The island province of Galapagos is found 12,000 Km. northwest of the coast and is composed of 17 large islands.

The Andes Mountains cross Ecuador from north to south dividing it into three natural regions known as the Coast (Costa), the Mountains (Sierra), and the East (Oriente), each with different ecological, climatic, orographic, and socio-economic characteristics.

The Mountain or interandean region has an area of 6,628,000 hectares. It is found between the Central and Western ranges of the Andes, which meet from place to place, causing the formation of valleys and plateaus. The greatest percentage of the population is found concentrated in this region; it has many different climates which are directly related to altitude and the influence of warm winds from the East and the Coast. This diversity of climates permits the cultivation of a wide range of crops from wheat, barley, potatoes, and beans to even sugar cane, yucca, tomatoes, etc.

The Coast, with an area of 6,770,200 hectares, extends from the spurs of the Western Range of the Andes to the Pacific Ocean. It has relatively flat topography, interrupted by small mountain ranges in the north and central parts of the country. The climatic conditions are heterogeneous due to the influence of ocean currents, river systems, and proximity to the mountain ranges, which causes the formation of dry zones, especially in Manabi Province, the Santa Elena Peninsula, and the northwestern part of El Oro Province, and wet regions, especially in Esmeraldas Province, to the north of Manabi, among others. This region traditionally has produced agricultural products for exportation such as bananas, cacao, coffee, sugar cane, cotton, and it also provides important products for domestic consumption such as rice, corn, tropical fruits, dry beans, oil seeds, and African palms.

The East or Amazon region, with an area of 13,027,000 hectares, extends to the east of the spurs of the Eastern Range of the Andes. Topographically it is divided into two zones: one of sharp slopes, formed by the spurs of the Central and Eastern Ranges, with very irregular relief, steep slopes and cuts, covered with forests which protect the watersheds, and another zone, the eastern Plains, with varied relief. The majority of these Plains are formed by low, round hills, plateaus, and flat areas generally of alluvial origin with some volcanic material involved.

2. Political-Administrative Organization

Politically, Ecuador is divided into 20 provinces, 115 cantons, 212 urban parishes, and 715 rural parishes. The Coast has 5 provinces, 42 cantons, 75 urban parishes, and 191 rural parishes. The Mountain is made up of 10 provinces, 53 cantons, 116 urban parishes, and 404 rural parishes. The East has 4 provinces, 17 cantons, 18 urban parishes, and 116 rural parishes. The province of Galapagos has 5 cantons, 3 urban parishes and 4 rural parishes.

3. Demography

Ecuador's population, according to the 1974 census, was 6,521,710 distributed as follows: Coast, 3,179,446; Mountain, 3,146,565; East, 173,469; Galapagos and disputed areas, 22,230. Forty-one and four tenths of a percent of the population is urban and 58.6% is rural.

In 1978 the average growth rate of the population was estimated at 3.4% annually, so it can be calculated that the present population of Ecuador is around 7,816,000 people.

4. Economy

In 1970 around 26.8% of the gross national product (GNP) came from the agricultural sector, but by 1977 this figure had been reduced to about 21%. This reduction in the relative importance of the agricultural sector shows the same tendency that has been observed in more developed countries, that is, other sectors of the economy gradually acquire greater relative importance.

It is worthy of note, regarding the composition of the GNP by sectors, that the agricultural sector will likely maintain its primacy due to the population which it includes, its nature as a generator of foreign exchange, and its importance in providing foodstuffs and raw materials for industry.

The growth of agricultural production in the period 1970-1972 achieved an average annual rate of about 3.9%, which is greater than the growth rate of the population, and represents a change equivalent to half of that observed for the whole economy (6.0%). During the period 1972-1977 it grew at an average rate of 11% and the total number of people involved grew at a rate of 3.4%, thus permitting a change in productivity at a rate of 7.6%. In the agricultural sector, production increased at an average rate of 4.8% and the number of people involved increased at 10.5%, thus increasing productivity at an annual rate of 4.3%.¹

B. Analysis of the Rural and Agricultural Sector

1. Population

According to population censuses taken in 1950, 1962, and 1974, the population in general and the rural population in particular have changed as shown in Table II.1.

¹National Planning Board

TABLE II.1

POPULATION BY REGIONS, PROVINCES, AND AREAS

PROVINCIAS	1950 (November)			1962 (November)			1974 (June)		
	TOTAL	Urbano	Rural	TOTAL	Urbano	Rural	TOTAL (3)	Urbano	Rural (3)
TOTAL REPUBLICA	3.202.757	913.932	2.288.825	4.476.007	1.612.346	2.863.661	6.521.710	2.698.722	3.822.988
TOTAL SIERRA	1.856.445	485.475	1.370.970	2.271.345	744.387	1.526.958	3.146.565	1.202.796	1.943.769
Azuay	250.975	49.118	201.857	274.642	69.722	204.920	367.324	117.493	249.831
Bolívar	109.305	11.242	98.063	131.651	15.422	116.229	144.593	19.044	125.549
Cañar	97.681	13.095	84.586	112.733	14.801	97.932	146.570	19.821	126.749
Carchi	76.595	20.701	55.894	94.649	27.260	67.389	120.857	38.094	82.763
Cotopaxi	165.602	18.497	147.105	154.971	24.294	130.677	236.313	32.378	203.935
Chimborazo	218.130	46.345	171.785	276.668	59.878	216.790	304.316	78.171	226.145
Imbabura	146.893	31.363	115.530	174.039	47.538	126.501	216.027	69.604	146.423
Loja	216.802	30.372	186.430	285.448	48.751	236.697	342.339	75.732	266.607
Palenque	386.520	225.655	160.865	587.835	374.308	213.527	988.306	658.791	329.515
Tungurahua	187.942	39.087	148.855	178.709	62.413	116.296	279.920	93.668	186.252
TOTAL COSTA	1.298.495	422.893	875.602	2.127.358	857.533	1.269.825	3.179.446	1.470.591	1.708.855
El Oro	89.306	23.297	66.009	160.650	67.455	93.195	262.564	126.407	136.157
Esmeraldas	75.407	15.301	60.106	124.881	39.619	85.262	203.151	72.146	131.005
Guayas	582.144	288.746	293.398	979.223	574.197	405.026	1.512.333	956.601	555.732
Los Ríos	150.260	20.341	129.919	250.062	51.288	198.774	383.432	97.434	285.998
Manabí	401.378	75.208	326.170	612.542	124.974	487.568	817.966	218.003	599.963
TOTAL ORIENTE	46.471	5.564	40.907	74.913	10.426	64.487	173.469	22.979	150.490
Morona Santiago	21.046 (1)	2.681 (1)	18.365 (1)	25.503	4.442	21.061	53.325	9.520	43.805
Napo	25.425 (2)	2.883 (2)	22.542 (2)	24.253	1.809	22.444	62.186	4.260	57.926
Pastaza	-	-	-	13.693	2.290	11.403	72.465	5.361	18.104
Zamora Chinchipe	-	-	-	11.464	1.885	9.579	14.495	3.838	30.655
GALAPAGOS	1.346	-	1.346	2.391	-	2.391	4.037	2.356	1.681

(1) Includes the population of Zamora Chinchipe.

(2) Includes the population of Pastaza.

(3) Includes the population of disputed territory.

SOURCE: 1950, 1962, and 1974 censuses.

PREPARED BY: Central Bank of Ecuador - Department of Economic Indicators (Banco Central del Ecuador - Departamento de Indicadores Economicos.)

In spite of the growth of the rural population, it has fallen from 71.5% of the total population in 1950 to 58.6% in 1974. This pattern in the national population is repeated in the regional populations and is more pronounced in the Mountain than in the other regions.

a. Population Growth

According to census data, the population of Ecuador has experienced varied average growth rates as can be seen in the following table:

TABLE II.2

RATES OF POPULATION GROWTH

REGION	PERIOD- 1950 - 1962			PERIOD - 1962 - 1974		
	Total	Urban	Rural	Total	Urban	Rural
Sierra (Mountain)	1.7	3.6	0.9	2.7	4.1	2.0
Costa (Coast)	4.2	6.1	3.1	3.4	4.6	2.5
Total	2.8	4.8	1.9	3.2	4.4	2.4

As can be seen in Table, II.2, the growth rates in the different regions, as compared to the national growth of population, again confirm our previous observations. The Mountain shows less growth than the Coast and the national average, while the Coast maintains a higher growth rate; the rural sector grows at a slower rate than the nation as a whole and especially the urban sector. Possible causes are immigration to the city from the country, the changes in different sectors of production, and the attractions of the city.

b. Composition of the Population by Age and Sex

According to Table II.3, the greatest percentage of the population (44.5%) consists of people under 14 years of age. This situation is similar in the urban sector (41.4%) and in the rural sector (46.6%). In relation to the distribution of the population by sex, there have not been great variations, although it is necessary to point out a small increase in the number of men and a small decrease in the number of women.

c. Birthrate - Mortality Rate

The annual average of births per 1,000 inhabitants was 50 in the period 1925-1930, and 45 from 1970-1975, which was a reduction of only 5 births per 1,000 inhabitants. The average annual rate of mortality was 27 per 1,000 inhabitants in the first of these periods and 12 in the second, which represents a reduction of 15 deaths per 1,000 inhabitants. Thus, during the last 45 years, the combined

TABLE II.3
TOTAL, URBAN, AND RURAL POPULATION BY SEX AND AGE -- 1962 and 1974 CENSUSES

Year: 1962

AGES	TOTAL			URBAN			RURAL		
	Total	Men	Women	Total	Men	Women	Total	Men	Women
0-14 years	2,014,505	1,025,937	988,568	706,955	352,706	354,249	1,307,550	673,231	634,319
15-19 years	435,120	214,241	220,879	169,278	78,317	90,961	265,842	135,924	129,918
20-44 years	1,404,040	689,142	714,898	509,635	237,118	272,517	894,405	452,024	442,381
45-60 years	381,405	191,301	190,104	141,299	66,401	74,898	240,106	124,900	115,206
60 and above	240,937	115,855	125,082	85,179	36,942	48,237	155,758	78,913	76,815
TOTAL	4,476,007	2,236,476	2,239,531	1,612,346	771,484	840,862	2,863,661	1,464,992	1,398,669

Year: 1974

AGES	TOTAL			URBAN			RURAL		
	Total	Men	Women	Total	Men	Women	Total	Men	Women
0-14 years	2,921,095	1,481,546	1,439,549	1,133,281	563,221	570,060	1,787,814	918,325	869,489
15-19 years	704,177	351,136	353,041	328,833	154,607	174,226	375,344	196,529	178,815
20-44 years	1,990,356	987,721	1,002,635	873,281	414,854	458,427	1,117,075	572,867	544,208
45-60 years	547,484	274,527	272,957	222,658	106,287	116,371	324,826	168,240	156,586
60 and above	388,983	187,437	201,546	148,663	65,349	83,314	240,320	122,088	118,232
TOTAL	6,552,095	3,282,367	3,269,728	2,706,716	1,304,318	1,402,398	3,845,379	1,978,049	1,867,330

SOURCE: National Planning Board

effect of the birthrate and the rate of mortality has contributed to the increase in the growth rate by 10 per thousand.

The reduction in mortality is mostly due to advances in sanitation, the adoption of new technology, the introduction of modern methods of control of infectious and parasitic diseases, the campaigns for vaccination against malaria and other diseases, and the installation of water supplies and sewerage removal, etc.

Of the total of all deaths registered in 1974, 40% occurred in children under 2 years of age due to diseases which still have not been controlled such as gastritis, enteritis, bronchitis, whooping cough, measles, typhoid, and other infectious and parasitic diseases.

d. Migration

It has been estimated that the internal movement of the rural population in the period 1954-1962 attained an approximate figure of 300,000 persons.

The Coast absorbed an approximate population of 250,000 persons, while the East received 11,000 persons. The Mountain, as a consequence of this population shift, lost approximately 270,000 persons.

The wave of migration was headed mainly from the country to the city, so that by 1963 it was calculated that the growth of the urban centers reached a rate of 4.7%.

There have existed three types of migratory movements in the countryside, according to the place of settlement and the type of permanence (See Appendices II.1. and II.2.).

a) Rural-urban: this constitutes the most important migratory movement;

b) Rural-rural seasonal: this constitutes a compensatory mechanism for those zones where the population of farm workers does not satisfy the demand for farm labor, especially during planting and harvest. This migratory movement is seen principally from the Mountain provinces such as Cotopaxi, Chimborazo, and Canar, to the provinces of the Coast, such as Guayas, El Oro and Los Rios. The length of stay can vary from a few days to several months;

c) Rural-rural permanent: in this movement the country people leave zones of high demographic pressure in favor of areas of colonization, especially in the western sector of Pichincha province and in certain areas of Esmeraldas and the provinces of the East.

The Colon Archipelago and the East received around 700 and 16,000 persons respectively, which represents in relation to the resident population, positive migration rates of 29.3% and 21.4% respectively.

The Coast has a positive migration rate of 4.2%, and the principal receiving areas are the provinces of Guayas and El Oro; nevertheless, it is not possible to determine what percentage of the migrating population has settled in the country and/or the city.

Los Rios and Manabi have negative migration. In the case of Los Rios, this is probably due to its proximity to Guayaquil, an important industrial and commercial center. In the case of Manabi, this is probably due to the deterioration of its land resources and the prices of the principal crops of the region, such as coffee, cotton, castor-beans, etc., the prolonged dry spells, and the population growth which is greater than in other provinces.

The Mountain region has a migration rate channeled, in large part, toward the zones of the East and the Coast. The province of Pichincha and its capital, Quito, constitute also a great attraction for the rural inhabitants of Ecuador, which explains why, in 1962, it was the only province of the Mountain region which had a relatively high positive migration rate of 14.5%.

e. Social and Cultural Factors

Ecuadorian society has been structured through time by different processes and diverse socio-economic molds. The ancient settlements, located both on the Coast and in the Mountain regions, were overcome by the Inca conquerors. They were totally assimilated into an economic and magical-religious model of the expanding and developing Inca empire. Social organization and economic participation were determined by the decisions of the Inca emperor and his Court, as well as the division of labor and the utilization of the land.

The evolution of Inca society was interrupted by the Spanish conquest. When the Incas disappeared, social organization based on religious belief became dismantled. The Spaniards did not meet with great resistance from the population and were able to capitalize on the organization of labor which existed at that time. The appearance of such institutions such as forced Indian labor, the "encomienda" (a grant of an Indian village and its inhabitants to Spanish colonists by royal decree), and small crafts served to rationalize the uses of labor and to achieve the objectives of becoming rich through the exploitation of mineral resources (gold, silver) and later, when these were used up, to find in agricultural and textile manufacturing endeavors a new source of income.

The massive subjugation of the native population and the free use of their labor by the new owners of the land began and progressively intensified with these activities.

Until the beginning of the Republic, the rural population remained dependent on large landholders. Rural social organization revolved around the work imposed on these people. Under the Republic, the rural population remained tied to the land through the legalization of forced labor until the passage of social legislation prohibiting such abuses.

The development of agricultural production is different in the Mountain and in the Coast, thus causing different types of ties between the rural population and the land. On the Coast, the type of plantation for the production of permanent crops such as rubber or cacao permitted a certain liberty in landowner-worker relations, but in the mountain area the decisions were made exclusively by the landowner.

These different labor relations caused the appearance of diverse population settlements in the same regions. Whether they were dispersed or concentrated, each one of them showed different manifestations of socio-economic organization.

At the same time, groups of people remained isolated, such as the natives of the East, Santo Domingo de los Colorados, Esmeraldas, and some Indian groups in the Mountain such as Saraguros, Canaris, Salacas, Chibuleos, Imbayas. These tribes and groups acquired more or less development according to their degree of interaction with the external environment, especially urban areas. Because of the presence of a wide range of organizational forms in different stages of development, the Ecuadorian government in 1937 legalized their existence by granting them the legal status of communes, an organizational form of Spanish origin based on the Inca "ayllu".

This institution is characterized by the inclusion under that name of settlements previously characterized by internal cohesion, identification with group goals, strong family ties, the acceptance of norms, values, and customs. There are currently 1428 communes, mostly located in the Mountain, registered with the Ministry of Agriculture, upon which they depend legally and administratively.

Subsequent to the development of communes, the organization of the campesinos according to the models of other societies was suggested, including cooperative, associations, and other organizations which remained without sufficient attention until 1973 when they came under the direction of the Ministry. A program of limited technical assistance was initiated, and new rules were approved and put into practice for the granting of credit offered by the National Development Bank (Banco Nacional de Fomento). The campesino groups began to participate more actively in the distribution of land granted by agrarian reform and colonization.

The basis of campesino social organization is the family. In the mountains it is extended, traditional, respectful of the values of the group, and it maintains old customs and traditions. On the coast the family is limited to father, mother, and children, it is more open to change and less attached to customs, values, and traditions.

Social mobility in terms of change of status is theoretically open, although with strong restrictions based on the economic status of the person, traditional family name, and educational level.

The division of rural property into plots smaller than five hectares does not permit complete use of the labor resources available to the campesino family, so the agricultural work is left to the wife and children except during planting and harvest, when the father also participates. The rest of his time is spent migrating in search of work, thus breaking the sedentary life pattern which is found among

rural families particularly in the mountains. In the eastern region some tribes continually change habitat because of their particular way of life (hunting, fishing, subsistence farming).

2. Education

The structure of the Ecuadorian educational system is made up of:

- a) the primary level of six years;
- b) the secondary level of six years, which includes a basic cycle of three years and a diversified cycle (modern humanities, education, and technical areas) which is also three years long and comes after the basic cycle; and
- c) higher education.

The Government is making financial efforts to develop the education sector to a level which reflects the relative participation of this sector in budgetary assignments, which increased from 16% in 1963 to 21% in 1971 and 30% in 1974. Institutional improvement has also deserved attention and in 1974 with external advice, general guidelines for the complete restructuring of the Ministry of Education were drawn up, establishing:

- a) centralization in the Ministry of the responsibility for implementing educational policy, planning, control, and evaluation of the educational system, and
- b) decentralization in the execution of plans and programs of action, granting responsibility for these to the Provincial Boards of Education (Direcciones Provinciales de Educacion).

a. Primary Level

Elementary education is legally obligatory and free in the public schools. It is accomplished through urban and rural schools which offer instruction from first through sixth grades. In order to enter the elementary school a child must be at least six years of age.

By 1978 20% of the schools were located in the urban areas and 80% in rural areas, while the urban sector has 49% of the total enrollment and the rural sector, 51%.

The total number of elementary school teachers is estimated to be 3.5 teachers for each school. The urban sector has 8.7 teachers per school and the rural sector, 2.3.

Nationally there are 129 students per elementary school; in the urban sector there are 311 students per school and in the rural sector, 83. Nationally there are 36 students per teacher and this relationship is the same in the rural schools.

The coverage of the elementary school system is still low. According to 1972 data approximately 28% of the school age population (6-12 years) were not enrolled. It is estimated that 40% of the school age population in rural areas and 10% in urban areas did not have access to elementary education. Given the rapid growth of the population, reduction in the population not covered by this service will be slow if the growth rate of registration is not increased, as well as the efforts to increase and improve the schools and the qualifications of the personnel.

Student retention is also low. In the elementary schools it was 42% in 1972, which means that only 42% of those entering first grade finished sixth grade. There is a great difference in this indicator between urban areas (67%) and rural areas (25%) in spite of the fact that rural areas have been increasing their retention rates in recent years.

b. Secondary Level

To enter secondary school, a student must be at least 13 years old and have completed elementary school. Secondary education is given in two cycles: the basic cycle (first, second, and third years) which consists of general education, and the diversified cycle (fourth, fifth, and sixth years) in which special courses are taught in modern humanities or in technical areas such as agriculture, accounting, mechanics, crafts, etc. Students who graduate from secondary school receive the title of "Bachiller."

The number of secondary schools in Ecuador is 1,200, of which 50.3% are located in the Mountain, 46.5% in the Coast, and 3.2% in the East.

Of 604 secondary schools in the Mountain, 41.4% are located in the province of Pichincha. Of 557 in the Coast, 52.8% are in Guayas province. These figures show the high concentration of secondary schools in the provinces where the most urban population is located.

Of 469,968 students, 313,626 are in the basic cycle (66.7%) and 156,342 are in the diversified cycle (33.3%). In the diversified cycle, 68% study modern humanities and 32% study professional-technical areas, among which agriculture is included.

The percentage of students who continue from elementary school to the basic cycle of secondary school is 72%. From the basic cycle to the diversified cycle the percentage is 93%. This results in a secondary school retention rate of 45% and an overall¹ retention rate (first primary grade to last secondary year) of 14%.

c. Higher Education

Higher education depends economically on the Ministry of Education, but its administration is carried out by each of the universities and polytechnical schools due to the autonomy which is granted to them by law.

To enter a university, it is necessary to hold the title of "Bachiller". A student may enter the program of study for which his secondary education has prepared him.

As shown in Table II.4., by 1978 there were 12 state universities (6 in the Coast region and 6 in the Mountain region) and 5 private universities (2 in the Coast region and 3 in the Mountain region), which gives a total of 17 centers of higher education.

¹ Inter-American Development Bank, Ecuador: Socio-economic Report. 1977.

TABLE II.4
NUMBER OF UNIVERSITIES, PROFESSORS, AND STUDENTS

UNIVERSITY	Place	No. of Profs.	Number of Students		
			1st Sem.	2nd Sem.	Annual Av.
<u>Mountain (Sierra)</u>					
<u>State</u>					
Central Univ. of Ec. (Univ. Central del Ec.)	Quito	2,296	54,665	50,718	52,691.5
State University (Universidad Estatal)	Cuenca	446	8,794	8,995	8,894.5
National University (Universidad Nacional)	Loja	261	3,755	3,755	3,755
Technical University (Universidad Tecnica)	Ambato	232	7,114	7,114	7,114
National Polytech. School (Escuela Politecnica Nacional)	Quito	341	14,705	15,163	14,934
Chimborazo Polytech. School (Escuela Politec. del Chimborazo)	Riobamba	193	2,745	3,533	3,139
Total State		3,769	91,778	89,278	90,528
<u>Private</u>					
Catholic University (Univ. Catolica)	Quito	1,033	14,667	14,924	14,795.5
Catholic University (Univ. Catolica)	Cuenca	246	2,736	2,736	2,736
Technical University (Univ. Tecnica)	Loja	114	3,120	3,120	3,120
Total Private		1,393	20,523	20,780	20,651.5
TOTAL MOUNTAIN		5,162	112,301	110,058	111,179.5
<u>Coast (Costa)</u>					
<u>State</u>					
State University (Univ. Estatal)	Guayaquil	2,922	53,831	54,135	53,983
Technical Univ. (Univ. Tecnica of Manabi)	Portoviejo	281	6,408	8,724	7,566
Technical Univ. (Univ. Tecnica)	Machala	226	4,311	4,311	4,311
" "	Esmeraldas	139	3,942	4,222	4,082
" "	Babahoyo	268	6,056	9,586	7,821
Coastal Polytec. School (Escuela Politecnica Litoral)	Guayaquil	157	9,334	9,889	9,611.5
Total State		3,993	83,882	90,867	87,374.5
<u>Private</u>					
Catholic University (Universidad Catolica)	Guayaquil	462	4,088	4,282	4,185
Universidad Laica Vicente Pocafuerte	Guayaquil	310	5,348	5,368	5,358
Total Private		772	9,436	9,650	9,543
TOTAL COAST		4,765	93,318	100,517	96,918
TOTAL COUNTRY		9,927	205,619	210,575	208,097

Source: National Higher Education Council (Consejo Nacional de Educacion Superior)

These have an enrollment of 208,097 students, of whom 52.1% are concentrated in the two state universities in Quito and Guayaquil; 11.5% are in the polytechnical schools in the same cities, and 11.7% in the private universities, which shows that three-fourths of university registrations are concentrated in the seven institutions in Quito and Guayaquil.

There are 9,927 professors for all the universities, which indicates that there is an average of 1 professor per 21 students; in the state universities the ratio is 1 to 23 and in the private universities, 1 to 14.

d. Informal Education

"Adult education and literacy training are integrated into the national education system and consist of three programs: a) elementary education, which includes three cycles of nine months duration apiece; b) secondary education which includes the basic and diversified cycles each of three years duration; and c) basic¹ crafts training, whose duration depends upon the specialization."

3. Nutrition

According to the Ecuadorian Institute of Nutrition (Instituto Ecuatoriano de Nutricion), during the 1960's not more than 1,776 calories and 23.4 grams of protein were available per capita on a daily basis in Ecuador. This shows a considerable deficiency when compared with the minimum daily requirements of between 2,200 and 2,500 calories and 45 grams of protein per capita daily.

If this is the general situation among the Ecuadorian population, the situation among the campesinos and marginal groups in the cities is even more difficult. These groups of people exist with even lower protein and calorie intake levels because their daily diets lack meat, eggs, milk, vegetables, fruits, etc. This results in deterioration of their physical and mental health and is reflected in low productivity in their daily activities.

The number of rural residents affected by malnutrition can only be estimated, but a study by the American Technical Assistance Corporation (Rivadeneira, 1973) of Ecuadorian mothers and their children found that 16% of the population (around 1.2 million persons) suffered a high degree of malnutrition. Sixty per cent of the groups studied were in the rural area of the mountains.

4. Housing

By 1974 the number of housing units in Ecuador was 1,373,934 in the urban sector and 846,614 in the rural sector. The distribution by type of housing is shown in Table II.5. The housing deficit is 750,000 units, 500,000 in the rural areas and 250,000 in the urban areas according to the 1974 census.

¹ Inter-American Development Bank. Ecuador: Socio-Economic Report 1977.

TABLE II.5

HOUSING STATISTICS, 1974

- Census Data -

Type of Housing	Total	Urban	Rural
TOTAL	1'373.934	527.320	846.614
Private residences	1'370.849	525.517	845.332
Country residences or villas	417.781	171.087	246.694
Apartments	110.126	104.235	5.891
Rented rooms or houses	158.744	146.292	12.452
Slope-roofed sheds	221.037	37.641	183.396
Farmer's huts	336.413	61.852	274.561
Shanties	121.477	1.126	120.351
Others	2.931	1.759	1.172
Buildings not designed for housing	2.340	1.525	815
Collective housing	3.085	1.803	1.282

(16)

PREPARED BY: Economic Research Institute of the
(Instituto de Investigaciones Economicas de la PUCE.)

Housing, especially in the rural areas, is constructed poorly in every respect. In the Coast the houses are generally constructed of wood (stilt palm) and usually have one room without basic necessities such as water, sewer, large enough windows for air circulation, etc. In the Mountain region the houses are constructed of adobe, "bareque" (a mixture of reeds with fine wet earth), with thatched roofs; the kitchen, dining room, and bedrooms are in one area which even serves as a rearing ground for small domestic animals especially the Guinea pig. Most of the houses do not have windows for ventilation and the floor usually is earthen. Most do not have running water, electric service, etc. In the East houses have the same type of construction as in the Coast, with the difference that the roofs are well built due to climatological conditions.

5. Health

a. Environmental Sanitation

In Table II.6 is a summary of distribution services for potable water. According to this table, 14.13% of all parishes have potable water service, 49.08% have running water and 36.79% lack this service.

It should be pointed out that all the provinces except Pichincha have a low percentage of parishes with potable water. In Pichincha this percentage is 77.4% and in the rest it fluctuates between 1.6% and 21.3%.

For 1977, the National Planning Board established that 83.0% of the urban population and 13.0% of the rural population had potable water.

Regarding sewerage service, according to data from the 1974 census 28.1% of all housing removed sewerage by means of a sewer system, 9.9% by septic tank, and 61.9% had no service for sewerage removal. In urban areas 64.4% of the housing eliminated sewerage by means of a sewer system, 15.7% by septic tank, and 19.8% have no service for removal of sewerage. In rural housing the problem of sewerage removal is alarming since only 3.1% of all housing has a sewer system, 5.9% remove sewerage by means of septic tanks, and 90.9% has no sewerage removal system.

b. Health Services

The preservation and improvement of health in Ecuador is carried out by the services of hospitals, clinics, health centers, and satellite clinics. The hospitals and clinics are found in the capitals of provinces and important cantons. These services are both public and private.

The health centers are operational units set up to deliver emerging health services, established preferably in the capitals and cantons.

The satellite clinics are operational units to deliver minimal health services, set up preferably in the capitals of important parishes.

TABLE II.6: Water Distribution Services by Province - 1974

Republic-Province	Total No. Parishes	Parishes with Potable Water	Percent	Parishes with Piped Water	Percent	Parishes without Service	Percent
REPUBLICA*	821	116	14.13	403	49.08	302	36.79
Carchi	27	3	11.11	16	59.26	8	29.63
Imbabura	42	9	21.43	24	57.14	9	21.43
Pichincha	62	48	77.42	13	20.96	1	1.62
Cotopaxi	37	4	10.81	24	64.86	9	24.32
Tungurahua	49	7	14.29	39	79.59	3	6.12
Chimborazo	48	5	10.42	43	89.58	-	
Bolivar	24	-		20	63.33	4	16.67
Canar	31	1	3.23	24	77.42	6	19.35
Azuay	63	2	3.17	37	58.73	24	38.10
Loja	71	3	4.43	53	74.65	15	21.13
Esmeraldas	55	4	7.27	2	3.64	49	89.09
Manabi	59	11	18.64	9	15.25	39	66.10
Los Rios	22	6	27.27	9	40.91	7	31.82
Guayas	58	9	15.52	15	25.86	34	58.62
El Oro	40	2	5.0	29	72.50	9	22.50
Napo	54	1	1.58	13	24.07	40	74.07
Pastaza	17	-	-	13	76.47	4	23.53
Morona Santiago	42	-	-	13	30.95	29	69.05
Zamora Chinchipe	20	1	5.0	7	35.0	12	60.00

*Does not include Galapagos because of a lack of information.

**SOURCE AND PREPARED BY: Regionalization of the MAG.

Health outposts are found in rural parishes, hamlets, and large farms to deliver first aid services. They are manned by paramedical personnel.

A summary of the parishes which have health services available is found in Table II.7. According to this table, only 52% of the parishes have health services.

The number of hospital centers in 1972 was 217, with a capacity of 13,618 beds, and an availability of 2.1 beds per 1,000 inhabitants. The highest percentage of health service establishments, beds, and doctors is found concentrated in Pichincha and Guayas. (For more information see Appendix II.3.)

In relation to the human resources specializing in health care, according to socio-economic indicators of the National Planning Board, in 1976 there were 5.1 doctors, 1.7 dentists, 1.6 nurses, and 0.6 midwives per 10,000 inhabitants.

6. Electrical Energy

The guidelines for the development of Ecuadorian electricity come from the National Electrification Plan (Plan Nacional de Electrificación) which is divided into: a) the Interconnected National Systems (Sistema Nacional Interconectado), and b) Regional Electrical Systems (Sistemas Electricos Regionales). The first of these is designed to integrate the electrical supply systems of the Coast and Mountain regions. These regions are the most populated and have the most urban and manufacturing centers. The basic objective is to put the supply of electrical energy on a firm foundation by using the economies of size inherent in large projects, thus eliminating small, unreliable, and uneconomic distributors. The Ecuadorian Electrification Institute (Instituto Ecuatoriano de Electrificación - INECEL) has as its responsibility the planning, construction, and operation of the system both in terms of power generation and transmission. The Regional Electrical Systems are made up of the necessary installations and machinery for the distribution of electrical energy in geographically defined areas, either under the administration of regional enterprises or in association with INECEL. Currently these enterprises are responsible for generating, distributing, and selling their own energy. Later when they are integrated into the Interconnected National System, they will be responsible for the purchase, distribution, and sale of the energy generated by that system.

In Table II.8 can be seen the changes which occurred between 1976 and 1977 in terms of capacity installed, energy generated, and population served.

In reference to the availability of electrical energy per housing unit, according to data taken from the 1974 census, 84.0% of housing in urban areas has electrical service and 16.0% does not. Twelve percent of rural housing has electrical service and 88.0% does not.

TABLE II.7: Health Services in the Parishes of Ecuador - 1974

REPUBLIC - PROVINCE	NUMBER OF PARISHES		
	with service	w/out service	Total
REPUBLIC*	432	400	832
Carchi	13	14	27
Imbabura	26	16	42
Pichincha	56	10	66**
Cotopaxi	18	19	37
Tungurahua	13	36	49
Chimborazo	28	20	48
Bolivar	10	14	24
Canar	12	19	31
Azuay	20	43	63
Loja	40	31	71
Esmeraldas	13	42	55
Manabi	58	1	59
Los Rios	15	7	22
Guayas	39	19	58
El Oro	14	24	40
Napo	18	36	54
Pastaza	8	9	17
Morona Santiago	13	29	42
Zamora Chinchipe	11	9	20
Galapagos	5	2	7

*The capitals of the cantons are considered as parishes.

**Recorded as 66 although there are actually only 62 parishes, due to Independencia and La Concordia which are not parishes and Chillogallo and Guapulo which are now urban.

SOURCE AND PREPARATION: Regionalization of the MAG

TABLE II.8
ELECTRICAL SERVICE

	1 9 7 6	1 9 7 7	Increase	Annual Growth Rate
Power installed (kw)	632,800	784,555	151,755	24%
Power installed per capita (watts/person)	91.8	110.4	18.6	20%
Energy generated (kwh)	1,884,998	2,150,000	265,012	14%
Energy generated per capita (kwh/person)	274	302	28	10%
Population with elect. service (person)	2,500,000	2,800,000	300,000	12%

SOURCE: National Planning Board, Socio-economic Indicators.

7. Means of Communication

According to data issued by the National Planning Board, the Ecuadorian highway network in 1976 had a total length of 28,275 km. (Table II.9), of which 13.5% are asphalt, 37.3% are improved dirt, 6.8% are passable year round, and 42.2% are seasonally passable. Forty-seven percent of all highways are in the Coast region, 29% in the Mountain, and 4% in the East and Galapagos.

The area of usable land for 1976 was 197,119 km². Relating the length of the highways in km. to each km.² of available land, the country had available 0.072 km. of main highways, 0.009 km. of secondary roads, 0.062 km. of residential roads, and a total average of 0.143 km. (See Table II.10.)

In Table II.11 is a summary of the accessibility of farm family units to each type of roadway. Thus 13.1% have access to first-class roads of varying lengths from 0 to 39.5 km. Eighty-two and seven tenths of a percent have access to second-class roads with distances to rail lines varying from 0 to 19.5 km., and 3.2% have access to waterways at distances from 0 to 34.5 km.

Of the total number of farm family units in the Mountain region, 8.8% have access to first-class roads, 90.2% to second-class roads, and 1% to rail lines. In the Coast region, 20.6% have access to first-class roads, 71.2% to second-class roads, 1.2% to rail lines, and 7% to waterways. In the East region, 88.5% have access to waterways and 11.5% to second-class roads (See Appendix 11.4.).

8. Transportation

It was previously indicated that farm family units have the greatest access to second-class roads. Consequently, motorized

TABLE II.9: HIGHWAYS BY PROVINCES - 1976

- Kilometers -

Provinces	Asphalt	Improved	Passable	Seasonal Roads	Total
Esmeraldas	174	267	-	412	853
Manabi	587	391	-	4,171	5,149
Los Rios	237	800	35	1,880	2,952
Guayas	861	366	86	1,566	2,879
El Oro	252	557	90	428	1,327
<u>TOTAL-COSTA</u> (Coast)	2,111	2,381	211	8,457	13,160
Carchi	96	278	176	599	1,149
Imbabura	185	374	357	239	1,155
Pichincha	532	1,175	397	88	2,192
Cotopaxi	372	1,161	-	398	1,931
Tungurahua	84	562	452	-	1,098
Bolivar	-	704	-	506	1,210
Chimborazo	177	550	270	312	1,309
Canar	153	411	-	116	680
Azuay	40	759	-	322	1,121
Loja	65	1,028	-	947	2,040
<u>TOTAL-SIERRA</u> (Mountain)	1,704	7,002	1,652	3,527	13,885
Napo	-	427	-	-	427
Pastaza	-	207	-	-	207
Morona Santiago	-	162	51	-	213
Zamora Chinchipe	-	315	-	-	315
<u>TOTAL-ORIENTE</u> (East)	-	1,111	51	-	1,162
GALAPAGOS	-	68	-	-	68
<u>TOTAL-NATIONAL</u>	3,815	10,562	1,914	11,984	28,275

SOURCE: Socio-economic Indicators.

PREPARED BY: Economic Research Institute of the National Planning Board
(Junta Nacional de Planificacion -- JUNAPLA)

TABLE II. 10
HIGHWAY DENSITY AS A FUNCTION OF HIGHWAY LENGTH AND USABLE AREA TO 1970

Regions and Provinces	Usable Land Km ²	Total	LENGTH IN KILOMETERS			Kilometers of Road per Km ² of Usable Land			
			Main Asphalt and Improved	Secondary Passable Year-Round	Residential and Seasonally Passable	Total	Main	Secondary	Residential
SIERRA: (Mountain)									
Carchi	2.837	1.148.5	376.5	176.0	599.0	0.405	0.133	0.062	0.211
Imbabura	3.748	1.154.4	558.9	356.8	238.7	0.308	0.149	0.095	0.064
Pichincha	13.266	2.191.5	1.706.5	397.0	88.0	0.158	0.129	0.029	0.005
Cotopaxi	3.803	1.930.0	1.532.5	-	397.5	0.507	0.403	-	0.105
Tungurahua	1.230	1.098.4	646.3	452.1	-	0.893	0.525	0.368	-
Chimborazo	2.674	1.308.7	726.7	270.0	312.0	0.489	0.272	0.101	0.117
Bolivar	2.459	1.209.5	702.0	-	505.5	0.492	0.286	-	0.206
Cañar	2.170	679.7	563.5	-	116.2	0.313	0.259	-	0.054
Azuay	3.575	1.120.3	798.7	-	321.6	0.313	0.223	-	0.089
Loja	4.328	2.039.9	1.092.8	-	947.1	0.471	0.252	-	0.219
TOTAL-SIERRA:	40.000	13.880.9	8.703.4	1.651.9	3.525.6	0.346	0.217	0.041	0.088
COSTA: (Coast)									
Esmeraldas	13.074	764.0	334.0	-	430.0	0.058	0.026	-	0.033
Manabí	13.256	5.149.0	978.0	-	4.171.0	0.388	0.074	-	0.315
Guayas	6.368	2.879.1	1.226.8	86.0	1.566.3	0.452	0.193	0.014	0.246
Los Ríos	5.528	2.952.0	808.5	35.0	1.880.0	0.534	0.146	0.006	0.340
El Oro	4.226	1.326.5	1.037.0	90.0	428.0	0.314	0.245	0.021	0.101
TOTAL-COSTA:	42.450	13.070.6	4.384.3	211.0	8.475.3	0.308	0.103	0.005	0.199
ORIENTE: (East)									
Napo	40.977	427.0	427.0	-	-	0.010	0.010	-	-
Pastaza	23.737	213.6	162.4	51.2	-	0.009	0.007	0.002	-
Morona Santiago	25.564	207.0	207.0	-	-	0.008	0.008	-	-
Zamora Chinchipe	16.496	315.0	315.0	-	-	0.019	0.019	-	-
TOTAL-ORIENTE:	106.774	1.162.6	1.111.4	51.2	-	0.011	0.010	0.001	-
GALAPAGOS:	7.805	68.0	68.0	-	-	0.009	0.009	-	-
TOTAL-NATIONAL	197.119	28.182.1	14.267.1	1.914.1	12,000.9	0.143	0.072	0.009	0.062

SOURCE: National Planning Board

(23)

TABLE II. 11
ACCESSIBILITY OF FARM FAMILY UNITS TO DIFFERENT MEANS OF TRANSPORTATION

SUMMARY - Entire Nation														
Distances	Total No. Families	First Class (1)	HIGHWAYS						Railway	Z	PT	Waterways	Z	PT
			Z	PT (2)	Second Class (3)	Z	PT	Z						
0 - 1.5	361.343	49.991	13.8	100.0	298.187	82.6	90.6	1.577	0.4	100.0	11.588	3.2	96	
1.5 - 4.5	200.061	30.050	15.0	100.0	161.950	81.0	90.0	2.231	1.1	100.0	5.830	2.9	97	
4.5 - 9.5	85.069	7.897	9.3	100.0	74.679	87.8	87.8	839	1.0	93.9	1.644	1.9	100	
9.5 - 19.5	37.619	3.084	8.2	100.0	30.103	83.0	83.0	2.455	6.5	100.0	1.977	5.3	96	
19.5 - 39.5	13.001	1.174	9.0	100.0	10.486	80.7	92.8				1.341	10.3	100	
39.5 - 59.5	7.328			100.0	7.238	100.0	99.5							
T O T A L	704.321	92.196	13.1	100.0	582.643	82.7	89.8	7.102	1.0	99.3	22.380	3.2	96	

(1) Asphalt highway

(2) PT - Passable time expressed as a percentage of days in a year

(3) Improved, gravel, and stone roads, passable year round, and seasonably passable roads

SOURCE: Regionalization of the MAG

transportation is the principal means of transportation which they use (76.7%). Other means are animals (15.5%), water (5.1%), human (1.7%), and rail (1.0%). (Table II.12)

The use of animals as a means of transportation is more frequent in areas distant from roads (19.5 to 59.5 km). This national trend can also be observed in each region (See Appendix II.5).

9. Storage Facilities

The marketing of agricultural products constitutes one of the most intense problems of the agricultural sector, to the point that it has served as an impediment to agricultural development. The principal limitation is insufficient storage capacity.

Studies prior to 1974 indicate that Ecuador had available a total storage capacity (silos and warehouses) of 230,000 metric tons (MT), of which 85% was in the private sector. In order to increase the storage capacity and provide the country with facilities which would permit the marketing of agricultural products, ENAC¹ undertook construction of silos and warehouses and by October of 1978, ENAC had a storage capacity of 76,250 MT, 49% of this in silos and 51% in warehouses. (Table II.13)

In order to increase their storage capacity, ENAC signed a contract for construction of a network of silos and warehouses located on the coast with a capacity of 34,000 and 27,000 MT, respectively. The contract was with Tiffany Iron and Steel Co. (Cia. Tiffany Siderurgica).

ENPROVIT² has a storage capacity of its own of 12,043 MT (Table II.14). Quito has the greatest number of warehouses (6) but the greatest capacity (61%) is in Guayaquil. Since this capacity is insufficient, the organization is obliged to rent additional warehouses.

According to data from the MAG Regionalization program, 1.2% of the total agricultural production units in Ecuador have some kind of storage available.

C. Availability, Distribution, and Utilization of Resources

1. Land

a. Availability

The total area of the country is 27,934,300 hectares, of which 24.8% is in the Coast region, 21.6% in the Mountain region, 46.2% in the East and 2.9% in Galapagos (See Table II.15).

1 National Storage and Marketing Organization (Empresa Nacional de Almacenamiento y Comercializacion)

2 National Vital Products Organization (Empresa Nacional de Productos Vitales)

TABLE II. 12
MEANS OF TRANSPORTATION

Distances	MOTORIZED		ANIMAL		WATER		HUMANS		RAILWAY		TOTAL
	No. of Farm Families	%	No. of Farm Families	%	No. of Farm Families	%	No. of Farm Families	%	No. of Farm Families	%	No. of Farm Families
0 - 1.5	399.574	85.3	37.517	8.0	23.105	4.9	4.888	1.0	3.146	0.8	468.230
1.5 - 4.5	81.773	68.5	26.150	21.9	7.319	6.1	3.393	2.9	751	0.6	119.386
4.5 - 9.5	34.472	56.5	22.664	37.2	1.160	1.9	1.962	3.2	740	1.2	60.998
9.5 - 19.5	16.831	47.4	12.763	36.0	2.772	7.8	791	2.2	2.358	6.6	35.515
19.5 - 39.5	4.835	37.3	5.779	44.6	1.344	10.4	994	7.7			12.952
39.5 - 59.5	2.778	38.4	4.462	61.6							7.240
T O T A L	540.263	76.7	109.335	15.5	35.700	5.1	12.028	1.7	6.995	1.0	704.321

(26)

SOURCE AND PREPARED BY: Regionalization of the MAG

TABLE II. 13
ENAC STORAGE CAPACITY - OCTOBER 1978

Place of Storage	Silos	Warehouses	Total
ENAC (original facility)	44,000	320,000	364,000
Guayaquil facility (1)	352,000	143,000	495,000
EDIALCE (1)	332,698	102,000	434,698
Aldigran (1)	<u>96,800</u>	<u>---</u>	<u>96,800</u>
Subtotal (cwt.)	825,498	565,000	1,390,498
Rented warehouses	<u>---</u>	<u>287,000</u>	<u>287,000</u>
Total	825,498	852,000	1,677,498
Metric Tons	37,523	38,727	76,250

(1) Acquired recently

TABLE II. 14
ENPROVIT Storage Capacity

Location	No. of Warehouses	Capacity (cwt)	Capacity (MT)
Quito	6	74.350	3.373
Guayaquil	3	161.300	7.318
Ambato	2	19.190	871
Loja	<u>1</u>	<u>10.600</u>	<u>481</u>
Total	12	265.444	12.043

(1) Represents ENPROVIT's facilities. These facilities are insufficient, and the agency is obliged to rent private warehouses when necessary.

SOURCE: ENPROVIT

TABLE II.15
LAND USE - 1977

REGION AND PROVINCES	CULTIVATED AREA			IRRIGATED	DOUBLE CROPPED	FORESTS		OTHER USES	TOTAL AREA	IN PRIVATE PROPERTY	
	PLANTED FIELDS-TOTAL*	PASTURE				TOTALS	ADMINISTERED			(1,000 ha.)	%
		TOTAL	IMPROVED								
A. COAST					(1,000 ha)						
Esmeraldas	67.1	129.9	66.0	0	5.0	1,099.0	900.0	484.7	1,780.7	502.7	28.2
Manabi	129.9	497.6	275.0	28.7	20.0	871.0	0.2	468.4	2,066.0	1,231.2	59.6
Los Rios	172.7	187.2	96.6	-	10.0	93.0	0.5	214.0	666.9	592.9	88.9
Guayas	123.9	545.1	231.5	33.6	30.0	433.0	0.4	769.1	1,871.1	1,199.9	64.1
El Oro	67.1	108.9	63.9	58.1	10.0	274.2	0.3	202.0	652.2	381.7	48.9
Sub Total	560.7	1,468.7	799.0	120.4	75.0	2,770.2	901.4	2,138.2	6,937.8	3,845.4	54.6
B. MOUNTAIN											
Carchi	20.9	79.4	9.8	4.1	-	279.0	0.6	61.8	441.1	188.0	42.6
Imbabura	45.5	130.1	17.6	-	-	289.8	1.9	101.5	566.9	240.7	42.4
Pichincha	131.3	573.9	53.4	-	-	888.5	7.7	115.3	1,709.0	786.7	46.0
Cotopaxi	28.9	166.1	107.2	8.3	-	213.4	4.8	175.0	583.4	299.1	51.2
Tungurahua	53.3	52.1	30.8	9.4	-	153.0	0.9	90.9	349.3	144.2	41.3
Bolivar	79.9	122.2	72.2	-	-	182.9	0.2	13.3	398.3	335.9	84.3
Chimborazo	65.6	87.2	45.5	13.5	-	227.0	1.8	261.6	641.4	325.7	50.8
Canar	50.2	95.4	47.8	0.8	-	216.0	0.6	89.8	451.4	248.6	55.1
Azuay	44.1	114.8	14.5	4.5	-	565.0	3.3	208.4	932.3	269.5	28.9
Loja	117.8	239.4	3.5	6.0	-	582.0	1.4	280.0	1,219.2	227.9	18.7
Sub Total	637.5	1,660.6	402.3	46.6	-	3,596.6	23.2	1,397.6	7,292.3	3,066.3	42.0
C. EAST											
Napo	14.5	58.4	46.1	-	-	4,569.8	-	537.1	5,179.8	256.7	5.0
Pastaza	6.7	44.9	43.2	-	-	1,596.9	-	1,552.3	3,200.8	926.4	28.9
Zamora	15.7	88.6	61.7	-	-	1,043.6	-	932.1	2,079.9	184.5	8.9
Morona	2.7	11.8	99.9	-	-	2,043.0	-	385.5	2,543.0	211.5	8.3
Sub Total	39.6	203.7	250.9	-	-	9,253.3	-	3,407.0	12,903.6	1,579.1	12.1
D. GALAPAGOS											
	1.5	7.9	-	-	-	-	-	791.2	800.6	-	-
TOTAL	1,239.3	3,240.9	1,386.2	167.0	75.0	15,620.1	924.3	7,734.0	27,934.3	8,490.8	30.2

*These areas are used to arrive at total area.
Source: National Regionalization Program of the MAG.

According to data in this table, in 1977 there were 1,239,300 hectares under cultivation, distributed as follows: Coast 45.2%, Mountain 51.5%, East 3.2% and Galapagos 0.1%.

The area cultivated can be increased by about 200%. The Coast can increase 228.2%, the Mountain by 63.5%, and the East by 2,005.6%.

Expansion in the East would be subject to a process of planned colonization according to guidelines to be set up on the use and conservation of natural resources to maintain the ecological balance. (See Table II.16).

b. Distribution

The unequal distribution of the land in the rural sector (Table II.17) influences the social class system, the distribution of wealth, and the exercise of power.

The number of agricultural production units in 1974 increased by 172,810 units over the number in 1954; area increased by 1,901,500 hectares in the same period. Part of these increases is due to agrarian reform, principally the increased number of agricultural production units. Another part is due to colonization, and the rest to the different coverage of the censuses (Table II.18).

Studying the data by size groups of agricultural production units the following can be determined:

- At the level of 0 - 5 hectares, the number of production units increased by 37.3% while the total area increased by only 24.0%. This means a subdivision of the production units in this group, since while in 1954 the units under 5 hectares had an average of 1.7 hectares, in 1974 they only average 1.5 hectares.
- Both the number of production units between 5 and 500 has. and their area show substantial growth in the period from 1954 to 1974. The number of production units grew by 78,112 (86.3%) and the area by 2,402,100 has. (83.9%). The average size of the units in this category remained about the same: 31.3 has. in 1954 and 30.9 has. in 1974.
- If the 9,548 units between 100 and 500 has. are excluded from the preceding category, with a total area of 1,675,132 has. and an average per production unit of 175.4 has., the rest of the production units in the category of 5 to 500 has. total 160,343 units with an area of 3,487,763 has. and an average area per production unit of 22.4 has.
- Although there is a slight increase of 53 units in the number of production units over 500 has., their area diminished by 604,700 has. (28.7%). Consequently, the average size of the production units in this category fell from 1,977 has. in 1954 to 1,478 has. in 1974.
- In spite of the favorable development seen in 1974 in the group of production units between 5 and 500 has., in which 169,891 existing units (32.8% of the total) cover 5,262,900 has. (66.6% of the total), an abnormal situation persists in

TABLE II.16

LAND RESOURCE POTENTIAL - CULTIVATED CROPS,
AND POTENTIAL FOR IRRIGATION

Region and Province	CULTIVATED AREA			IRRIGATION AREA			TOTAL
	Present	Potential	% Increase (1,000 ha)	In Use	In Plans	Potential w/plans	
A. COAST							
Esmeraldas	67.1	76.7	12.5	-	3.5	-	3.5
Manabí	129.9	585.5	325.7	28.7	4.4	-	33.1
Los Rios	172.7	343.0	98.6	-	-	-	-
Guayas	123.9	695.5	461.3	33.6	114.7	23.0	171.3
El Oro	67.1	139.6	52.0	58.1	-	0.8	58.9
Sub-Total	560.7	1,840.3	228.2	120.4	122.6	23.8	266.8
B. MOUNTAIN							
Carchi	20.9	41.5	98.6	4.1	3.2	19.8	27.1
Imbabura	45.5	76.7	68.5	-	-	9.2	9.2
Pichincha	131.3	128.6	- 2.1	-	13.6	30.7	44.3
Cotopaxi	28.9	64.2	122.1	8.3	45.1	-	53.4
Tungurahua	53.3	61.4	15.2	9.4	10.5	2.0	21.9
Bolívar	79.9	51.5	- 35.5	-	3.2	-	3.2
Chimborazo	65.6	147.9	125.5	13.5	4.3	0.6	18.4
Cañar	50.2	73.8	47.0	0.8	4.3	6.7	11.8
Azuay	44.1	135.6	207.5	4.5	-	12.9	17.4
Loja	117.8	261.4	121.9	6.0	1.4	23.6	31.0
Sub-Total	637.8	1,042.6	63.5	46.6	85.6	105.5	237.7
C. EAST							
Napo	14.5	187.3	1,191.2	-	-	-	-
Pastaza	6.7	232.3	3,367.2	-	-	-	-
Zamora	15.7	292.1	1,760.5	-	-	-	-
Morona	2.7	122.1	4,422.2	-	-	-	-
Sub-Total	39.6	833.8	2,005.6	-	-	-	-
D. GALAPAGOS	1.5	-	-	-	-	-	-
T O T A L	1,239.3	3,716.7	199.9	167.0	208.2	129.3	504.3

SOURCE: MAG National Regionalization Program

TABLE II.17

NUMBER AND AREA OF FARMING ENTERPRISES BY SIZE, 1954 to 1974, WITH INCREASES SHOWN

Size Category	Number of Enterprises			AREA (Thousands of has.)		
	1954	1974	Increase to 1974	1954	1974	Increase to 1974
Less than 5 has.	251.686	345.731	94.045	432.2	536.3	104.1
5 to 100 has.	85.392	160.343	74.951	1.704.5	3.587.8	1.883.3
100 to 500 has.	5.787	9.548	3.761	1.156.3	1.675.1	518.8
500 to 1000 has.	664	820	156	464.7	541.4	76.7
1000 to 2500 has.	464	431	- 33	685.3	625.9	- 59.4
2500 has. and up	241	171	- 70	1.556.7	934.6	-622.1
TOTAL	344.234	517.044	172.810	5.999.7	7.901.1	1.901.4

SOURCE: 1954 and 1974 Agricultural Censuses

TABLE II.18
Average Size of Agricultural Production Units, 1954-1974

Size Categories	Average Size	
	1954	1974
Smaller than 5 Has.	1.7	1.5
From 5 to 100 Has.	19.96	22.37
From 100 to 500 Has.	199.80	175.44
From 500 to 1.000 Has.	699.84	660.21
From 1.000 to 2.500 Has.	1.476.93	1.452.34
From 2.500 Has. up	6.459.33	5.465.66
National Average	17.42	15.28

SOURCE: Agricultural Censuses

which a very high number of units smaller than 5 has., 345,731 units, which represent 66.9% of the total number, cover only 536,300 has. or 6.7% of the land. At the same time, 1,422 units greater than 500 has. (0.2%) control 2,102,000 has. (26.7%).

The problem of small, inefficient farms is located mainly in the mountain provinces, where there are 250,875 production units smaller than 5 has. (72.5%). The Coast region, on the other hand, has only 91,057 of this size unit (26.3%); the East, only 3,762 units (1.0%); and Galapagos, 37 units (0.2%).

Nevertheless, the production units of more than 500 has. are concentrated mostly on the coast, where in 1974 there were 734 such units (51.6% of all units in this category). Next in concentration are the mountain provinces with 598 units (42.2%) and then the eastern provinces with 89 units (6.2%). For more information see Appendix II.6.

c. Utilization

As seen in Table II.15, Ecuador has a total area of 27,934,300 has. This area is distributed among cultivated area, 4.4%, pastures, 12.0%; forests, 55.0%; and other uses, 27.7%.

The Coast region totals 6,937,800 has. (25% of the country's total), of which 8% is cultivated area, 21% is in pasture, 40% is forested, and 31% is used for other purposes.

The Mountain region covers an area of 7,292,300 has. (26% of the country's total), of which 9% is cultivated area, 23.0% is in pasture, 49.0% is forested, and 19.0% is used for other purposes.

The East has 12,903,600 has. (46% of the country's total). In spite of its great size, only 0.3% is cropped, 1.6% is in pasture, 71.7% is forested, and 26.4% is used for other purposes.

2. Water

The precipitation in Ecuador varies a great deal. On the coast the rainy season goes from December to May and the annual precipitation varies from 12 inches in Ancon to 130 inches in Bucay to over 150 inches in some parts of Esmeraldas province.

In the Mountain region rain occurs principally from October to May. Rainfall amounts vary from 15 to 50 inches and, compared to the Coast, this rain is better distributed.

In the East the annual precipitation is over 120 inches distributed throughout the year.

In recent years, possibly due to deforestation of watersheds, prolonged dry spells have occurred which have affected the agricultural production of the country. All water, regardless of origin, belongs to the Ecuadorian government and to INERHI, the organization in charge of its utilization. According to the MAG

(Table II.16), in 1977 the land area under irrigation reached 167,000 has., which represents 4.0% of the land under cultivation, regionally, the Coast has 6.0% of its land irrigated and the Mountain has 2.0%.

According to information in Table II.16, the area currently under irrigation can be increased to 504,300 has. when all of INHERHI's irrigation projects are operational. This would triple the current irrigated land area. The Coast would increase by 121.0% and the Mountain by 410%. In Table II.19 irrigation projects are broken down into stages of development as well as the capacity and irrigated area which each project encompasses.

Of the 167,000 has. which are under irrigation in Ecuador, 120,400 has. are located in the Coast region and 46,400 in the Mountain region. At the provincial level, El Oro has 48.3% of the irrigated area in the Coast region and Chimborazo has 29% in the Mountain region.

3. Credit

a. Availability

Credit for the agricultural sector comes from different sources. The principal sources are those authorized by the Ecuadorian Central Bank (Banco Central del Ecuador) either directly such as, for example, the financial resources used in agricultural exports and the credit granted through the Marginal Rural Development Fund (Fondo de Desarrollo Rural Marginal (FODERUMA), or the credit granted through the Financial Funds (Fondos Financieros) mechanism, which is channeled through the State Development Banks (Bancos de Desarrollo Estatal), the National Development Bank (Banco Nacional de Fomento) (BNF), the Bank for Agricultural Funds Cooperatives (Banco de Cooperativas de Caja Agricola) and the Private Banks. The government has established legal means whereby private banking interests participate in the granting of credit to the agricultural sector with a certain percentage of their capital.

Credit granted to agriculture by banks increased from 14% to 19% of total credit between the years 1970 and 1977 (Table II.20). Until 1973, private banking granted a greater volume of credit to the agricultural sector. After 1974, credits to the agricultural sector increased significantly due to the income received from the export of petroleum and to the government's decision to put capital into the official bank, the BNF, from newly available sources (Table II.21). The BNF's capital includes: 1) government allowances; 2) credit from the Central Bank through the Financial Funds; 3) international credits; and, 4) capital generated from money on deposit.

b. Distribution

In order to handle credit applications and to grant and supervise loans the BNF has 50 branches, of which 24 are in the Coast region,

TABLE II.19
 INERHI IRRIGATION PROJECTS

<u>STAGE</u>	<u>CAPACITY</u>	<u>AREA TO BE IRRIGATED</u>
	Cubic Meters/second	Hectares
Design	43.8	57.808
Feasibility	34.0	51.800
Pre-feasibility	72.7	140.700
Preliminary study	50.6	52.895
Inspection study	50.14	63.720
TOTAL	251.24	366.923

SOURCE: INERHI. 1966-1976

TABLE II.20

CREDIT GRANTED BY THE NATIONAL BANKING SYSTEM

(Millions of sucres)

	1970	1973	1975	1976	1977 ¹
Total	11,309	16,622	28,070	41,665	43,640
Agricultural	1,591	2,371	4,690	7,974	7,921
%	14.1	14.2	16.7	19.1	18.5
Business	6,396	9,864	14,144	19,295	18,949
%	56.6	59.3	50.4	46.3	43.4
Industry	2,152	3,060	5,473	9,150	9,854
%	19.0	18.4	19.5	22.0	21.0
Others	1,167	1,327	3,763	5,246	6,918
%	10.3	8.1	13.4	12.6	12.8

SOURCE: Superintendency of Banks (Superintendencia de Bancos)

¹ Estimates.

\$1.00 US Dollar = 25 Sucres

SOURCE: 1977 Labor Report (Informe de Labores 1977)

Ministry of Agriculture, Quito, January 1978

TABLE II.21

AGRICULTURAL CREDIT THROUGH THE DEVELOPMENT BANK (BNF) BY ACTIVITY 1970-1976
(In thousands of sucres)

ACTIVITY	1970	1971	1972	1973	1974	1975	1976
Agricultural crops	224,293	253,816	221,775	593,391	1,405,282	1,766,329	2,017,375
Pastures & Livestock	195,529	242,934	278,421	412,015	856,621	1,013,933	936,310
Machinery and implements	46,996	46,226	44,589	82,100	259,850	228,420	223,803
Land improvement	21,302	33,428	34,638	41,020	99,730	47,538	102,043
Product movement	46,883	13,237	9,925	13,920	147,069	136,123	144,722
Others ¹	-	4,000	4,000	2,000	31,500	32,000	-
NATIONAL TOTAL	535,003	593,641	593,348	1,144,446	2,800,052	3,224,343	3,424,253

1 No breakdown available

SOURCE: BNF

27 in the Mountain region, and 9 in the East. Each of these offices has technical and administrative personnel assigned to it according to the amount of capital which it handles. The BNF's volume of credit grew from 505,033 million sucres in 1970 to 3,502,550 million in 1977. Similarly, the agricultural subsectors which received credit in the same period grew as follows: agricultural crops, 10 times; pastures and livestock, farm machinery, implements, and land improvements, 5 times; and product movement 3 times (see Table II.21). These credits are granted, depending on investment plans, on a short-, medium-, and long-term basis (see Table II.22). According to this table, the greatest volume of credit is granted for a term not greater than a year and the subsector of agricultural crops receives the greatest benefit (over 50% of credit granted).

In comparison with the total number of loans (Table II.23), in crops over 50% of the loans are for more than 50,000 sucres. In farm machinery and implements most loans are also for more than 50,000 sucres, and the same situation prevails in the category of land improvements.

Credit is not uniformly distributed among regions, (II.24). The Coast receives greater favor from the Bank, possibly because it is the region where export crops are grown and where the best opportunities for mechanization exist. Annually the Coast has always received more than 60% of the credit, while the Mountain has not received more than 30%.

FODERUMA is an agency of the Central Bank which grants loans to groups of more than 50 campesinos. This organization, which has only been in existence for four months, works with groups of families whose income level is under 7,500 sucres. In other words, FODERUMA works with marginal producers and tries to increase their level of participation in the economy. This institution makes agricultural loans but is not limited exclusively to this type of loan. It also finances road construction, health clinics, water supplies, electrical installations, etc. The initial source of capital for FODERUMA came from the Central Bank and it is hoped to increase it with national and international loans.

Its criteria for granting credit seem to depend in large measure upon its evaluation of the group. An effort is made to reduce red tape so that a group can get loans more easily.

A characteristic of FODERUMA, in relation with other Ecuadorian institutions, is the effort they have made to work with other ministries and agencies such as the Ministries of Agriculture, Health, Public Works, etc.

Since this is a new agency which has just begun its work and has, at the time of this study, only made loans to four groups of campesinos, no analysis can yet be made of its loan delinquencies and repayments.

TABLE II. 22

NATIONAL DEVELOPMENT BANK (BNF). CREDIT GRANTED BY AMOUNT, PURPOSE, AND TERM, FOR 1970-77 (millions of sucres)

YEAR and TERM	CROPS	PASTURES and LIVESTOCK	FARM and MACH.	LAND IMPROVE- MENTS	MOVEMENT and OTHERS	SUBTOTAL:	OTHERS			T O T A L:
							SMALL INDUSTRY	OTHERS	SUBTOTAL	
1970	224.293	195.529	46.996	21.302	46.883	535.003	113.238	25.929	139.167	674.170
to 1 year	175.539	48.244	16.984	6.569	46.435	293.771	64.554	25.680	90.234	384.005
1 to 2 years	7.204	23.992	1.913	1.374	159	34.642	23.383	172	23.555	58.117
2 to 5 years	18.572	76.867	25.516	6.423	236	127.614	21.373	129	21.502	149.116
over 5 years	22.978	46.426	2.583	6.936	53	78.760	3.928	28	3.956	82.932
1971	253.816	242.934	46.226	33.428	17.237	593.650	130.076	39.914	169.981	763.631
to 1 year	173.281	49.026	14.812	6.948	16.209	260.276	60.533	36.498	98.031	357.307
1 to 2 years	9.499	22.956	1.726	1.505	20	35.706	24.464	52	24.516	60.222
2 to 5 years	13.997	98.017	20.544	8.770	198	141.526	38.171	654	38.825	180.351
over 5 years	57.039	72.935	9.144	16.205	819	156.142	6.908	2.701	9.609	165.751
1972	221.775	278.421	44.589	34.638	13.925	593.348	149.064	65.437	214.501	807.855
to 1 year	179.759	52.304	11.487	6.330	13.353	263.333	43.166	62.721	105.887	369.220
1 to 2 years	6.764	34.318	1.665	2.942	84	45.773	35.956	366	36.322	82.095
2 to 5 years	13.937	115.342	22.918	10.823	189	163.209	53.752	950	54.701	217.910
over 5 years	21.315	76.457	8.419	14.543	305	121.039	16.191	1.400	17.591	138.630
1973	593.391	412.015	82.100	41.020	15.920	1'144.446	219.252	142.673	361.925	1'506.371
to 1 year	521.694	69.647	11.940	7.938	15.751	626.970	41.203	141.168	182.371	809.341
1 to 2 years	14.682	60.149	4.702	2.984	14	82.531	82.492	85	82.577	165.108
2 to 5 years	22.658	138.493	57.531	14.421	213	233.316	82.002	1.295	84.997	318.313
over 5 years	34.357	143.726	7.927	15.607	12	201.629	11.855	125	11.980	213.609
1974	1'405.272	856.621	259.850	99.730	178.569	2'800.042	493.541	348.261	841.802	3'641.844
to 1 year	1'203.023	69.269	14.215	5.899	171.086	1'463.492	48.160	333.684	281.844	1'845.336
1 to 2 years	40.361	214.703	18.164	7.141	910	281.279	226.342	1.807	228.149	509.428
2 to 5 years	57.982	170.105	150.009	260.084	3.339	407.519	162.586	6.528	129.114	576.633
over 5 years	103.906	492.544	77.462	60.606	3.234	647.752	56.453	6.242	62.695	710.447
1975	1'766.329	1'013.933	228.420	47.538	168.123	3'224.349	535.346	263.448	798.788	4'023.137
to 1 year	1'499.238	69.780	20.907	2.340	152.941	1'745.209	54.384	239.672	294.056	2'039.262
1 to 2 years	89.494	471.932	25.975	14.297	2.034	603.732	292.385	3.220	295.605	899.319
2 to 5 years	58.256	86.896	94.766	6.868	10.490	257.276	131.490	16.464	147.954	409.230
over 5 years	119.341	385.310	86.772	24.051	2.658	618.132	57.087	4.092	61.179	679.326
1976	2'017.375	936.310	223.803	102.043	144.722	3'424.253	523.347	389.586	912.933	4'337.186
to 1 year	1'580.237	72.816	11.582	1.897	118.368	1'784.900	56.317	318.650	374.967	2'159.867
1 to 2 years	177.681	551.188	28.804	7.825	4.732	770.830	104.997	12.789	117.786	888.618
2 to 5 years	132.014	86.609	120.799	23.238	13.820	376.480	213.251	37.229	250.480	626.960
over 5 years	127.443	225.097	62.618	69.083	7.802	492.043	148.782	2.918	169.700	661.743

(39)

SOURCE: BNF

PREPARED BY: MAG DIGEPLAN. Agricultural Planning Department

TABLE - II. 23

AGRICULTURAL CREDIT GRANTED BY THE NATIONAL DEVELOPMENT BANK (BNF) BY AMOUNTS IN THE PERIOD
1970-1976 (millions of sucres)

	1 9 7 0	1 9 7 1	1 9 7 2	1 9 7 3	1 9 7 4	1 9 7 5	1 9 7 6
CROPS	224.293	253.816	221.775	593.391	1'405.282	1'766.329	2'017.000
TO: 25.000	76.144	72.054	73.949	112.568	183.149	214.457	220.088
25.000 - 50.000	33.484	30.942	27.509	71.346	136.297	205.860	225.597
50.000 - 200.000	67.038	59.965	54.204	168.843	320.081	457.937	480.122
over 200.000	47.627	90.855	66.113	240.634	765.755	880.075	1'091.568
PASTURES & LIVESTOCK	195.529	242.934	278.421	412.015	856.621	1'013.933	936.310
TO: 25.000	52.473	56.386	62.480	64.923	78.265	60.900	57.949
25.000 - 50.000	33.906	45.711	55.785	72.092	134.947	119.726	131.532
50.000 - 200.000	63.517	81.223	89.147	164.003	336.708	389.147	355.210
over 200.000	45.633	59.614	71.009	110.997	306.701	444.160	391.619
FARM MACHINERY & IMPLEMENTS	46.996	46.226	44.589	82.100	259.850	228.420	223.803
TO: 25.000	4.162	2.636	2.279	3.780	10.712	5.487	4.393
25.000 - 50.000	5.047	3.426	3.705	3.979	18.301	10.556	8.264
50.000 - 200.000	24.179	22.709	22.425	29.792	58.498	37.990	28.786
over 200.000	13.608	17.455	16.180	44.549	172.339	174.387	182.360
LAND IMPROVEMENTS	21.302	33.428	34.638	41.020	99.730	47.538	102.043
TO: 25.000	3.792	4.120	4.963	4.528	4.588	5.269	4.654
25.000 - 50.000	3.765	4.298	4.419	5.586	7.034	5.268	3.250
50.000 - 200.000	7.476	11.311	8.093	14.482	23.166	12.092	11.737
over 200.000	6.269	13.699	17.163	16.424	64.942	14.909	82.402
PRODUCT MOVEMENT	46.883	13.237	9.925	13.920	147.069	136.123	144.722
OTHERS	-	4.000	4.000	2.000	31.500	31.910	-
T O T A L	535.003	593.646	593.348	1'144.446	2'800.052	3'224.253	3'424.253

SOURCE: BNF

PREPARED BY: MAG DIGEPLAN. Agricultural Planning Department

(40)

TABLE II.24

AGRICULTURAL CREDIT GRANTED BY THE DEVELOPMENT BANK (BNF) BY REGIONS

(millions of sucres)

1970 - 1977

REGION	1970	1971	1972	1973	1974	1975	1976
Mountain %	114,635 21.4	150,196 25.3	195,032 32.9	284,457 24.9	576,675 20.6	629,145 19.5	670,149 19.6
Coast %	401,331 75.0	414,860 69.9	366,011 61.7	813,965 71.1	2,085,322 74.5	2,142,533 74.8	2,582,978 75.4
East %	19,037 3.6	24,585 4.1	28,305 4.7	444,024 3.8	106,555 8.8	150,865 4.7	171,126 5.0
Others %	- 0.7	4,000 0.7	4,000 0.2	2,000 1.1	31,500 1.0	32,000 -	- -
Total National: %	535,003 100.0	593,641 100.0	593,348 100.0	1,144,446 100.0	2,800,052 100.0	3,224,343 100.0	3,224,253 100.0

SOURCE: National Development Bank (BNF)

c. Utilization

The BNF, FODERUMA, the Bank for Cooperatives, and the private banks all grant credit to farmers. The BNF is the principal source of credit for this sector. A frequently expressed opinion is that all the credit goes to the large farmers. Although there is some evidence that this is true, it seems less true today than in 1966. Credit is available at less than the going rate. This will create a situation in which some farmers who would like credit at that rate will not be able to get it. This kind of subsidized interest is generally justified for reasons of income distribution but there is not strong evidence that this policy benefits the small farmer, as compared to the large farmer. It is clear, nevertheless, that the subsidized interest rate reduces capital formation and the growth of the sector.

4. Labor

The economically active population (EAP) was in 1974 30% of the total population and was mostly concentrated in the rural sector. In terms of types of activities (see Table II.25), 46.2% of the EAP works directly in the agricultural sector. This constitutes the main source of employment for the Ecuadorian population. The other sectors, in spite of having grown dynamically in the last years of this decade, have not achieved the importance of agriculture.

The determination of what constitutes full-time employment, part-time employment, and unemployment is done by means of norms and patterns economically developed nations. In Ecuador, as in all developing countries, this situation is completely different due to the characteristics of urban and rural marginal existence.

A 1976 study done by the Regional Employment Program for Latin America and the Caribbean (Programa Regional de Empleo para America Latina y el Caribe) (PREALC) shows that 40% of the rural EAP is under-employed and does not have the necessary skills to choose among the different types of agricultural jobs.

Regarding income, the Central Bank indicated that the GNP per worker between 1970 and 1977 grew by 151% while the GNP per agricultural worker grew by only 124% in the same period. The greatest limitation on the agricultural worker's ability to increase his income is the large number of producers on small farms and the scarce resources which they have to work with; thus agricultural salaries have increased nominally without any real increase in salaries paid in the agricultural sector.

On the other hand, the National Planning Board (JUNAPLA) states that in rural areas there is an unequal distribution of income (see Table II.26). From data in the table, we see that 44.6% of the employed persons have incomes under 10,500 sucres per year (US\$420) and they receive 7.8% of the income generated in the rural sector. Forty-two and nine tenths of one percent of the people have an income between 10,500 and 40,000 sucres (US\$1,600) annually and share 38.7% of the income. The remaining 12.5% of the people receive 53.5% of the income.

TABLE II.25
 ECONOMICALLY ACTIVE POPULATION BY TYPE OF ACTIVITY, 1974

Type of Activity	Population	%
TOTAL	1,940,650	100.0
Agriculture	896,910	46.2
Mines and Quarries	6,155	0.3
Manufacturing	226,264	11.7
Construction	86,193	4.4
Electricity, gas, water	8,470	0.4
Business and Finance	208,764	10.8
Transportation	54,650	2.8
Other Services	329,559	17.0
Unspecified Activities and New Workers	123,685	6.4

SOURCE: Socio-economic Indicators. JUNAPLA.

PREPARED BY: PUCE Economic Research Institute

TABLE II.26
INCOME DISTRIBUTION IN RURAL AREAS, 1975

INCOME RANGE	No. of Persons Employed	% of Total	Total Income	% of Total
			(Millions of Sucres)	
0 - 10,500	512,119	44.6	162	7.8
10,500 - 40,000	492,768	42.9	809	38.7
40,000 - 90,000	110,213	9.6	416	19.9
90,000 - 200,000	25,120	2.2	296	14.2
Over - 200,000	7,923	0.7	405	19.4
TOTAL	1,148,143	100.0	2,805	100.0

SOURCE AND PREPARATION: PROGEN-JUNAPLA

The National Planning Board also indicates that the average employment level per person employed is 141 days per year and the per capita income in the agricultural sector is 3,950 sucres (US\$238), which is less than the national per capita income of 12,500 sucres (US\$500).

D. Changes in Production

In order to determine the changes in acreage, yield, production, deficit, and surplus of agricultural crops, 20 commodities were identified as to the number of hectares planted in 1977 (Table II.27). These crops covered 95% of the total cultivated area for that year.

The crops shown in the table, based on utilization, were divided into 4 levels (see Appendix II.7): a) export commodities whose production exceeds domestic demand such as coffee, cacao, bananas, and hemp; b) commodities used as raw materials: sugar cane, cotton, soybeans, African palm, and peanuts; c) commodities produced for domestic consumption: corn, rice, plantains, barley, dry beans, wheat, potatoes, yucca, oranges, and lima beans; and d) livestock such as cattle, sheep, and swine.

1. Export Commodities

Coffee is showing a highly significant growth trend in both acreage and production but not in yield, in which there are significant variations. In spite of this statistical information, it should be pointed out that improved varieties are being planted for better yields and advanced cultural practices and technology are being incorporated into coffee production. These improvements are not yet widespread basically due to the fact that most coffee producers are small operators who are afraid of taking risks when their coffee production generates the major part of their family income.

The volume of exports is only increasing moderately, possibly

TABLE II.27

YIELD AND PRODUCTION TRENDS IN HECTARES HARVESTED FOR THE 20 CROPS CONSIDERED
IN THE STUDY, 1962 - 1977

Crop	Hectares	TRENDS				
		Area	Yield	Production	Export.	Import.
	1977					
1. Coffee	260.000	++	0	++	+	
2. Cacao	238.000	+	0	+	*	
3. Hard Corn	163.000	++	0	++		
4. Sugar Cane	109.300	0	-	0	*	
5. Rice	107.054	0	++	+		
6. Bananas	100.540	-	+	-	0	
7. Plantain	97.900	++	-	+		
8. Soft Corn	84.000	--	0	-		
9. Barley	60.000	--	0	-		
10. Dry Beans	59.000	-	0	-		
11. Wheat	40.900	--	0	-		
12. Potatoes	36.000	0	+	+		++
13. Yucca	31.023	+	0	0		
14. Cotton	26.200	0	+	+		
15. Oranges	23.447	+	0	+		
16. Lima Beans	15.100	--	+	0		
17. Soybeans	14.830	++	+	++		
18. African Palm	14.263	++	0	++		
19. Hemp	13.000	++	0	++		
20. Peanuts	12.000	*	0	*		

- + Significant growth trend
 ++ Highly significant growth trend
 - Significant trend to reduction
 -- Highly significant trend to reduction
 0 No change
 * Irregular behavior

SOURCE: Ministry of Agriculture

due to the increase in domestic consumption, the establishment of more processing plants in Ecuador, international marketing problems, and the defective treatment of green coffee beans.

The main coffee producing provinces are Manabi, Pichincha, the subtropical part of Santo Domingo de los Colorados, and Loja.

Acreage and production of cacao are increasing significantly. Yield have not undergone any change and remain stable. It is important to note that recently new plantings of cacao have been made which are not yet in production.

Cacao exportation is very irregular. Los Rios, El Oro, and Guayas are the main producing provinces.

Banana acreage and production are showing a trend toward significant reduction due to the government's policy of decreasing area under production of this crop. This policy is due to difficulties in marketing the crop internationally and competition from other countries which are located closer to consuming countries and therefore do not have to pay the high cost of tolls on the Panama Canal.

The introduction of new, more productive varieties which are resistant to certain diseases and receive greater acceptance in international markets have caused the average yield per land unit to show a significantly increasing trend. The provinces which produce the most bananas are El Oro, Guayas, and Los Rios. The exportation of this product does not show any significant change.

Hemp acreage and production is growing significantly but yields show no change. Hemp production is concentrated in Santo Domingo de los Colorados Canton of Pichincha province. Ecuador does not process hemp because its entire production is for export.

2. Commodities Used as Raw Materials

Oil seeds, soybeans, and African palm are recently introduced crops in Ecuador. They have been favorably received by farmers in Santo Domingo de los Colorados in the province of Pichincha, especially the African palm. Soybeans have been favorably received in the provinces of Los Rios and Guayas. Therefore both acreage and production are increasing significantly. This trend may be due to legal regulations established regarding these crops as well as credit and seed availability.

Peanuts, in spite of experiencing an increase in acreage and production, show irregular trends. Yields are stable. Peanuts are grown mostly in the provinces of Loja, El Oro, and Manabi.

Cotton acreage does not show any change, although it should be pointed out that in 1974 it reached the highest level of area planted. Production is growing significantly as a result of increased yields. Ecuador is characterized by the production of medium fiber cotton in Guayas and Manabi.

The figures shown for sugar cane are those used in the cane processing industry (sugar, aguardiente (a liquor), and brown sugar,

especially). Acreage and production do not show significant variations, but yield shows a significant decrease. The provinces which produce a lot of cane for the sugar industry are Guayas and Canar. Production of cane for other uses is found in Azuay, Loja, Cotopaxi, and Pichincha. Cane production for the sugar industry is found generally on large plantations and flat lands while cane for other uses is grown on small plots with varying topography.

Sugar exports are subject to the fluctuations of the international market price, which has been quite irregular in the last two years.

3. Commodities for Domestic Consumption

The cereal grains, rice, corn, barley, and wheat have shown different trends.

Hard corn is increasing significantly both in acreage and production while yields remain stable. This increase in area under production is due to the development of poultry production which requires a large quantity of hard corn for the preparation of balanced rations. It is expected that the acreage of this crop will grow proportionately as poultry production increases. Due to the price of poultry and eggs, it is also predicted that the poultry industry will be able to afford the price of hard corn. National production is insufficient to meet the demands of domestic markets, so in recent years corn has been imported. The principal producers are Manabi, Loja, and Guayas provinces.

The trends in acreage planted to rice are not stable. Rice production shows a significant growth tendency and yield shows a highly significant growth trend. The provinces of Guayas and Los Rios are the largest producers. Since national rice production has not satisfied domestic demand in recent years, the government has imported increasing quantities to satisfy domestic demand.

A highly significant tendency toward reduction of acreage of soft corn, barley, and wheat, is evident. At the same their production also shows a highly significant downward tendency except for soft corn, whose reduction is only classed as significant. No significant changes in yields have been observed.

In these crops, the decrease in acreage may be due to the abolition of certain insecure forms of land tenancy since they have high labor requirements which the large farms no longer have available.

The reduction in barley acreage is due to greater industrial demand for malting barley as well as the presence of insects and diseases.

The reduction of wheat acreage is due to the lack of disease-resistant varieties, marketing problems, and higher return of alternative crops.

Soft corn is grown in Canar, Pichincha, Imbabura; barley, in Chimborazo, Pichincha, and Canar; wheat, in Bolivar, Pichincha, and Imbabura.

Ecuador imports a large volume of wheat and barley. Importation

of these two commodities constitutes 86.9% of domestic consumption and accounts for 61.0% of all agricultural production in 1977.

Dry and lima beans show different trends. Dry beans have a significantly decreasing trend in both acreage and production while yields show no change. Lima beans show a highly significant decrease in acreage, no change in production, and a significant increase in yields.

The provinces with the most dry bean acreage are Loja, Azuay, and Pichincha; for lima beans, Chimborazo and Pichincha.

Potatoes and yucca show different trends. The potato shows no change in acreage but yield and production show significant increases. Lima beans show a highly significant decreasing trend in acreage but no change in production and a significant increase in yields. Yucca acreage is growing significantly, but yields and production are stationary. Canar, Pichincha, and Carchi have the most potato acreage; the highest yields and production are found in Carchi province. The greatest yucca acreage is found in Guayas, Pichincha, and Napo.

The acreage and production of oranges shows a significant growth tendency but no change in yield. This growth may be due to the introduction of new varieties as well as to the adoption of new technology and to the prices paid in the marketplace. The largest producers are the provinces of Bolivar, Pichincha, and Esmeraldas.

Plantain acreage displays highly significant growth. Its production is growing significantly and yields are decreasing significantly. Most plantain production takes place in the provinces of Pichincha, Manabi, and Esmeraldas.

4. Value of Agricultural Production

The Gross National Product in 1970 was 34,275 million sucres, of which 29.2% originated in the agricultural sector (crops, livestock, forestry, and fishing) (see Table II.28). The GNP grew after 1970 until in 1977 it reached a value of 153,812 million sucres. In this period the value of agricultural production in Ecuador expressed as per cent of GNP fell constantly until reaching 21.3% in 1977.

The other sectors of the economy experienced different trends. The mining sector grew from 1.1% in 1970 to 12.2% of the GNP in 1977. The industrial and manufacturing sector experienced great changes but in both 1970 and 1977 its participation was on the order of 17.5%. The commercial sector also varied considerably but in 1970 was 13.7% and in 1977, 13.5%.

5. Gross Value of Agricultural Production-Composition and Changes

According to JUNAPLA data in Table II.29, the total value of agricultural production in 1970 was 11,918.9 million sucres of which 60.3% came from crop production, 28.2% from livestock, 9.2% from forestry, and 2.2% from hunting and fishing.

In 1972 the total value of agricultural production was 12,689.5 million sucres, of which 56.3% was generated by crop production. This shows a reduction in this subsector of 4.0% under the 1970 figures. The livestock subsector in the same year reached 31.0% of the total, increasing its value 3.8% over the base year. The forestry subsector

TABLE II.28

GROSS NATIONAL PRODUCT BY TYPE OF ECONOMIC ACTIVITY, 1970-1977
 -Value in billions of current sucres-

Activity	1970		1971		1972		1973		1974		1975		1976		1977	
	Value	%	Value	%	Value	%	Value	%								
1. Agriculture, Forestry, Fishing	9,471	29.2	10,689	27.9	11,951	26.6	15,345	25.5	20,098	22.4	24,666	23.7	27,393	21.8	31,279	21.3
2. Mining and Quarrying	360	1.1	436	1.2	1,593	3.5	6,449	10.7	16,481	18.4	14,366	13.8	18,190	14.4	17,899	12.2
3. Manufacturing	5,671	17.5	6,328	16.5	7,824	17.4	9,928	16.4	12,803	14.3	16,442	15.8	19,953	15.9	25,748	17.5
4. Electricity, gas, water	406	1.3	492	1.3	574	1.3	643	1.1	808	0.9	886	0.9	1,126	0.9	1,381	0.9
5. Construction	1,441	4.4	2,416	6.3	2,023	4.5	2,853	4.7	5,194	5.8	6,255	6.0	8,295	6.6	9,671	6.6
6. Commerce (Wholesale & retail), Hotels & Restaurants	4,435	13.7	5,723	14.9	6,605	14.7	6,969	11.5	10,248	11.4	12,677	12.2	15,786	12.5	19,873	13.5
7. Transportation & Storage	2,319	7.2	2,821	7.3	3,154	7.0	3,667	6.1	4,300	4.8	5,029	4.8	5,868	4.7	7,130	4.9
8. Financial estimates & Insurance	802	2.5	949	2.5	1,064	2.4	1,300	2.1	1,790	2.0	2,374	2.3	3,198	2.5	4,318	2.9
9. Real Estate	2,482	7.6	2,777	7.2	3,440	7.7	4,141	6.9	5,806	6.5	7,418	7.1	9,654	7.7	11,783	8.0
10. Misc.	5,652	17.4	6,439	16.8	7,525	16.7	10,004	16.6	13,251	14.8	15,546	14.9	18,513	14.7	20,929	14.2
- Costs assigned to banking and similar services	- 607	-1.9	- 700	-1.9	- 792	-1.8	- 915	-1.6	-1,171	-1.3	-1,600	-1.5	-2,186	-1.7	-2,987	-2.0
AGGREGATE VALUE OF DOMESTIC PRODUCTION AT PRICES PAID TO PRODUCERS	32,432	100.0	38,370	100.0	44,951	100.0	60,384	100.0	89,608	100.0	104,059	100.0	125,799	100.0	147,029	100.0
Customs Duties	1,843		1,877		2,141		3,191		3,975		4,187		4,384		6,783	
GNP AT WHOLESALE PRICES	34,275		40,247		47,102		63,575		93,583		108,246		130,183		153,812	

SOURCE: National Accounting Department, Central Bank (Departamento de Cuentas Nacionales)

PREPARED BY: Economic Research Institute of the PUCE

TABLE II.29
GROSS VALUE OF AGRICULTURAL PRODUCTION -- COMPOSITION AND CHANGE
(millions of 1970 sucres)

Commodity Group	1970		1972		1976	
	Value	%	Value	%	Value	%
1. Cereal grains	1,460.5	12.3	1,287.0	10.1	1,636.6	9.6
2. Tubers and roots	933.8	7.8	842.2	6.6	988.3	5.8
3. Vegetables	331.2	2.8	346.8	2.7	406.0	2.4
4. Oil seeds	158.9	1.3	285.6	2.3	652.2	3.9
5. Fruits	2,381.1	20.0	2,211.7	17.4	2,906.3	17.1
6. Fibers	34.0	0.3	54.5	0.4	159.8	0.9
7. Beverages and tobaccos	1,443.9	12.1	1,601.8	12.7	1,796.1	10.6
8. Sugar products	174.0	1.4	210.0	1.7	233.5	1.4
9. Pyrethrum	6.2	-	3.4	-	3.0	-
10. Other crops	270.4	2.3	302.1	2.4	294.0	1.7
TOTAL CROPS	7,194.0	60.3	7,145.1	56.3	9,078.6	53.4
11. Cattle production	2,062.2	17.3	2,224.0	17.5	3,195.7	18.8
12. Sheep production	127.5	1.1	142.3	1.1	158.5	0.9
13. Swine production	604.5	5.1	692.2	5.5	929.9	5.5
14. Poultry production	369.3	3.1	642.7	5.1	769.7	4.5
15. Production of other species	195.9	1.6	229.5	1.8	312.9	1.8
TOTAL LIVESTOCK	3,359.4	28.2	3,936.7	31.0	5,336.7	31.6
TOTAL FOREST PRODUCTS	1,092.3	9.2	1,325.8	10.5	1,925.0	11.3
TOTAL HUNTING AND FISHING	273.2	2.3	281.9	2.2	635.6	3.7
TOTAL AGRICULTURE	11,918.9	100.0	12,689.5	100.0	17,005.9	100.0

SOURCE: JUNAPLA

PREPARED BY: Economic Research Institute of the PUCE

reached 10.5% of the total, increasing by 1.3% over the base year. The hunting and fishing subsector fell by 0.1% to 2.2%.

In 1976 the total value of all agricultural production was 17,005.9 million sucres, broken down by subsectors as follows: crops, 53.4%, a decrease of 2.9% as compared with 1972; livestock, 31.6%, an increase of 0.6% over 1972; forestry, 11.3%, a decrease of 0.8% as compared with 1972; hunting and fishing, 3.7%, an increase of 1.5%.

The decrease in the crops subsector may be due to the large number of small, inefficient producers who are unable to generate a surplus for market or to use family labor efficiently. It may also be due to the lack of storage and marketing capability, the lack of guidance in proper use of credit, the limited coverage of technical assistance, the lack of price stability in international commodity markets, and to adverse climatic conditions.

The increase in the livestock subsector is a response to public policy regarding livestock importation, provision of credit, technical assistance, etc. It is also due to special characteristics of livestock production with the predomination of medium and large production units which are capable of using government production incentives more efficiently.

In 1972 the availability of meat per capita was 19.21 kg.; in 1977 it was 21.51 kg., compared with 17.69 in 1970. The availability of milk per capita remained at a constant level of 67 liters from 1972-76, and the availability of eggs has also remained at 7.5 kilos per urban resident.

Forest production has grown but not significantly. This can be explained by the stagnation in charcoal and firewood production in recent years, by the substitution of petroleum derivatives, and by a reduction in activity in forests currently in production.

Hunting, as an economic activity, is small and has stagnated in recent years. Fishing has grown principally due to the stimulus of the canned fish and fish meal industry.

The breakdown of the value of production for the 20 commodities selected can be seen in Table II.30.

6. Agricultural Foreign Trade Balance

a. Exports

Until the end of 1971, Ecuadorian exports were traditionally based on agricultural commodities, especially bananas, cacao, coffee, rice, and sugar. The situation has changed in recent years due to exports from the mining sector (petroleum). In effect, although the contribution of all agricultural exports fell from 70.7% in 1972 to 32.9% and 39.0% in 1975 and 1976 respectively, it is evident that their value constantly increased in this period. This demonstrates a positive change and a tendency toward change in their composition in favor of non-traditional agricultural commodity exports.

According to foreign trade statistics, the value of exports of

TABLE II.30
AREA AND VALUE OF AGRICULTURAL PRODUCTION BY PROVINCES AND REGIONS

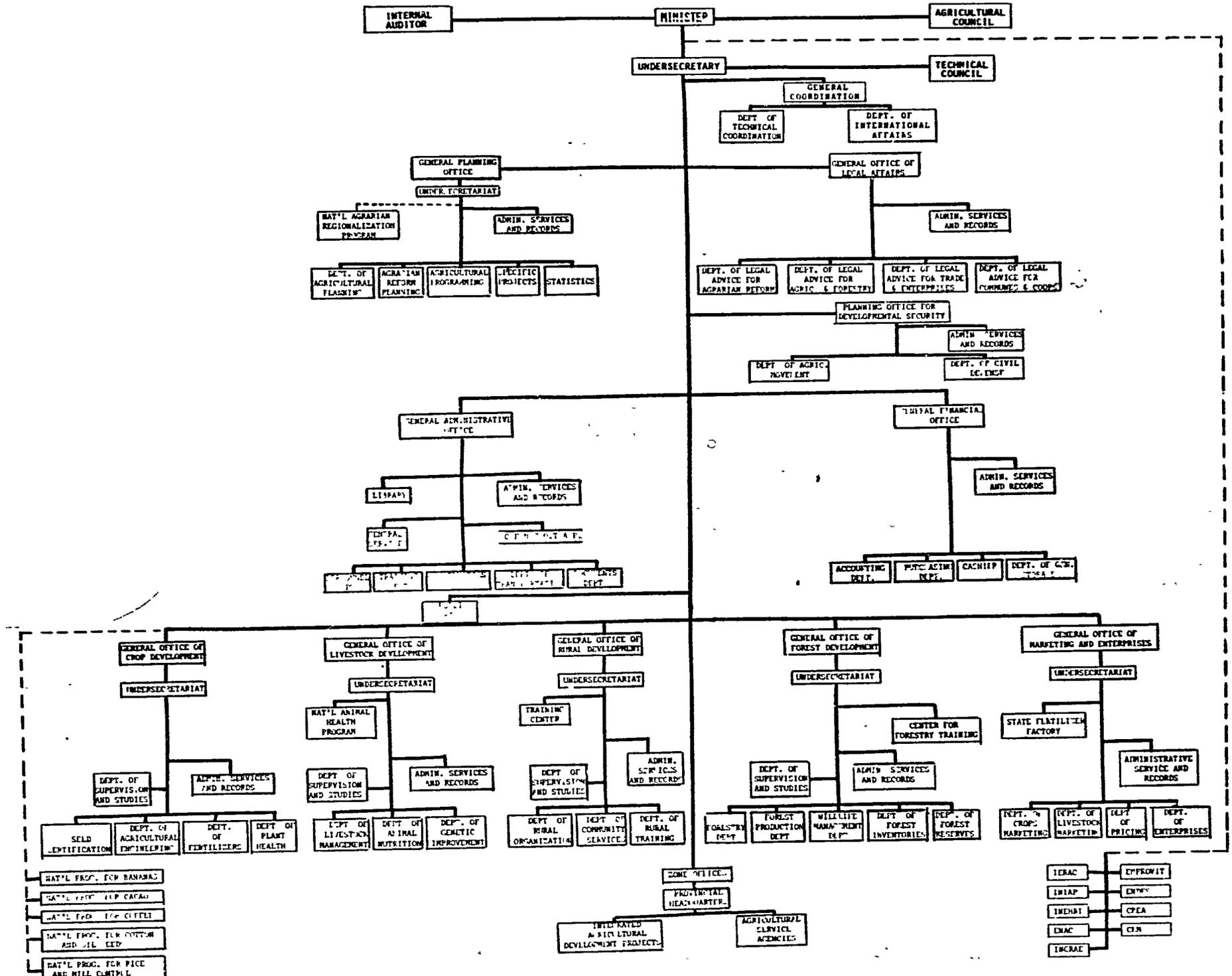
Region	Production of Domestic Food Crops				Export Products				Total Crop Production				Total Livestock Production		Total Agriculture Production	
	Has.	R	Value	R	Has.	R	Value	R	Has.	R	Value	R	Value	R	Value	R
			Thousands of Sucres				Thousands of Sucres				Thousands of Sucres		Thousands of Sucres			
1. Esmeraldas	26,077	(9)	345,837	(9)	25,609	(7)	749,714	(5)	51,686	(10)	1,095,551	(6)	60,104	(10)	1,155,655	(7)
2. Manabi	76,877	(4)	657,872	(4)	133,994	(2)	1,772,383	(4)	210,871	(2)	2,430,255	(3)	238,771	(4)	2,669,026	(3)
3. Guayas Los Rios	165,878	(1)	2,851,186	(1)	366,719	(1)	6,355,176	(1)	532,597	(1)	9,206,362	(1)	907,181	(1)	10,113,543	(1)
4. El Oro	9,315	(10)	91,935	(10)	76,636	(3)	2,069,857	(3)	85,951	(6)	2,161,792	(4)	174,477	(7)	2,336,269	(4)
COAST	278,147		3,946,830		602,958		10,947,130		881,105		14,893,960		1,380,533		16,274,493	
5. Imbabura, Carchi	47,511	(8)	630,506	(5)	4,243	(9)	39,769	(9)	51,754	(9)	670,275	(9)	99,845	(8)	770,120	(9)
6. Pichincha, Cotopaxi, Napo	141,193	(2)	1,362,460	(2)	69,199	(4)	2,121,295	(2)	210,392	(3)	3,483,755	(2)	859,219	(2)	4,342,974	(2)
7. Tungurahua, Bolivar, Pastaza	62,266	(5)	876,275	(3)	20,746	(8)	225,683	(8)	83,102	(7)	1,101,958	(5)	292,845	(3)	1,394,803	(5)
8. Chimborazo	53,800	(7)	437,966	(7)	3,705	(10)	27,154	(10)	57,505	(8)	465,120	(10)	222,010	(5)	687,130	(10)
9. Azuay, Canar Morona Santiago	77,344	(3)	619,072	(6)	35,493	(6)	409,988	(7)	112,837	(4)	1,029,060	(7)	174,508	(6)	1,203,568	(6)
10. Loja, Zamora Chinchi	57,163	(6)	350,086	(8)	51,789	(5)	547,334	(6)	108,952	(5)	897,420	(8)	88,937	(9)	986,357	(8)
MOUNTAIN	420,757		4,130,417		174,381		3,241,900		595,138		7,372,317		1,698,520		9,070,837	
EAST	18,520		145,948		10,794		129,323		29,314		275,271		38,844		314,115	
T O T A L	717,424		8,223,195		788,133		14,008,353		1,505,557		22,541,548		3,117,897		25,659,445	

R: Range according to the smallest or greatest area cultivated or value

SOURCE: National Accounting Department. Ecuadorian Central Bank.

(52)

STRUCTURAL DIAGRAM
MINISTRY OF AGRICULTURE



(53-A)

agricultural origin, both raw and processed products, grew from US\$263.6 million in 1972 to US\$556.7 million in 1976.

The change per group of products shows that the greatest percentage of agricultural exports is in raw agricultural products. Favorable development has also been seen in forest, fish, and food products. Nevertheless, the most substantial increases have been in products manufactured from cacao and products from the sea, which means that the exportation of products with higher total value is strengthening.

In reference to the value of the main export commodities, it is worth pointing out the changes in the exportation of coffee, hemp, and castor beans.

b. Imports

The importations of raw materials and intermediate goods destined for the agricultural sector between 1972 and 1976 increased four times reaching US\$22.9 million in 1976, as compared with US\$4.5 million in 1972.

The importations of capital goods destined for the agricultural sector rose from US\$4.4 million in 1972 to US\$25.5 million in 1976. The agricultural proportion of all capital goods thus rose from 3.5% to 5.8% in the period mentioned.

Importations of food products changed from US\$3.9 million in 1972 to US\$17.7 million in 1975 and US\$11.1 million in 1976. Thus the percentage which food products represent of all importations of non-durable goods grew from 8.4% in 1972 to 11.1% in 1976.

c. Balance of Trade

The trend of the agricultural sector's trade balance during the period 1972-1976 shows a favorable development, explained by the excess growth of exportations over importations destined for the agricultural sector. The trade balance has changed from US\$247.0 million in 1972 to US\$484.6 million in 1976, as can be seen in Table II.31.

With the positive balance of trade resulting from agricultural activity, the sector has contributed to earning foreign exchange to finance importation in the other sectors of the economy, although in recent years this role has decreased in importance due to foreign exchange generated due to petroleum exploitation.

E. Structure and Functions of the Public Agricultural Sector

1. Profile of the Sector

The public agricultural sector is made of the Ministry of Agriculture (MAG) as well as other agencies associated with it. This Ministry, in turn, is one of ten into which the Executive Branch of Ecuador is divided (see diagram). In accord with Decree No. 162 of 16 February 1973, published in Official Registry No. 253 of 23 February 1973, the Ministry of Agriculture is the agency charged

TABLE II.31

PARTICIPATION OF THE AGRICULTURAL SECTOR IN THE BALANCE OF TRADE, 1972-1976
(Millions of Dollars)

CATEGORIES	1972	1973	1974	1975	1976
Total exports	326.3	532.0	1.124.5	897.1	1.127.3
Index	100.0	163.0	344.6	274.9	345.5
Agricultural exports	259.8	237.7	409.7	365.2	544.1
Index	100.0	91.5	157.7	140.6	209.4
Total imports	318.6	397.3	958.5	943.2	993.1
Index	100.0	124.7	300.8	296.1	311.7
Agricultural imports	12.8	16.1	97.5	84.1	59.5
Index	100.0	125.9	760.5	655.7	464.2
Total trade balance	7.7	134.8	166.1	46.2	134.2
Agricultural trade balance	247.0	221.6	312.1	281.2	484.6

SOURCE: Foreign Trade Bulletins. - MICEI

PREPARED BY: JUNAPLA

with formulating, directing, and putting into practice policies on research, production, and marketing of agricultural products, agrarian reform and colonization, irrigation, rural development, and planned use of renewable natural resources, with the object of increasing agricultural and forest production and productivity. The Ministry also is to generate greater employment opportunities and to contribute to the policy of income redistribution for the Ecuadorian people.

The following agencies are attached to the Ministry of Agriculture:

Ecuadorian Institute of Agrarian Reform and Colonization
(Instituto Ecuatoriano de Reforma Agraria y Colonizacion, IERAC)

National Institute for Agricultural Research
(Instituto Nacional de Investigaciones Agropecuarias, INIAP)

Ecuadorian Institute of Water Resources
(Instituto Ecuatoriano de Recursos Hidraulicos, INERHI)

National Vital Products Organization
(Empresa Nacional de Productos Vitales, ENPROVIT)

National Storage and Marketing Organization
(Empresa Nacional de Almacenamiento y Comercializacion, ENAC)

National Semen Enterprise
(Empresa Nacional del Semen, ENDES)

Center for Economic Rehabilitation of Azuay, Canar, and Morona Santiago
(Centro de Reconversion Economica del Azuay, Canary Morona Santiago, CREA)

Center for Rehabilitation of Manabi
(Centro de Rehabilitacion de Manabi, CRM)

The following public agencies are associated with the MAG:

National Development Bank
(Banco Nacional de Fomento, BNF)

Study Commission for the Development of the Guayas River Basin
(Comision de Estudios para el Desarrollo de la Cuenca del Rio Guayas, CEDEGE)

Ecuadorian Subcommittee for the Development of the Puyango-Tumbez and Catamayo-Chira River Basins
(Subcomision Ecuatoriana para el Desarrollo de las Cuencas Hidrograficas Puyango Tumbez y Catamayo-Chira, PRECESUR)

The following are mixed public-private companies associated with the MAG:

Cuenca Milk Products
(Productos Lacteos Cuenca, PROLACEN)

Chimborazo Milk Products
(Productos Lacteos Chimborazo, PROLAC)

Huancavilca Milk Products
(Productos Lacteos Huancavilca, PROLAHUAN)

Meat Packing House of Loja, Inc.
(Camal Frigorifico de Loja, S.A., CAFRILOSA)

Certified Seed Enterprises
(Empresa de Semillas Certificadas, ENSEMILLAS)

Ecuadorian Fertilizers
(Fertilizantes Ecuatorianos, FERTISA)

Forestry Manufacturing
(Industrial Forestal, CAYAPAS)

Fruits and Vegetables
(Frutas y Hortalizas, FRUTAGRO)

Salinas Alfalfa Processors
(Alfarina Salinas, BANARINA)

National Enterprises for the Marketing and Industrial Use of Potatoes
(Empresa Nacional de Comercializacion e Industrializacion de la Papa, ENCIPA)

Other such companies as may be established under laws in effect.

The National Councils, Committees, and Commissions which may be established for consultation or coordination purposes are also agencies of the MAG.

2. General Organization of the Ministry of Agriculture

The MAG is made up of the following technical and administrative levels:

- Executive level: the Minister and Undersecretary
- Coordination and Advisement Level: the Agricultural Council (Consejo Agrario Superior), the Technical Council (Consejo Tecnico), the General Coordination (Coordinacion General), the Internal Auditor (Auditoria Interna), the General Planning Office (Direccion General de Planificacion), the General Office of Legal Affairs (Direccion General de Asuntos Juridicos), the Office of Security Planning for Provincial Agrarian Councils (Direccion de Planeamiento de la Seguridad para el Desarrollo y por los Consejos Agrarios Provinciales).
- Administrative Lev.: General Administrative Offices (Direccion General Administrativa), General Financial Office (Direccion General Financiera), and the Public Relations Office (Oficina de Relaciones Publicas).
- Operational Level: made up of the following General Offices of the Ministry: Crop Development (Desarrollo Agricola), Livestock Development (Desarrollo Ganadero), Marketing and Enterprises (Comercializacion y Empresas), Rural Development (Desarrollo Campesino), and Forest Development (Desarrollo Forestal).

In addition the MAG encompasses 10 Agricultural Zone Offices (Direcciones Zonales Agropecuarias) and the National Programs of Bananas, Cacao, Coffee, Rice and the Control of Mills, Cotton and Oil Seeds, Animal Health, and Agrarian Regionalization.

3. Functions of the Ministry of Agriculture

- to promote agricultural and forest development in accord with

national development plans

- to improve social and economic conditions of the rural population
- to formulate, direct, and put into practice the strategy and policies of the country's agricultural sector
- to make possible a better distribution of the income generated in the agricultural sector
- to bring about an increase in agricultural production and productivity with the object of fulfilling domestic demand, making food importation unnecessary, and diversifying exports.
- to establish mechanisms and systems for the marketing of agricultural products and production inputs
- to determine, in conformity with the Price and Quality Control Law, pricing policy for agricultural commodities and inputs
- to promote the development of agri-business in rural areas
- to recommend to the Ministries of Finance, Industry, Trade, and Integration the tax and foreign trade policies which are most advisable to adopt in order to develop adequately the production and marketing of agricultural commodities
- to submit to the Monetary Board for its consideration the policy on agricultural credit such as requirements for financing in order to insure sufficient production to meet national needs
- to determine the rules which regulate receiving technical assistance services
- to fix, in consultation with the Ministry of Industry, Trade, and Integration, raw material use quotas for domestically produced materials, thus limiting importation permits
- to issue regulations for regulation of the agricultural sector and for enhancing cooperation between institutions of the public and private sectors
- to bring about the participation of the agricultural sector in the processes of regional and subregional integration and to use fully the benefits which such integration brings to the country
- to perform those functions which are required for the efficient development of Ecuadorian agricultural activity.

4. Advisement and Coordination Level

It is important to include in this brief description of the MAG aspects related to the Agricultural Council and the Technical Council which pertain to the Coordination and Advisement Level of this agency.

a. Agricultural Council

This Council is made up of the Minister, who presides, the Undersecretary and the Directors-General of the MAG, the Technical Director of the National Planning Board, the managers or executive directors of the public agencies associated with the Ministry, and representatives of other public and private agencies involved in agriculture as the MAG may request.

Among the functions of this Council are those of advising the Minister on agricultural, legal, or economic matters such as the adoption of plans for agricultural development or wise use of renewable natural resources, to analyze agricultural policies and to examine the problems which affect the development of agricultural programs. Finally, this Council will adopt means to effect coordination among the institutions which make up the public agricultural sector and other agencies associated with it and will recommend policies which assure the effective participation of the agencies associated with the Ministry for the execution of programs and projects involved in agricultural development.

b. Technical Council

This is made up of the Undersecretary, who presides, the Coordinator-General, the Directors-General, and the advisors to the Minister.

Among the main functions of this Council are those of studying the programs of the Zone Offices, national programs, and programs of the associated agencies presented through the General Planning Office, in order to recommend means for their implementation. This Council also brings about the necessary coordination to assure an efficient logistic and technical support for the development of the programs of the Zone Offices.

5. Organization and Functions at the Operational Level

a. General Offices

Organization

The Office of Crop Development is made up of the Departments of Supervision and Studies, Seed Certification, Agricultural Engineering, Fertilizers, and Plant Pathology.

The Office of Livestock Development consists of the Departments of Supervision and Studies, Livestock Management, Animal Nutrition, and Genetic Improvement.

The Office of Rural Development is made up of the Departments of Supervision and Studies, Rural Organization, Community Services, and Rural Training.

The Office of Forest Development consists of the Departments of Supervision and Studies, Forestation, Forest Use and Production, Administration of Wildlife Habitat, Forest Research, and Forest Inventories.

Finally, the Office of Marketing and Enterprises is made up of the Departments of Crop Marketing, Livestock Marketing, Prices, and Associated Enterprises.

Functions

The main functions of the Offices of Agricultural and Forest Development are:

- to promote agricultural and forest development through the best use of renewable natural resources, human resources, and financial resources
- to advise the Executive Level of the Ministry in the formulation of strategy for the establishment of specific policies for the development of the crops, livestock, and forest subsectors
- to be responsible for the application, on the national level, of policies for the agricultural and forest subsectors, and for the control and technical supervision of the programs and projects which the Zone Offices and national programs carry out in these areas
- to prepare, together with the General Planning Office, Zone Offices, and national programs, programs, annual budgets, and corresponding plans of operation
- to establish the basic features and technical standards for giving technical advice in rural areas in order to meet objectives for increases in production and productivity in crops and livestock, as well as research in forestry, national parks, and wildlife
- to offer specialized technical assistance to the Zone Offices in the execution of Integrated Agricultural Development Projects (PIDA) and of Agricultural Services Agencies (ASA) (Proyectos Integrados de Desarrollo Agropecuario) (Agencias de Servicios Agropecuarios)
- to perform other functions as set forth by law, regulations, or international agreements.

The functions of the General Office of Rural Development are:

- to promote technical and cultural development of the rural population, strengthening rural organization
- to advise the Executive Level of the Ministry on the formulation of the strategy and the establishment of specific policies directed toward the organization and training of the rural population and the delivery of basic community services
- to be responsible for the application, on a national level, of policies for rural organization and training and the delivery of basic community services, and for the control and supervision of the programs and projects which the Zone Offices and national programs carry out in this area
- to prepare, together with the National Planning Board and the Zone Offices the programs, annual budgets, and projects through which

are channeled the efforts of rural organization and training and the delivery of basic community services

- to establish basic features and technical standards so that the delivery of services at the local level meets the basic objectives of promoting social development and participation of the rural population

- to offer technical assistance to the Zone Offices in the organization of the rural population for the execution of Integrated Projects of Agricultural Development

- to prepare and put into practice, through the Zone Offices, training methods which, by drawing together the experience in the country, allow raising the level of technical and social knowledge of the campesinos through courses, seminars, etc., and the preparation of appropriate materials for the training process

- to promote actions in the rural environment which permit the greatest use of food assistance offered by international organizations

- to perform other functions set forth by law or regulations.

The functions of the General Office of Marketing and Enterprises are:

- to introduce marketing technology into the sales of agricultural commodities and inputs as well as entering directly into the marketing process in order to complement efforts of the public sector of agriculture in the field of production increases

- to advise the Executive Level of the Ministry on the formulation of strategies and establishment of policies and priorities for marketing the main agricultural commodities, on government intervention in marketing, creation of combined public-private enterprises and warehouses for agricultural inputs and other strategic areas

- to be responsible, on the national level, for the policies and priorities for agricultural marketing and control and supervision of the programs and projects which agencies of the Ministry, its associated wholesale and retail marketing organizations, public-private enterprises, warehouses for production inputs, and other organizations in the sector carry out

- to recommend the adoption of general and specific pricing policies for agricultural commodities and surpluses

- to prepare, in coordination with the General Planning Office and the general offices of operation, technical reports and studies on basic consumer goods and services and on indispensable raw materials of agricultural origin, with the purpose of determining the conditions under which they are produced and marketed and to recommend the regulations to which they should be subject for the purpose of fixing consumer price ceilings, producer price supports, or the determination of reasonable profit margins

- to prepare the necessary studies so that the Price Commission

can recommend to the Minister the level of consumer price ceilings and reasonable profit margins for consumer goods and services included in the lists approved by the Economic Front (Frente Economico)

- to carry out in coordination with the municipalities, and the local and national legal authorities, price and quality control activities to assure reaching the goals of price control and other similar policies

- to prepare, together with the General Planning Office and the Zone Offices, the programs, annual budgets, and operational plans through which marketing efforts are devised

- to provide economic support to the Zone Offices, national programs, and other institutions of the agricultural sector, in the marketing areas required by the Integrated Agricultural Development Projects

- to identify, with the agencies of the Ministry and other institutions of the public sector of agriculture, support actions in marketing for the execution of programs and projects for agricultural development, and to establish basic features and technical standards so that the delivery of services at the local level meets the basic goals of introducing technology into the marketing and supply systems for agricultural commodities and inputs

- to carry out, in coordination with the General Planning Office, studies and research on the supply, demand, and storage levels of agricultural commodities, and the structure of agricultural marketing, in order to determine the production and foreign trade requirements and the level of government intervention necessary to insure a sufficient domestic food supply

- to recommend international trade policy for agricultural products to provide production incentives and to satisfy the requirements of the domestic market

- to establish, in coordination with the Ecuadorian Institute of Normalization (Instituto Ecuatoriano de Normalizacion), bases for the formulation of marketing standards for agricultural commodities

- to establish price and marketing information services for agricultural commodities and to advise the Zone Offices on the gathering, use, and management of such information

- to supervise, on a national level, the application of laws and regulations which control agricultural marketing

- to perform other functions set forth by law or regulation.

b. National Programs

In this group we include National Programs for Bananas, Coffee, Rice and the Control of Mills, Cotton and Oilseeds, Cacao, Animal Health, and Agrarian Regionalization.

Organization

These programs depend technically on the General Office of Crop Development. The National Program of Agrarian Regionalization depends on the General Office of Livestock Development.

These programs have three technical-administrative levels:

- Administrative level: made up of the executive director
- Managerial level: made up of the administrative and finance departments
- Operational level: made up of the technical and marketing departments and the different agencies of the program.

Functions

The principal common functions of the National Programs for Bananas, Rice, Cacao, Coffee, Cotton, and Oil Seeds are:

- to recommend to the Executive Level of the ministry, in coordination with the operations offices, the specific policies and priorities necessary to increase production and productivity and to improve the marketing systems for bananas, rice, cacao, cafe, cotton, and oil seeds, in order to assure domestic supplies and to permit exportation
- to prepare annually, in coordination with the General Offices of Planning, Crop Development, and the Zone Offices, the technical organization and budgetary requests adequately separated for Integrated Agricultural Development Projects and Agricultural Service Agencies, so that the Zone Offices have available the necessary funds for the promotion of the corresponding crops
- to carry out studies for the zoning of crops
- to prepare and apply, in coordination with the General Office of Crop Development, the basic features and technical standards for the delivery of support services at the local level
- to be responsible for carrying out, at the local level, advice on promotional activities for these crops
- to promote, with the support of the General Offices of Marketing and Enterprises and of Rural Development, association with small producers for the production and marketing of agricultural commodities
- to collaborate in experiments which INIAP performs involving these crops and to promote the dissemination and application of their results
- to perform other functions established by law or regulation.

The National Program of Agrarian Regionalization has the following functions:

- to carry out an agricultural resource inventory: natural, renewable, demographic, and economic, and to maintain the inventory up-to-date

- to evaluate renewable natural resources, both current and potential, determining their production potential, and to recommend technical standards for their proper use and conservation

- to prepare the necessary maps for evaluation of renewable natural resources and of agricultural, social, and economic aspects of the country

- to carry out specialized studies on relevant aspects for agrarian regionalization

- to comply with other laws, rules, and regulations in force.

The National Program for Animal Health has the following as its main functions:

- to recommend to the Executive Level of the Ministry, in coordination with the General Office of Livestock Development, the specific policies and priorities for carrying out programs, projects, and activities of animal health

- to supervise, on the national level, the application of health policies and priorities as set forth by the Zone Offices

- to formulate, in coordination with the General Offices of Planning and Livestock Development, animal health plans, programs, and projects of national, regional, and local significance

- to carry out studies to identify, prevent, and control the diseases which affect the livestock subsector

- to prepare, together with the General Office of Livestock Development, the basic features and technical standards for the control of biological and pharmaceutical products for veterinary use

- to advise and supervise for the support services units, the integrated Agricultural Development Projects and the Agricultural Services Agencies, from the Zone Offices, the performance of activities provided for in the Animal Health Program

- to issue recommendations for the formulation of agreements for international economic and technical cooperation on animal health and to coordinate the corresponding activities in this field

- to participate in the studies and work which, in the area of animal health, the country may acquire under the Cartagena Agreement (Acuerdo de Cartagena) and other international agreements

- to promote dissemination and application of the results of animal health research carried out by INIAP and other institutions

- to fulfill other requirements of law or regulations.

c. Agricultural Zone Offices

Organization

The Agricultural Zone Offices are constituted as follows:

- The Central Office, Auditing, Programs Unit, and Legal Advisor for Communications, Administration, Finance, and the Specialized Services Support Unit, located in their respective headquarters

- in the Zone Offices whose jurisdiction includes more than one province there will be established a Provincial Agricultural Headquarters

- the Integrated Projects of Agricultural Development

- the Agricultural Service Agencies

A list of Zone Offices with their respective jurisdictions and headquarters, as well as the PIDA and ASA associated with them, is found in Table II.32.

Functions

- to promote the development and increase of crop, livestock, and forest production in their jurisdiction, assuring proper utilization of resources available to the agricultural sector

- to plan agricultural development within their jurisdiction, in conformity with national strategies, policies, and plans, based on guidelines issued by the Ministry's General Planning Office

- to be responsible for the application, at the Zone level, of the policies and priorities established by the Executive Level of the Ministry, for the crops, livestock, and forestry subsectors, and to be responsible for relations with support activities for the introduction of technology into marketing and supply of agricultural commodities as well as organization and training of campesinos for increased production

- to carry out activities designed to organize and train the rural population, trying to improve their economic and social conditions and to incorporate them into the national development process

- to identify, formulate, and execute in coordination with agencies of the public sector of agriculture, projects of development (PIDA) in irrigation, agrarian reform, colonization, and under production where favorable conditions exist to increase production, in which the participation of public and campesino organizations can be justified

- to insure the permanent technical, financial, and administrative coordination among public agencies in the sector dedicated to the execution of the PIDA's, having recourse for this purpose to the Provincial Agricultural Councils or to the Agricultural Council of the Ministry, through proper channels

TABLE II.32
AGRICULTURAL ZONE OFFICES

Agricultural Zone Offices	Provinces	Can- tons	Par- ishes	Head- Qrtrs.	P I D A'S	A S A'S
1	Esmeraldas	Santo Domingo de los Colorados.		Esmeraldas	Valle Hermoso, San Miguel, Quindé-Milimpia.	Santo Domingo, Plan Piloto, San Lorenzo, Borbón, Atacames, Muisne, Rio Verde, Limones, Quindé
2	Manabi			Portoviejo	Jipijapa	El Carmen, Chone, Jama, Bahía de Caraquez, Tosagua, Rocafuerte, Santa Ana, Montecristi, Jipijapa, Paján.
3	Guayas, Los Ríos, Galápagos		Manuel de J.-Calle, La Troncal Rancho Negro.	Guayaquil	Milagro, Azúcar Churute.	Empalme Balzar, Daule, Urbina Jado, Pedro Carbo, Yaguachi, Milagro, El Triunfo, La Troncal, Naranjal, Santa Elena, Babahoyo, Vinces, Ventanas, San Cristobal, Santa Cruz, Quevedo, Catarama.
4	El Oro		Camilo Ponce Enriquez Santa Isabel, Tenguel, Balao	Machala	Jumon, Ponce Enriquez, Fronte-rizo, Uzhcurrumi.	Machala, Zaruma, Piñas, Panaja.
5	Carchi, Imbabura			Ibarra		Ibarra, Otavalo, Cotacachi, Pimampiro, Cahuasqui, Peñaherrera, San Isidro, Tulcán, San Gabriel, Bolívar, El Angel, Mira.
6	Píchincha, Cotopaxi, Napó.			Quito	Pisque, Tumbaco, Salcedo, Lago Agrio, Francisco de Orellana.	Sangolquí, Cayambe, Machachi, San José de Minas, Nanegalito, los Bancos, Tabacundo, Latacunga, Pujilí, El Corazón, La Maná, Sigchos, Tumbaco, Mualaló, Saquisilí, Tena, Baeza, Lago Agrio, El Coca.
7	Tungurahua, Bolívar, Pastaza	Palora		Ambato	Tungurahua	Ambato, Patate, Rio Negro, Guaranda, Chillanes, San Miguel, Caluma, Fchandia, Puyo, Palora, Pillaro.
8	Chimborazo			Riobamba	Químiag-Penipe	Guamote, Alausí, Chunchi, Pallatanga.
9	Cañar, Azuay, Morona Santiago			Cuenca	Santa Isabel, Cañar.	Cuenca, Tarquí, Nabón, Gualaceo, Paute, Azoguez, Pindilig, Macas, Sucúa, Héndez, Semilla Don Bosco.
10	Loja, Zamora-Chinchi-pe	Gualaquiza		Loja	Macará, Vilcamba-Malacatus	Loja, La Toma, Gonzanamá, Catacocha, Saraguro, Cariamanga, Analuza, Alamor, Cética, Gualaquiza, Yanzatza, Zumba, Zamora.

- to deliver technical assistance services to agricultural producers in the PIDA's to help them use their resources to the maximum and thus help meet the project goals

- to deliver, through the ASA's, technical assistance for the principal commodities in those areas which are not under the jurisdiction of the PIDA's

- to offer specialized assistance services required by the PIDA and ASA activities, making use of the facilities of farms, laboratories, greenhouses, agricultural training and mechanization centers, and other facilities available in the Zone Office jurisdiction

- to apply technical assistance methodologies and standards set forth by the General Offices and, based on the results achieved, to make adjustments to increase the efficiency of the production units serviced

- to disseminate and promote the results of research and experiments done by INIAP and other public and private institutions

- to prepare the program and budget, taking into consideration the guidelines issued by the General Planning Office and the technical features recommended by the other General Offices

- to insure compliance with the laws governing agricultural and forest promotion, communes and cooperatives, animal and plant health, seed certification, wildlife and wild plants, financial administration and control, civil service and administrative careers, and with their respective regulations

- to carry out other functions delegated by the Ministry of Agriculture and those functions delegated by law and other regulations.

6. Agencies Attached to the Ministry of Agriculture

a. National Institute of Agricultural Research (INIAP)

a. 1 Organization

INIAP is an autonomous agency associated with the MAG, charged with guiding and carrying out agricultural research in accord with the nation's agricultural priorities.

INIAP is governed by an Administrative Council composed of the following members:

- Minister of Agriculture (President)
- Finance Minister
- Manager of the National Financial Corporation (Corporacion Financiera Nacional)
- Manager of the National Development Bank (BNF)
- Technical Director of the National Planning Board (JUNAPLA)
- Director General of INIAP
- Representative of Farming Groups
- Secretary of the Council.

This Council is charged with the planning and approval of policies for agricultural and administrative research for the Institute. It has four regular sessions each year and extraordinary sessions as needed.

a. 2 Objectives

On the national level, the Institute has the following objectives:

General: To develop the technology necessary to increase agricultural productivity so as to increase producers' income.

Specific:

- to increase yields of commodities produced for domestic markets
- to achieve reductions in crop production costs
- to offer alternatives for dietary diversification and improvement for the Ecuadorian people
- to obtain improvement in export commodities which earn foreign exchange, as well as products used as raw materials for industry
- to train professionals, technicians, and producers.

a. 3 Activities

Research work for reaching the objectives is divided into four general categories:

- genetic improvement: development of more prolific, early maturing, resistant, and better quality varieties
- improvement of cultural practices: seeking improved methods of planting, improved cultural practices, fertilization, improved harvest methods, better cultivation, etc.
- methods of pest control: control of insects and diseases
- livestock research: management and nutrition.

b. Center for Economic Rehabilitation of Azuay, Canar, and Morona Santiago (CREA)

b. 1 Organization

CREA is organized as follows:

- Board of Directors: made up of the Minister of Agriculture, the Technical Director of the National Planning Board, the Provincial Prefects of Azuay, Canar, and Morona Santiago, representatives from the business sector, and representatives from campesino organizations

- Executive Level: made up of the Executive Director and Assistant Director

- Advisor Level: made up of the Departments of Legal Advice and Internal Audit, the Consulting Committee, and other agencies for advice which may be created either temporarily or permanently. The Consulting Committee is made up of the Executive Director and Assistant Director, the Legal Advisor, the Internal Auditor, the Directors of

Program Performance and Planning, The Chiefs of the Administrative and Financial Departments of the three Provincial Councils

- Administrative Level: made up of the Administrative and Financial Departments

- Operational Level: made up of the Offices of Planning and Program Performance. The Planning Office is made up of the Departments of Regional Planning, Budget Planning and Evaluation, Organization, and Systems and Statistics.

The Office of Program Performance is made up of the Departments of Social Development, Industrial, Crafts, and Mining Development, Agricultural Development, Support Units, and Technological Research and Training.

b. 2 Functions

The Operational Level carries out the programs and policies set forth by the Administrative Board and the Executive Level.

Its objectives are summed up as follows:

- planning regional development
- coordination of activities with regional, national, and international agencies
- advice to public and private agencies
- execution and evaluation of development programs.

With these activities it is hoped that a more fair income distribution, integrated regional development, and an increase in the economic growth rate can be achieved.

c. National Storage and Marketing Organization (ENAC)

c. 1 Organization

ENAC has four organizational levels: Directors, Executive, Advisement, and Operational.

The Board of Directors is made up of the Undersecretary of the MAG, the Director of Marketing and Enterprises of the MAG, the Director of Trade of the Ministry of Industry, Commerce, and Integration, the Assistant Director of the National Development Bank and a representative of the Federation of Boards of Agriculture (Federacion de Camaras de Agricultura).

c. 2 Objectives

The basic objective of ENAC is to regulate the marketing of agricultural commodities and processed goods with the purpose of stimulating and guiding increases in agricultural production and to guarantee the domestic supply for the benefit of both producers and consumers.

c. 3 Functions

The functions of ENAC are:

- to propose to the Ecuadorian government policies for marketing agricultural commodities and processed goods
- to participate in the wholesale buying and selling, processing, supply, storage, regulation of surplusses, importation, and exportation of agricultural commodities and processed goods, in conformity to the list of products and the policy set forth by the government through the MAG
- to establish the National Storage System for agricultural commodities and processed goods for its own benefit and that of others, with the power to issue warehouse certificates and transferable and negotiable security bonds (bonos de prenda), subject to the General Warehouse and Storage Law (Ley de Almacenes Generales y Depositos)
- to participate in the planning, development, management, and operation of wholesale supply markets, commodities exchanges, public agricultural markets, or other marketing systems which may be established
- to propose to the proper agencies, either periodically or as determined by market conditions, changes in maximum and minimum prices established for commodities under its supervision
- to contribute to the national system of marketing and price information
- to discourage speculation, hoarding, and adulteration of agricultural commodities and processed goods in any phase of marketing. To this end, ENAC will support the proper regional and national agencies.

d. National Vital Products Organization (ENPROVIT)

d. 1 Organization

ENPROVIT has its main office in Quito and branch offices in Quito, Guayaquil, Cuenca, Riobamba, and Loja. Each of them has a full complement of administrative, professional, technical, and service personnel.

For the sale of commodities, ENPROVIT has 156 warehouses, 3 cellar-warehouses, 10 rolling warehouses, 4 small markets, 19 supermarkets, 7 commissaries and associated stores.

d. 2 Objectives

The main object of the Organization is to regulate retail prices of basic consumer goods for the benefit of the economically disadvantaged.

Presently ENPROVIT handles 42 product lines. In basic necessities the prices are official, while in the rest the prices are a little

less in order not to harm private enterprise.

e. Ecuadorian Institute of Water Resources (INERHI)

e. 1. Organization

INERHI is an agency with legal status created by public law and is attached to the MAG.

It is made up of:

- Director's Council: made up of the Minister or Undersecretary of Agriculture, who presides; a Representative of the National Planning Board; the Executive Director of the Technical Director of IERAC; a Delegate from the private sector of agriculture; the Manager of the BNF or his representative who will act as Secretary

- Executive Level: made up of the Director

- Administrative Level: made up of the Financial and Administrative Units

- Operations Level: includes Technical Management, the Technical Advisement Office, and the Divisions of Water Resource Planning and Irrigation, Drainage and Flood Control, made up of their corresponding departments and districts

- Advisory Level: made up of the Internal Auditor, Legal Advisor, and Department of Programming.

e. 2 Functions

- to carry out the National Irrigation and Drainage Plan (Plan Nacional de Riego y Saneamiento) which is part of the General Plan for Economic and Social Development (Plan General de Desarrollo Economico y Social) and to collaborate with the General Office of Agricultural Development and the National Planning Board in carrying out said Plan

- to study, plan, construct, and operate irrigation and drainage systems, both alone and in concert with other agencies

- to establish, by means of regulations which will be issued by the MAG, technical standards and specifications to control legal bodies or people who construct irrigation or soil drainage systems

- to determine whether construction projects meet the standards established by the Institute before such projects can be started

- to promote organizations made up of water users and to establish, by means of regulations to be issued by the MAG, standards for the management and conservation of irrigation canals, and to approve the internal regulations of Water Boards, according to applicable laws

- to carry out, together with the National Meteorological and Hydrological Service (Servicio Nacional de Meteorologia y Hidrologia),

the evaluation of national water resources, and to establish a complete inventory of those resources and to keep it up to date

- to collaborate with other agencies in the use and protection of river basins

- to promote the establishment of private or private-public irrigation enterprises, including by means of capital funding, and to stimulate the investment of capital in irrigation enterprises

- to study and determine water needs for irrigation and other uses, in order to establish proper limitations or increases to water rights, and to set necessary reserves for irrigation of dry land and for other uses necessary for the country's development

- to receive and negotiate requests for water use permits and to issue reports to those who, regarding technical aspects, must adhere to decisions of competent authorities for definitive judgments under existing laws

- to maintain a registry of water rights granted by the government

- to deliver technical assistance to public or private agencies or private parties, under the proper regulations

- to contract for loans from national agencies for financing the projects which the Institute is to carry out under law

- to charge users the corresponding rates for its services and to set rates

- to exercise other functions established by law.

7. Agencies Associated with the Ministry of Agriculture

a. Study Commission for the Development of the Guayas River Basin (CEDEGE)

a. 1 Organization

In conformity with the Statutes, the organizational structure of CEDEGE is divided into the following levels:

- Governing Level: made up of the Directorate of the agency
- Advisement Level: made up of the Permanent and Special Commissions
- Executive Level: corresponds to the Management
- Operational Level: includes the Technical Department with its respective sections
- Administrative Level: made up of the Financial and Administrative Departments

The Directorate is the highest level of CEDEGE and consists of eight representatives, seven of whom are from the public sector and one from the private sector.

Those from the public sector are: a representative of the President of the Republic, who presides and represents the agency officially, a representative of the Ministry of Public Works, a representative of the MAG, a representative of the Ministry of Natural and Energy Resources, a representative of the Finance Ministry, the Technical Director of the National Planning Board, a representative of the Provincial Council of Guayas, and from the private sector, a representative of the Society of Engineers and Architects of the Coast.

The Commissions of the Directorate are: the Commission for Technical Advisement, the Development Commission, the Budget and Finance Commission, and the Commission for Special Studies.

The Executive Level is represented by the Director, who exercises the institution's legal representation.

The Operations Level is made up of the Technical Department, which includes the following sections: Regional Planning, Studies, Design, Inspection and Construction, Installation, and Inspection.

The Administrative Level includes the Financial Department, which is made up of the following sections: Accounting, Budget Programming and Control, Audits, Treasury, and Provisions and Stores.

a. 2 Functions

- to formulate a strategy for regional development in harmony with the change and development features set forth by the national government

- to assume direct responsibility for the continuation of basic studies previously undertaken, reorienting them toward the identification of projects which lead to the use of existing resources for the benefit of the majority of the people involved

- to carry out the Babahoyo Irrigation Project (Proyecto de Riego Babahoyo), the first developmental pilot project undertaken by CEDEGE, insuring the participation of the people benefitting thereby and inter-agency cooperation with other national, regional, and sectional agencies associated with the Project.

b. Regional Program for the Development of the Southern Region of Ecuador (PREDESUR) (Programa Regional para el Desarrollo de la Region Sur del Ecuador)

b. 1 Organization

The highest body of this Program, as set forth in the Regulations, is the Directorate. The Directorate is made up of a representative of INERHI, a representative of the Ministry of Foreign Relations, a representative of the MAG, a representative of the National Planning Board, and a representative of the Ecuadorian Electrification Institute.

The Executive Office is made up of the Director. Departments under the Executive Office are: Regional Development, Agriculture,

Physical Development and Tourism, Operations, Highways, Environmental Health and Mining, Renewable Natural Resources, and Irrigation and Energy. At the regional level we have the Management Offices of Zamora Chinchipe, Loja, and El Oro, each one of which is made up of administrative and technical units according to its objectives.

b. 2 Functions

The Ecuadorian Subcommission is charged with carrying out the development of the Southern Region of Ecuador, made up of the provinces of El Oro, Loja, and Zamora Chinchipe, and with achieving balanced development in harmony with other regions of the country. It also is responsible for solving the problem of a serious social and economic depression and for enabling the region to participate successfully in the frontier integration process with Peru as well as to coordinate efforts and collaborate with other agencies in the area.

The central office is in Quito and has the functions of planning, coordinating at the highest level, and directing the work of the Regional Offices. The Regional Offices enjoy autonomy in their administrative functions, which are necessary for the success of the project.

8. Mixed Public-Private Enterprises Associated with the Ministry of Agriculture

These encompass exclusively the agricultural-industrial sub-sector with the purpose of promoting in the private sector the formation of new agricultural industries which will permit an adequate and planned development of rural areas, thus to offer better social services to the consumer.

a. Organization and Participation of the MAG

The MAG has at least one representative on the Directorate of Enterprises. The Zone Director of the Ministry of the respective jurisdiction in which the Enterprise is located is always a member of this Directorate.

The MAG originally envisioned visits of its delegates to each Enterprise six times a year, two at the beginning and end of each year, because of financial matters, and the rest related to supervision and control, making an effort to solve administrative or financial problems. The MAG depends on a group of technical personnel such as industrial engineers, accountants, lawyers, economists, etc., for these functions.

In Table II.33 is a list of mixed public-private enterprises with details on their location, capital investment, and date of formation. In PROLACEM, COMPROLACSA, ENSEMILLAS, and CAYAPAS, the MAG owns more than 90% of the stock; in the rest, it fluctuates between 7 and 50%.

TABLE II.33

MIXED PUBLIC-PRIVATE ENTERPRISES ASSOCIATED WITH THE MAG

NAME	OFFICE	CAPIT... INVESTMENT (Thousand of sucres)	DATE OF ESTABLISHMENT
CAFRILOSA	Loja	14,639,000	June 1965
PROLAC	Riobamba	5,535,000	April 1971
PROLACEM	Cuenca	22,118,000	Dec. 1971
FORESTRY (CAYAPAS)	Quito		
	Guayaquil		
	San Lorenzo	90,000,000	Nov. 1971
FERTISA	Quito	131,459,000	Nov. 1971
COMPROLACSA	Loja	10,822,000	Nov. 1972
FRUTAGRO	Ambato	3,200,000	Aug. 1973
ENSEMILLAS	Quito	26,930,000	April 1973
PROLAHUAN	Guayaquil	20,720,000	May 1974
SALINAS ALFALFA PROC.	Iharra	3,500,000	Jan. 1974
BANARINA	Quevedo, Quito	21,281,900	Dec. 1970
ENCIPA	San Gabriel	<u>en formacion</u>	March 1978
TOTAL CAPITAL		354,205,900	

SOURCE: MAG - Office of Marketing and Enterprises

b. Objectives of the Mixed Public-Private Enterprises

b. 1 General

- to foster confidence in work shared by the government and private parties
- to motivate the interest of private enterprise so that it will contribute to the development of the agricultural sector
- to arrange effective action and to bring together resources of the public and private sectors to make possible high yields from agricultural activities
- to organize and orient the factors which operate in the field of agriculture in order to achieve adequate specialization of production by sectors and geographic areas
- to increase opportunities so that all the members of the collective, especially the small and medium-sized farmers, can participate as stockholders.

b. 2 Specific

- Meat Packing House of Loja (CAFRILOSA): Establishment of a meat packing house for the slaughter of livestock, with strict adherence to sanitary procedures for local consumption of high quality meat and meat products
- Chimborazo Milk Products (PROLAC) and Cuenca Milk Products (PROLACEM): Pasteurization of milk and manufacture of dairy products
- Ecuadorian Fertilizers, Inc. (FERTISA): production and marketing of fertilizers
- Forestry Manufacturing (CAYAPAS): exploitation, industrialization, and marketing of wood and wood products
- Southern Milk Products (Productos Lacteos del Sur), (COMPROLACS): processing and marketing of milk and dairy products to assure supplies to the city of Loja and surroundings
- Certified Seeds (ENSEMILLAS): production, selection, and marketing of certified seeds
- Fruits and Vegetables (FRUTAGRO): production and marketing of fruits and vegetables from the enterprise's area of influence (Province of Tungurahua)
- Huancavilca Milk Products (PROLAHUAN): Processing and marketing of milk and dairy products
- Salinas Alfalfa Processors: production and marketing of alfalfa pellets
- BANARINA: Production of banana flour

(76)

- Enterprise for Marketing and Industrial Use of the Potato
(Empresa de Comercializacion e Industrializacion de la Papa (EMCIPA)).

III. DESCRIPTION OF RESEARCH, EDUCATION, AND EXTENSION IN THE AGRICULTURAL SECTOR

A. Agricultural Research

1. History

Agricultural research in Ecuador began in 1943 with the Ecuadorian Agricultural Research Station (Estacion Agricola del Ecuador), now called the Pichilingue Experiment Station (Estacion Experimental Pichilingue), whose first work was related with the improvement of cacao. Later, studies were undertaken on coffee and bananas. This station was administered by the General Agriculture Office of the Ministry of Economics and received assistance and advice from the United States Department of Agriculture. In the early 1950's, this center joined the Interamerican Cooperative Agricultural Service. Later, the Conocoto Experimental Farm was created. The National Wheat Commission carried out experiments in the Mountain region having its main center in Isobambo.

In June of 1959 the National Institute for Agricultural Research (INIAP) was created. For budgetary reasons, it did not begin to function until 1962. In order to undertake research studies, INIAP established the research stations and centers located strategically in the regions of the Coast, Mountain, and East. The first experiment station established was "Santa Catalina" in 1962 and soon after came "Portoviejo". Later, in 1963, "Pichilingue" joined INIAP. Until that time it had been a part of the Interamerican Cooperative Agricultural Service. In that same year "Santo Domingo" was created. Finally "Boliche" was established in 1969, the "Southern Experiment Station" in 1974, and "Napó Experiment Station" (East region) in 1978.

2. The Present Situation in Agricultural Research

The main agricultural research institution in Ecuador is INIAP. Nevertheless, a small amount of agricultural research is carried out by other government agencies and in universities.

Examples of educational institutions which conduct agricultural research are the Central University of Quito Polytechnical School, the National University of Guayaquil, the Chaborazo Polytechnical School, the University of Machala, the Magro School, and the Leonardo Murialdo de Archidona School.

The Health Ministry, through the National Institutes of Nutrition and Social Research, does research on aspects of nutrition and food.

Forest research is conducted by Conocoto Forest Center which is administered by the General Office of Forest Development of the MAG.

The Study Group did not have any information about budgets or personnel for most of these institutions except for INIAP. In any case it is recognized that their research is limited to a few areas and their personnel are less specialized.

The following section includes a summary of INIAP, programs, activities, research philosophy and procedures.

3. Plans and Programs

INIAP has eight Departments at the national level: Agricultural Economics, Agricultural Engineering, Communication, Nutrition, Biometrics, Station Planning and Development, Coordination of International Projects, and Training.

These departments function mainly in the central administrative offices in Quito and in the Santa Catalina Experiment Station. In addition to these departments, INIAP has others at the Experiment Station level. The placement of experiment stations is based on the conduct of research with representative crops for the different ecological zones of the country and are:

Santa Catalina Experiment Station

Programs: cereal grains (wheat, barley, and oats), corn, seed legumes, potatoes, vegetables, pastures, dairy cattle, and swine.

Departments: Soils, Plant Pathology, Flour Milling & Quality, Nutrition, Barley Quality, Corn Quality, Veterinary Medicine, and Swine.

Pichilingue Experiment Station

Programs: Cacao and coffee, corn, bananas, oil bearing crops, (soybeans, peanuts, sesame seeds), pastures, beef cattle, dual purpose cattle.

Departments: Soils, Plant Pathology, Weed Control, and Seed Production.

Boliche Experiment Station

Programs: Rice, cotton, oil bearing crops, (soybeans, peanuts, sesame seeds, castor beans, safflower, and sunflowers), bananas, seed legumes, pastures, and swine.

Departments: Soils, Entomology, Plant Pathology, Weed Control and Seed Production.

Portoviejo Experiment Station

Programs: Cotton, annual oil bearing crops, peanuts, sesame

seeds, castor beans, safflower, sunflowers, corn and sorghum, wheat, and pastures.

Departments: Soils, Entomology, Plant Pathology, Weed Control, and Seed Production.

Santo Domingo Experiment Station

Programs: African palm, pastures, cattle, swine.

Departments: Soils, Entomology, and Plant Pathology.

Southern Experiment Station

Programs: This center collaborates with the Santa Catalina station in research programs for cereal grains (wheat, barley, and oats), corn, potatoes, pastures, and dairy cattle.

Departments: Similarly, it collaborates with the Departments of Soils, Entomology, Plant Pathology, and Weed Control.

Napo Experiment Station

Research: Development and transfer of technology for small farmers in the Ecuadorian Amazon region. This Station works in coordination with other programs and departments of the Institute.

The Institute conducts 400 regional field trials annually to confirm results obtained in the Stations and to verify the characteristics of the varieties, plant treatments, and fertilizer levels in the different ecological systems of the country. At the same time, these activities make possible the dissemination of new technology. For this purpose the Institute cooperates with other units of the MAG.

In order to disseminate new technology in rural areas for the use of farmers and cattlemen of limited resources, INIAP created five production research programs: wheat, in the Cayambe zone of Pichincha province; soft corn, in the Ibarra area of the province of Imbabura; rice, in the area of Samborondon-Urbina Jado; hard corn, in the area of Balzar-El Empalme, province of Guayas; and dairy cattle, in the environs of the city of San Gabriel, Carchi province. The Institute has plans for future research in two new areas, Fruit Production and Poultry.

The Institute's process for conducting research is as follows: the programs and departments organize their research according to Projects, Subprojects, and field trials. The project proposal is submitted for the consideration of the Station Director. With the advice of the Technical Committee he either approves or rejects it. Final approval is subject to the opinion of the Director General. INIAP requires that the different project proposals submitted include the following: title, statement of the problem, justification, methodology, bibliography, project leaders, cost estimate, and probable time involved. In Table III.1 is a summary of the field trials carried out between 1967 and 1978.

TABLE III.1
FIELD TRIALS PERFORMED BY INIAP

YEAR	NO. of FIELD TRIALS
1967-68	2,842
1971	557
1972	579
1973	743
1974	800
1975	828
1976	902
1977	1,259
1978	1,777
TOTAL:	10,287

SOURCE: INIAP

Once a year, evaluation meetings of the different programs and departments take place. Representatives of the different institutions related to the agricultural sector attend these meetings.

INIAP, in order to get research results into the hands of producers conducts field days, offers courses, edits publications, and releases seed for the varieties researched.

Up to November of 1978, the Institute organized 150 field days for some 24,000 people (see Table III.2); it offered 261 courses for 6,341 participants (see Table III.3); it edited 312 publications of various types approximately 800,000 total copies, which have been distributed to all the specialized libraries of the nation, including Universities, Agricultural Colleges, offices and other agencies of the Ministry of Agriculture, agricultural cooperatives, farmers and cattlemen's associations, agricultural centers, national and international agencies, and a large number of farmers in the regions of the Coast, Mountain, and the East (see Table III.4). In addition, the Institute has released varieties which are the results of research and are used by farmers (see Table III.5).

International Collaboration. The assistance offered by international research centers, advisors from other countries, and credit agencies, has been a valuable contribution for the advance of the Institute. Presently collaboration is received from the following agencies:

Cooperation from the International Center for Tropical Agriculture (CIAT) includes assistance in the production of beef cattle and swine, forage species trials, peas, rice, personnel training in these areas and in corn. The CIAT library and documents program includes personnel located in Ecuador who work for the Rice Program and CIAT groups which travel to and from Ecuador for different research programs.

The cooperation of the International Potato Center (CIP) consists of technical assistance in the area of training and a project for production of potato seed. The Director General of INIAP forms part of the Board of Directors of the CIP.

The cooperation of the International Center for the Improvement of Corn and Wheat (CIMMYT) includes assistance in personnel training and in planning and carrying out corn and wheat research. The participation of CIMMYT is achieved through the personnel located in Ecuador and through groups of CIMMYT officials who travel to and from Ecuador.

The Government of China cooperates with rice and swine programs through exchanges of personnel and technology.

The Andina Brewery, Inc., is cooperating in the program for quality control of malting barley.

The Federal Council of Switzerland grants technical assistance in the development of laboratories and for the programs of wheat and corn improvement.

TABLE III.2
INIAP FIELD DAYS

<u>YEAR</u>	<u>No. of Field Days</u>
To 1973	115
1974	3
1975	3
1976	6
1977	17
1978	6
TOTAL:	150

SOURCE: INIAP

TABLE III.3

COURSES TAUGHT BY INIAP SINCE 1962

Designed for:	No. of Courses	No. of Participants
Cattle producers	39	1,490
Swine producers	13	507
4-H Clubs	6	132
Agricultural Schools	12	405
Universities	32	771
Ministry of Agriculture	45	881
National Development Bank (BNF)	5	72
CEDEGE	2	20
CREA	2	23
SECAP	3	22
Rural Schoolteachers	4	87
Agricultural Cooperatives	7	30
Machinery Operators	6	90
Army Personnel	5	104
Industry Personnel	1	27
Agents of the World Bank	1	20
INIAP	24	576
Misc.	54	1,084
Total	261	6,341

SOURCE: INIAP

TABLE III.4
INIAP PUBLICATIONS SINCE 1962

Informational Bulletins	98
Technical Pamphlets	23
Misc. Publications	33
Short Bulletins	60
Technical Reports	15
Informational Reports	7
News Releases	70
Technical Magazines	1
Educational Series	1
Others	4
Total	312

SOURCE: INIAP

TABLE III.5

VARIETIES RELEASED BY INIAP

WHEAT:	'Crespo', 'Atacazo', 'Napo', 'Ruminahui', 'Amazonas', 'Romero 73', 'Cayambe 73', 'Antizana', and 'Chimborazo'.
BARLEY:	'Paccha', 'Torada', and 'Duchicele'.
OATS:	'INIAP 67' and 'Santa Catalina 67'.
POTATO:	'Santa Catalina'.
MOUNTAIN CORN:	'Chillos Mejorado', 'Santa Catalina', 'INIAP 176', and 'Amaguana'.
HYBRID CACAO:	'SCA-6 x 400', 'SCA-6 x IMC 67', 'SCA-6 x EET 62', 'SCA-6 x ICS 6', 'SCA-6 x EET 95', and 'EET 103 x EET 387'.
CLONES:	'EET 400', 'EET 399', 'ICS 95', 'EET 19', 'EET 95', 'EET 103', 'IMC 67', and 'EET 387'. In total over 400 clones.
COFFEE:	'Caturra Rojo', 'Mundo Novo', 'Tacas', 'Bourbon Amarillo', and others.
COASTAL CORN:	'INIAP 515', 'VS-2', 'Pichilingue 513', and 'Pichilingue 504'.
COTTON:	'Empire WR-61', 'Dixie King', and 'Coker Carolina Queen'.
RICE:	'IR S', 'INIAP 2', 'INIAP 6', and 'INIAP 7'.
SOYBEANS:	'Mandarin', 'Pelikano', 'Abura', 'Americana', 'Manabi', and 'INIAP Jupiter'.
SESAME:	'Portoviejo 1', and 'Portoviejo 2'.
CASTOR BEANS:	'Portoviejo 67'.
AFRICAN PALM:	'Duar' and 'Tenera'.
PEANUTS:	'Boliche', 47-67-D; 46-115-B; 'Tarapoto'.

SOURCE: INIAP

Great Britain assists technically in the plant pathology program.

The University of Florida collaborates in the development of the Limoncocha Station (NAPA).

Other international institutions which offer assistance to INIAP are:

American Cocoa Research Institute
International Center for Rice Research (Centro Internacional de Investigaciones sobre el Arroz) (IRRI).
Michigan State University
Rockefeller Foundation
World Bank and Interamerican Development Bank
U.S. Agency for International Development
International Institute for Tropical Agriculture (IITA)
International Institute of Crops for Semi-arid Tropical Areas (Instituto Internacional de Cultivos para las Zonaz Tropicales Semiaridas) (ICRISAT)

4. Availability of Resources

a. Physical

INIAP has an office of Central Administration in Quito and another in Guayaquil which oversee the Regional Offices and Experiment Station which are as follows:

Santa Catalina Experiment Station. Located 14 kilometers south of Quito, it has an area of 950 hectares and 18,000 square meters of buildings. It includes soils, entomology, plant pathology, physiology, and animal nutrition laboratories, as well as a stockman's training center.

Boliche Experiment Station. Located 26 kilometers east of Guayaquil on 200 hectares, it has soils, entomology, plant pathology, nematology, and swine laboratories.

Portoviejo Experiment Station. Situated 12 kilometers south of Portoviejo on 262 hectares with 5,000 square meters of buildings, it has soils, plant pathology, and entomology laboratories.

Santo Domingo Experiment Station. Located 38 kilometers west of Santo Domingo de los Colorados on 332 hectares with 10,000 square meters of buildings, it includes soils, plant pathology, entomology, and vegetable oil quality laboratories, and an extraction plant for oil from African palm.

Southern Experiment Station. This is located 19 kilometers north of Cuenca with an area of 11 hectares and 500 square meters of buildings.

Napo Experiment Station. Located 52 kilometers out on the road to Lago Agri-Coca, it has 980 hectares and an area of 150 square meters of buildings.

Between 1972 and 1978 considerable construction took place in the Experiment Stations. Building area surpassed 26,000 meters. During this time construction of drainage, roads, water control systems, etc., reached 20,000 meters of construction. Presently INIAP has construction plans for each Experiment Station in the joint INIAP-BID Project (see Table III.6).

b. Human Resources

The availability of INIAP personnel and their distribution are indicated in Tables III.7, III.8, and III.9.

By subject or discipline, INIAP personnel are distributed as follows: a) in natural resources, 10.5%; b) in production technology 86.8%, and a large number are in industrial crops, cereal and other grains; c) in socio-economics, 2.7%.

By clientele groups, INIAP personnel are assigned to each category as follows: 35.3% raw materials producers; 7.9% producers of crops for export; 40.3% producers of crops for domestic markets; and 16.5% subsistence farmers.

The regional breakdown is as follows: 64.8% in the Coast region, 32.9% in the Mountain region, and 2.3% in the East.

INIAP has made personnel training efforts seeking the efficient development of agricultural research. Presently it has 5 Ph.d.'s, 58 M.S.'s, (46 in agronomy, 6 in agricultural economics, 6 in veterinary medicine), 109 B.S. agronomists, 109 agricultural engineers, 3 chemical engineers, 2 veterinarians (D.V.M.'s), and 127 with some agricultural university graduates and intermediate-level technicians. In addition, 22 persons are currently receiving training in other countries (2 at the Ph.d. level, 12 at the M.S. level, and 8 in special courses.)

c. Economic Resources

INIAP's share of the national budget is shown in the part corresponding to the entire agricultural sector of which it is a part. Following is a description of some aspects of budget distribution as it concerns clientele groups, disciplines, functions, regions, and the relationship between employees and activities.

According to Table III.10, during the years in question the percentage assignments for each group of clientele has remained constant while a notable increase is shown in the absolute figures.

The previous situation is repeated in the budget distribution by disciplines (see Table III.11). Natural resources retained a share of 11% in each of the years, technological production maintained

(88)
TABLE III.6

CONSTRUCTION PLANS OF THE INIAP-BID PROJECT

LOCATION & TYPE OF CONST.	SQUARE METERS OF CONST.
<u>Santa Catalina Exp. Station</u>	
Plant Nursery	450
Office Building	320
Storage Facilities	600
Greenhouses	415
Cold Rooms	36
Poultry Houses	400
Poultry Laboratories	550
Second Story Laboratory	400
Second Story Library (office)	420
<u>Boliche Exp. Station</u>	
Office Building	600
Storage Facilities	600
Greenhouses	270
Cold Rooms	36
Nurseries	450
Head House	400
<u>Pichilingue Exp. Station</u>	
Storage Facilities	600
Greenhouses	270
Cold Rooms	36
Technicians' Housing	750
Head House	400
Laborers' Housing	720
Sports Center	
<u>Portoviejo Exp. Station</u>	
Office Building	260
Greenhouse	270
Cold Rooms	36
Laborers' Housing	120
Nurseries	450
Poultry Houses	500
Head House	400
Dining Room & Clubhouse	500
Storage Facilities	600
Machinery Shed	1.000
<u>Santo Domingo Exp. Station</u>	
Storage Facilities	600
Greenhouse	270
Stable	4.800
Head House	400
Laborers' Dining Room	225
Central Office	
Office Building	3.665.1
<u>Napo Exp. Station</u>	
Administrative Offices & Labs.	360
Technicians' Housing	600
Laborers' Housing	120
Shed	400
Dining Room & Clubhouse	240

SOURCE: INIAP

TABLE III.7

DISTRIBUTION OF INIAP PERSONNEL BY SUBJECT OR DISCIPLINE - 1977

SUBJECT OR DISCIPLINE	ACADEMIC LEVEL					TOTAL	
	Phd	MS	(1)	(2)	(3)		
A. Natural Resources							
-Land		3	21	5	3	32	
-Water		-	-	-	-	-	
-Climate		-	-	-	-	-	
B. Production Technology							
1. Industrial Crops		10	17	17	16	60	
2. Cereals & other grains ²		11	13	13	11	50	
3. Oil Seeds		6	10	10	12	38	
4. Bananas	1	3	8	7	3	22	
5. Tubers	1	4	3	3	2	13	
6. Vegetables & Fruits	-	-	-	-	-	-	
7. Pastures & Forage	-	2	3	1	3	9	
8. Forestry	-	-	-	-	-	-	
9. Others	-	-	-	-	-	-	
1. Dairy Products		4	3	6	4	17	
2. Beef	1	4	8	3	9	25	
3. Lamb & Mutton		-	-	-	-	-	
4. Pork		4	3	3	9	19	
5. Poultry		-	1	1	-	2	
6. Others		1	1	1	-	3	
C. Social-Economic							
-Technology		6			2	8	
TOTAL		5	58	91	70	74	298

SOURCE: INIAP

(1) Professionals

(2) Technicians

(3) Interns

TABLE III.8

DISTRIBUTION OF INIAP PERSONNEL BY CLIENTELE GROUP -1977

CLIENTELE GROUP	PROFESSIONAL-ACADEMIC LEVELS					TOTAL
	PhD	MS	(1)	(2)	(3)	
<u>Producers of Raw Materials</u>						
-Coffee and Cacao		3	5	5	5	18
-Cotton		3	12	9	2	26
-Oil Seeds		7	17	11	13	48
-Hard Corn		4	6	1	4	15
						<u>107</u>
<u>Products for Exportation</u>						
-Coffee and Cacao			1	3	3	10
-Banana	1	2	5	4	2	14
						<u>24</u>
<u>Products for Domestic Markets</u>						
-Bananas		1	3	3	1	8
-Cereals and other Grains	1	10	7	6	10	34
-Tubers	1	2	2	2	1	8
-Milk		3	2	4	3	12
-Beef	1	6	11	4	12	34
-Pork		3	5	2	4	14
-Poultry				1		1
-Peas		1	3	2	1	7
-Rice		1	1	1	1	4
						<u>122</u>
<u>Susbistence Farmers</u>						
-Cereals and other Grains	1	6	6	7	5	25
-Tubers		2	1	1	1	5
-Rice		1	2	2		5
-Milk		1	1	2	1	5
-Pork		1	3	1	1	6
-Peas			2	2	1	5
						<u>51</u>
						<u>304</u>

SOURCE: INIAP

- (1) Professional
(2) Technicians
(3) Interns

TABLE III.9

TRAINING LEVEL OF THE PERSONNEL OF THE NATIONAL INSTITUTE FOR AGRICULTURAL RESEARCH, 1977

REGIONS	Ph.D	ACADEMIC TRAINING		Some Univ. Study	Technical Training	TOTAL
		M.S. University Graduate				
A. Costa (Coast)	3	36	66	49	43	197
B. Sierra (Mountain)	2	22	27	23	26	100
C. Oriente (East)	-	-	4	-	3	7
TOTAL:	5	58	97	72	72	304

SOURCE: INIAP

TABLE III.10

INIAP BUDGET BY CLIENTELE GROUPS 1971-1975
(millions of sucres)

Clientele Groups	1971		1972		1973		1974		1975		Average %
	Expenses	%	Expenses	%	Expenses	%	Expenses	%	Expenses	%	
Producers of Raw Materials	18.030	35	21.981	35	28.801	35	41.558	35	57.516	35	35
Producers of Export Crops	4.121	8	5.024	8	6.583	8	9.499	8	13.146	8	8
Producers for Domestic Markets	20.606	40	25.121	40	32.916	40	47.496	40	65.732	40	40
Subsistence Farmers	8.758	17	10.677	17	13.989	17	20.186	17	27.936	17	17
TOTAL	51.515	100	62.803	100	82.289	100	118.739	100	164.330	100	100

(92)

SOURCE: INIAP

TABLE III.11

INIAP BUDGET BY SUBJECT OR DISCIPLINE

1971-1975
(millions of sucres)

SUBJECT OR DISCIPLINE	1971		1972		1973		1974		1975		
	Expenses	%									
A. Natural Resources	5.667	11	7.568	11	9.052	11	13.061	11	18.076	11	11
B. Technological Production	44.302	86	59.171	86	70.768	86	102.116	86	141.324	86	86
C. Socio-Economic	1.546	3	2.064	3	2.562	3	3.562	3	4.930	3	3
TOTAL	51.515		68.803		82.289		118.739		164.330		

SOURCE: INIAP

86%, and socio-economic disciplines, 3%.

In the area of functions (see Table III.12), research in natural sciences accounted for 97% of the budget and social sciences, 3%.

Similarly, the different regions maintained the same budget percentage for the years in question. The Coast received a higher percentage with 66% and the Mountain region received 34% (see Table III.13).

For 1977, the last year with figures available, the budget is broken down as follows: personnel, 20%; materials and equipment, 21%; administrative expenses, transportation of personnel, and development, 59% (see Table III.14).

The budgets shown in the tables are higher than the governmental budgetary assignments. This is because the assignments were supplemented by international agreements.

B. Agricultural Education

1. History

The first secondary agricultural school was established in Ambato in 1913 with the name Quinta Normal de Agricultura. In 1927, the Salesian Fathers founded a school in Cuenca for training of young people from the region of the East in coordination with the Plan for Loja, Azuay, and Canar of the Interamerican Cooperative Agricultural Service. These establishments granted their graduates the title of "Agricultural Practitioner" ("Practico Agricola"). The Quinta Normal de Agricultura was later called the "Luis A. Martinez Agricultural School" and granted the title of "Agronomist" ("Agronomo"). In 1949 the Daule Practical School of Agriculture was established and later similar schools in Quininde, Chone, Pagua, and Latacunga.

In 1954 a training center was created in Otavalo for children of farmers. It offered two years of training and did not grant any title. In 1965 other similar schools were started in San Gabriel and Chunchi. Due to the influence of local pressure groups these centers became practical schools and later, agricultural high schools which granted the title of "Bachiller Agronomo."

The training centers, practical schools, and high schools were administered exclusively by the MAG and taught both on a practical and a theoretical level, for which purpose they had both the land and equipment.

At the same time the Ministry of Education, through rural schools, gave limited agricultural education. In 1957, agricultural education was increased through the El Angel, Patate, and Chimbo high schools. After 1971, the Ministry of Education took complete charge of agricultural education. Previously, agricultural education had been administered by the MAG.

TABLE III.12

INIAP BUDGET BY FUNCTIONS, 1971-1975
(Millions of Sucres)

FUNCTIONS	1971		1972		1973		1974		1975		AVERAGE
	EXPENSES	%	EXPENSES	%	EXPENSES	%	EXPENSES	%	EXPENSES	%	%
<u>Research</u>											
-Natural Sciences	49.969	97	66.739	97	79.820	97	115.177	97	159.400	97	97
-Social Sciences	1.546	3	2.064	3	2.469	3	3.562	3	4.930	3	3
TOTAL EXPENSES	51.515		68.802		82.289		118.739		164.330		

TABLE III.13

INIAP BUDGET BY REGIONS, 1971-1975
(Millions of Sucres)

REGION	1971		1972		1973		1974		1975		AVERAGE
	EXPENSES	%	EXPENSES	%	EXPENSES	%	EXPENSES	%	EXPENSES	%	%
A. Coast	34.000	66	45.410	66	54.311	66	78.368	66	108.458	66	66
B. Mountain	17.515	34	23.393	34	27.978	34	40.371	34	55.872	34	34
C. East											
(The Program began in 1977)											
TOTAL EXPENSES	51.515		68.803		82.289		118.739		164.330		

SOURCE: INIAP

TABLE III.14

BUDGET USED BY INIAP

1977

ITEMS	AMOUNT (Suces)	%
<u>Salaries</u>		
Program Leaders	6,618,422	3.98
Agronomists and Veterinarians	15,274,564	9.20
Agronomy Technologists	4,338,479	2.61
Laborers	7,626,732	4.60
Material & Equipment	34,291,066	20.64
<u>Administration</u>		
Expenses, transportation of personnel, facilities added to various stations	97,953,406	58.97

Advanced agricultural education began in 1931 with the establishment of the School of Agronomy of the Central University of Quito's College of Sciences. Two years later, in the same University, the School of Veterinary Medicine was created. In 1945, the University of Loja also created a School of Agronomy. The University of Guayaquil followed suit in 1948. Later, technical universities with an agricultural branch were set up in Manabi, Machala, Esmeraldas, and others. After 1949 and 1950 the schools of Loja, Guayaquil, and Quito were consolidated as Colleges of Agronomy and/or Veterinary Medicine. Private Universities such as the Catholic Universities of Guayaquil*, Cuenca, and Quito,** and the Technical University of Loja, established their respective Schools and Colleges for agricultural education.

The Technical Institutes which offer practical training and advanced technical training should be mentioned. The MAG organized and administers two such institutions: The Luciano Andrade Marin Forestry Center in Conocot which was organized in 1962, and the Technical Agricultural Center of the Mountain in Ambato which was created in 1976.

There are no graduate programs in agriculture which offer the Master's or the Ph.d.

The secondary schools received a grant from the World Bank and the greatest beneficiaries were the agricultural high schools, which received buildings, laboratories, furniture, and equipment. From 1964 until 1969, the Colleges of Agronomy and Veterinary Medicine of the Central University received technical assistance from PNUD including experts, scholarships for personnel, books, laboratory equipment, etc.

2. The Present Situation

a. Elementary Education

Except for the school gardens in the rural schools, agricultural training is not offered and very little is taught about rural life.

b. Secondary Education

There are 64 secondary schools in the country which offer agricultural training in the diversified cycle. A total of 5.2% of all the high schools in the country offer agricultural education. The status of Agricultural education, as determined by surveys and visits to 26 of these institutions, is described in Table III.15.

Eighteen of the 26 high schools are located in the Mountain region, 7 in the Coast region, and 1 in the East. Of the total number of students, 67.0% are in the Mountain region, 32.0% in the Coast, and 1.0% in the East.

*To prepare livestock technicians

**Closed the College in 1973

TABLE III.15

STUDENT INFORMATION - 1978
Secondary Education

HIGH SCHOOL	Enrolled Per Year (%)							Agricultural Education %	Student Origin (%)				Graduates	
	Total Students	1st	2nd	3rd	4th	5th	6th		Urban	Rural	Farm Families		1978	Last 5 Years
											Small	Large		
SIERRA														
Salesiano	398	27	27	19	15	8	4	29	20	80	80	20	28	160
Pedro Fermin														
Cevallos	365	32	24	20	11	7	6	46	15	85	100	--	12	19
Benjamin Araujo	330	33	25	16	13	8	5	80	38	62	100	--	22	132
Vicente Anda														
Aguirre	220	34	25	18	12	11	-	60	30	70	50	50	--	--
Alfredo Perez														
Guirrero	169	25	28	24	6	9	8	50	40	60	55	45	5	17
Tecnico Agropecuario														
Chunchi	127	25	18	17	13	12	15	100	35	65	98	2	--	--
Calaus	211	35	20	15	15	8	7	30	60	40	100	--	23	108
Alejandro Andrade	300	27	18	21	15	12	7	26	83	17	98	2	27	73
Sig Sig	316	36	21	22	10	6	5	20	30	70	100	--	19	52
26 de Febrero	378	34	25	16	13	8	4	18	60	40	60	40	16	69
Javeriano	210	35	20	17	12	10	6	20	8	92	100	--	10	24
12 de Diciembre	209	26	22	26	13	10	3	26	40	60	60	40	24	100
Daniel Alvarez	2.378	27	19	15	18	10	10	47	80	20	20	80	138	625
San Vicente Ferrer	170	28	24	20	11	9	8	100	60	40	60	40	12	--
Luis A. Crespo	194	58	15	10	10	5	2	50	80	20	70	30	17	40
Macara	531	27	23	15	13	12	10	30	70	30	30	70	23	101
Celina Vivar	187	32	24	16	12	7	9	100	40	60	60	40	8	43
Cariamanga	531	28	24	16	12	10	10	50	5	95	95	5	37	117
COSTA														
Julio Moreno														
Espinoza	1.975	27	23	20	12	10	8	29	40	60	95	5	28	110
Manuel Encalada	102	24	22	30	13	11	-	100	30	70	100	--	--	18
Milagro	900	33	22	18	12	9	6	29	20	80	90	10	20	90
Perez Guerrero	176	38	23	22	8	9	-	--	60	40	90	10	--	--
San Lorenzo	45	--	--	--	42	29	29	100	60	40	90	10	11	66
Quininde	74	--	--	--	39	31	30	100	76	24	--	--	22	87
Odilon Gomez	210	--	--	--	45	30	25	100	30	70	80	20	18	80
ORIENTE														
Leonardo Murialdo	105	50	24	10	9	2	5	80	25	75	90	10	4	27
TOTAL	10.801												524	2.158

(86)

Of all the high schools surveyed, only 7 offered agricultural training exclusively. Others vary between 18% and 80% agricultural and offered other types of training as well, such as secretarial, business, crafts, modern humanities, etc.

According to this same survey, 44.0% of the students in the Mountain region come from urban areas and 56% from rural areas. As can be seen from the table, in rural areas 74.0% of the students are children of small producers and 26.0% are the children of large landowners. In the Coast region 45.0% come from the urban sector and 55.0% from the rural sector. Students from the rural sector are 91.0% from families which own small farms and 9.0% from large properties.

As noted previously, the largest number of students come from the rural areas and are the children of small landholders.

Last year 524 high school students graduated with training in agronomy (bachilleres agronomos) and in the last five years, 2,158.

According to the same survey, 25 of the 26 high schools have land for practical training. These farms vary in size from 1 to 4 has. although they are not completely under cultivation.

Most of the high schools are equipped with basic tillage equipment such as machetes, shovels, and hoes to work small horticulture plots. A few of them have sophisticated equipment financed with aid from outside of the Ministry of Education.

Only a few high schools have livestock projects. The presence of such projects depends on the existence of the necessary installations and resources for them.

Most of these institutions have laboratories available in order to offer a balance of theoretical and practical instruction, but most of these laboratories are inadequately equipped. There is an almost total absence of libraries.

c. Technical Institutes

Luciano Andrade Marin National Forestry Center

The Forestry Center offers four six-month cycles of study, with a boarding school financed by the MAG. Each student must sign a contract agreeing to serve a minimum of two years as a Forest Ranger in the Office of Forest Development after his first year of training. After two or more years as a Forest Ranger, the student may enter his second year of training. This will qualify him as a Forest Expert (Perito Forestal). Instructional personnel are officials of the Forest Development services, with local and international professional experience. Teaching facilities are satisfactory and include large classrooms, halls, rooms equipped with audiovisual aids, dormitories, library, laboratories for cartography, botany, physics, and interpretation of aerial photographs, carpentry shops, and other installations for wood processing.

Technical Agricultural Center of the Mountain Region

In order to be admitted to this relatively new institution, a student must have graduated from a secondary school with a diversified cycle of studies in agriculture with the title of "Bachiller Agronomo." When this institution opened in 1977, 25 students were accepted and 13 have finished their first year of a two-year program in cultivation of fruit trees. This institution shares installations with the Luis A. Martinez Agricultural School, which has around 16 has. with buildings and installations which occupy about half of the land. Offices, laboratories, and classrooms have been built for the functioning of the institution.

Both the Martinez School and the Technical Agricultural Center share land and other installations for demonstrations and student practice. Presently there are demonstration and practice plots for cultivation of fruit trees.

d. Higher Education

Agricultural higher education is the responsibility of the Ministry of Education and is administered by three private universities and nine autonomous public universities. In order to be accepted by one of these programs the student must have graduated from a secondary school with the title of "Bachiller Agronomo" or with a diploma in modern humanities. After satisfactory completion of a 5-year program of studies the title of Veterinarian, Agricultural Engineer, Agronomist, Livestock Specialist, or Forester is granted.

The following is a list of Ecuadorian universities with their location and the titles which they grant:

<u>State Universities</u>	<u>Location</u>	<u>Titles Granted</u>
1. Central Univ. of Ec.	Quito	Agronomist - D.V.M.
2. State Univ. of Guayaquil	Guayaquil	Agronomist - D.V.M. Doctor of Animal Science
3. Technical Univ. of Manabi	Portoviejo	Ag. Engineer - Agro- nomist - D.V.M.- Doctor of Animal Science
4. National Univ. of Loja	Loja	Agronomist - D.V.M. Doctor of Animal Science
5. Chimborazo Polytech. School	Riobamba	Agronomist - Livestock Specialist
6. Luis Vargas Technical University of Esmeraldas	Esmeraldas	Forester - Livestock Specialist
7. Technical Univ. of Machala	Machala	Agronomist - D.V.M. Livestock Specialist
8. Technical Univ. of Babahoyo	Babahoyo	Agronomist
9. Technical Univ. of Ambato	Ambato	Agronomist

<u>Private Universities</u>	<u>Location</u>	<u>Titles Granted</u>
1. Catholic Univ. of Guayaquil	Guayaquil	Livestock Technician
2. Private Technical Univ. of Loja	Loja	Agro-Industrial Engineer
3. Private Univ. of Cuenca	Cuenca	Agronomist

In order to become acquainted with the current situation of the Colleges and Schools of agriculture a survey was done of 6 institutions of higher education (4 in the Coast region and 2 in the Mountain region) from which the information in Table III.16 was obtained.

Of the total number of students enrolled, approximately 42.0% were in the first year, a relatively high percentage as compared with other years. This percentage diminishes significantly until it reaches only 5% in the fifth year. This dropout rate may be due to the ease with which students are accepted or the immaturity of the students when choosing a university profession.

On the average each university has 350 students in agricultural programs, 70 students per year.

Twenty-five percent of the professors teach full-time, 50% teach half-time, and the other 25% teach less than half-time.

On the average, professors in the universities surveyed spend 75% of their time on teaching, 19% on research, and 6% on community service. Sixty percent of the instruction is theoretical.

The importance and responsibilities of the country's universities are not given the necessary support of sufficient land, laboratories, classrooms, and equipment.

The land available is both worked and used partially to carry out research. This research has apparently not had a strong impact on the adoption of new technology.

All of the universities lack laboratories to cover the areas which require theoretical and practical instruction, and do not have the necessary equipment and materials available to give the students proper training.

As can be seen in Table III.17, from 1970-1976 Ecuadorian universities granted degrees to a total of 1,024 agronomists, 338 veterinarians, 47 agricultural engineers, 14 forest specialists, 21 animal scientists, and 12 livestock technicians. Approximately 85% of the graduates in agronomy and animal science, 60% of the veterinarians, half of the agricultural engineers, and most of the forest specialist.

*The Catholic University of Guayaquil presently offers a two-year program in animal husbandry and grants the title of Livestock Technician to those who complete the program. This degree is not equivalent to the five-year degree in the same area.

TABLE III.16
STUDENT INFORMATION - 1978
Higher Education
(percentage)

UNIVERSITY	Number of students	Enrollment by Year					Origin				Number of Graduates
		1st	2nd	3rd	4th	5th	Urban	Rural	Farmers		
									Large	Small	
Catholic U. - Guayaquil	67	51	49	--	--	--	30	70	5	95	21
Technical U. of Machala	581	51	16	13	12	8	20	80	--	--	20
Technical U. of Manabi-Agricola	1.550	30	25	20	13	12	40	60	--	--	12
Vargas Torres U.	495	40	30	11	10	9	40	60	30	70	12
Catholic U. - Cuenca	89	42	27	16	6	9	60	40	15	85	4
Chimborazo Polytechnical School	519	40	20	18	12	10	60	40	30	70	9
TOTAL	3.301										78

INFORMATION ON PROFESSORS
(percentage)

UNIVERSITY	Number of Professors	Full Time	Half Time	Less Than Half Time	TYPE OF ACTIVITY			TYPE OF TEACHING	
					Teaching	Research	Community Assistance	Theoretical	Practical
Catholic U. - Guayaquil	23	--	--	23	80	15	5	60	40
Technical U. of Machala	53	12	32	8	80	15	5	50	50
Technical U. of Manabi	98	10	40	7	80	15	5	70	30
Vargas Torres U.	35	18	15	9	80	20	--	60	40
Catholic U. - Cuenca	28	8	14	6	65	30	5	60	40
Chimborazo Politechnical School	61	12	18	12	70	20	10	60	40
TOTAL	298	60	119	65					

TABLE III.17

NUMBER OF GRADUATES BY UNIVERSITY AND MAJOR FIELD BETWEEN 1970 and 1976¹

UNIVERSITY	MAJOR FIELD	1970/71	1971/72	1972/73	1973/74	1974/75	1975/76	TOTAL
1. Central Univ. (Quito)	Agronomy	38	60	73	61	63	39	334
	Veterinary Med.	13	22	28	23	27	19	132
2. State Univ. (Guayaquil)	Agronomy	67	--	50	80	50	86	333
3. Technical U. (Manabi)	Veterinary Med.	20	--	14	29	17	32	112
	Ag. Engineering	6	1	10	7	10	13	47
	Agronomy	18	13	28	16	28	31	134
4. National U. (Loja)	Veterinary Sciences	11	8	9	10	3	6	47
	Agronomy	--	33	34	30	27	18	142
	Veterinary Medicine	1	8	3	14	16	5	47
5. Chimborazo Polytech. (Riobamba)	Agronomy	12	--	--	--	--	--	12
	Animal Science	--	--	--	--	--	--	--
6. Technical U. (Esmeraldas)	Forestry	--	--	--	3	3	8	14
	Animal Science	--	--	--	4	6	11	21
7. Technical U. (Machala)	Agonomy	--	--	14	9	22	13	58
	Veterinary Medicine	--	--	--	--	--	--	--
8. Technical U. (Babahoyo)	Agronomy	--	--	--	--	3	8	11
9. Technical U.	Agronomy	--	--	--	--	--	--	--
10. Catholic U. (Guayaquil)	Animal Husbandry	2	3	4	1	2	--	12
11. Private U. (Loja)	Agro-Industrial Eng.	--	--	--	--	--	--	--
12. Private U. (Cuenca)	Agronomy	--	--	--	--	--	--	--
TOTAL		188	148	267	287	277	289	1,456

(103)

¹IICA report on the real situation of agricultural higher education in Ecuador, 1978, by B. Navas.

occupy positions in public institutions. The rest are employed by private enterprise. On the other hand, most of the graduates of the 2-year animal husbandry program at the Catholic University of Guayaquil are self-employed.

C. Agricultural Extension

1. History

Agricultural technology transfer has been done in Ecuador through the Office of Agriculture (Dirección de Agricultura), a government agency which has been an integral part of the Ministry of Agriculture. The MAG took over responsibility for agricultural development from the Ministries of Development and Economics, and took over responsibility for the community development program from the Ministry of Social Planning. Until 1937, the Office of Agriculture's professional and technical staff was limited to foreign personnel (United States, France, Chile) or to personnel from the Vocational School of Ambato. The cities of Quito, Guayaquil, Cuenca, Ambato, and Ibarra scarcely had any agricultural services. In 1938 the personnel grew by approximately 50 graduates of the Central University who are located in each province.

The Office's work was extremely limited and inadequate, and consisted only of visits to farmers to offer assistance in disease and insect control, pruning of fruit trees, fertilizer recommendations, etc. Pest control projects were carried out and fruit trees were provided. There was no general effort to help the farmer and his family analyze problems and make their own decisions.

From 1945 to 1954 the extension activities of the Office did not effect any coordination between the growth of agricultural technology and the credit originating from the BNF. Rather, it was engaged in giving personal assistance to carrying out pest control campaigns in the provinces of Guayas, Pichincha, and Azuay.

From 1954 to 1960, due to an agreement with the Interamerican Cooperative Agricultural Service, extension offices were organized in other provinces. For efficient operation, the extension agents were trained in aspect of the fields of communications, sociology, psychology, program planning, and others which might let them reach farmers more easily and promote attitude changes so that the campesino and his family would take the initiative and responsibility for solving their own problems and those of their community. To complement the extension service, programs for rural youth and housewives were set up in 1956.

The impact of this approach gave positive results. New, specialized extension programs for producers of bananas, rice, cacao, and sheep, among others were established. Nevertheless, their function was specifically to foster production increases without regard for the human factor.

In 1968 all of the programs were grouped under an Extension Office in the Ministry of Agriculture. Officials of the central departments started acting as advisors for field personnel. This organization lasted only a short time due to the frequent reorganizations of the Ministry.

In the Mountain region the community development program was under the Ecuadorian Andean Mission from 1954 to 1972, during which time it made significant advances. In 1972, it became part of the MAG when the Mission became part of the Agricultural Extension Service and was known as the Office of Rural Development.

2. Present Situation

In Ecuador, extension can be defined as an educational process for the organization of the rural population, making it more conscious and critical of its situation in order to facilitate change in its way of thinking about its knowledge abilities, and skills, both in traditional production patterns and in levels of family and community life.

Legally, the MAG is the main public agency for extension within the agricultural sector even though other agencies associated with the MAG also carry on extension activities. Some private institutions also carry on extension activities but only on a very limited scale.

Basically, the following institutions carry on extension activities: The Ministry of Agriculture, with its General Offices, Zone Offices, and the National Programs for Animal Health, Bananas, Coffee, Cacao, Rice and Milling Control and Cotton and Oil Seeds.

Other institutions whose main functions are not extension but which nevertheless are involved in extension on a limited basis are:

- Ecuadorian Institute for Agrarian Reform and Colonization (IERAC)
- Ecuadorian Institute of Water Resources (INERHI)
- Center for Economic Rehabilitation of Azuay, Canar, and Morona Santiago (CREA)
- Center for Rehabilitation of Manabi (CRM)
- Ecuadorian Subcommission for the Development of the Puyango-Tumbez and Catamayo-Chira River Basins (PREDESUR)
- Study Commission for the Development of the Guayas River Basin (CEDEGE)

3. Plans and Programs

From 1973 to 1977 the agricultural sector in general and the MAG in particular based their activities on ideas set forth in "Philosophy and Plan of Action" ("Filosofia y Plan de Accion") of the military government which took power on February 16, 1972.

This plan logically gives a high priority to the agricultural sector taking into consideration not only its position as an earner of foreign exchange through the production of products for exportation but also the fact that the majority of the population which lives and works on the fringes of the economy belongs to this sector.

Nevertheless, in the execution of the plan emphasis was given to the industrial sector. This caused a series of situations which, added to the natural rigidity of the agricultural sector, caused its slow development. Among these situations the following are worth noting:

- Flight of the campesinos to the cities, where instead of fulfilling their hopes and dreams they have often been frustrated by inability to adapt to the requirements of industry and other sources of employment.

- Lack of agricultural labor in certain areas with consequent production decline

- Increase in the prices of agricultural products caused by the interference of middle-men and other external factors related to the provision of imported fertilizers and other inputs.

- On the other hand, when increased income in certain sectors of the population creates an increased demand for goods and services, pressure has been brought to bear on the agricultural sector to achieve increased production because simple price control favors neither the consumer nor the producer.

Based on this, the government's agricultural policy, through the MAG has been oriented to foster the sector's development and to improve the living conditions of the Ecuadorian farmer. The Five-Year Plan has supported this policy in the following priority fields: regionalization, increases in production and productivity, expansion of credit, agrarian reform and colonization, improvement in the marketing system for agricultural commodities and production inputs, and the promotion of agricultural industries.

To carry out these programs the public sector of agriculture made some necessary changes in order to achieve efficiency in the services which are offered to the producer. In order to implement these changes a study was done between 1975 and 1976 to identify problems which affect its efficiency. Among these problems, the following can be identified:

- Scattering of human and financial resources caused by a lack of coordinated action between the services of the Ministry, its associated agencies, and the others such as the National Development Bank, which had been acting with poor coordination at the local level.

- Significant concentration of agricultural technologists in the main urban centers, especially the provincial capitals.

- Shortage of specialized technical personnel to attend to certain problems in the agricultural field.

- Commodity programs which resulted in uncoordinated technical assistance at the farm level, creating confusion in the producers' decisions.

Therefore it was necessary to adopt adequate mechanisms for planning, executing, and coordinating activities based on a reorganization which brought four priority thrust into focus:

- Decentralization of the administrative, financial, planning, and operational activities of the ministry. Decentralization increased the importance of the Zone Offices in programs planning and financial and administrative planning by means of delegating responsibility for these functions to the Zone Directors. This implied decentralization and relocation of agricultural professionals in rural areas to avoid excessive concentration in the urban sector.

- The implementation of a system of integrated activities which permits the programs to be carried out through specific projects called the Integrated Agricultural Development Projects (PIDA's) located with priority in areas of irrigation, agrarian reform, colonization, and areas which are depressed in a socio-economic sense, but which have sufficient natural resources for production and productivity increases. This priority, in turn, would be oriented to meet the needs of small and medium-sized producers and associations of producers such as in the case of campesino communes and agricultural cooperatives.

- The make-up of advisement teams, composed of agricultural professionals from different disciplines in order to formulate production plans at the farm level and to offer integrated technical assistance services in accord with the managerial capacity of the producer and the natural resources which the production unit has available.

- Coordination, at the Integrated Project level, with the direct participation of all the technical and administrative units which make up the public sector of agriculture in the respective project jurisdictions.

In this way, the Ministry consolidated its organization in order to achieve the following basic objectives:

- to achieve increases in agricultural and forest production and productivity in order to meet domestic demands, reduce import levels, and increase and diversify exports
- to improve the social and economic conditions of the rural population
- to plan the adequate use of renewable natural resources
- to get the agricultural structure adjusted to the needs of the country
- to put domestic marketing of agricultural and forest products on a rational basis.

The restructuring previously referred to encompasses the organization of ten Zone Offices, Provincial Agricultural Headquarters,

PIDA's, and ASA's. The ASA's will enter in when there are areas which do not qualify for a PIDA.

Additionally, the restructuring of the executive level of the MAG's central staff, the general offices, and the executive offices of the National Programs in units from the advisor level to the executive level was begun in terms of policies and strategies for the corresponding subsectors. These act in the areas of supervision and evaluation of the programs and responsibilities of the Zone Offices and are in charge of the specialized technical assistance which the activities of the PIDA's and ASA's require. (1)

4. Availability of Resources

a. Human

In 1973 the MAG, without including the national programs, had 333 professionals. One hundred thirty one of these were agronomists, 53 were foresters, 131 veterinarians, 17 economists, and 1 sociologist. It also had 270 middle-level technicians including 216 agronomy and forestry assistants, 23 home economists, 6 laboratory technicians, and 25 veterinary assistants. (see Table III.18)

Of the 333 professionals, 29.7% were located in the central office (Quito) and 70.3% in the provinces. Of the 270 technicians, 7.0% were in the central office and 93.0% in the provinces.

By 1978 the MAG had 382 professionals broken down as follows: 247 agronomists, 26 foresters, 103 veterinarians, 4 economists, 7 sociologists, and 5 biologists (Table III.19). There were 294 technicians, including 108 in agronomy, 103 in forestry, 83 social workers, and one laboratory technician (Table III.20).

Of the 382 professionals, 30% are located in Quito and 70.0% in the provinces. Of the 294 technicians, 7.0% are in Quito and 93.0% in the provinces.

In Tables III.19 and III.20 there are also data on both professionals and technicians who work in the national programs. By 1978 there was a total of 831 professionals of whom 515 were agronomists, 50 were foresters, 214 were veterinarians, 40 economists, 7 were sociologists, and 5 were biologists. Of the 371 technicians, 165 were in agronomy, 105 in forestry, 92 were social workers, and 9 were laboratory technicians.

The most significant increases were in professional agronomists, Veterinarians, economists, and sociologists. Foresters, however, decreased in number (see Table III.21). In reference to the technicians, the fields have different names and therefore it is impossible to make comparisons.

(1) MAG. Agricultural Policy - Conference of the Ministry of Agriculture in the IAEN, July 1978, Quito.

TABLE III.18

NUMBER OF PROFESSIONALS AND TECHNICIANS ON JANUARY 1, 1973
Ecuadorian Ministry of Agriculture

PROFESSIONALS	Agronomists						Foresters						Veterinarians						Economists						Sociologists				Total
	1	2	3	4	5	Total	1	2	3	4	5	Total	1	2	3	4	5	Total	1	2	3	4	5	Total	1	2	3	Total	
Main Office	3	10	13	14	-	40	2	7	9	4	-	22	1	7	6	5	-	19	11	4	2	-	-	17	1	-	-	1	99
Provinces	41	45	5	-	-	91	15	16	-	-	-	31	48	57	7	-	-	112	-	-	-	-	-	-	-	-	-	-	234
Total	44	55	18	14	-	131	17	23	9	4	-	53	49	64	13	5	-	131	11	4	2	-	-	17	1	-	1	1	333

TECHNICIANS	Agronomy Assistants				Forestry Assistants				Home Economists				Laboratory Assistants				Veterinarian Assistants				Total
	1	2	3	Total	1	2	3	Total	1	2	3	Total	1	2	3	Total	1	2	3	Total	
Central Office	-	3	4	7	-	3	-	3	-	-	1	1	4	1	1	6	-	2	-	2	19
Provinces	5	15	89	109	33	64	-	97	17	3	2	22	-	-	-	-	7	16	-	23	251
Total	5	18	93	116	33	67	-	100	17	3	3	23	4	1	1	6	7	18	-	25	270

(109)

TABLE III.19
 NUMBER OF PROFESSIONALS AND VACANCIES IN THE
 MINISTRY OF AGRICULTURE
 October 12, 1978 Ecuador

PROFESSION CATEGORY	Agronomist Agriculturist						Forester					Veterinarian					Economist					Sociologist				Biologist				Total	R			
	1	2	3	4	5	total	1	2	3	4	5	total	1	2	3	4	5	total	1	2	3	4	5	total	1	2	3	total	1			2	3	total
CENTRAL OFFICE	4	16	23	22	12	77	-	1	7	8	8	24	2	3	6	11	6	28	7	6	4	4	4	25	1	6	-	7	1	-	2	3	164	
Zone Offices																																		
Esmeraldas	5	5	9	3	-	22	-	1	1	2	-	4	1	7	-	-	1	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	35	(5)
Portoviejo	1	8	8	3	-	20	-	1	-	1	-	2	3	2	5	2	-	12	1	-	-	-	-	1	-	-	-	-	-	-	-	-	35	(4)
Guayaquil	33	12	12	6	-	63	-	-	2	-	-	2	11	3	4	-	-	18	-	-	2	-	-	2	-	-	-	-	1	-	-	1	86	(1)
Machala	6	4	4	-	-	14	-	-	1	-	-	1	3	2	1	1	-	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	22	(9)
Ibarra	3	8	12	1	-	24	-	1	-	-	-	1	1	5	1	-	-	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	32	(6)
Quito	8	14	8	3	-	33	1	4	2	-	-	7	3	14	2	2	-	21	-	-	-	-	-	-	-	-	-	-	-	-	1	1	62	(2)
Ambato	4	9	4	1	-	18	-	1	1	-	-	2	-	4	3	-	-	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	27	(7)
Riobamba	2	1	7	1	-	11	-	-	1	-	-	1	2	3	1	-	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18	(10)
Cuenca	5	4	7	1	-	17	-	-	1	1	-	2	-	1	4	1	-	6	-	-	1	-	-	1	-	-	-	-	-	-	-	-	26	(9)
Loja	5	12	6	2	-	25	-	1	3	-	-	4	1	2	7	-	-	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	39	(3)
Sub-Total	72	77	77	21	-	247	1	9	12	4	-	26	25	43	28	6	1	103	1	-	3	-	-	4	-	-	-	-	1	-	1	2	382	
SPECIAL PROGRAMS																																		
Cotton & Oil																																		
Seeds	14	13	5	2	1	35	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	2	-	-	-	-	-	-	-	-	37	
Rice	13	7	3	1	1	25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	25	
Cacao	22	5	2	1	-	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-	-	-	-	-	-	31	
Banana	13	17	16	4	2	52	-	-	-	-	-	-	-	-	-	-	-	-	2	-	1	-	-	3	-	-	-	-	-	-	-	-	55	
Coffee	9	6	8	1	2	26	-	-	-	-	-	-	2	4	-	-	-	6	-	1	-	-	-	1	-	-	-	-	-	-	-	-	33	
Animal Health	-	1	-	-	-	1	-	-	-	-	-	-	20	27	15	10	4	76	1	-	-	-	-	1	-	-	-	-	-	-	-	-	78	
Regionalization of																																		
Resources	3	2	7	4	6	22	-	-	-	-	-	-	-	-	-	1	-	1	2	-	1	-	-	3	-	-	-	-	-	-	-	-	26	
Sub-total	74	51	41	13	12	191	-	-	-	-	-	-	22	31	15	11	4	83	6	2	3	-	-	11	-	-	-	-	-	-	-	-	285	
Total	150	144	141	56	24	515	1	10	19	12	8	50	49	77	49	28	11	214	14	8	10	4	4	40	1	6	-	7	2	-	3	5	831	
Vacancies	1	2	2	1	-	6	-	-	-	-	1	1	-	-	1	-	-	1	1	1	-	-	-	2	-	-	-	-	-	-	-	-	10	

110

TABLE III.20

NUMBER OF TECHNICIANS AND VACANCIES IN THE
Ministry of Agriculture -- October 12, 1978

PROFESSION CATAGORY	Agronomists						Foresters						Social Workers						Laboratory Technicians				TOTAL	R
	1	2	3	4	5	Total	1	2	3	4	5	Total	1	2	3	4	5	Total	1	2	3	Total		
Central Office	2	2	7	3	-	14	-	-	2	-	-	2	-	-	-	5	-	5	1	-	-	1	22	
ZONE OFFICES																								
1. Esmeraldas	-	2	4	2	-	8	1	15	6	-	-	22	-	1	6	-	-	7	-	-	-	-	37	(3)
2. Portoviejo	-	1	1	1	-	3	-	2	3	-	-	5	1	2	3	1	-	7	-	-	-	-	15	(9)
3. Guayaquil	2	2	15	-	-	19	1	19	-	-	-	20	-	4	1	-	-	5	-	-	-	-	44	(2)
4. Machala	1	-	1	1	-	3	1	5	-	-	-	6	1	-	-	-	-	1	-	-	-	-	10	(10)
5. Ibarra	-	5	10	-	-	15	-	5	2	-	-	7	1	4	1	-	-	6	-	-	-	-	28	(5)
6. Quito	1	4	12	3	-	20	1	15	4	-	-	20	4	12	7	1	-	24	-	-	-	-	64	(1)
7. Ambato	-	4	12	1	-	17	-	4	2	-	-	6	2	7	3	-	-	12	-	-	-	-	35	(4)
8. Riobamba	3	3	2	-	-	8	-	6	1	-	-	7	2	4	4	1	-	11	-	-	-	-	26	(6)
9. Cuenca	2	1	3	4	-	10	-	1	3	-	-	4	-	3	2	-	-	5	-	-	-	-	19	(7)
10. Loja	1	3	1	-	-	5	2	3	1	-	-	6	1	3	1	-	-	5	-	-	-	-	16	(8)
Sub-Total	7	25	62	14	-	108	6	75	22	-	-	103	13	39	28	3	-	83	1	-	-	1	294	
SPECIAL PROGRAMS																								
Cotton - Oil Seeds	-	-	1	1	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	
Rice	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Cacao	1	-	-	1	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	
Banana	-	-	9	-	-	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	
Coffee	3	9	7	-	-	19	-	-	-	-	-	-	-	4	-	-	-	4	-	-	-	-	23	
Animal Health	4	1	6	-	-	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11	
Regionalization	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	3	4	8	8	
Sub-Total	8	10	23	2	-	43	-	-	-	-	-	-	-	4	-	-	-	4	1	3	4	8	55	
TOTAL	17	37	92	19	-	165	6	75	24	-	-	105	13	43	28	8	-	92	2	3	4	9	371	
VACANCIES	2	-	2	1	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	

(111)

TABLE III.21

MAG PROFESSIONALS

POSITION	1973	1978	Increase or Decrease
Agronomists	131	515	+384
Foresters	53	50	- 3
Veterinarians	131	214	+ 83
Economists	17	40	+ 23
Sociologists	1	7	+ 6

In recent years the MAG has shown substantial stability in the professional and technical team. The percentage of those who left the Ministry during the last 12-months period has only been 3.9% of the professionals and 5.4% of the technicians.

Technician-Client Group Relations

In order to quantify the responsibility of the extension agent's efforts, he is frequently assigned a goal of a specific number of producers to work with. In Ecuador an extension agent frequently works with about 20 producers, but the impact of his work is generally greater due to a multiplier effect resulting from the methodology used such as demonstrations of techniques, fairs, field days, radio programs etc.

The information in Table III.22 shows the number of MAG professionals in national programs distributed to each Zone, in relation to the number of hectares cultivated in each zone or by the value of the products produced. There are 1.45 professionals for each 1,000 producers with less than 20 hectares of land. This figure increases to 2.2 when the number of technicians is added to the number of professionals. Based on the total number of producers there were 1.24 professionals per 1,000 producers or 1.9 professionals and technicians per 1,000 producers. In comparison, the state of Oklahoma employs about 4 extension agents per 1,000 producers. Comparing the number of professionals per 1,000 has. under cultivation we have a relationship of 0.082, while the number of professionals compared to the value of production, in millions of sucres, comes out to 0.025. Not only is the relationship of the number of extension agents to the number of producers, the number of hectares under cultivation, or the number of sucres generated, of great importance, but also the level of acceptance of the extension agents, their leadership, the ease with which they can influence producers, the information that they can offer, the teaching methodology which they use, etc.

The agents are limited in their attempts to reach farmers by such factors as the lack of access to farms, the lack of vehicles or fuel, high rates of illiteracy, the campesinos' mistrust, language problems, limited knowledge of extension methodology, lack of incentives, lack of stability, and lack of support in their work.

TABLE III.22

ALLOCATION OF PROFESSIONALS BY ZONES WITH PROPORTIONS OF PROFESSIONALS PER 1,000 PRODUCERS
AND PER MILLION SUCRES OF PRODUCTION

ZONE	DISTRIBUTION OF PROFESSIONALS ¹								No. Prof./ 1.000 Prod. - 20 Has.		No. Prof./ 1.000 Prod. Total		No. Prof./ 1.000 Hectares		No. Prof./ S/1'000.000 of Production		
	ZONE OFFICE	COTTON AND OIL SEEDS		RICE	CACAO	BANANA	COFFEE	ANIMAL HEALTH	TOTAL	No.	R	No.	R	No.	R	No.	R
		OFFICE	OIL SEEDS														
1. Esmeraldas	35	1	-	-	7	1	2	46	5.70	(1)	3.10	(1)	0.089	(4)	0.0398	(8)	
2. Portoviejo	35	7	1	2	1	13	6	66	1.30	(5)	1.02	(5)	0.052	(9)	0.0247	(4)	
3. Guayaquil	86	18	23	24	25	9	24	209	3.25	(3)	2.75	(3)	0.129	(2)	0.0207	(1)	
4. Machala	22	2	-	4	15	2	4	49	4.27	(2)	3.48	(2)	0.163	(1)	0.0210	(2)	
5. Ibarra	32	-	-	-	-	-	2	34	1.05	(7)	0.98	(7)	0.093	(3)	0.0441	(9)	
6. Quito	62	6	1	-	3	3	21	96	1.41	(4)	1.11	(4)	0.061	(8)	0.0221	(3)	
7. Ambato	27	-	-	1	-	1	7	36	0.69	(8)	0.64	(8)	0.082	(5)	0.0258	(5)	
8. Riobamba	18	-	-	-	-	-	6	24	0.60	(9)	0.58	(9)	0.064	(7)	0.0349	(7)	
9. Cuenca	26	-	-	-	2	-	4	32	0.45	(10)	0.40	(10)	0.040	(10)	0.0266	(6)	
10. Loja	39	3	-	-	1	4	2	49	1.14	(6)	1.00	(6)	0.078	(6)	0.0497	(10)	
National	382	37	25	31	55	33	78	641	1.45		1.24		0.082		0.0250		

¹Professionals in the National Programs were distributed by zone on basis of Hectares cultivated for crop programs and on basis of value of livestock for animal health program.

Motivation Factors

The extension service needs more well trained personnel, highly motivated, capable of getting satisfaction from their jobs, and a stable system which recognizes their knowledge, experience, and achievement.

The present system of job classification for the agricultural sector lacks the means to establish this type of recognition. Nevertheless, in the 1973-1978 period an improvement was seen with the creation of a fifth category in the level of jobs of the professionals. In 1973, 20% of the professionals reached the fourth category while in 1978 this number rose to 44% including those in the fifth category (see Table III.23).

Job Categories

The most common job titles in the MAG can be seen in Appendix III.1. The professional, technician, administrative, and assistant levels all have a 1-5 scale (1 is lowest, 5 is highest). This scale is related to the rank, responsibility, and specific functions carried out by the MAG employees. The salaries received by public service employees vary by profession; nevertheless a professional's monthly salary is not less than 7,300.00 sucres per month (US\$292.00).

In the present system of job classifications very small compensation is made for years of experience. Those who wish to rise to a higher category almost always need a title change since this is what determines classification by category and not experience or achievements. This is the reason for the continuing job changes and consequent limitation on gaining experience and broadening knowledge. This is also a reason why less than 10% of the MAG personnel have graduate degrees.

b. Economic Resources

The budgets approved and amounts transferred to the MAG and other official agencies of the agricultural sector during the period 1973-1978 are found in Table III.24. The effectiveness of budgetary performance measured in percentage of budget transferred varies between 68.3% in 1973, a low of 51.8% in 1974, and a high of 87.1% in 1977. The apparent reason for this situation is that the revenue predicted by the government to finance the budget is not completely attained due to a number of factors which are not subject to governmental control. This uncertainty places public agencies which administer government programs in a difficult situation relevant to planning.

The importance of the agricultural sector to the country has not been reflected in budgetary assignments nor in budgetary disbursements (see Table III.25). In 1973 the agricultural sector was assigned 5.8% of a total budget of 8,700 million sucres. In subsequent years the national budget grew until it reached a figure of 24,300 million sucres in 1978, tripling its volume in that period. The budget of the agricultural sector showed a continuous increase until 1976 and

TABLE III.23
CLASSIFICATION OF PERSONNEL BY CATEGORIES, COMPARING 1973 with 1978 ECUADOR

PROFESSION	1978						1973				
	1	2	3	4	5	Total	1	2	3	4	Total
Agronomist	150	144	141	56	24	515	44	55	18	14	131
Forester	1	10	19	12	8	50	17	23	9	4	53
Veterinarian	49	77	49	28	11	214	49	64	13	5	131
Economist	14	8	10	4	4	40	11	4	2	-	17
Sociologist	1	6	-	-	-	7	1	-	-	-	1
Biologist	2	-	3	-	-	5	-	-	-	-	-
TOTAL	217	245	222	100	47	831	122	146	42	23	333
Percentage	26.1	29.5	26.7	1.20	5.7	100.0	36.6	43.8	12.6	7.0	100.0
Agronomist (technician)	17	37	92	19	-	165	5	18	93	-	116
Forester (technician)	6	75	24	-	-	105	33	67	-	-	100
Social worker	13	43	28	8	-	92					
Home Economist	-	-	-	-	-		17	3	3	-	23
Veterinary Assistant	-	-	-	-	-		7	18	-	-	25
Laboratory Technician	2	3	4	-	-	4	1	1	1	-	6
TOTAL	38	158	148	27	-	371	66	107	97	-	270
Percent	10.2	42.6	39.9	7.3	-	100.0	24.4	39.6	36.0	-	100.0

TABLE III.24
STATUS OF BUDGET DISBURSEMENT
1973-1977

	1973		1974		1975		1976		1977	
	Budget Allotment	Amount Transferred								
Board of Director & General Admin.	17,783,050	14,713,437,53	57,569,780	32,830,321,46	27,821,989	18,565,323,11	51,787,947	44,844,396,11		
Planning	6,195,332	3,847,678,24	15,087,070	6,942,974,54	24,379,310	17,221,856,03	27,998,888	21,312,279,65		
Crop Development	8,328,281	5,572,751,80	9,580,790	7,264,760,88	13,706,432	10,888,800,20	162,290,602	136,971,664,68	164,569,215	145,781,072,26
Livestock Development	4,835,390	3,159,014,11	6,089,980	4,938,844,73	7,496,013	6,109,310,18	157,807,740	80,106,914,93	137,803,396	105,191,059,12
Social Work & Rural Organization	9,465,624	4,846,305,60	10,259,180	7,994,178,55	12,503,740	11,066,304,79	65,094,500	45,897,795,69	66,938,761	62,041,370,45
Forest Development	7,371,062	5,526,776,64	6,976,420	5,662,009,12	9,598,060	6,870,599,71	47,249,825	41,475,677,67	54,909,945	50,301,823,29
Business & Indep. Enterprise Dev.	3,508,180	2,454,485,69	26,522,290	13,070,838,02	57,514,431	50,050,618,90	132,993,800	109,894,223,76	137,593,044	121,561,352,94
Zone Development	181,680,891	130,591,056,45	272,901,524	237,783,830,47	288,541,939	253,948,668,13	16,434,096	14,830,003,50		
Lump Sum Capital Assignments	97,505,000	67,778,020,14	381,172,419	328,311,479	117,793,717	103,628,475,53	213,385,592	153,335,954,81		
Fee & Agreements	22,957,206	22,944,506	19,987,653	17,319,825	19,772,000	13,585,940,98	18,146,624	17,697,374		
INIAP	67,000,000	55,500,000	123,000,000	27,500,000	101,000,000	27,166,666	133,685,000	132,278,737,34	160,154,213	137,896,213
IERAC	105,000,000	52,480,500	570,150,000	119,313,332	605,000,000	242,500,000	466,096,000	132,000,000	291,033,658	241,044,806
INERHI	124,000,000	185,469,000	246,600,000	156,683,415	228,000,000	181,857,500	257,826,000	242,959,000	292,713,585	286,044,025
CPEDGE	50,600,000	58,250,000	36,716,666	32,425,000	49,000,000	57,186,000	126,581,000	110,748,737	155,000,000	133,495,745
CRM	18,000,000	15,500,000	42,510,000	32,425,000	49,000,000	29,047,880	50,156,000	49,855,000	52,000,000	51,400,000
CREA	15,000,000	15,000,000	109,107,000	54,222,500	94,000,000	80,129,741	92,238,000	86,288,000	100,200,000	89,488,000
Poza Honda Comm.			185,000,000	169,950,000	180,000,000	101,813,627	173,426,000	68,307,040	75,000,000	70,588,983,54
PREDESUR					67,000,000	55,267,832	73,707,000	71,822,998	124,000,000	123,856,647
Central Activities and Projects									254,106,783	176,038,467,04
Common Budgetary Credits									125,794,734	114,648,887
TOTAL	739,230,016	505,383,532,20	2,104,764,106	1,258,929,974	2,157,047,721	1,266,904,846,62	2,267,740,614	1,360,625,797,19	2,191,817,334	1,909,397,492,56

(116)

TABLE III.25

BUDGETS APPROVED FOR THE MINISTRY OF AGRICULTURE AND ASSOCIATED AGENCIES FOR FINANCIAL ACTIVITIES

1973-1978
(Millions of Sucres)

	National Total	MAG	INIAP	IERAC	CEDEGE	CRM	CREA	POZA HONDA COMM.	MAE	INERHI	PREDESUR	Total of Agri. Sector	Agri. Sector AS % of Natl. Total
1973	8,700,000	236,000	66,000	105,000	43,000	1 000	15,000		18,000			501,000	5.8
Demand Accts.	5,877,719	223,705	20,000	55,000					18,000			316,705	5.4
Capital	2,822,281	12,295	46,000	50,000	43,000	18,000	15,000					184,295	6.5
1974	9,472,000	311,300	123,000	175,000	47,000	18,000	16,000	25,000	20,000			735,300	7.8
Demand Accts.	6,423,662	305,225	30,000	125,000					20,000			480,225	7.5
Capital	3,003,338	6,075	93,000	50,000	47,000	18,000	16,000	25,000				255,075	8.5
1975	15,700,000	555,100	131,000	455,000	165,000	43,000	90,000	180,000		217,000	35,000	1,871,800	4.9
Demand Accts.	11,054,087	511,935	30,000	135,000	57,000	15,510	33,000			40,000	10,000	832,445	7.5
Capital	4,645,913	43,165	101,000	320,000	108,000	27,480	57,000	180,000		177,700	25,000	1,399,355	22.4
1976	17,384,000	693,405	128,000	466,096	44,156	44,156	92,238	176,626	255,126	255,126	67,707	2,050,480	11.8
Demand Accts.	12,783,911	577,411	97,945	165,000	65,000	18,000	35,000			45,000	17,000	1,019,956	8.0
Capital	4,600,089	115,994	31,000	301,096	61,581	26,156	57,038	176,626		210,126	50,707	1,030,524	22.4
1977	17,050,000	517,979	122,000	192,100	105,000	47,000	84,200			167,700	49,000	1,284,879	7.5
Demand Accts.	13,647,410	516,794	85,000	155,000	55,000	15,000	29,200			30,000	20,000	905,994	6.6
Capital	3,402,590	1,185	37,000	37,000	50,000	32,000	55,000			137,700	29,000	378,885	11.1
1978	24,300,000	814,570	160,000	312,000	105,000	130,000	107,000			230,700	128,130	1,987,400	8.2
Demand Accts.	18,262,500	714,404	93,000	175,000	55,000	20,000	30,000			30,000	20,600	1,137,404	6.2
Capital	6,037,500	100,166	67,000	137,000	50,000	110,000	77,000			200,700	108,130	849,996	14.1

(117)

SOURCE: OFFICIAL RECORDS

declined in the last two years. Although it is true that in absolute figures the agricultural sector's budget grew, its percentage of the total budget is not proportional. Nevertheless the agricultural budget reached its maximum percentage of the total in 1976, 11.8%, and fell to 8.2% in 1978.

Budgetary distribution as it has been carried out constitutes a limiting factor for developing activities and the achievement of the sector's program goals as can be seen in Table III.26. The smallest amount of distributions occurs in the first quarter which is precisely when most agricultural activity occurs and when it is necessary to intensify technical assistance for planting, fertilization, pest control, weed control, vaccinations, etc. In addition it can be seen from the table that distributions are received in the last quarter, usually in the last days of the year, limiting the planned revenues since, because of legal requirements, the funds must be deposited in a separate account until December 31.

c. Physical Resources

The MAG rents its office locations except for Zone Offices 2 and 7 which own their offices. Most offices do not have the necessary space and comfort to carry out their activities and give clients the necessary attention.

TABLE III.26

PERCENTAGE OF TOTAL BUDGET DISTRIBUTED BY QUARTERS, 1977

QUARTER	MAG	INIAP	IERAC	Sector Total
I	8	11	13	13
II	18	60	25	27
III	14	18	25	26
IV	60	11	37	34
Total	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>

SOURCE: MAG

Furniture, office equipment and office supplies necessary for carrying out present functions are all considered adequate.

After the MAG's reorganization and under the philosophy of ruralization, the Ministry began a rural building program under the ASA's and PIDA's with the idea that these buildings would serve both as offices and living quarters for the officials assigned to them.

For transportation it has various types of motorized vehicles.

In some Zone Offices there are not sufficient numbers of vehicles and their mechanical condition does not permit their continuous use. The main problem is deficient maintenance due to the fact that budget disbursements for this purpose are not timely.

The MAG has a series of installations for extension activities which are described in Appendix III.2. There 122 installations are distributed among the different Zone Offices and they constitute true specialization and support centers for specific activities.

The experiment stations, training centers, farms, and nurseries are the most important installations for the work of the field agents and producers.

IV. ANALYSIS AND RECOMMENDATIONS FOR THE REE SYSTEM

This chapter presents the analysis and recommendations formulated by the U.S. team in order to achieve greater efficiency and productivity in the Agricultural Research, Education, and Extensions systems in Ecuador. A summary of the strong and weak points of the REE systems is presented. Recommendations for system improvement are given along with priority for implementation as recommended by the team.

A. Agricultural Production Constraints

In accordance with the methodology previously outlined, the team studied and analyzed the agricultural and rural sector with special consideration for the constraints on current and future production. Recommendations for the improvement of the REE system are developed to reduce the impact of these constraints on future agricultural production. The constraints were viewed in six general categories: 1) Natural Resources, 2) Productivity, 3) Credit, 4) Infrastructure, 5) Marketing and Price Policy and 6) Human Resources.

Some of these constraints have been completely or partially discussed in previous sections of the report. Additional material about some of the factors is included in this section. The influence of the REE system on reduction of the impact of production constraints is achieved largely through the training of personnel to function in both the public and private sector, development of concepts and technology through research and the development and implementation of problem-solving projects involving the clientele through extension. The influence of the REE system is more direct on reducing constraints in the areas of human resources, productivity and natural resources. Influences outside the REE system have more direct control on reducing the constraints associated with credit, infrastructure, marketing and price policy.

1. Natural Resources

Natural resources are a constraint to agricultural production and total development of the country if they are not used in a manner and form consistent with their highest economic return. The natural resource base may be a constraint to agricultural production for a particular producer and to his ability to generate income for his family, but from a total society or country point of view, natural resources may be producing to their economic limit. The problem then becomes one of equity in distribution of resources and subsequent income and employment opportunities to low income producers. Chapter II in this report presents data on distribution of land by size of holding and addresses the problem of small land holdings. The REE system is limited in its impact on small land holders to the extent of providing technical assistance for improving productivity of the limited resources under their control.

Agricultural production using Ecuador's natural resources can be increased through (1) improved conservation of soil and water resources, (2) improved data and planning procedures for determining optimum use of natural resources and (3) continued investments in development of irrigation and other resource projects.

Utilization of land and water resources was presented in Chapter II of this report. The Ministry de Agricultura y Ganaderia, through the Programa Nacional de Regionalización Agraria (PRONAREG) and with technical assistance from the Oficina para la Investigación

Científica y Técnica de Ultramar (OSTROM), has been developing an extensive plan of research to inventory, evaluate and quantify the natural renewable resources. On the basis of this information, natural resource projects are planned for future development.

The potential for increasing area cultivated has been estimated at about 200 percent of the present area under cultivation (Table #16). This amounts to about 2.5 million hectares. Approximately 340,000 hectares of additional irrigated land is presently in the development or planning stage. The potential for improving the total natural resource base through drainage, soil conservation methods and forest and pasture improvement programs has not been completely determined.

Relating to the REE System

Improving the extensive natural resource base in Ecuador requires a large cadre of trained professionals. Research on cost-effective ways of conserving soil and water resources and improving productivity of soil resources in all regions of the country requires trained scientific manpower. To inventory and evaluate the natural resource base and to plan new resource improvement projects requires trained manpower. Training farmers in methods of soil and water conservation and in proper rotations for maintaining soil fertility requires a knowledgeable extension staff. The REE system is able to contribute substantially to increasing agricultural production through improving the natural resource base.

2. Productivity

Increases in total agricultural production and improved incomes for agricultural producers, in part, must come about through increased productivity of resources used in the sector. Agricultural productivity has not increased significantly over the last 15 years (see Table II.27, Chapter II). Available data show few crops with any significant upward trend in yield per hectare. Even though the data are not highly reliable, there is no other strong evidence to indicate substantial changes in yields per hectare. Rice, bananas, potatoes, cotton, broad beans and soybeans are the only crops that show any upward trend in yields. Bananas show an upward trend due to significant changes in hectares planted to the higher yielding Cavendish variety and to the significant decrease in hectares planted with presumably the more marginal hectares being taken out of production first. Soybeans have shown substantial increases in area cultivated and yield per hectare. The soybean, in general, is a large producer crop with a significant share of the increased area coming from land previously planted to bananas.

Comparisons of crop yields between Ecuador and other countries and between results obtained on research stations and national yield levels indicate substantial room for improvement in yield productivity (see Table IV.1). On-station research results are several fold increase in comparison to the national average. Several factors contribute to the large differences in yields including effectiveness of the technology transfer process, availability and use of agricultural inputs and proper incentives for increasing production. These factors are further discussed in the remainder of this section and related to the total REE system needs.

TABLE IV.1

COMPARISON OF YIELDS OBTAINED AT THE EXPERIMENTAL LEVEL WITH NATIONAL AVERAGE ¹

CROP	Experimental Yields, INIAP ^a (M.T./ha.)	National Average ^b (M.T./ha.)
Wheat	4.1	0.95
Barley	4.8	0.69
Soft Corn	4.5	0.71
Hard Corn	4.9	1.10
Rice	7.3	1.30
Soybeans	2.7	1.10
Sesame	1.4	0.87
Peanuts	3.6	0.82
Beans	2.3	0.46
Cacao	1.4	0.30
Cotton	2.5	0.70
Coffee	2.7	0.40
Potatoes	27.3	9.50
African Palm	6.0	1.10

a) Average yield of recommended varieties

b) 1969-1973 National average

SOURCE: 1 INIAP and the International Institute of Statistics
(Instituto Internacional de Estadísticas)Potts, H.C. Dec. 1, 1975. Seed Program for Industrial Development in Ecuador, A report under
AID/ta-C-1219. Mississippi State University, Mississippi

a. Increasing Quantity of Inputs

Increasing inputs (chemicals, fertilizers, insecticides), per unit area of land irrigation and double cropping are considered.

Although there is no comprehensive study on the availability and overall utilization of agricultural chemicals, fertilizers and ground limestone, indications are that the opportunities to increase production from their use could be very great in Ecuador.

In 1977 total imports of chemical fertilizers amounted to 93,492 metric tons. If an assumed 20,000 tons of domestic output is added, the total chemical fertilizers available would be approximately 113,000 tons, enough to fertilize 565,000 hectares at 200 Kg. per hectare. Average land in cultivated crops (not counting pasture land of 2.2 million hectares) from 1971 to 1974 totaled 1,645 thousand hectares; thus the fertilizer available would have been sufficient to fertilize about one-third of the cultivated land. Total arable land is estimated at 4.5 million hectares.

In 1974, 61% of the rice farmers used nitrogen; 8% used a complete fertilizer. From 1971 to 1974 the percentage of wheat farmers using fertilizer ranged from 33 to 44%. Because rice and wheat are crops on which a higher percentage of improved technology is used, we could expect the general percentage using fertilizer to be even lower. It is estimated that no more than 10 percent of the small farmers in the mountain region use chemical fertilizers and other chemicals.

The National Fertilizer Company, FERTISA, is the source of supply for inputs and locally manufactured fertilizers. FERTISA produces granular fertilizer with a rated capacity of 35,000 tons annually, although indications are that production is somewhat lower. The nutrient most needed is nitrogen, with a lesser need for phosphorus. It was not determined if the fertilizer distribution system is sufficiently adequate to cover the country. Most fertilizer usage is with large producers, primarily the export crops with banana accounting for 40 percent and sugar cane 10 percent of the total. Limestone, while produced and used in the country, was not indicated as a major constraint. Its use appears to be on renovated pastures by the larger dairy herds.

In 1975, plans were made to install a 1,200 to 1,500 tons per day ammonia plant. This could exceed the present and near future market demand. Ecuador has the hydrocarbon reserves to undertake this enterprise. It is doubtful that rock phosphate or potassium exist within the country and therefore would continue to depend upon imports.

Use of agricultural chemicals (herbicides, nematicides, insecticides and fungicides) occurs primarily with the export crops and large producers. Technical assistance through the national programs would account for much of the education, promotion and use of these chemicals on crops such as bananas, coffee, cacao, cotton and oil seeds. These tend to be medium to large producers with capital or capability of obtaining credit.

Specific pest problems by crops were not identified. A major problem of nematode damage in bananas is quite widespread and some use of nematicides occurs. It is estimated that most small producers do not use these plant protection chemicals. It is doubtful that they understand their use, nor would have the funds to purchase them. Production of these agricultural chemicals does not occur in the country, but it was not determined if formulation capability exists.

Pyrethrum, a plant that yields raw material for an insecticide, is grown in the country, but it is not known if it is processed here for local use.

Increased and proper use of agricultural chemicals along with expanded irrigation and proper water management should lead to increased double cropping. Statistics indicate only 75,000 hectares of double cropping now occurring, primarily in the coastal region. There is an apparent lack of understanding of crop ecology, farming systems, rotations, crop successions and suitable combinations that restrict increased use of this practice.

b. Improving Quality of Inputs

Improved Varieties and Breeds

The failure to use improved seeds is a constraint to improving agriculture production in much of Ecuador, especially among the small farmers who are still using traditional production methods. For example, corn is often planted year after year by selecting seed from last year's crop.

The same is true in livestock production. The same genetic material may be used generation after generation by using breeding stock from the same herd. This restricts production by failing to upgrade the livestock herds through the incorporation of improved strains.

Thus, there exists excellent opportunities to improve production throughout the agricultural sector by the introduction and incorporation of improved varieties and strains of crops and livestock.

Improved Labor and Management Skills

Agricultural output is often restricted by a failure to employ improved production techniques. The general use of traditional farming methods constrains long term improvement in agricultural productivity.

Considerable increases in production could be achieved by multiple cropping, crop rotations and use of fertilizers based on soil analysis. Increased production can be achieved by utilizing more farm power during critical operations such as plowing, pulverizing and preparing of the soil. Lack of modern tillage equipment suitable for conditions in Ecuador and a good understanding of soil management and conservation practices limits increases to be gained in agricultural productivity.

Knowledge of prices and good marketing practices are essential for increasing incomes to farmers and providing incentives for greater total production in the country. This requires a knowledgeable work force in agriculture with sufficient management skills to analyze alternatives and make selections.

Although productivity can be greatly increased with the application of improved technology in agriculture (credit, fertilizers, seed, irrigation, etc.) without the knowledge of the how, when and where, failure may result. The guidance and technical assistance to farmers by capable specialists and general development officers can provide the necessary link to enable the farmer to apply the appropriate technology in achieving optimum yields. Therefore, there is a need for more well-trained agriculturalists to teach at secondary and superior levels and to help develop the farm skills which are essential. They could train the extension or general service personnel to work directly with the farmer. A teacher can teach no more than he knows or is capable of doing himself. Unless the teacher has the necessary practical skills, he cannot impart those skills to others. There is a close correlation between the capability of a farm adviser and the results obtained by his clients.

c. Improving Agricultural Organization

Cooperatives

The generally low level of efficiency in the organization and administration of Ecuador's Farmer Cooperatives constitutes a considerable constraint to agricultural output. Working together in groups is a strong part of Ecuadorian tradition; cooperatives and communes are quite common along with the more recently organized colonization groups.

More than 1,280 cooperatives serving almost 40,000 members are spread throughout the country. These form a sound base for expansion and improvement in organization and operation of agricultural production. By working together in well-managed groups, farmers can build up their production and incomes through more efficient purchasing of production inputs, incorporating improved farm practices, and more efficient marketing of products.

These cooperatives and other groups are presently little understood from a lack of research as to their complexity and potential. It is generally known that the greatest hinderance is a low level of efficiency in administration. There are indications that some groups have failed due to a lack of support and continued guidance in production technology. There is a need for more research in organizing and administering cooperatives involving the disciplines of Anthropology, Sociology and Economics.

Technology Packages

After techniques of improved seeds, use of fertilizers, herbicides, insecticides, planting, cultivating, harvesting, storage and marketing are developed through research, there remains the problem of transferring results to the farm level.

A proven method of transferring results is the "technology package". To be fully effective one improved practice usually must be combined with one or more other practices. The set of practices necessary for a successful outcome is the "technology package".

For example, in corn production a "technology package" may consist of preparing a good seed bed, laying of the rows one meter apart, and applying 200 kilos of 10-20-10 per hectare; planting the seeds in hills 25 centimeters apart in the rows, cultivating to control weeds and applying a side dressing of nitrogen at tasselling; harvesting when corn is mature; and finally, storing in a dry place, protected from insects and rodents.

The package may consist of the actual seeds, fertilizer, insecticides and written instructions for a production cycle on a specified plot of land. The package is prepared by the technology-transfer team for each relevant crop. The change agent will take the package to farms of community leaders to be set up as a technology demonstration. All farmers within the zone of influence may observe, learn the techniques, and apply them to their own farms. Thus technology will be spread resulting in increased total production. Not to employ this or similar methods of technology transfer constitutes a constraint to reaching production potential.

National Programs

In an effort to concentrate on certain products of special interest for domestic consumption and export, many countries have organized special crop and livestock programs. In Ecuador, for example, there are national programs in bananas, rice, cacao, coffee, cotton and other annual oil crops.

There are both advantages and disadvantages in organizing the functions of research, education and extension by specific crop and livestock programs as opposed to organizing by areas of concentration (Research, Education, Extension) for application to the entire agricultural sector.

The advantages lie in a more concentrated focus on specific problems by enterprise which may significantly increase production of important products.

However, this may be an inefficient use of scarce professional and technical manpower. Either the relatively few persons working on specific products may do so by neglecting that part of the agricultural sector outside of special programs, or, if the process is carried to the logical limit of organizing all products, there simply would not be enough qualified personnel to effectively serve the entire agricultural sector.

Generally, trained professional and technical manpower can contribute more to agricultural production by being organized around research in the basic biological sciences, soils and fertility, and animal and plant protection, etc. The advantages lie in that research findings and extension to the production levels are broadly applicable across the entire list of agricultural enterprises.

Thus, a more effective use of research findings can be transferred to the farm level with fewer personnel and resources.

d. Relating to the REE System

New knowledge on improving agricultural inputs and methods for organizing agricultural production form a major part of the basis for improving agricultural productivity. Another important part is disseminating new knowledge to an individual farmer or a group of farmers that have been sufficiently prepared to be able to accept the new knowledge and apply to their production processes. The REE system is the basic vehicle used to generate new knowledge, put it into appropriate packages and disseminate to agricultural producers. The process requires a large, well trained cadre of professional workers in each of the three REE subsystems. It also requires a continuing training process to keep the professional cadre current in new production processes and methods of technology transfer.

3. Credit

Availability of agricultural credit, distribution and utilization were presented and analyzed in Chapter II of this report. As per that discussion, availability of agricultural credit is less of a constraint than getting the credit to the small producer and showing him how to use it. The amount of credit a small producer is able to beneficially use is frequently limited by the level of technology he understands and uses. Hence, credit and technical assistance together are generally required by small producers in order to increase agricultural production and incomes.

Relating to the REE System

The REE system contributes to capital formation and growth in agriculture through credit by increasing the level of trained manpower in technical assistance and hence indirectly in educating producers to credit use.

4. Infrastructure

Limitations of the infrastructure (or what is sometimes called social overhead capital) of Ecuador is a constraint to increased agricultural production. This category of inputs needed to enable production and marketing to take place includes physical facilities such as transportation (ports, roads and railroads) and storage as well as investments which result in information on production and prices, grading of commodities, etc. Infrastructure availability, distribution and utilization were discussed in Chapter II.

The government of Ecuador, as any government, is faced with a number of alternatives with regard to policy toward the development of infrastructure: (1) the government can make investments in infrastructure which will reduce production and distribution costs, (2) the government can regulate production and distribution functions, or (3) the government can assume the production and distribution functions directly.

Legislation is often passed because it is felt necessary to protect producers and consumers against speculators and middlemen. This may be, however, an excessive preoccupation because excessive profits may occur less frequent than commonly believed. If there were no barriers preventing competition among middlemen and speculators, excess profits should attract competition that would reduce or dissipate the excess profits. If the difference between prices charged consumers and prices paid to producers prevails in the absence of barriers to competition, an alternative explanation is that it is not excess profits, but the legitimate costs of marketing agricultural products in a situation where the lack of infrastructure causes marketing costs to be high.

The Ecuadorian government has not interfered extensively in the marketing of agricultural products. There is evidence that government intervention has only affected the prices of sugar, rice and wheat. The prices of other products have generally been left for the market to determine.

It is apparent that the government of Ecuador does not plan to intervene in the production and distribution of agricultural products. It is important therefore, that the government make investments in infrastructure appropriate to the needs of the agricultural sector.

Relating to the REE System

The agricultural REE system is linked to rural infrastructure basically through planning of infrastructure projects consistent with the needs of agricultural production, marketing and distribution. A cadre of trained professional workers are required to plan and implement infrastructure projects that facilitate the production and marketing processes.

5. Marketing and Price Policy

Agricultural products tend to be cyclical in supply with inversely related low and high prices due to a relatively stable demand for food. Governments have generally found it necessary to intervene in the market process in an effort to smooth out these fluctuations in prices.

Part of the lag in Ecuador's agriculture has been due to the uncertainty in the behavior of prices which has adversely affected the decision of producers to undertake production. As the marketing problem became more acute, the GOE has intervened in agricultural markets. This intervention has been both direct and indirect, including a large number of individual laws, and other legal actions, import and export policy, the creation of mixed private-public companies, the setting and publishing of official prices, and the creation of ENAC and ENPROVIT.

All these activities have failed to fully reach the objectives of stable prices, and an adequate flow of products at reasonable

prices for both producers and consumers.

To focus on agricultural marketing problems national leaders from both public and private sectors met last December 19-21 for a three-day seminar.¹ The four themes discussed were:

1. Legislation, Regulation and Normalization
2. Direct intervention by the state in marketing (ENAC and ENPROVIT)
3. Training, marketing associations and other support programs
4. Research and information on prices and markets.

Legislation, Regulation and Normalization

In general, the regulations governing the marketing of agricultural products are found in the civil code, the code of commerce, the code of health, and in more specific terms, among the regulations of the Ministry of Agriculture, its special institutions, and others which deal with agricultural products.

Besides these,² there are a large number of decrees and laws still on the books, perhaps no longer heeded and many largely forgotten, nevertheless they have never been formally superseded. In addition to illustrating the great concern of the government over the marketing problem, this proliferation of legal acts demonstrates the piecemeal approach to the problem. A large number of organizations and institutions are trying to solve a small part of the whole problem, often working in isolation, and not coordinated with similar groups in both the private and public sectors.

Most of the laws and regulations with respect to marketing in Ecuador appear to have been promulgated in response to emergency situations; there has been a general lack of an overall national point of view in dealing with marketing problems until quite recently. Ecuadorian leaders in this field are now recommending a national marketing code based on a careful study and analysis. The code should coordinate and integrate marketing institutions and activities.

In summary, the present legal structure is a considerable constraint to orderly marketing in that it lacks national focus and coordination. The large accumulation of laws, regulations and quasi public institutions leads to confusion, a lack of compliance and difficulty in enforcement. A further weakness is that the present legal marketing framework was developed with only minimal participation by the private sector.

Direct Intervention in Marketing

Ecuador has intervened in marketing by controlling imports and

1 Office of Marketing and Enterprises, First National Seminar on Agricultural Marketing (Mimeograph, 127 pp, Quito, 1978)

2 An inventory of laws and decrees since 1959 totals more than 40. First National Seminar on Agricultural Marketing.

exports, by purchasing from the producer (ENAC), and by selling to the consumer (ENPROVIT).

The papers presented at the seminar on marketing demonstrate a consensus that state intervention in marketing is completely justified and necessary. However, there also seems to be a general agreement that both ENAC and ENPROVIT have fallen far short of achieving their objectives.

ENAC

In the case of ENAC the seminar concluded that the intervention had been irregular and discontinuous, failing to reach a scale necessary to have the desired impact on markets and prices.

Reasons cited were lack of adequate support from MAG, in the provisions of sufficient guidelines and other assistance, and a shortage plus an irregular flow of funds. From its inception ENAC has also been handicapped by insufficient storage, and has resorted to rentals and temporary storage under canvas.

Other deficiencies cited in the seminar include a shortage of trained personnel, inefficient use of manpower, as well as legal restrictions which, for example, prevented ENAC from extending credit to its sister agency ENPROVIT.

ENPROVIT

The seminar participants were not in total agreement over the efficiency and success of ENPROVIT in carrying out its role of regulating and providing a supply of basic foods at reasonable prices to consumers. One participant said that in Ecuador, where business firms are able to manipulate prices of basic products, ENPROVIT has been a positive element in stabilizing markets. Without ENPROVIT speculation would have driven prices considerably higher.

A different view expressed at the seminar concluded that ENPROVIT was contributing little or nothing to a positive transformation of the agricultural marketing system.

The relationship between ENAC and ENPROVIT in the past was weak. Any lack of coordination should now be removed, however, since under law 1683-A of September, 1977, both institutions have the same board of directors.

Price Policy

There is considerable evidence that Ecuador's price and foreign trade policy has contributed to the lagging production of agriculture in that (1) domestic prices have been set lower than import prices, (2) generous incentives have been given to the industrial sector for import-substitution, and (3) there has been a failure to adjust the tariff structure to take account of surplus labor.

These policies have shifted the terms of trade against agriculture vis a vis industry leading to an imbalanced development in favor of the industrial sector. Incentives to produce agricultural products declined, under-employment and unemployment rose, contributing to a rural to urban migration, rising imports of agricultural products and a reduction in quantities of exports from the sector.

There is economic danger in setting prices either too low or too high. Achieving a rational marketing and price policy is a difficult task, requiring considerable economic training and experience. An efficient and comprehensive information gathering, processing and analysis capacity is indispensable.

Relating to the REE System

The REE system should provide the trained manpower necessary to analyze agricultural production and marketing systems. The REE system should provide the needed manpower to collect, tabulate and analyze data concerning agricultural production and marketing. The REE system should provide the needed trained manpower to analyze alternative policies for assuring a production system consistent with Ecuador's potential for meeting domestic demand and for generating foreign exchange.

6. Human Resources

The quantity of labor in agriculture by general consensus is adequate or more than adequate. During certain periods of the year, however, labor may appear to be in short supply at prevailing wage rates. A more important factor, and hence constraint on agricultural production, is the quality of the labor resource. In general, education levels limit the ability of farmers and farm laborers to adopt improved agricultural practices and new technologies.

General levels of education and rural-urban comparisons were given in Chapter II. Emphasis should continue in the direction of providing basic educational skills. However, in order for agriculture to adopt improved agricultural practices and new technologies, an increased emphasis should also be placed on agricultural education.

Relating to the REE System

There are approximately 46 agricultural high schools graduating about 455 (agronomy students) each year. These agricultural graduates are used extensively in the technology transfer process and in general agricultural education.

Table IV.2 contains information on the distribution of these agricultural high schools. On a national basis, less than one school exists for each 10,000 agricultural producers. There are 19 cantons with more than 5,000 producers and no agricultural high school.

TABLE IV.2 TOTAL NUMBER OF AGRICULTURAL HIGH SCHOOLS BY REGION AND NUMBER PER 10,000

PRODUCERS, ECUADOR

Region	Number of High Schools	Number of High Schools per 10,000 producers	Number of cantons with 5,000 producers and no high school	Number of cantons with 3,000-5,000 producers and no high school	Number of cantons with 1,000-3,000 producers and no high school	Number of cantons with less than 1,000 producers and no high school
1. Esmeraldas	2	No. 1.348 R (3)	0	1	1	0
2. Portoviejo	3	0.466 (10)	5	1	3	1
3. Guayaquil	4	0.527 (8)	3	6	4	2
4. Machala	4	<u>2.842</u> (1)	<u>0</u>	<u>0</u>	<u>2</u>	<u>0</u>
Coast (COSTA)	13	0.768	8	8	10	3
5. Ibarra	3	0.861 (5)	1	2	1	0
6. Quito	5	0.560 (7)	2	2	6	2
7. Ambato	4	0.711 (6)	2	3	3	1
8. Riobamba	2	0.484 (9)	3	1	0	0
9. Cuenca	9	1.126 (4)	2	1	3	1
10. Loja	<u>10</u>	<u>2.036</u> (2)	<u>1</u>	<u>1</u>	<u>0</u>	<u>2</u>
Mountain(SIERRA)	28	0.868	11	10	7	0
East (ORIENTE)	<u>5</u>	<u>1.990</u>	<u>0</u>	<u>0</u>	<u>6</u>	<u>6</u>
NATIONAL	46	0.890	19	18	23	9

(132)

The total number of graduates in agricultural fields from all universities in the country, through 1976, compared to those graduating in the year 1975-76, are reflected by the following data:¹

<u>Area of Specialization</u>	<u>Year 1975-76</u>	<u>Total through 1976</u>
Agronomists	109	1,248
Veterinarians	30	496
Agricultural Engineers	13	65
Foresters		14
Animal Science		21
TOTAL	152	1,844

These university graduates form the major component in the cadre of professional workers needed for the REE system.

The above data shows the level and trend of available personnel trained in agriculture to serve both the public and private sectors. The numbers and levels of training need to be increased to provide the quantity and quality of personnel capable of providing the educational leadership for Ecuador's most important and basic industry, that of agriculture.

B. An Overview of the REE System and Strengths and Weaknesses

Ecuador's REE System in the agricultural sector is really a group of systems functioning simultaneously and parallel to each other. The systems include the usual 3 elements of the REE and are described below.

Research and Extension are under the control of the MAG but the coordination needed to optimize the use of research, especially among small producers does not exist. Research results are not adequately disseminated nor are problems needing investigation adequately channeled.

Education is directed by the Ministry of Education including the educational institutions in rural areas and agricultural high schools. The Ministry of Education does not involve itself directly in higher education due to the universities' autonomy.

These characteristics result in the institutions which make up each system or subsystem having independent administration, standards, plans, programs, and resources. Some characteristics common to all of the systems are as indicated in the following paragraphs.

The administrative leadership in the subsystems is somewhat limited. Only one or two of the subsystems have plans for training and development of administrators or orientation of newly selected administrators. Decision making seems limited to a small number of key people. When these people are absent it is difficult to obtain decisions due to the lack of ability or willingness of subordinates

¹ IICA: Present Situation of Agricultural Higher Education in Ecuador, by Bolivar Navas, 1978.

to accept the authority and responsibilities temporarily and in other cases, the administrative ability of subordinates may not be adequate to do the job.

The systems plans and programs have common objectives and goals, although each system seems to have independent strategies, for attaining the goals. There is an absence of coordination mechanisms among the systems for the many services to clientele. This indicates the lack of existence of a broad, integrated program model to identify the problems and establish priorities. The clientele apparently do not participate in the formulation of these plans and programs or if they do, their participation is limited and variable.

The assigned resources often are not sufficient nor timely to fully implement the plans and programs. Similarly, the present incentives for the employees in each subsystem are insufficient. The professionals and technicians have limited opportunities for specialization. Many employees perform functions not included in their area of training and often are involved in several parallel activities at the same time.

The systems carry on the following activities but are not restricted to them exclusively:

- The MAG, through extension provides technical assistance to farmers, training to campesino organizations, regulates marketing of agricultural products, and performs other service and regulatory functions.
- INIAP is the major agricultural research agency. It designs, executes, and disseminates research results.
- The agricultural colleges of the universities teach, do some research, but are not involved in extension activities.
- The agricultural high schools educate youth but have only limited involvement in community service.
- Other public and private institutions in Ecuador perform some planning, technical assistance, training, and research activities.

C. Strengths and Weaknesses of the REE System

1. Research

Strengths

- There are high quality facilities and good distribution of field locations of INIAP.
- The general organization and governance of INIAP is good.
- The staff of INIAP is knowledgeable in specialty areas and has a good reputation in training programs.

- Linkages of INIAP with international research centers are excellent.
- The Institute's status as an autonomous unit, independent of political intervention, aid in its administrative stability.
- INIAP has established a policy for recruitment and selection of professional and technical personnel which prohibits hiring professional and technical personnel who have worked in other institutions. Entrance of new personnel is done on the basis of scholarships granted to university graduates and university students in their last years of study for thesis preparation. This situation permits INIAP to determine if they have research ability and if they are willing to subject themselves to the disciplinary and work standards of INIAP. This policy, together with a post-graduate training program, permits INIAP to keep its personnel at a higher level of preparation in the agricultural field than some personnel in other programs in the REE system.

Weaknesses

- Salary levels and fringe benefits are lacking compared to private industry in Ecuador and to high-level technically trained personnel in neighboring countries. This results in some loss of personnel.
- There is a lack of adequate personnel in the areas of economic and social sciences, agricultural engineering and natural resources.
- There is a lack of personnel with adequate training in research administration and planning.
- Most personnel lack a practical background or experience in agricultural production and technology.
- There are limited contacts with clientele groups for problem identification and priority setting in research planning.
- Lack of in-country graduate and foreign language training plus the high cost of second country scholarships limits progress in upgrading staff.
- There is a lack of adequate involvement with other MAG personnel in planning the transfer of technology, off-station research and identification of researchable problems for new projects.
- The library and reference system is inadequate for useage by scientific personnel, particularly in languages other than Spanish. There are also inadequate numbers of journals and scientific references.

General Research Weaknesses in the Agricultural and Rural Sector

- There is an absence of research oriented to the needs of the family and the home (Home Economics research). There appears to be an absence of personnel for such research and a training program to develop them.

- There is no graduate education in the country. This significantly limits independent research of the type and level of thesis and dissertation research at the M.S. and Ph.D. level.
- There is a relatively limited commitment by the government to fund basic research activities at the Universities. This limits the expansion in types and areas of research or the improvement of teaching through attraction of scholars of international renown.
- The absence of a major commitment by the Universities to research and public service (extension) restricts them to primarily instructional agencies and governed largely by students and faculty with that sole purpose. This lack of research involvement limits the capacity of the Universities to attract and/or develop scholars of international renown. Lack of such scholars prevents the country from having the benefits of high-level university research and graduate training.

2. Education

Strengths

- An elementary school is available in every urban and most every rural community in the country.
- Agricultural secondary schools (colegios) are available in 64 centers throughout the major population areas of the country.
- Universities offering training in crops, veterinary medicine, livestock, agricultural engineering, and forestry are appropriately distributed over the country.
- There exists a number of well-trained professionals, capable and interested in promoting improved educational programs in Agriculture.

Weaknesses

- There is an absence of instructional programs in agricultural and rural life problems at the elementary school level.
- A lack of colegios (secondary schools) offering agricultural training for some of the major producing areas exists.
- There are insufficient numbers of agricultural professors possessing the quality of training needed for teaching in the colegios.
- Lack of land, farm machinery and tools limits demonstration and student practice (in most colegios and universities).
- Lack of library facilities and reference materials limits study of recent developments in the agricultural sciences.
- There is a lack of laboratory facilities for instruction in physical sciences (in most colegios and universities).

- There is a lack of practical training to develop student skills (in colegios and universities).
- Standardized curricula is lacking at both colegio and university levels.
- There is an absence of curricula and programs for training agricultural teachers in "how to teach."
- No system exists for standardizing, certifying and evaluating instructional programs in agriculture (at colegio and university levels).
- There is a lack of full-time university professors with sufficient technical training and practical skills.
- Rural adult education programs are not adequate to meet the needs of the farmer and the rural family.

3. Extension

Strengths

- The extension agents believe that their work is important, and they indicate satisfaction in this work for activating campesino families into the economy.
- The MAG's administrative decentralization and delegation of responsibilities to the Zone Offices permits quick response and timely attention to the agricultural problems of the different zones. This same decentralization permits the development of educational projects more in tune with the local problems, better distribution and use of resources, better supervision, and evaluation and readjustments of goals.
- The decision to concentrate resources of the Zone Offices in PIDA's will permit better interagency coordination for broad solution of agricultural and socio-economic problems of the area where these 22 projects are being carried out.
- The 113 ASA's supported by a group of specialists (professionals in some cases with great experience but without a graduate degree) are in a position to solve the farmers' problems because of their proximity.
- Government policies of emphasizing work with small and medium-sized producers is significant. In this way giving Technical assistance can be to the largest group of agricultural producers, where it is needed is high priority to maximize production.

Weaknesses

- There is a shortage of extension personnel and many are not trained in basic principles of planning, preparation and implementation of programs (only 5 have M.S. degrees).
- Extension technicians generally come from urban areas and their

technical experience, if any, is related to large scale enterprises. The situation is further confounded by the absence of practical training in agricultural production at the secondary and university level. Therefore, they do not adequately understand the application of their training to the small farm sector.

- The recruitment and orientation of new employees in MAG do not provide for sufficient training before assigning them to a field position to work with campesino families.
- Technical assistance programs in the past have not been based on practical and applied technology, utilizing the campesino family's available resources.
- Extension field personnel do not have adequate demonstration-type materials, including improved seed, fertilizer, small farm implements, and livestock (poultry, rabbits, etc.), for projects on application of appropriate technology to the campesino family situation. There is also a lack of bulletins visuals aids and materials for fairs and field days.
- The present methods for transferring research results into effective extension projects are not adequate.
- Extension personnel need additional training in working with clientele in group situations to increase the effectiveness of limited resources.
- There is a lack of confidence among extension agents in the assistance which the specialized service units of the Zone Offices have been given. There exists doubt about the promotion of specialists to the unit without training in the area of specialization.
- In Ecuador, some extension work is carried out by a number of public and private agencies, (some of international origin); each one of them carries on its activities independent from the others without coordination. This results in duplication of efforts, waste of resources, and confusion for the farmers.
- The mechanisms to coordinate extension work with research are very weak and function accordingly. This results in limited dissemination of research findings and accounts in part for the difference between national average crop yields and research yields. Extension agents participate sporadically in regional trials and in production research.

D. Strategies and Recommendations for Development of the REE System

In this section the group presents its recommendations. Each recommendation is based on an analysis of a specific problem that is obstructing the effective functioning of the REE system in Ecuador. The steps followed in developing these recommendations are:

1. Using the information and analysis presented in the earlier sections of this report, the group identified a specific group of

priority problems that is obstructing the effective functioning of the REE system. In the course of the study a much larger array of problems that impinge on the effective functioning of the REE system was discussed. The 32 Recommendations of the study team represent the groups professional judgement on the analysis high priority problems and methods of solution if the potential of the REE system to promote agricultural and rural development in Ecuador is to be realized.

2. For each priority problem identified, the group developed alternative strategies for resolving the problem and selected a specific strategy as a recommended strategy. The recommended strategy represents the group's appraisal of the most effective way of resolving the problem given the present REE institutional setting in Ecuador.

3. For each recommendation, the group specified the inputs needed to execute the recommendation and the output that should be expected if the recommendation is implemented. The projected inputs represent the group's appraisal of the critical inputs needed to successfully implement the recommendation. The projected outputs represent the group's professional judgement of the types of results needed if the problem to which the recommendation is addressed is to be resolved.

The specific recommendations of the group are presented below. Each recommendation includes a discussion of the problem to be addressed, alternative strategies for implementing the recommendation, a recommended strategy, and projected outputs and inputs of the recommendation if it is implemented.

1. General Areas and Administration of the REE System

Recommendation 1.1

Coordinate and integrate planning, implementation, evaluation and management of the total REE System in the Food, Agricultural and Rural sector.

Problem:

The effectiveness of the REE System is limited because it functions as a series of autonomous mini-systems somewhat independent of each other without full analysis of the linkages, relationships and strategies of relevant units. Examples of the autonomy and independence of the mini-systems are (1) the technology transfer and service agencies of the Ministry of Agriculture, (2) the research agency INIAP and (3) the educational entities such as Colegios and Universities.

Alternative Strategies:

1. Coordination and implementation of an REE System is easier when direct administrative control of the total system is vested in one authority. For example, such coordination and implementation would be facilitated if a chief administrative officer were named for the total Agricultural Research, Education and Extension System.

In the case of Ecuador this would require changes so as to vest authority, responsibility and administrative control in a single entity for (1) the extension (technology transfer) and service programs of MAG (2) the research programs of INIAP and (3) the agricultural education programs of the Colegios and Universities.

2. A second strategy for coordination of the REE System in Agriculture could utilize fiscal control as the primary device for coordination. Coordination would occur as outlined in Strategy 1 but be expanded to include: (1) Allocation of funds for agricultural education to an entity in the Ministry of Agriculture. These funds would become available to Colegios and Universities for Agricultural Education through compliance with proper curriculum and program standards. (2) Allocation of additional funds to INIAP for cooperative research projects and programs to be conducted in conjunction with Universities and in accordance with project specifications and standards controlled by INIAP.

Recommended Strategy:

The recommended strategy is a third approach and involves the achievement of coordination and integration of the functions of the REE System through a cooperative approach of program planning and development of linkages. Optimum use of REE resources, i.e., personnel, funds and facilities, may best be achieved through concentration of attention on linkages and synchrony of the mini-systems. This strategy must be designed in a way to serve the goals, statutory functions, and self-interests of the individual mini-systems while simultaneously pursuing the greater goal of improved service to the agricultural and rural communities. The program coordination and integration must come through the Consejo Superior Agrario, the Consejo Tecnico Agrario and the Consejos Zonales Agrarios. Attention to the linkages and synchrony must be in four program aspects of the REE system: (1) planning, (2) implementation, (3) evaluation, and (4) overall management. This overall management of programs includes (1) selection and assignment of personnel to program areas or functions, (2) orderly development and coordination of annual project work plans, (3) reporting of results or outputs by functions or mini-systems, and (4) appraisal, evaluation and rewarding of personnel for performance in their assigned duties. The existing consejos at the national and zonal levels must be directed and oriented to this process. New consejos should be established if needed to perform these functions. Additional details about the four aspects of coordination and integration are given below.

(a) Planning of Programs. For optimum success the planning of programs must include adequate representation and participation in the consejos at zonal and national levels by clientele, and by all the groups (or mini-systems) involved in the agricultural program at that level. For example, Research Program Planning should include representatives from: (1) Clientele groups for problem identification and prioritizing; (2) Investigators for project design, methodology and creative ideas; (3) Educators for ideas and coordination related to personnel developmental needs and training including thesis projects; and (4) Extension personnel for problem, and priority assessment and for experimental design, relating technology transfer to the ultimate clientele. Extension Program Planning should include representatives from: (1) Clientele groups for problem identification

and prioritizing; (2) Extension personnel for project design, technology selection, extension methodology and innovative ideas; (3) Research Investigators for technology contribution, methodology suggestions and for future technology generation; and (4) Educators for ideas and coordination related to personnel development and training including thesis projects.

Education Program Planning should include representatives from: (1) Clientele groups for identification of criteria for employment of personnel and needed skills; (2) Educators for curriculum and course design, coordination and creative ideas; (3) Research Investigators for technology review in courses and curricula, thesis ideas, and review of practicum experiences in the curricula; and (4) Extension personnel for identification of educational methodology needs, technology assessment in courses and curricula, and for review of practicum experiences in the curricula.

(b) Implementation of Programs. This is largely a function of the individual organization with the assigned responsibility for the program. Representatives of the related groups (mini-systems) involved in the planning process in the consejos are interested in progress reports and should receive them through quarterly meetings of the planning group or through written communications in the form of newsletters. When the implementation of the program involves contributions from other organizations (mini-systems) the specific needs and responsibilities and the timetable for each contributor should be clearly defined and communicated. At the end of the year or project, a written summary of the results should be prepared.

(c) Evaluation of Programs. This process follows program planning and implementation. The same group of people in the consejos who planned the program or their representatives (mini-systems) should be involved in the evaluation. The evaluation should be an overall objective assessment of the performance of persons contributing to the implementation of the program. The evaluator should receive inputs from other persons involved in the project.

(d) The Overall Management of Programs. This represents a set of position descriptions and plans of work for the administrators in charge of the organizations (or mini-systems) which are being linked and synchronized in the total REE System. There must be communication and cooperation among these administrators as they assess the overall performance of the process of the system(s) and the output or result of the program. The function of individual persons, and units comprising the system must be assessed and the performance of each appraised. Appropriate followup action should be a significant part of management. This includes (1) assignment of rewards, (2) review of allocation of resources and the efficiency of the use of the resources, (3) review of the effectiveness of the linkages with other organizations (mini-systems), and (4) corrective action as needed in each case. The consejos should insure annual reporting on the management of all programs. The annual review of the program management by the Consejos should include reviews of cooperative linkages and their effectiveness.

Expected Output. An improved coordination and integration of the functions of the REE system leading to a more efficient use of resources.

Needed Inputs: (1) An executive directive by the Ministry of Agriculture requiring the proper integration and coordination of the REE System through existing consejos or the establishing of new consejos as needed to perform the functions as outlined above. (2) 24 man/months of technical assistance from expert advisors to counsel with administrators in implementing the plan.

Recommendation 1.2

Improve the salary structure and incentives for personnel in the public sector of the total agricultural REE System.

Problem:

Public sector salaries are notably lower than salaries for comparable positions in the private sector. Few options are available in the rather restrictive national personnel system to entice more professionals in disciplines of high demand or short supply. One option, used in the case of petroleum engineers, is to classify professionals at a higher level or category. Given the importance of the agricultural sector in the country's economy, similar adjustments could theoretically be made.

Overall salary levels and classification methods are important to obtain adequate numbers of professionals in the total REE system: of even more importance is the incentive structure to compensate those individuals who have more experience and those that are more productive. As evidenced in the personnel data of MAG; some improvement has been made in the incentive system between the years 1973 and 1978. But much more needs to be done. The present personnel system has five categories of professionals versus four during the 1973 period. Over 44 percent of the professionals were classified in categories three, four and five in 1978 versus about 20 percent in 1973. Hence, some improvement has been made. However, an overall improvement in level of trained personnel also occurred during this period indicating a need for faster promotion to the higher levels.

As the number of professionals with advanced degrees increases and as the number of experienced technicians increases, the need for a wider range of categories becomes more important to assure adequate incentives for personal advancement. An example of such a system is the U.S. Department of Agriculture where there are ten professional categories with ten steps or salary levels within each category. Individuals may advance both within categories and across categories.

Other methods for recognizing exceptional individuals within the Ministry of Agriculture should also be considered such as (1) rewarding the outstanding zone and national change agent, (2) selecting and rewarding the individuals with the outstanding research and extension programs and (3) selecting and rewarding the outstanding administrator.

Recommended Strategy:

Only one strategy is proposed which is that the Consejo Agrario Superior name a task force to obtain data comparing salary levels between the public and private sectors for agricultural professions and to recommend a plan for adjusting salary levels in the public sector to be both competitive and rewarding to more experienced and productive individuals.

Needed Inputs: 1. Executive decision of the Consejo Agrario Superior.

2. Assignment of a task force of three to five individuals from both the public and private sectors to carry out the study and make recommendations to the MAG administration.

Recommendation 1.3

Develop and implement an Administrative Training Program.

Problem:

The REE System of Ecuador has significantly less than optimum effectiveness because of the shortage of trained administrators who understand and can implement principles of management, particularly in areas of planning and implementation of integrated and coordinated programs. These program areas include:

(1) Development and transfer of technology and (2) Provision of needed services for enhancement of the developmental and transfer process.

In many units the chief administrative officer is the only decision-maker. In some cases this person has limited experience and/or training in the allocation of resources, assignment of responsibilities, and the development of programs. The result is a reduced effectiveness and efficiency of the unit. This is particularly noticeable when the key administrator is absent for any significant period of time.

Part of the reason for lack of depth in administrative talent is that the present REE system includes many personnel who are well trained but lack sufficient experience.

Alternative Strategies:

1. Develop an in-country administrative training system using specialists from other REE systems of the world.

2. Provide scholarships for administrative internships or degree programs with specific orientation to REE system needs.

Recommended Strategy:

Develop and implement strategy two for administrative training during the next five years through granting of scholarships (1 year

in length) including 4 months of language training (see Appendix for appropriate exhibits). After five years, an in-country program for continuation and in-service training could be developed using this cadre of trained administrators. Sequencing of the scholarships is recommended at the rate of ten per year for three years and five per year for two years.

This alternative is recommended because of the creativity of administrative leadership that can be developed in the training associated with on-going programs in another country.

Expected OutPut: A cadre of 40 additional trained administrators for the REE system at the end of five years.

Needed Inputs: 40 man years of fellowship during the next five years.

Recommendation 1.4

Develop and implement a long-range plan for curricula development and quality control for education in Agriculture from the primary school level through the graduate program level.

Problem:

The curricula for education in agriculture at all levels from primary school through the university are lacking in-depth of subject matter training and practical production methods. This limits the development of personnel capable of improving productivity of the REE system for the development of the agricultural sector.

Both the general and specialized information needed in agricultural curricula are limited in availability to educational institutions. The present level and scope of training and experience of the instructional personnel limits their ability in curricula development, program evaluation, and quality control. There is no evidence of an accrediting authority for agricultural education at any level in Ecuador. Educational leaders in the agricultural sector are the best qualified and have the greatest interest and commitment for bringing about improvement in educational programs. Assignment of quality control authority to persons without proper background or interest would further limit the effectiveness of agricultural education programs.

Alternative Strategies:

1. Establish, through interministerial agreement, that the Ministry of Agriculture has authority for quality control because of program interest and need for improvement in agricultural education. Also establish a method for continuous monitoring of the content of curricula in education in agriculture at all levels and, where needed, develop and improve curricula. Implement a plan for quality control and improvement to be done through a unit of the Ministry of Agriculture.

2. Request the Ministry of Education to develop an implementation plan for quality control and curricula development for education in agriculture.

Recommended Strategy:

Strategy number one, that of implementing a plan for quality control and improvement through a unit of the Ministry of Agriculture is recommended.

This strategy is recommended because it would improve coordination of the total REE system by having all elements of the system identified with the Ministry in a meaningful and important way.

Output: Stronger curricula in agricultural education for training of agriculturalists.

Needed Inputs: 1. Executive directive by the joint Ministries of Agriculture and Education.

2. Two man/years of technical assistance for implementation.

3. 12 man/months of training outside the country for staff members in development and implementation of procedures.

Recommendation 1.5

Establish a National Graduate Program in Agricultural Science.

Problem:

Ecuador has no graduate program in Agricultural Science. Instruction, research and technology transfer programs of the country are largely dependent upon personnel with only bachelor's level degrees or personnel with graduate level training in other countries. At the present time significant levels of funds are being invested in scholarships for persons to pursue graduate level training in other countries. The absence of a graduate program significantly limits independent research of the type initiated in graduate level theses and dissertations. The absence of this type of research and academic pursuit limits the capacity of the REE system of the country to attract and/or develop scholars of international renown. The absence of such scholars in the country limits intellectual, economic and cultural development in the agricultural sector as well as other areas.

Recommended Strategy:

Only one strategy is proposed requiring a long-range program with periodic evaluations. The strategy is to establish a National Graduate Program in Agricultural Science in the Ministry of Agriculture in association with INIAP. The program must be sequenced with strengthening of undergraduate education in agriculture and the establishment of quality control for the total educational system in agriculture. The direct involvement of the Ministry of Agriculture is proposed because the personnel with background and education in agriculture are presently, and will continue to be, available in the Ministry.

The long-range program for graduate education in agriculture will require a Convenio with a recognized foreign University or consortium of foreign universities with well established graduate

programs. Initially, the granting of graduate degrees would be a cooperative function of the established foreign university graduate program and the graduate program of the Ministry of Agriculture and INIAP. At the end of ten years, the granting of graduate degrees would be totally transferred to the Ministry of Agriculture and INIAP.

During the first five years the MS degree would require three years. The first year would be in Ecuador for language training and preparatory or introductory courses; the second year (on a scholarship) would be at the cooperating university; and the third year would be in Ecuador for thesis research, organized seminar courses, and research and/or extension program planning. The development of this plan would permit a larger percent of the country's scholarships to be channeled to the programs of doctoral candidates who would become the instructional staff for the graduate program in future years.

Expected Output: A graduate program yielding 20 or more MS degrees annually after 5 years and about 30 after 10 years. The program would be operational solely through Ecuadorians at the end of 10 years.

Needed Inputs: 1. Eight man years of graduate faculty technical assistance per year for 10 years. Total technical assistance would be 80 man years over 10 years. These persons could be involved as research leaders in the INIAP program to assist in filling gaps created by personnel away for training. They would also have the opportunity for involvement in thesis research of the graduate students.

2. Supporting services of \$2,300,000 for buildings, equipment, materials and operation expenses.

Recommendation 1.6

Establish a National Agricultural Library and Reference Center.

Problem:

A limited knowledge base of technology for the agricultural Sector was observed in the contents of the libraries at various locations; in the Ministry of Agriculture, in the INIAP Stations, and at the Universities and Colegios. In many cases the libraries were small, inadequate and unused; in others the volumes on the shelves were not current. In still other cases, many volumes or periodicals on the shelves were printed in English and most personnel using the library did not read the language well enough to make routine use of the materials.

Alternative Strategies:

1. Appropriation of additional funds for strengthening and improving existing libraries through the addition and/or updating of volumes plus a translation service for more extensive use of library materials in English.

2. Development and implementation of a plan to create a National Agricultural Library and Reference Center. The Center would be linked with units outside of Quito needing reference service; and internationally with libraries and reference centers of other important agricultural REE systems. The plan should include addition of needed equipment and 20,000 to 30,000 new volumes during the next 10 years.

Recommended Strategy:

The second strategy is recommended because it will make the greatest long-range contribution to the improvement of the REE activities during the coming decade.

Output: A library and reference system that supports agricultural research, education and technology transfer available to all locations and education levels in the country.

Needed Inputs:

1. Two man years of expert technical assistance of specialists in library science and documentation for planning and establishing the library and reference system.
2. \$200,000 worth of equipment for cataloguing, reproduction, accessing and transferring reference items as needed.
3. 25,000 new volumes of reference material at \$15 per volume (635,000 sucres or US\$ 25,000).
4. 3 one-year scholarships for study abroad.

Recommendation 1.7

Develop and implement a plan for increased training in languages.

Problem:

Effectiveness of the REE system in Ecuador is limited because a majority of the personnel do not have the ability to read or utilize scientific literature and other agricultural material printed in languages other than Spanish. Similarly, the Ecuadorian scientists and educators have difficulty communicating with their peers of other countries who cannot communicate in Spanish. At the present time Ecuadorian personnel who desire graduate study in other countries are having difficulty developing the appropriate language capability. This delays progress of these individuals in completing their graduate study and increases the out-of-country scholarship costs of the sponsoring agency.

Alternative Strategies:

1. Utilize existing private linguistic training facilities and provide financial incentives and release time for participants.
2. Develop a language training facility within INIAP or other units of the Ministry of Agriculture to serve the REE system. It is necessary to procure proper equipment to handle groups of 20 trainees in programs four months in length.

Recommended Strategy:

The second alternative is recommended but it is recognized that employees must be provided with release time for the training and should be given preference in the use of the facilities.

Expected Output: Fifty or more trained people per year with ability to communicate more effectively in the scientific fields.

Needed Inputs:

1. Twenty linguistic units including recorders, tapes, text-books and work books.
2. Two man years annually for two years of technical assistance in the form of Instructor-Directors for the unit.

Recommendation 1.8

Establish a National Agricultural Sciences Journal.

Problem:

Research results and educational methodology in the agricultural sector are not adequately disseminated in the country because of the lack of a publication for this purpose in the agricultural professional field. Lack of such a professional publication also reduces the opportunities for individual scientists and educators to grow professionally through the experience of publishing professional level papers. This also limits the opportunity for individuals to gain peer recognition through publication of their results in a professional journal.

Alternative Strategies:

1. Develop a contract with a professional organization, publishing company, or agricultural agency external to the country for the development, production and distribution of this publication.
2. Expand the function of the Agricultural Communications Center to include the production and distribution of this publication. Initially, technical assistance from an organization or agency currently producing such a publication would be sought.

Recommended Strategy:

The second strategy is recommended to assure local interest and involvement in the project and to strengthen its chances for continued success.

Expected Output: A journal that provides professional publication opportunities and a communication vehicle for the entire agri-industrial sector of the country.

Needed Inputs: One and one-half man years of technical assistance.

2. Research

Recommendation 2.1

Review and improve the processes for determination of research priorities and planning research programs.

Problem:

The research program in some areas seems to lack a coordinated focus on central problems of the agricultural sector related to high priority clientele, i.e., those with limited land and capital resources. Development of research plans with a central problem focus such as illustrated in Figures IV.1 and IV.2 requires special attention in planning and prioritizing. Similarly, research plans are required for problem solution with maintenance of strong disciplinary programs in areas such as entomology, nutrition, soils and plant pathology. The planning processes in an effective research organization must be constantly evaluated and updated.

Alternative Strategies:

1. An external review and study team of three experienced researchers and research administrators would work for three months with the project leaders of INIAP in developing and implementing improved procedures.

2. A selected group of six research project leaders and administrators of INIAP would develop a plan for improved research program prioritizing and planning. This group would spend one month studying research planning and prioritizing procedures at one or more international centers and in established research planning agencies such as the Science and Education Administration of the U.S. Department of Agriculture.

Recommended Strategy:

The second strategy is recommended because it provides for continuation of the process for research planning and review.

Expected Output: A research planning and prioritizing process with a stronger focus on more central, high priority problems.

Required Inputs: Six man months of study and travel outside of the country for the research team.

Recommendation 2.2

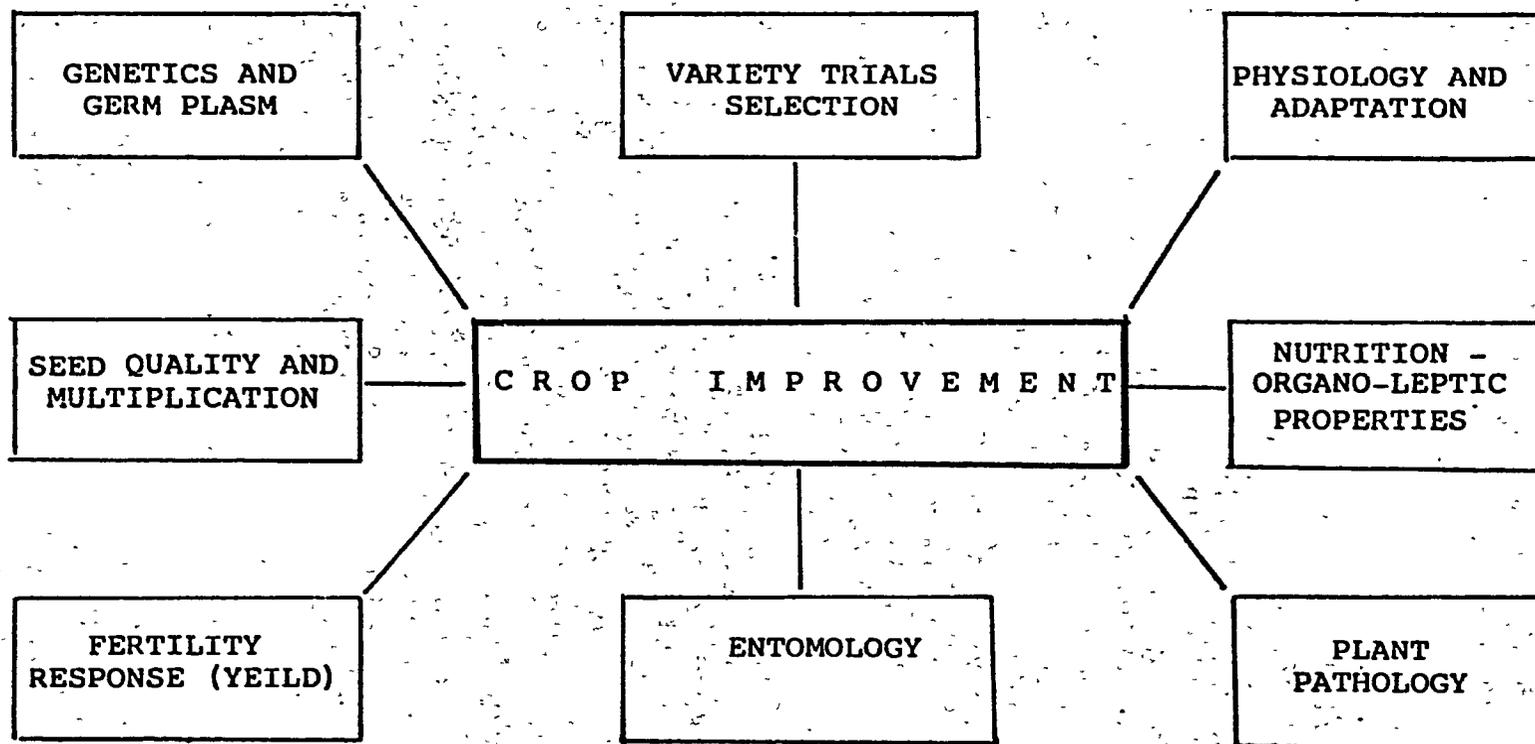
Increase the quantity and level of trained manpower.

Problem:

Only 39 percent (63 persons) of the INIAP investigators and administrators have graduate level degrees (5 Phd's, and 58 MS) in

FIGURE IV.1

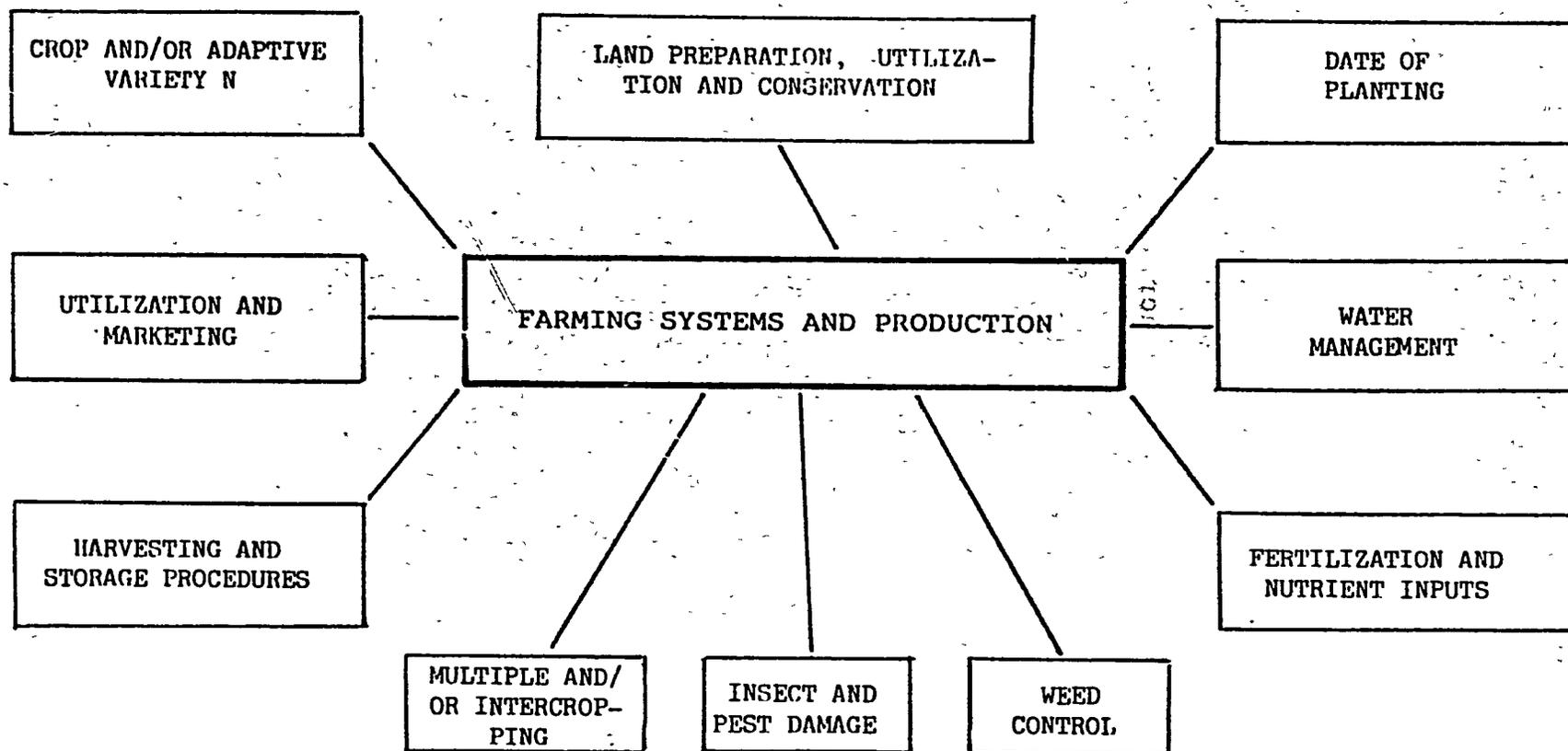
MULTI-DISCIPLINE APPROACH TO CROP IMPROVEMENT



(150)

FIGURE IV.2

MULTI-DICIPLINE APPROACH TO FARMING SYSTEMS AND PRODUCTION



(151)

Agricultural Sciences. Curricula in the bachelor level agricultural training programs do not include courses in research methodology and project development needed for effective performance as research investigators. The improvement of INIAP's effectiveness as a research agency is limited in part by the capacity of its research project leaders.

Recommended Strategy:

Because of the limited opportunities to deal with problems due to the absence of an in-country graduate program, only one strategy is offered. This strategy recommends 100 scholarships in high priority areas for carefully selected candidates over the next five years. New program areas such as horticulture and poultry should receive emphasis. These should be used as follows:

	Year	1	2	3	4	5
M.S. Programs		20	15	10	10	5
PHD Programs		5	5	10	10	10

By the end of five years the in-country graduate program, if implemented simultaneously, would assist in developing future personnel.

Output: Approximately 30 additional project leaders with MS degrees and 15 additional project leaders with PhD degrees at the end of five years.

Needed Inputs: 100 man years of additional scholarships during the next five years.

Recommendation 2.3

Conduct an in-depth national study of current nutritional status of the people of Ecuador, particularly of the rural sector.

Problem:

General observations and review of relevant data provide strong indications of significant nutritionally-related health problems in Ecuador, particularly for rural areas. Although USAID has supported educational work in nutrition in Ecuador, the last in-depth study of the nutritional status of the people was completed in the late 1950's. The general growth in productivity of the agricultural sector is limited by the productive capacity of the people operating the production units. Nutritional status significantly affects human health which in turn affects the productive ability of people.

Alternative Strategies:

1. Contract with a research foundation or agency external to the country to perform the study.

2. Through the interministerial alliance, perform the study cooperatively with a university or consortium of universities or agencies with special expertise in nutrition.

Recommended Strategy:

The second strategy is recommended because it provides for more involvement of Ecuadorian personnel with the subsequent training.

Expected Outputs: Verifiable data on the nutritional status of the people for use in planning future research and development programs.

Expected Inputs:

Two man years of technical assistance.

Recommendation 2.4

Expand and coordinate off-station research and experimentation in conjunction with other rural development institutions.

Problem:

Lack of personnel and inadequate financial resources have limited INIAP in the development of an extensive off-station research program for testing technology cooperatively with other agencies on clientele farms. The wide geographic, topographic and climatic differences in Ecuador limit the direct application of research results to producer units without field testing. Long-range progress in technology development and transfer will require an expansion of off-station testing and demonstration.

Alternative Strategies:

1. Develop stronger linkages with the zone offices and general divisions of MAG. This will require some expansion of INIAP and MAG staffing for development of this work in a cooperative venture of technology development and transfer.

2. Assign the function totally to INIAP and expand funding and staffing to cover it.

Recommended Strategy:

The first strategy is recommended because it strengthens MAG-INIAP field relationships and because this type of research is, in part, technology transfer.

Expected Output:

More rapid adoption of research results with a subsequent increase in agricultural productivity.

Needed Inputs:

1. Administrative directives by appropriate officials of INIAP and MAG.

2. Increased funding for INIAP and MAG to cover added costs of staffing and operations.

Recommendation 2.5

Implement expansions and additions to the research program areas of: Renewable natural resources planning and conservation; social and economic sciences for technology transfer, agricultural policy analysis, and agricultural marketing; agricultural engineering in power and machinery systems and structures for small farms.

Problem:

a. Renewable Natural Resources

This report previously presented data on the renewable natural resources: present and potential use, their strengths and weakness, and some general evaluations of their eco-system. Soil erosion is a major problem of the lands being cultivated at high altitudes. Slopes are steep, cultivation is mostly by hand, and land is cultivated from the bottom of the field to the top. Contouring and terracing are not practiced except in some cases where rows generally follow a contour. Topsoil removal results in excessive runoff. Flood damage is reported on the narrow floodplains at lower elevations. Water runoff in the Oriente region is already evident by the red color in major headwaters of the Amazon. Wind erosion is a serious problem. Some of the sandy and fine sandy soils could be stabilized with reforestation practices. These describe very briefly some of the observed problems, but does not elaborate upon the consequences of inadequate programs of conservation of the renewable natural resources. A multidiscipline approach to research and education in planning, utilization and conservation of renewable natural resources is needed. An inventory of available data in the broad discipline areas of meteorology, soil science, plant science and agricultural engineering is needed early in the program. Later studies should include gathering data on precipitation and soils and the interactions between the two for the development of soil loss equations. These data plus crop adaptation, production, and economic data could be utilized for developing conservation programs and eco-systems adapted to the various geographic regions. Similarly, research on designs of suitable structures and soil preparation methods could facilitate development of an integrated natural resources conservation program.

b. Social and Economic Sciences

Expansion of micro as well as macro social science research is required. Each agricultural experiment carried out by INIAP should include social-economic analysis of why the expected results are useful to the farmer. Why should the farmer be interested in that experiment? How does it relate to what he is presently doing? How much risk is involved? What is the cash outlay? What is the probability of the farmer being able to obtain the needed inputs including technical assistance? What is required to complete the technology transfer process as gained from the research results?

Macro social science research includes analysis of economy-wide problems. Effects of migration need to be analyzed as they impact

on sending and receiving regions. As stated in other sections of this report, agricultural policies have frequently been ineffective in obtaining national development objectives. Part of the problem has been lack of knowledge on behavioral responses of producers leading to ill-defined or contradictory policies.

Marketing has been identified again and again by technicians and producers as a limiting constraint to production and improved farmer incomes. Producers lack marketing information and market alternatives. Controls on quality, weights and measures are lacking or ill-defined. Market infrastructure such as farm access roads, market terminals, storage and processing have been observed as major constraints. Research capacity is extremely limited in identifying marketing problems, analyzing alternative solutions and making recommendations.

The number of trained social and economic scientists in research, extension and agricultural services is grossly limited. INIAP has six social scientists out of a total professional staff of 160. The Ministry of Agriculture has a total of 47 economic and social science professionals. Thirty-two of the 47 professionals are in the central office. Less than 10 percent of the social scientists and economists have post-graduate level training and yet they are filling positions in highly complex areas of agricultural economic research, agricultural planning and policy analysis, and agricultural administration.

c. Agricultural Engineering

Field interview information and secondary data show apparent large underemployment of rural families and particularly of agricultural producers. Yet, at the same time, farmers on small land areas apparently do not work their land as intensively as they might. Many factors influence the latter phenomena including inappropriate policy incentives for increased production. However, farm management information shows periods of peak or seasonal labor requirements. Farmers are limited in the number of hectares they can farm when using traditional technologies. Periods of land preparation, cultivation and harvesting frequently require large amounts of labor under traditional technologies.

Increased research is required to assess periods of labor constraints and to seek methods for alleviating these constraints. Development of appropriate mechanized technologies consistent with labor availability and labor skills of the small producers are required. Testing and adaptation of small scale mechanized equipment used in other countries needs to be performed in Ecuador. Research in designing appropriate structures for small scale livestock systems needs to be performed. Engineering research is needed in testing soil and water conservation techniques as identified under the expanded program for research in renewable natural resources.

Alternative Strategies:

Three priority areas of expanded research have been identified: renewable natural resources, economic and social sciences, and agricultural engineering. INIAP is presently carrying out related research in soils, economics of field crop and livestock production, and engineering. These areas need to be expanded. More emphasis should be placed on economic and social research both as it relates to crop and livestock production and as it relates to analysis and formulation of agricultural policy and agricultural marketing.

Alternative strategies include the following:

1. Expand the present departments of soils and agricultural engineering at INIAP to identify and address the research problems as described above. This is the only strategy considered in these two research areas. INIAP already has substantial research facilities and personnel in these areas as well as related areas.
2. Expand the INIAP economics section and include social scientists from such disciplines as rural sociology and cultural anthropology.
3. Create a separate economic and social science research and public policy analysis institute with independent status similar to INIAP. Economic and social analysis within INIAP would remain at about the same level as presently.
4. Expand the INIAP economics section to handle appropriate micro economic and social analyses of all proposed agricultural experiments. Expand the Department of Planning in the Direccion de Planificacion of MAG to include major areas of economic and social research and policy analysis. This Department would perform the major amount of economic and social research for agriculture including marketing research.

Recommended Strategy:

Strategy number one has been selected for expanding research in renewable natural resources and agricultural engineering. The reasons were presented above. Strategy number four is recommended for significantly increasing the amount of economic and social research in the agricultural sector. INIAP should increase its number of economic and social science personnel to assure proper problem identification and evaluation of expected results during the technology transfer process. However, INIAP will remain closely tied to physical and biological experimentation and only marginally concerned about macro issues of economic policy and marketing. For this reason, the strategy of building a strong economic and social research unit in the Direccion de Planificacion is proposed. Such a unit would be centrally located relative to all operational divisions of MAG and would be able to provide them with needed research services.

Expected Output:

In a period of five years, the research capability of INIAP would be increased substantially in areas of renewable natural

resources and agricultural engineering. A highly qualified economic and social research and policy analysis unit would be established in the Direccion de Planificacion.

Needed Inputs:

1. INIAP will require 15 additional positions and scholarships in each of the areas of renewable natural resources and agricultural engineering. An additional five positions and scholarships will be required in the economic and social sciences. Two man years of technical assistance will be required in each of the areas of renewable natural resources and agricultural engineering to assist in problem identification and development of research methodology. Specialized equipment and facilities will also be required in these two areas to conduct research and is estimated at 5,505,000 sucres (\$220,000) for each area.

2. A major training program and technical assistance will be required to establish the economic and social research unit in MAG. Thirty scholarships will be required over the next five years to train the necessary cadre of professionals to the MS level. Eight man years of technical assistance will be required to assist in orienting the research unit and provide in-service training.

3. Education

Recommendation 3.1

Develop improved agricultural and rural life curricula for use in primary schools.

Problem:

A large percentage of the rural population enter the agricultural profession at the end of or during the elementary phase of the education process. Literacy should remain the primary goal of the initial education process. However, given the importance of agriculture in the rural sector, basic concepts of plant and animal growth and reproduction would improve future farmer's perceptions of agricultural production processes. Similarly, concepts of home management and community development would better prepare future families for rural living. Presently, curricula for use in primary schools does not contain significant material such as this.

Alternative Strategies:

1. Bring this problem to the attention of the Ministry of Education and encourage them to develop a curricula for implementation in primary schools.
2. Ministry of Agriculture could assist the Ministry of Education in developing a agricultural and rural life curricula by providing the needed technical personnel.

Recommended Strategy:

Since the Ministry of Education does not normally have personnel with training and experience in agriculture, it is recommended that the Ministry of Agriculture develop the curricula for use in the primary schools.

Expected Output:

Developed curricula in general agriculture, home management and community living appropriate for the elementary level, printed and distributed to all elementary schools.

Needed Inputs:

Four man years of staff time from Ministry of Agriculture.

One man year of technical assistance.

Office equipment and supplies to duplicate or print 12,000 sets and distribute to each elementary school at an estimated cost of 2.5 million sucres (US \$100,000).

Recommendation 3.2

Increase the quality of education in agriculture at the secondary and post-secondary levels through development of a plan for improving and standardizing instructor training.

Problem:

University programs for training agricultural instructors at the secondary and post-secondary levels are not uniform. There is no program for teacher certification. Each institution is autonomous with few linkages between them. The need is for more standardization of instruction and improvement of programs including emphasis on teaching methods.

Alternative Strategies:

1. Bring the problem to the attention of the Ministry of Education.
2. Bring the problem to the attention of the Deans of the Faculties of Agriculture in each University.
3. Bring the problem to the attention of the Superior Normal Institutes (for secondary school teacher preparation).
4. Ministry of Agriculture, in collaboration with Ministry of Education and the University Faculties of Agriculture, should develop a plan for improving and standardizing agricultural instructor training and for certifying agricultural instructors at the secondary level and above.

Recommended Strategy:

The fourth alternative is recommended since standardizing agricultural instruction and certification of instructors requires involvement of all three entities; the Ministry of Agriculture

for technical agriculture, the Ministry of Education for standardizing programs and the Universities and Technical Institutes for instructional content and methods.

Expected Output:

1. A plan developed for improving and standardizing instructor training for agricultural instructors at the secondary (colegio), technical (instituto) and university levels.

2. A Department of Agricultural Education established within a national graduate program in agricultural sciences, especially designed to develop and provide courses of study in methods of teaching, curricula development, preparation of lesson plans, student evaluation, etc.

3. An established system of certification for agricultural instructors at the secondary and post-secondary levels, with responsibility placed in the Ministry of Agriculture.

Needed Inputs:

1. 6 man years of staff time (4 professional plus 2 secretarial) first year, increasing to 6 and 8 man years respectively by 3rd and 5th years, of professional personnel plus support staff.

2. One man year technical assistance for the first year, increasing to 3 man years each from 3rd to 5th years, as a teacher training department is established.

3. Scholarship training for 1 Ph.D. and 4 Masters degrees in Agricultural Education within the first 5 years.

4. An established agreement or convenio with a selected University which has a strong Department of Agricultural Education, to provide on-going consultation and technical assistance in developing a program to train agricultural instructors.

5. Offices, classroom and audio-visual room, together with office equipment and teaching aids for a teacher training department (a Department of Agricultural Education) to be established within a national graduate school for agricultural sciences.

Recommendation 3.3

Develop a plan for improving and expanding agricultural instructional facilities.

Problem:

The quantity and quality of instructional facilities vary from near-adequate to non-existent in different program areas of the colegios, institutos and university faculties. Some institutions have laboratories with very little equipment and supplies; school farms without livestock, farm machinery or equipment; libraries without technical reference books or scientific journals; etc.

Alternative Strategies:

1. Establish standard recommendations for minimum facilities to be required for each level of training, and discuss with Ministry of Education and respective University Deans to encourage adoption.
2. Encourage associations of Colegios and Universities to work together to set up standard facility recommendations.
3. Ministry of Agriculture develop recommended standards for instructional facilities, hold special short courses for colegio and agronomy professors and directors, and use persuasion to have them set goals for improving instructional facilities.
4. Ministry of Agriculture develop and implement plans for improving and expanding agricultural instructional facilities for secondary and post-secondary agricultural educational institutions.

Recommended Strategy:

The fourth alternative strategy is recommended since the MAG has a broad perspective of agricultural problems and is in a position to determine priorities.

Expected Output:

1. A developed plan for improving and expanding agricultural instructional facilities for secondary and post-secondary agricultural educational institutions.

2. An office or unit within the Ministry of Agriculture established to develop plans for and to certify adequacy of facilities for secondary and post-secondary agricultural educational institutions.

Estimated Inputs:

1. Two man years of staff time per year (1 professional and 1 clerical).

2. Six months initial technical assistance.

3. Equipment for agricultural education units for practical Farm Training for Secondary Schools 56,450,000 sucres (US \$2,250,000), Agricultural Technical Schools 10,000,000 sucres (US \$400,000), and Universities 60,000,000 sucres (US \$2,400,000) during the next 5 years.

Recommendation 3.4

Develop agricultural curricula and teacher work plans with a better balance between classroom and laboratory or practical field work at the agricultural secondary schools, technical institutes and universities.

Problem:

There is a wide variation in amount of laboratory and practical field work in agricultural curricula at the various training levels. This is due to (1) lack of facilities for instructional purposes, (2) lack of practical experiences and training of instructors and (3) lack of teacher work plans with laboratory exercises and field work. As facilities are improved and instructors receive practical training in agriculture, the need for development of teacher work plans emphasizing more laboratory and field work will become more evident.

Alternative Strategies:

1. Suggest to the Ministry of Education that agricultural curricula be revised to include more laboratory and practical field work and that instructors in the colegios develop and submit course outlines, lesson plans outlining course content and plan of instruction.
2. Encourage Agricultural Faculties in the Universities and Technical Institutes to establish a review committee for purposes of recommending uniform agricultural curricula emphasizing laboratory and practical field work for all levels of instruction.
3. Ministry of Agriculture, in cooperation with professionals from each level of agricultural education will design and develop improve curricula emphasizing laboratory and practical field work and recommend adoption in teacher work plans.

Recommended Strategy:

Alternative three is recommended since the Ministry of Agriculture (1) is a primary employer of agricultural graduates, (2) has long term interests in improving productivity in the agricultural sector and (3) has the technical competence to develop the needed curricula.

Expected Output:

1. Basic curricula guides developed for agricultural secondary schools, technical agricultural institutes and university faculties emphasizing laboratory and practical field work.
2. Typical teacher work plans to serve as models and guides for individual schools and instructors.

Estimated Inputs:

1. 2 man years of professional staff time (plus support staff).
2. 2 man years of technical assistance in development of curricula and program standards.
3. Scholarships for three man years of training in development of agricultural curricula.
4. Agreement or convenio with a selected University which has

a strong Department of Agricultural Education, to provide in-country training, consultation and technical assistance in development of curricula and program standards.

Recommendation 3.5

Evaluate the University training programs in agricultural and related faculties including the ranking of priorities for program improvement.

Problem:

Although the goals and objectives for all University Faculties of Agronomy may be very similar, if not the same, and the goals and objectives for all faculties of veterinary medicine may be similar, yet the interpretation of those goals and the established standards for achieving them appear to vary widely among the various faculties. Program standards should be established for each type of agricultural and related faculty; and then, evaluation procedures should be set up to measure the performance of each institution toward achieving established goals and objectives, and to rate each institution according to established program standards (including curricula, qualification of instructors, instructional facilities, teacher work plans, student achievement, etc.).

Alternative Strategies:

1. Request the Ministry of Education to set up a committee or task force to evaluate the training programs in agricultural and related faculties of the universities, and to rank priorities for program improvement.
2. Organize a task force among related agricultural faculties of the Universities to perform this job.
3. Request the services of an impartial international task force, composed of representatives of notable foreign Universities, to perform the job.
4. Ministry of Agriculture set up an evaluation unit or committee to organize an evaluation task force composed of professional technical agricultural specialists of the Ministry, representatives of the related Ecuadorian University faculties and private agribusiness, together with consultants from international educational or research institutions.

Recommended Strategy:

Alternative number four above is recommended to establish and implement a system to evaluate the university training programs in agricultural and related faculties and to rank priorities for program improvement.

Expected Output:

1. An initial evaluation of university training programs in agricultural and related faculties, together with a ranking of priorities for program improvement, as outlined in the fourth alternative above.

2. Establishment of a permanent evaluation unit or office within the Ministry of Agriculture to supervise future routine evaluations as required. This could be handled through the same unit that would handle teacher certification and program standards for instruction.

Needed Inputs:

1. 2 man years of professional staff time.
2. 24 man months of consultants (approximately 8 consultants for 3 months each).

Recommendation 3.6

Increase the quantity and level of trained manpower for education in agriculture at the University level consistent with the University Agricultural Training Program evaluation.

Problem:

Slightly over 150 university graduates per year are entering the public and private services as Ingenieros Agronomos, Veterinarians and Agricultural Engineers, with only general course training without specialized emphasis. There are no post graduate university programs for Master or Ph.D. degrees.

Much of the university level instruction is being given by part time professors. Furthermore, a large percentage of the instructors have little or no graduate training. A need exists to provide university instructors the opportunity for advanced study in their subject matter areas.

Recommended Strategy:

Universities should make special provisions for faculty members to study in the National Graduate Program in Agricultural Science, to be established under recommendation 1.4. The purpose is to increase the quantity and level of trained manpower for education in agriculture at the university level consistent with the University Agricultural Program evaluation. Until the national Graduate Program is activated, Universities should cooperate with MAG and INIAP to assist key faculty members to obtain scholarships as recommended in 2.2 and 4.2.

Expected Output:

1. Faculties in agricultural science with a higher level of training within the country, including more specialized training.
2. Consistent with the university agricultural program evaluation, a higher level of training for the undergraduate students would also be achieved.

Needed Inputs:

Those inputs specified in Recommendation 1.5 would be sufficient to meet this recommendation.

Recommendation 3.7

Develop improved community programs for education in agriculture including (a) youth development such as 4-F and (b) farm and home development with emphasis on nutrition and improved quality of life for rural families.

Problem:

There exists a number of community programs being sponsored in part by cooperatives and serviced through IERAC, CREA, PREDESUR, etc., but they do not reach nearly all the rural families. In interviews with small farmers, many expressed a desire and need for technical help from agricultural specialists. There are not enough agricultural specialists with practical training to meet the needs.

Alternative Strategies:

1. Develop community programs through the rural elementary school teacher.
2. Develop community programs through agricultural secondary schools.
3. Develop community programs through the service personnel of the Ministry of Agriculture, in cooperation with the agricultural instructors of agricultural secondary schools (colegios) and universities. Use the facilities of both secondary and primary schools, as well as those of the National 4-F Centers to train community leaders and to hold group meetings. Train community leaders in youth activities, nutrition, food production and preservation, etc. In areas where needed, establish rural capacitation centers for use by MAG service personnel in conducting community education activities for campesinos, especially women. Special attention in this capacitation program should be directed toward the rural landless campesino families.

Recommended Strategy:

Alternative strategy 3 is recommended, since the Ministry of Agriculture has more personnel trained in the technology of food production, and who are closer to rural life problems of the campesino. This would strengthen the informal educational efforts of the Ministry.

Expected Output:

1. Improved community programs in agriculture for youth and adults, with increased emphasis on farm and home development, nutrition and improved quality of life.

2. Increased numbers of 4-F organizations and community adult programs for greater participation in activities leading toward better rural living.

3. More capacitation centers in rural communities distributed throughout the country.

Needed Inputs:

1. Three man years of technical assistance per year for 4 years for a total of 12 years.

2. Scholarships for 12 people, one year each.

Recommendation 3.8

Expand and improve programs for training women to work in farm and home improvement.

Problem:

There is currently no university or graduate level program especially designed for training women to work in farm and home improvement. In most rural communities, the women are responsible for much, if not most, of the livestock and poultry projects as well as the vegetable production for home use, in addition to much of the field work. They have responsibility for all the internal maintenance functions of the home, including child care, nutrition, health, clothing, etc., and therefore play a key role in decision-making that involves rural family welfare. Considering that both men and women community development service personnel have equal training and capability, the woman could more effectively communicate with rural women to learn their problems than could the man. She could also be more effective in introducing improvements in rural life styles. It is only natural to suggest that more women be trained for this kind of work.

Alternative Strategies:

1. Bring this problem to the attention of the Ministry of Education and determine whether current school curricula could be expanded to provide more farm and home development training at the diversified secondary levels (4th, 5th, and 6th course levels) and also at the Instituto Normal Superior level. MAG could offer assistance in curricula improvement and in training instructors for this farm and home phase of the program. MAG could also conduct short courses at their National 4-F Center or other campesino training centers for instructors or "trainers" for women going into community development programs.

2. Solicit international service agencies to set up centers for training women in rural community development programs.

3. Request Universities to establish and/or expand their programs for training women in farm and home development, either at the professional or technical level, or both.

Recommended Strategy:

A combination of alternative, 1 and 3 are recommended to speed up earlier training of larger numbers of women for farm and home development.

Expected Output:

1. Expanded curricula with increased emphasis on training women for farm and home development, at the secondary school level and above.

2. Increased number of special short courses to provide technical and practical training for women who would serve as community development workers or trainers for others.

3. A capacity for training at least 40 women per year to go into farm and home development work.

Estimated Inputs:

1. 5 person years of professional staff time, plus support and clerical personnel.

2. 1 person year of technical assistance per year for 3 years.

3. 12 person years of scholarships.

4. Extension (Technology Transfer) and Agricultural Support Services

Recommendation 4.1

Improve the organization of the technology transfer process by:
(a) Developing and implementing a personnel system including job description, classification, evaluation, and advancement procedures.
(b) Developing a plan with appropriate linkages between Central Divisions and Zone Offices focusing on field problems. (c) Strengthening program planning, linkages and policies of the technology transfer staff with research, education, national programs, the privated sector and other agricultural service entities.

Problem:

Ecuador's technology transfer process is limited by a lack of clear-cut work plans for personnel, by problems in the supervision of personnel, and by inadequate incentives and mobility for field personnel. This situation with regard to incentives is partly due to the lack of financial resources in the Ministry to fully implement the existing system of incentive.

Coordination and communication between Zone Offices and the Central Divisions are often faulty with a resulting loss of coordination of data gathering and use. Between MAG personnel and other agencies there is often loss of productivity and in some cases there is duplication of effort because of faulty communications. Similarly, farmer problems and needs are not adequately communicated to the research and service agencies and/or private sector.

Alternative Strategies:

1. Make an executive decision in the Ministry to require each Division and Zone Office to develop and file a complete plan including: (a) Job descriptions and classifications including incentives and evaluation procedures. (b) Linkages with other zones and agencies. Once these are filed, have a review team from the central office and other directorates review the plan for adequacy, uniformity and appropriateness.
2. Have the central office staff construct appropriate models for the personnel system and linkages and require adaptation and implementation by the Divisions and Zone Offices.
3. Establish a task force of five or more representative persons from the Central Divisions and Zone Offices to develop appropriate personnel and linkage models and monitor these systems for improvement of linkages and policies related thereto. This development process may require on-site visits to other countries by two or three persons for reviewing systems now in operation. The models developed by the task force should give consideration to the role of the Zone Offices in obtaining clientele inputs for program planning. The model should also consider the importance of linkage relationships and policies at the zone level and at higher levels in the Ministry. The system should give consideration to special incentives for persons with high performance ratings on the evaluation of their work in a well-defined job. For example, salary increases or higher bonuses could be given to the top 10 or 20 percent of the personnel.

Recommended Strategy:

The recommended strategy is number three because it provides for total agency involvement and broader expertise relating to both field and central office problems. It also provides for a shortening of the implementation process due to appropriate involvement of field and central office personnel.

Expected Output:

A system of well-defined job responsibilities, incentives, lines of supervision and authority and clear channels for linkages with other agencies for improved services to producers.

Needed Inputs:

1. An executive decision at the appropriate level in the Ministry.
2. Assignment of a Task Force of five to eight people of MAG to spend three to five months to develop and assist in implementation of the desired system to improve technology transfer.
3. Three members of the task force to travel to a country such as the U.S. for a two month training period to study established systems in REE units such as state cooperative extension services, and the agricultural service systems such as state and federal

departments of agriculture.

4. Financial incentives for high performing workers in well-defined positions.

Recommendation 4.2

Expand the size of the technology transfer staff and increase the level of training of all field personnel, particularly in specialist areas including home economics.

Problem:

The extension field staff lack adequate training in extension methodology and in higher level agricultural technology and home economics to carry out the most effective and complete technology transfer program in the rural sector. Only a small number have received training beyond the Bachelor of Science degree. Furthermore, the number of trained personnel in the agency are not adequate to fill the needs of the program.

The Research and Education sectors have 4.0 and 2.5 times as many technicians trained to the Masters degree level, respectively, as does the Extension system. Since the extension service must work hand in hand with these other systems, this lower level of training leaves the extension staff at a disadvantage. This difference can be especially sensitive and have a definite effect on inter-agency coordination, transfer of understanding of research and technical results on program development and implementation.

Recommended Strategy:

Graduate level training must be provided to the staff of the extension services. Sometime in the future there will be some opportunity for graduate study in Ecuador when a graduate program is activated. Meanwhile, scholarships for graduate study are proposed for extension personnel to be carried out in other countries. It is possible for graduate courses to be taken in other countries and the thesis completed in Ecuador.

A personnel orientation system can also be developed to provide strong practical farm and family oriented training for new staff members joining MAG. Such training should be three to six months in length and should include work in the field.

Expected Output:

Fifty field personnel will receive graduate training thus preparing them to serve more effectively in the development and implementation of technical assistance projects for the rural farm family. New personnel would be more adequately prepared to assist campesino families in solving their problems.

Needed Inputs:

Twenty scholarships will be provided on a yearly basis for a period of five years to update and improve the technical base of the Ecuadorian Extension System. A task force of MAG personnel should develop the details of the new employee-orientation and training program.

Reommendation 4.3

Improve the technical skills of the technology transfer staff by strengthening in-service training programs and program effectiveness in priority areas, including but not restricted to: (1) Practical farming methods including technologies applicable to small producers. (2) Communication skills necessary for working with small producers, diverse ethnic groups, youth, women, and other specialized clientele. (3) Methods and procedures of group organization. (4) Improve the physical accessibility of field personnel to clientele groups.

Problem:

Evidence indicates that a large majority of the current field staff employed by the MAG have not received training or experience at the small farmer level of production or in group organization. Since the current program of MAG emphasizes technology transfer and service to small farmers this lack of training and experience is especially limiting program progress. Similarly, most MAG employees have not lived in rural areas and have limited understanding of campesino family problems. MAG personnel are also limited in their ability to work in the field because lack of vehicles and equipment.

Recommended Strategy:

In-service training can be provided to extension field technicians by first training a team of five technicians from each zone during the first year of an overall training project.

This training will provide the necessary skills to work with the entire campesino family and to work more effectively in organizing these families into groups for more effective community action programs. The team will receive training in the production of crops and livestock, home economics and youth program development (This training must be strongly oriented to the campesino family situation and the essential practical methods and the communicative skills needed to achieve a transfer of technology. Each zonal team will develop examples of five basic technology packages during the training program which will be utilized and tested in the course of the year.

At the beginning of the second year of the project each zonal team will receive one month of training in teaching methodology as a preparation exercise and experience prior to training other extension technicians in their zone for technology transfer to campesino families.

Following the teacher training program the zonal team will train the remaining technicians within their zone during the remainder of that year. During the 3rd year the entire MAG staff will utilize this system of technology transfer coordinated with the technology packages prepared under recommendation 4.6.

Expected Output:

At the end of the project, the entire field personnel of MAG will be more adequately prepared to assist campesino families.

Needed Inputs:

1. During the first year of the program five technicians should be trained from each of the ten zones. Total number of extension personnel trained is equal to 50 person years.

2. Training activities during the second program year is equivalent to an additional 50 person months of teacher training preparation.

3. Five counterparts from the MAG's Central Staff will work with the specialists during both training programs. A total of 4.0 man years of short-term technical assistance for the training programs in the first and second years is needed.

4. To solve the problem of mobility of personnel, vehicles and equipment equal to 5 million sucres (U.S.\$200,000) is needed per zone and a similar amount for the MAG central staff, or a total of 55 million sucres (U.S.\$2,200,000).

Recommendation 4.4

Improve the technology transfer process by strengthening skills of program specialists in areas of crop and livestock production, marketing and product utilization and in the conduct of regional field research and demonstration.

Problem:

The specialist role in the technology transfer process is vital to the MAG serving the total needs of agriculture. Varied duties in the present organization gives less time and emphasis to specialized program needs. Often, lack of trained personnel in specialized areas of production, marketing and utilization of crops limits program effectiveness. Specialists in agricultural credit and financial management are needed to work cooperatively with financial agencies in credit programs for campesino families.

Recommended Strategy:

The specialists' role and function needs to be identified, defined and emphasized in the zones. Participation in appropriate training programs at international centers and in cooperation with INIAP is vital. The role and function of the specialist is very important in programs of technical assistance, demonstration and field trials conducted cooperatively with INIAP and staff members

of the National Programs. Linking of projects with credit agencies should be an important phase of the program.

Expected Output:

A specialist staff that can effectively serve total program needs including the conduct of regional field trials and demonstrations.

Needed Inputs:

50 short-term scholarships of 6 months length (5 per zone) for specialized training including the conduct of field demonstrations and research. Total of 25 man years of scholarships.

Recommendation 4.5

Expand and improve the technology transfer process by planning and implementing a project to utilize radio in disseminating extension information.

Problem:

Campesino families are receiving neither the amount nor the type of production technology they need to increase and improve the quantity and quality of their agricultural production. Radio communication is a system familiar to rural families. Ecuador does not have sufficient well-trained personnel to provide necessary technical assistance and advice to large numbers of campesino families. Radio programs have been used in many developing countries to disseminate information for development and social change efforts in rural areas.

Recommended Strategy:

The use of radio programs to reach campesino families can be an efficient and effective means of communicating the application of practical and applied technology to a large number of small farmers. A radio program should be developed to advise campesinos on how to use appropriate technology.

Subject matter specialists should prepare special materials for the various radio stations and make this available by a "tape service."

Field staff would participate in the evaluation of the program after a testing period before it is considered a final field program.

Expected Output:

A system for wide dissemination of applied production technology prepared well in advance to conform with seasonal production needs. This includes information on availability of agricultural inputs and current market prices of farm products. The system would also include information of general benefit to farm families.

Needed Inputs:

The cost of needed equipment would be included in the total strengthening program for the communications Department of MAG and given in Recommendation 4.8. This would also include a 6 month scholarship in radio communications for a training program for the MAG staff member responsible for originating the broadcast programs.

Recommendation 4.6

Improve the technology transfer program focus by developing appropriate technology packages based on research results concerning campesino and rural landless family problems such as, but not restricted to:

- 1) Small scale crop and livestock farming systems.
- 2) Small scale power and machinery systems.
- 3) Development of labor skills for farm and home enterprises and for off-farm employment.

Problem:

The present program is not in proper focus with the needs of the campesino families. The felt needs identified by clientele groups include technical assistance in areas such as small scale crop and livestock production systems; small scale power and machinery systems; home education in family nutrition, sanitation and health; and home management (including clothes making and repair). Agricultural and rural landless families have limited training opportunities for strengthening their personal competitive position in the economy as a whole.

Recommended Strategy:

The extension field staff in each zone would have assistance from technical advisors and INIAP personnel for developing appropriate technology packages. This team of resource personnel would work directly with campesino families for obtaining information for the purposes of planning and preparing appropriate technology packages. These packages would be oriented to food production problems based on existing research results here and elsewhere and to other problems such as family health and well-being.

During the first year the team of personnel would develop technical packages in crops, livestock, and use of small farm implements. Application in all zones would occur over a 2-year period.

Technology packages should be focused on, but not limited to, identifying appropriate seed varieties, cultural practices, and harvesting methods for subsistence and commercial crops. Other needs should include improved technology in the areas of soil management, irrigation opportunities, and crop rotation systems that improve soil fertility.

The project should also identify small scale power and machinery systems that are economically advantageous for improving the family's farming efficiency and productivity.

At the onset of the third year, the program will have reached a high level of use in all zones.

Expected Output:

An extensive (technology transfer) program that provides technology packages designed especially for the needs of campesino families.

Needed Input:

Technical assistance is needed to work with the MAG specialist staff, the INIAP personnel and the zone field staff in preparing technology packages: Two person years in the livestock area, two person years in the crop area, two person years in agricultural engineering and two person years in the field of home economics and farm-family management.

Recommendation 4.7

Improve the technology transfer program focus by integrating program specialists in a team approach for demonstration projects in solving problems of campesino families.

Problem:

Campesinos have problems greater than a single technical generalist or specialist can handle. There is a definite need to develop an integrated group of specialists to study and develop methodology to approach this particular problem. The Baseline study included review of program techniques used in some other countries. The Extension Service in Columbia has a program in progress oriented to needs of campesino families. It involves the use of teams of specialized personnel to cope with the total programs of the family.

Home economists play a major role in rural development because campesino housewives are in charge of the operation and management of many farm production enterprises. Therefore, it is essential to increase the number of women employees to work with campesino families. It will be necessary to provide them with in-service training to prepare them in the basic sciences of home economics, and livestock and crop management.

Recommended Strategy:

Select a team of five experienced technicians from each of the basic staffing areas required in a field extension office, i.e. home economics, crop production, farm management and marketing, livestock production, and youth program specialists to receive practical training in appropriate methods for demonstrating production practices and solving problems of campesino families. The training would include orientation to the concept used in Colombia. After training, this team would develop a plan for field testing the team approach. After field testing this group would become involved in demonstrating the technique to other extension workers and training them to use it.

Expected Output:

At the end of three years a cadre of extension field personnel trained, oriented and confident in using the team approach to working with campesino families.

Needed Input:

Develop a plan for a team of five extension technicians to spend two weeks in Colombia, studying Colombian programs of working with campesino families. The total training will require 0.6 man years of scholarships. The training program will be coordinated with training activities in Recommendation 4.3, strengthening in-service training programs in priority areas.

The technicians, upon their return, will spend a month developing a program plan for placing into practice in Ecuador, the extension methodology observed in Colombia.

Recommendation 4.8

Improve the technology transfer program focus by strengthening the technical agricultural communications center for preparation and distribution of technology packages appropriate for campesino families.

Problem:

The communication center has limited ability to support the specialist staff and field personnel in the preparation and distribution of appropriate technology packages for campesino families.

Recommended Strategy:

To further develop and train, in-country, a team of communication technicians, it is necessary to provide 1.5 man years of technical assistance during a 3-year period, a program to assist specialists in designing and planning publications and instructional materials specifically oriented to campesino families. This effort will be coordinated with a 1.5 man years of technical assistance for publishing the Agricultural Science Journal.

Expected Output:

A staff of Ecuadorian technicians capable of preparing and distributing publications and materials in support of 25 or more technology packages to technicians and campesino clientele, explaining and graphically demonstrating the implementation of appropriate production technology.

Needed Input:

One and one-half man years of technical assistance and 5,000,000 sucres (U.S.\$200,000) worth of equipment for the development and publication of technology packages for campesino families.

Recommendation 4.9

Expand and improve agricultural services in planning, utilization and conservation of renewable natural resources.

Problem:

As previously stated, Ecuador has great renewable natural resources in the form of soil and water. The topography in some areas of the country, particularly the Sierra, presents some unique challenges in maintaining and utilizing these resources in food and agricultural production. At present, research in this area is limited and scattered among agencies. Similarly, action programs are widely located in rather autonomous groups of the Ministry. Experience of other countries emphasizes the importance of strong coordination and direction in programs to control soil erosion and to develop water management and use systems. A similar plan needs to be developed and implemented in Ecuador.

Recommended Strategy:

Only one strategy will be offered because of the complex nature of this problem and the unique experiences needed in integrating the planning, utilization and conservation of renewable natural resources. An experienced specialist in organization of soil and water conservation programs would be utilized in planning and implementing the development of an effective infrastructure in the utilization and conservation of renewable natural resources.

Expected Output:

More effective program in the use and conservation of renewable natural resources.

Needed Inputs:

Three man years of technical assistance and appropriate executive decisions in implementation of the plan.

Recommendation 4.10

Expand and improve statistical information systems for agricultural planning purposes.

Problem:

The most recent and complete statistics for agriculture is the agricultural census of 1974 which has not yet been published except for a few provinces. The statistics department in the Ministry of Agriculture's Division of Planning is small and working without adequate support in trained personnel and equipment.

Statistics are gathered by obtaining subjective estimates from field agricultural workers on hectares planted, yields and total production. This series is published quarterly, with a lag of about

three months. A second series on prices is published quarterly by obtaining information on prices farmers are receiving at the farm level throughout the country. Modern statistical techniques such as area frame sampling are not used.

A dynamic agricultural development program cannot be successfully executed without a timely and continuous flow of scientifically estimated information on areas planted, yields, production, numbers of livestock, current crop and livestock conditions and forecasts of production.

Presently, Ecuador does not have sufficient personnel, training nor equipment to generate adequate and timely statistics.

Alternative Strategies:

1. Organize a tripartite national agricultural statistics unit by combining statistics unit of the Central Bank, the unit under the authority of the National Census Institute, and the MAG Unit.
2. Build up the Department of Statistics in the MAG sufficiently to perform the statistical work necessary for the successful planning and execution of national agricultural programs.

Recommended Strategy:

Strategy number two is recommended. The present Statistics Department is already strategically located within the Division of Planning and can effectively contribute to national policy and planning.

Expected Output:

A modern statistical unit manned by adequately trained personnel, equipped to apply the science of statistics to collecting, processing and publishing strategic data on the agricultural sector in a timely fashion.

Needed Inputs:

1. 25 man years of MAG personnel.
2. 4 man years of long-term technical assistance and 18 months short-term technical assistance. The technical assistance to be arranged by an agreement with a government or other entity outside Ecuador which has a modern statistical gathering system in operation.
3. Twenty-seven million sucres (U.S.\$1,000,000) for purchase of a computer.
4. A minimum of five scholarships for masters degrees in statistics and two for Ph.D. degrees in statistics over five years.
5. Two one-year scholarships for training in computer operation, programming and analysis.

Recommendation 4.11

Expand and improve agricultural services in the area of economic planning, including agricultural policy analysis and product marketing.

Problem:

Presently, the responsibility for making the necessary statistical and basic economic studies necessary for a rational marketing and price policy is shared by the Direccion General de Planificacion and the Direccion de Comercializacion y Empresas. Under present circumstances and levels of trained manpower in the two Divisions, the arrangement appears acceptable and perhaps the only one feasible. However, there is a need to upgrade technical training and modern computing equipment to more efficiently generate the information needed. To build up both Divisions would be wasteful in scarce manpower and associated resources. One center for doing all statistical and basic economic studies would more efficiently serve all entities needing such data for policy analysis planning and programming.

Recommended Strategy:

Only one strategy is recommended in keeping with the recommendations to greatly strengthen the departments of statistics and planning and policy analysis in the Direccion General de Planificacion. During the transition period, while improvements are taking place, the Direccion de Comercializacion would continue to collaborate with the Division of planning as directed in the Reglamento Organico Funcional, 1977, but gradually relying more and more on the strengthened capacity of the planning departments for basic statistics and studies. A close collaboration between the two Divisions will continue to be necessary; the Planning Division to provide basic and fundamental research and statistics and the Marketing Division to use information to recommend policy and action programs and to supervise the activities of ENAC, ENPROVIT and the mixed private-public companies.

Expected Output:

A strong capacity to perform scientific statistical and economic research within the Ministry of Agriculture able to serve the Division of Marketing, the entities under its supervision, as well as all other Divisions within and without the Ministry for which the information may be useful. This concentration of effort and division of labor will certainly strengthen the Ministry by forcing manpower within the other division to more effectively execute action programs.

Needed Inputs:

1. An Administrative Directive at the appropriate level to carry out this recommendation, along with the recommendations to strengthen the departments of planning and policy analysis and statistics given elsewhere.

2. Two scholarships for masters degrees in marketing (one to be in grain marketing) to be awarded for personnel to work in the Division of Marketing.

3. Five short-term scholarships, 3 to 6 months each for training abroad in specific areas of marketing, such as Management of Marketing, Storage and Elevators, etc.

D. Priorities for Development of the REE System

The Methodology proposed for the Baseline Study called for setting of priorities in three, five and ten year planning periods. Graph 1 presents information on the proposed recommendations in such a manner that priority and timing of inputs can be read directly.

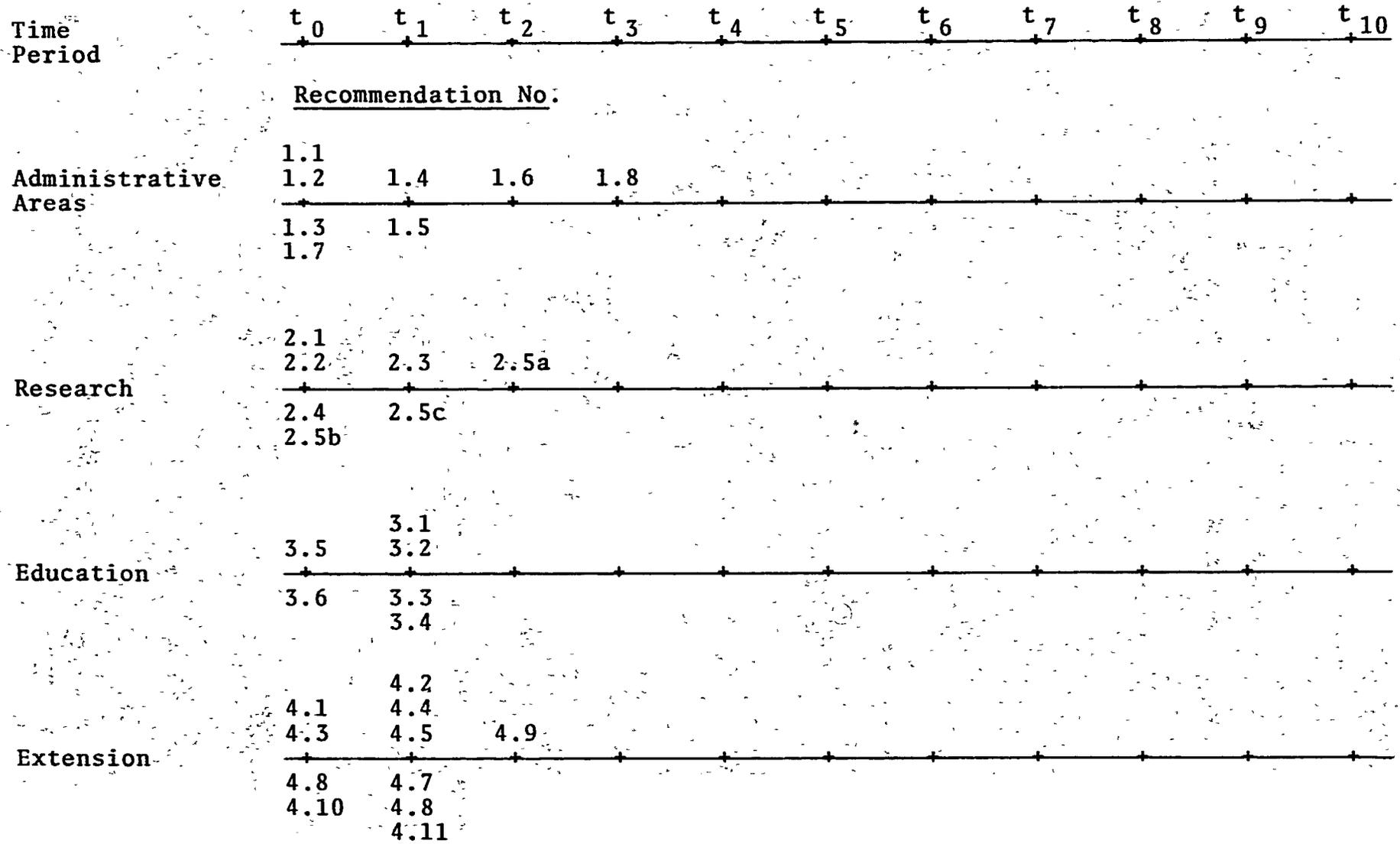
Section A of the graph shows initiation of the proposed recommendation. Numbering of recommendations is consistent with numbering given in the previous section of this report and follows the major categories of General Administration, Research, Education and Extension. Hence, recommendation 1.1 is proposed to commence in the initial period with recommendation 1.4, 1.6 and 1.8 to initiate in the following time periods 1, 2 and 3, respectively.

Section A presents information only on when the recommendation is proposed to commence. Sections B, C and D present information on the flow of resources or inputs during the life of the recommendation. Hence, recommendation 2.2 (Section B) shows person years of training starting in the initial time period (t 0) and continuing through time period four (t 4). Recommendation 1.5 (Section C) shows a need for technical assistance starting in time period one (t 1) and continuing through the ten year planning period. Recommendation 1.5 (Section D) also requires facilities and operating expenses starting in time period two (t 2) and continuing for the ten year planning period.

Estimated inputs are shown by year and for the total ten year period.

GRAPH 1

Section A PRIORITIES AND TIMING OF ACTIVITIES FOR THE RECOMMENDATIONS



(179)

Continuation

SECTION B

TRAINING

Time Period	t ₀	t ₁	t ₂	t ₃	t ₄	t ₅	t ₆	t ₇	t ₈	t ₉	t ₁₀	Total	
Recommendation												(man-years)	
1.3	10	10	10	5	5							40	
1.4	.5	.5										1	
1.6		2	1									3	
Administration	10.5	12.5	11	5	5							44	
2.1		.5										.5	
2.2	25	20	20	20	15							100	
2.5a				3	8	10	8	1				30	
2.5b		7	15	18	15	15						70	
2.5c			5	10	10	5						30	
Research	25	27.5	40	51	48	30	8	1				230.5	
3.2		2	5	4								11	
3.4		1	2									3	
3.5		3	5	4								12	
3.6		2	3	3	2	2						12	
Education		8	15	11	2	2						38	
4.1	.5											.5	
4.2		10	30	30	15	15						100	
4.4		5	8	8	4							25	
4.7		.5										.5	
4.10		4	4	4	4	2						18	
4.11			2	3	2							7	
Extension	.5	19.5	44	45	25	17						151	
TOTAL	36.0	67.5	110	112	80	49	8	1				436.5	

(180)

SECTION C

FOREIGN TECHNICAL ASSISTANCE

Time Period	t ₀	t ₁	t ₂	t ₃	t ₄	t ₅	t ₆	t ₇	t ₈	t ₉	t ₁₀	Total
Recommendation	(man-years)											
1.1	1	1										2
1.4	1	1										2
1.5		2	4	8	10	12	12	10	8	8	6	80
1.6			1	1								2
1.7	1	1										2
1.8				1	.5							1.5
Administration	3	5	5	10	10.5	12	12	10	8	8	6	89.5
2.3		1	1									2
2.5a			1	1								2
2.5b	1	2	2	1	1	1						8
2.5c		1	1									2
Research	1	4	5	2	1	1						14
3.1		1										1
3.2		1	1	3	3	3						11
3.3		.5										.5
3.4		1	1									2
3.5		1.5	.5									2
3.7	1	3	3	3	2							12
3.8	1	1	1									3
Education	2	9	6.5	6	5	3						31.5
4.3	2	2										4
4.6	2	4	2									8
4.8		1	.5									1.5
4.9				1	1	1						3
4.10	1	1.5	1.5	1.5								5.5
Extension	5	8.5	4	2.5	1	1						22
TOTAL	11	26.5	20.5	20.5	17.5	17	12	10	8	8	6	157.0

Continuation

SECTION D

FACILITIES AND EQUIPMENT

Time Period	t ₀	t ₁	t ₂	t ₃	t ₄	t ₅	t ₆	t ₇	t ₈	t ₉	t ₁₀	Total	
Recommendation												(U.S.\$1,000)	
1.5			1,500	100	100	100	100	100	100	100	100	2,300	
1.6			150	150	50	50	50	50	50	25		575	
1.7	20											20	
Administration	20		1,650	250	150	150	150	150	150	125	100	2,895	
2.5a			110	110								220	
2.5c		110	110									220	
Research		110	220	110								440	(182)
3.1		50	50									100	
3.3		1,050	1,000	1,000	1,000	1,000						5,050	
Education		1,100	1,050	1,000	1,000	1,000						5,150	
4.3	500	500	500	500	200							2,200	
4.8		100	100									200	
4.10		500	500									1,000	
Extension	500	1,100	1,100	500	200							3,400	
TOTAL	520	2,310	4,020	1,860	1,350	1,150	150	150	150	125	100	11,885	

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APPENDIX II.1

PERCENTAGE OF CHANGE IN THE PROPORTION OF URBAN AND RURAL POPULATION
BY PROVINCES - 1950-1962, 1962-1974

<u>Provinces</u>	1950 - 1962		1962 - 1974	
	<u>Urban</u>	<u>Rural</u>	<u>Urban</u>	<u>Rural</u>
Total - Mountain (Sierra)	6.6	- 6.6	5.4	- 5.4
Azuay	5.9	- 5.9	6.6	- 6.6
Bolívar	1.4	- 1.4	1.5	- 1.5
Canar	-.3	.3	.4	- .4
Carchi	1.8	- 1.8	2.7	- 2.7
Cotopaxi	4.5	- 4.5	- 2.0	+ 2.0
Chimborazo	.4	- .4	4.1	- 4.1
Imbabura	5.9	- 5.9	4.9	- 4.9
Loja	3.1	- 3.1	5.0	- 5.0
Pichincha	5.3	- 5.3	2.9	- 2.9
Tungurahua	14.1	-14.1	-1.4	+ 1.4
Total Coast (Costa)	7.7	- 7.7	6.0	- 6.0
El Oro	15.9	-15.9	6.1	- 6.1
Esmeraldas	11.4	-11.4	3.8	- 3.8
Guayas	9.0	- 9.0	4.7	- 4.7
Los Ríos	7.0	- 7.0	4.9	- 4.9
Manabí	1.7	- 1.7	6.2	- 6.2
Total East*(Oriente)			-.7	.7
Morona Santiago			.4	- .4
Napo			-.6	.6
Pastaza			6.1	- 6.1
Zamora Chinchipe			-5.3	+5.3

*For 1950-1962, no information was available.

SOURCE: Classes of Population

APPENDIX II.2

RATE¹ OF MIGRATORY CHANGE BY PROVINCE²

<u>Province</u>	Rate of Migratory Change
Pichincha	+19.5
Guayas	+12.0
El Oro	+10.5
Esmeraldas	+ 8.0
Los Rios	- 1.0
Imbabura	- 3.2
Tungurahua	- 10.0
Canar	- 12.5
Azuay	- 12.5
Manabi	- 13.0
Chimborazo	- 13.5
Cotopaxi	- 15.0
Carchi	- 16.0
Loja	- 18.0
Bolivar	- 26.0

SOURCE: National Census Office, Third Population Census, Second Housing Census, Ecuador, 1974.

1 The proportion, expressed as the percentage which those migrating (immigration or emigrating) represent of the total population of the province.

2 The East (Oriente) is not included since the figures are very small.

APPENDIX II.3
1972 INDICATORS OF HEALTH SERVICES

Regions PROVINCES	No. of Doctors	Doctors per 10,000 in- habitants	No. of Hospitals	No. of Beds	Beds per 1000 in- habitants
REGION 1	100	1.88	16	712	1.3
CARCHI	22	1.77	4	206	1.7
ESMERALDAS	24	1.25	7	206	1.1
IMBABURA	54	2.45	5	300	1.4
REGION 2	842	8.99	52	3.760	4.0
NAPO	8	1.95	5	205	4.9
PICHINCHA	843	9.31	47	3.555	4.0
REGION 3	115	1.33	11	742	0.9
MANABI	115	1.33	11	742	0.9
REGION 4	213	1.92	36	1.574	1.4
BOLIVAR	24	1.29	1	173	0.9
CHIMBORAZO	61	1.56	10	547	1.4
COTOPAXI	443	1.76	9	288	1.2
PASTAZA	9	3.91	3	93	4.0
TUNGURAHUA	76	2.78	13	473	1.8
REGION 5	785	4.18	55	4.726	3.2
GUAYAS	742	4.95	49	4.484	3.0
LOS RIOS	43	1.13	6	242	0.6
REGION 6	136	2.70	19	1.079	2.1
AZUAY	106	3.29	13	762	2.4
CANAR	24	1.73	2	214	1.5
MORONA SANTIAGO	6	1.40	4	103	2.4

CONTINUATION OF APPENDIX II.3

REGIONS PROVINCES	No. of Doctors	Doctors per 10,000 inhabi- tants	No. of Hospitals	No. of Beds	Beds per 1000 in- habitants
REGION 7	97	1.44	26	978	1.5
EL ORO	48	1.86	14	480	1.9
LOJA	45	1.14	11	426	1.1
ZAMORA CHINCHIPE	4	2.00	1	72	3.7
REGION 8	4	10.00	2	47	12.2
GALAPAGOS	4	10.00	2	47	12.2
TOTAL	2.292	3.52	217	13,618	2.1

SOURCE: Statistical Series 1967-1972. INE, Quito, 1974.

PREPARATION: Division of Regional Studies

APPENDIX II.4

ACCESSIBILITY OF FARM FAMILY UNITS TO DIFFERENT TYPES OF COMMUNICATION ROUTES

REGION : MOUNTAIN (SIERRA)

Distances	TOTAL NO. FARM UNITS	1 HIGHWAYS						RAIL- ROADS	%	T.P.	RIVER	%	T.P.
		1st Class	%	T.P.	2nd Class	%	T.P.						
0 - 1.5	202.577	22.989	11.3	100.0	179.109	88.4	94.8	305	0.2	100.0	174	0.1	100.0
1.5 - 4.5	111.416	8.169	7.3	100.0	102.635	92.2	94.2	612	0.5	100.0			
4.5 - 9.5	52.377	2.180	4.2	100.0	49.584	94.6	89.6	613	1.2	91.7			
9.5 - 19.5	24.364	1.268	5.2	100.0	20.750	85.2	83.7	2.346	9.6	100.0			
19.5 - 39.5	7.293	698	9.6	100.0	6.595	90.4	94.6						
39.5 - 59.5	4.999				4.999	100.0	100.0						
TOTAL	403.026	35.304	8.8	100.0	363.672	90.2	93.3	3.876	1.0	98.7	174	-	100.0

(191)

(1) Includes asphalt roads.

(2) Includes improved, gravel, and stone roads, passable year-round and seasonal roads

T.P.: Time passable expressed as a % of days in the year.

SOURCE AND PREPARATION: Regionalization Office of the MAG

CONTINUATION OF APPENDIX II.4

ACCESSIBILITY OF FARM FAMILY UNITS TO DIFFERENT TYPES OF COMMUNICATION ROUTES

REGION : COAST (COSTA)

DISTANCES	TOTAL NO. FARM UNITS	1 HIGHWAYS						RAIL- ROADS	%	T.P.	RIVER	%	T.P.
		1st Class	%	T.P.	2nd Class	%	T.P.						
0 - 1.5	145.550	27.002	18.5	100.0	106.714	73.3	82.4	1,272	0.9	100.0	10.562	7.3	95.7
1.5 - 4.5	83.105	21.881	26.3	100.0	54.839	66.1	81.4	1,619	1.9	100.0	4.765	5.7	96.7
4.5 - 9.5	29.867	5,717	19.1	100.0	23,005	77.0	82.8	226	0.8	100.0	919	3.1	100.0
9.5 -19.5	11.248	1.816	16.1	100.0	7.621	67.8	77.6	109	1.0	100.0	1.702	15.1	96.2
19.5 - 39.5	4.338	476	11.0	100.0	2.612	60.2	85.7				1.250	28.8	100.0
39.5 - 59.5	952				952	100.0	96.6						
TOTAL	275.060	56.892	20.6	100.0	195,743	71.2	82.1	3,226	1.2	100.0	19,199	7.0	96.5

(1) Includes asphalt roads.

(2) Includes improved, gravel, and stone roads, passable year-round and seasonal roads.

T.P.: Time passable expressed as a % of days in the year.

SOURCE AND PREPARATION: Regionalization Office of the MAG

CONTINUATION OF APPENDIX II.4

ACCESSIBILITY OF THE FARM FAMILY UNITS TO DIFFERENT TYPES OF COMMUNICATION ROUTES

REGION: EAST (ORIENTE)

DISTANCES	TOTAL NO. FAM. UNITS	HIGHWAYS						RAIL- ROADS	%	T.P.	RIVER	%	T.P.
		1st Class (1)	%	T.P.	2nd Class (2)	%	T.P.						
0 - 1.5	13.216				12.364	93.6	99.9				852	6.4	100.0
1.5 - 4.5	5.540				4.476	80.8	98.9				1.064	19.2	100.0
4.5 - 9.5	2.815				2.090	74.2	100.0				725	25.8	100.0
9.5 -19.5	2.007				1.732	86.3	100.0				275	13.7	100.0
19.5 -39.5	1.370				1.279	93.4	98.1				91	6.6	100.0
39.5 -59.5	1.287				1.287	100.0	100.0						100.0
TOTAL	26.235				23.228	88.5	99.6				3.007	11.5	100.0

(195)

(1) Includes asphalt roads.

(2) Includes improved, gravel, and stone roads, passable year-round and seasonal roads.

T.P. Time passable expressed as a % of days in the year.

SOURCE AND PREPARATION: Regionalization Office of the MAG

APPENDIX II.5
MEANS OF TRANSPORTATION

REGION: MOUNTAIN (SIERRA)

DISTANCES	MOTORIZED		ANIMAL		RIVER		HUMAN		RAILROAD		TOTAL
	No.	%	No.	%	No.	%	No.	%	No.	%	
0 - 1.5	229.298	86.4	23.951	9.0	7.733	2.9	3.766	1.4	714	0.3	265.462
1.5 - 4.5	37.822	59.0	18.856	29.4	4.395	6.9	2.661	4.1	408	0.6	64.142
4.5 - 9.5	18.494	48.6	17.268	45.3	325	0.9	1.493	3.9	510	1.3	38.090
9.5 -19.5	9.151	39.7	10.057	43.7	897	3.9	681	3.0	2.244	9.7	23.030
19.5 -39.5	3.026	41.4	3.777	51.7			498	6.9			7.301
39.5 -59.5	1.826	36.5	3.175	63.5							5.001
TOTAL	299.617	74.3	77.084	19.1	13.350	3.3	9.099	2.3	3.876	1.0	403.026

(194)

SOURCE AND PREPARATION: Regionalization Office of the MAG

CONTINUATION OF APPENDIX II.5

MEANS OF TRANSPORTATION

REGION: COAST (COSTA)

DISTANCES	MOTORIZED		ANIMAL		RIVER		HUMAN		RAILROAD		TOTAL
	No.	%	No.	%	No.	%	No.	%	No.	%	
0 - 1.5	156.043	83.5	13.212	7.1	14.150	7.6	1.122	0.6	2.432	1.2	186.959
1.5 - 4.5	41.716	81.2	6.829	13.2	1.899	3.7	615	1.2	343	0.7	51.402
4.5 - 9.5	14.780	70.8	4.893	23.6	489	2.3	469	2.2	230	1.1	20.861
9.5 -19.5	7.533	71.4	1.252	11.8	1.599	15.2	52	0.5	114	1.1	10.550
19.5 -39.5	1.751	40.4	1.013	23.4	1.251	28.8	321	7.4			4.336
39.5 -59.5	952	100.0									952
TOTAL	222.775	81.0	27.199	9.9	19.388	7.0	2.579	0.9	3.119	1.2	275.060

(195)

SOURCE AND PREPARATION: Regionalization Office of the MAG

CONTINUATION OF APPENDIX II.5

MEANS OF TRANSPORTATION

REGION : EAST (ORIENTE)

DISTANCES	MOTORIZED		ANIMAL		RIVER		HUMAN		RAILROAD		TOTAL
	No.	%	No.	%	No.	%	No.	%	No.	%	
0 - 1.5	14.233	90.0	354	2.2	1.222	7.8					15.809
1.5 - 4.5	2.235	58.2	465	12.1	1.025	26.7	117	3.0			3.842
4.5 - 9.5	1.198	58.5	503	24.6	346	16.9					2.047
9.5 -19.5	147	7.6	1.454	75.1	276	14.3	58	3.0			1.935
19.5 -39.5	58	4.4	989	75.2	93	7.1	175	13.3			1.315
39.5 -59.5			1.287	100.0							1.287
TOTAL	17.871	68.1	5.052	19.3	2.962	11.3	350	1.3			26.235

(196)

SOURCE AND PREPARATION: Regionalization Office of the MAG

APPENDIX II.6

NUMBER OF FARM FAMILY UNITS ACCORDING TO SIZE CLASSIFICATION BY PROVINCES FROM 1954 TO 1974

Provinces	1-4		5-10		10-20		20-50		50-100		100-500		500-1000		1,000-2,500		+ de 2,500		TOTAL			
	1954	1974	1954	1974	1954	1974	1954	1974	1954	1974	1954	1974	1954	1974	1954	1974	1954	1974	1954	1974		
ARAYA	# 12,852 S. 5,900	22,005 10,124	21,743 48,700	20,375 43,336	3,132 22,800	3,255 21,425	1,352 17,800	1,524 19,724	545 17,900	929 27,308	157 10,400	337 22,374	155 30,320	174 30,206	42 31,520	10 11,390	11 14,700	10 16,047	6 50,500	40,059 27,573	49,634 249,600	
BOLIVAR	# 3,015 S. 1,600	6,068 2,617	8,474 23,202	9,834 25,129	2,943 21,200	3,176 22,504	2,002 27,500	2,221 30,858	1,448 41,200	1,643 49,202	339 23,800	358 32,700	181 24,940	148 6,900	10 7,767	11 16,200	11 3,316	7 75,500	3 8,223	19,434 260,700	25,464 159,734	
CHIMBORAZO	# 8,580 S. 4,600	12,425 5,493	20,045 47,720	21,809 54,437	2,550 17,700	2,885 20,241	935 12,100	2,807 34,035	585 18,800	619 18,279	205 14,300	226 15,290	236 50,700	234 47,969	58 25,120	41 25,160	29 44,000	26 33,959	17 80,500	16 120,178	33,221 332,600	41,088 276,651
COTACACHI	# 9,515 S. 4,800	12,331 6,023	12,523 29,200	16,048 37,289	2,161 14,400	3,582 24,704	1,008 13,700	2,146 29,137	913 25,800	1,381 40,587	267 17,700	629 36,659	178 36,700	263 50,428	33 24,000	30 19,374	23 34,800	31 47,825	22 124,000	10 43,673	26,413 392,100	36,552 335,067
PICHINCHA	# 7,681 S. 3,900	12,800 4,751	15,331 30,900	12,820 26,551	2,015 11,300	3,244 20,350	871 11,500	7,526 33,027	5,076 24,400	1,471 164,606	2,520 79,300	1,471 170,433	722 337,500	524 169,321	90 39,220	93 63,119	70 94,400	52 75,327	28 103,631	22 103,631	27,345 613,300	26,527 482,311
LOJA	# 5,506 S. 3,900	8,921 4,319	20,558 52,600	22,542 54,399	4,742 33,600	6,447 43,044	2,045 28,400	3,473 46,234	1,534 37,400	1,860 51,207	261 18,200	531 34,324	746 73,900	775 62,460	36 24,500	55 35,012	58 79,000	34 50,914	27 136,700	9 36,100	435,200 136,700	422,876 22,876
IMBABURA	# 10,390 S. 4,200	9,878 5,270	8,687 20,200	9,294 19,813	1,440 9,400	2,004 12,772	626 8,000	939 12,377	501 15,100	769 22,155	407 23,500	433 26,683	187 35,800	20 39,012	32 22,600	21 13,429	19 31,600	15 22,095	10 55,377	44,769 44,769	22,289 22,289	23,515 23,515
CARCHI	# 1,070 S. 600	1,781 678	4,031 9,800	5,414 12,086	1,330 8,900	1,808 11,551	686 11,551	1,020 13,293	491 14,900	678 19,846	226 14,400	267 17,444	156 31,300	184 34,626	25 17,700	12 7,977	20 27,200	7 12,870	9 53,200	2 12,100	8,044 106,800	11,373 102,422
TUNGURAHUA	# 16,025 S. 8,000	16,399 7,108	11,410 23,200	12,089 25,378	890 5,800	903 6,124	452 5,800	491 6,961	447 10,400	292 8,724	170 9,800	175 10,724	125 25,000	100 15,553	11 7,900	11 7,164	4 5,000	5 2,626	7 19,400	31,000 31,000	31,529 111,000	30,784 111,000
CAÑAR	# 7,080 S. 3,000	10,807 4,268	7,344 15,700	7,277 15,232	1,250 7,000	1,619 10,787	591 8,300	1,000 9,100	311 8,700	507 15,001	91 6,400	188 12,478	82 17,100	124 21,700	11 9,900	19 12,171	7 10,000	9 10,822	3 36,300	10,762 37,063	20,544 122,000	10,672 10,672
TOTAL SIERRA	# 83,714 S. 40,400	113,395 49,402	128,459 301,300	137,480 313,788	22,443 154,700	29,023 175,062	10,570 122,000	17,907 235,328	7,722 220,000	13,754 420,619	5,594 218,700	6,045 370,347	2,358 471,100	2,814 504,374	330 228,300	311 204,551	251 361,700	204 303,801	138 880,200	83 456,950	259,569 7,022,400	49,175 3,026,055
GUAYAS	# 3,538 S. 2,420	10,180 4,162	10,200 25,600	19,564 49,547	2,716 20,600	6,526 45,381	2,136 31,400	5,084 69,186	2,119 54,000	4,683 149,717	909 66,000	1,462 94,751	262 206,000	1,005 197,883	114 79,900	149 101,945	85 126,400	81 118,787	54 401,800	39 256,213	22,821 1,023,000	49,175 1,029,229
LOS RIOS	# 738 S. 500	6,220 2,633	2,670 6,700	9,544 23,772	1,139 8,100	3,946 28,230	910 13,000	3,395 47,408	1,550 49,400	3,132 94,456	788 53,600	1,020 72,269	740 147,600	788 124,028	105 76,600	78 97,400	61 49,766	36 159,300	28 47,000	11 602,000	8,723 533,014	28,121 533,014
E.S.A.B.I	# 3,657 S. 2,200	11,351 5,042	11,551 34,000	22,734 58,189	6,789 65,000	9,104 62,448	5,587 78,800	7,573 105,286	6,645 215,500	8,650 271,889	2,427 167,000	3,235 217,169	1,246 235,000	1,935 344,559	69 48,300	111 74,774	42 67,600	58 85,800	15 68,600	19 80,950	34,000 902,200	54,700 1,388,401
EMERALDAS	# 210 S. 100	524 212	2,700 8,000	2,874 7,609	1,466 10,200	2,150 14,545	1,040 11,200	2,545 33,260	708 21,800	3,779 112,647	278 18,700	2,090 120,843	237 46,500	800 138,326	15 10,200	64 39,795	78 25,400	19 24,183	5 15,600	7 29,735	6,677 171,000	14,832 520,214
EL ORO	# 530 S. 490	2,424 1,062	3,739 10,600	5,242 13,060	1,695 12,900	1,157 15,019	1,631 16,000	671 22,104	1,424 20,800	331 43,871	554 22,400	234 37,245	522 50,100	31 98,599	46 21,400	9 30,289	14 14,600	3 19,063	5 30,000	3 11,463	8,400 139,000	12,025 230,775
TOTAL COSTA	# 8,673 S. 5,600	31,099 11,418	30,860 84,900	59,958 152,175	13,807 116,000	23,871 169,223	10,830 152,200	20,229 277,244	11,693 371,500	21,680 663,580	4,733 328,500	8,431 542,277	3,419 685,200	4,990 913,861	334 235,400	448 299,553	213 321,600	207 285,526	113 676,500	79 424,838	84,655 2,919,200	170,952 3,752,735
MERUGA SANTIAGO	# S.	467 107	 2,143	845 5,087	750 5,087	1,128 15,153	2,454 76,876	2,589 157,273	773 112,249	21 17,878	9 12,254	4 23,300	8,459 622,027	 4	 4	 4	 4	 4	 4	 4	 4	
ZAMORA CHINCHIPE	# S.	194 91	573 1,426	441 2,759	677 8,716	1,419 43,760	1,300 76,923	397 59,235	5 3,547	4,966 155,657	 4	 4	 4	 4	 4	 4	 4	 4	 4	 4	 4	
NAPO	# S.	164 51	1,011 2,395	612 3,933	806 10,376	2,043 67,963	3,462 181,694	548 55,043	19 12,135	348 10,606	4 27,200	1 2,211	1 87,380	6 24,704	1 24,704	1 24,704	1 24,704	1 24,704	1 24,704	1 24,704	1 24,704	1 24,704
PASTAZA	# S.	40 18	468 1,164	181 1,147	188 2,531	576 18,284	567 32,261	183 24,163	6 3,810	1 1,500	1 2,500	1 2,500	1 2,500	1 2,500	1 2,500	1 2,500	1 2,500	1 2,500	1 2,500	1 2,500	1 2,500	1 2,500
TOTAL ORIENTE	# S.	865 267	2,897 7,130	1,954 12,924	2,789 36,576	6,492 206,483	7,917 448,318	6,492 448,318	250,490 250,490	37,170 37,170	24,370 24,370	52,900 52,900	1,076,328 1,076,328	 1	 1	 1	 1	 1	 1	 1	 1	 1
GALAPAGOS	# S.	5 1	32 98	29 206	36 512	91 2,848	95 6,400	43 6,607	1 1,200	332 17,952	 1	 1	 1	 1	 1	 1	 1	 1	 1	 1	 1	
TOTAL NACIONAL	# 92,387 S. 46,700	145,364 63,095	159,299 386,200	200,367 473,391	36,250 271,900	34,777 377,355	21,400 294,300	40,961 547,860	19,435 591,500	42,017 1,229,526	8,327 547,200	22,488 1,367,222	5,787 1,156,300	9,548 1,675,332	664 464,700	820 541,374	464 683,300	431 625,357	241 1,556,700	171 934,628	344,234 5,922,700	517,044 9,901,140

(197)

SOURCE: Agricultural Censuses of 1954 and 1974

PREPARATION: ERA

APPENDIX II.7
CHANGE IN AGRICULTURAL PRODUCTION FROM 1970 TO 1977

Products	Area in Ha.	1970 Yield Kg/Ha	Tot. Prod. in MT	Area in Ha	1971 Yield Kg/Ha	Prod. MT	Area in Ha.	1972 Yield Kg/Ha	Prod. MT	Area in Ha.	1973 Yield Kg/He	Prod. MT
A. Export Products												
Coffee	214.830	335	72.053	214.830	290	62.252	221.695	322	71.386	227.903	329	74.980
Cacao	228.262	235	53.584	219.077	323	70.806	217.915	311	67.784	213.100	297	63.374
Banana	190.176	15.309	2,911.342	157.494	17.416	2,742.948	132.703	19.454	2,581.639	121.193	20.595	2,495.927
Hemp	1.850	750	1.387	2.100	937	1.968	3.330	815	2.691	6.525	703	4.585
B. Raw Materials												
Dry Corn	80.190	1.266	101.516	110.740	1.088	120.528	101.840	989	100.748	140.850	1.089	153.346
Cotton	8.720	866	7.552	8.237	1.301	10.714	13.874	833	11.550	23.066	848	19.549
Soybeans	610	984	600	949	1.145	1.087	725	1.168	847	1.200	1.282	1.538
African Palm	4.825	4.381	21.140	6.410	4.912	31.484	7.850	5.672	44.528	8.589	6.795	58.358
Peanuts	6.169	854	5.270	10.313	954	9.838	11.666	925	10.788	15.401	814	12.541
Sugar Cane	29.000	78.500	2,276.500	30.000	79.000	2,370.000	30.059	85.910	2,582.369	34.678	71.866	2,492.152
C. Domestic Markets												
Wet Corn	211.480	794	167.990	241.305	582	140.385	249.990	633	170.642	123.770	811	100.342
Rice	86.593	1.830	158.500	56.587	2.401	135.900	91.393	1.889	172.700	84.757	2.410	204.300
Barley	133.920	590	79.087	119.971	573	68.700	118.957	617	73.400	93.178	852	79.400
Wheat	76.230	1.063	81.033	75.560	906	68.493	56.054	903	50.640	46.504	972	45.189
Haricot beans	81.600	506	41.331	67.100	449	30.148	62.139	419	26.038	66.639	482	31.961
Potatoes	47.220	11.474	541.794	53.452	12.310	680.740	37.129	12.546	473.348	43.576	12.374	539.198
Yucca	27.718	9.606	266.251	29.520	9.305	274.686	32.413	8.340	270.334	35.849	9.900	350.905
Lima Beans	24.005	625	15.009	22.711	654	14.862	13.259	715	9.479	17.450	708	12.352
Oranges	9.106	16.792	152.904	10.480	16.609	172.864	11.045	13.858	153.060	11.871	12.105	143.698
Plantains	35.930	12.924	464.350	36.698	11.922	437.500	36.093	11.431	411.771	35.283	11.283	398.100

(198)

SOURCE : MINISTRY OF AGRICULTURE

PREPARATION: ECU 78-006 Project

Continuation of Appendix II.7

Products	Area in Ha.	1974 Yield Kg/Ha	Tot. Prod. in MT	Area in Ha.	1975 Yield Kg/Ha	Prod. MT	Area in Ha.	1976 Yield Kg/Ha	Prod. MT	Area in Ha.	1977 Yield Kg/Ha	Prod. MT
A. Export Products												
Coffee	231.809	300	69.638	230.665	331	76.437	256.179	340	87.101	260.000	318	82.680
Cacao	221.726	411	91.039	229.540	328	75.272	229.500	284	65.192	238.000	304	72.120
Banana	121.806	21.973	2,676.411	109.860	23.160	2,544.327	107.300	23.960	2,570.925	100.540	24.373	2,450.690
Hemp	7.376	1.179	8.688	8.180	1.274	10.425	10.873	1.274	13.852	13.000	1.273	16.550
B. Raw Materials												
Dry Corn	161.640	1.148	185.628	165.000	1.552	190.000	165.000	1.204	198.607	163.000	1.007	164.100
Cotton	45.929	912	41.899	32.484	930	30.210	30.000	900	27.000	26.200	1.026	26.900
Soybeans	3.083	1.420	4.378	8.216	1.500	12.324	10.023	1.500	15.035	14.830	1.399	19.270
African Palm	10.407	7.288	75.846	11.576	8.164	94.512	14.372	7.764	111.587	14.263	8.749	124.800
Peanuts	19.439	884	17.180	11.920	958	11.424	11.900	664	7.900	12.000	700	8.400
Sugar Cane	35.083	74.543	2,615.186	37.080	78.976	2,928.437	44.000	85.582	3,765.588	47.000	80.000	3,760.000
C. Domestic Markets												
Wet Corn	109.615	698	76.252	108.763	830	90.247	111.766	850	95.000	84.000	647	54.350
Rice	102.687	1.813	186.200	131.600	2.442	321.400	130.000	2.521	327.800	103.000	3.100	319.300
Barley	60.844	922	56.100	71.558	878	62.801	71.600	878	62.872	60.000	674	40.460
Wheat	45.332	961	43.582	70.073	810	64.531	51.900	887	46.056	40.900	973	39.800
Haricot Beans	66.181	423	28.001	62.553	417	26.130	70.000	457	32.000	59.000	440	26.000
Potatoes	39.138	12.835	503.340	39.499	12.643	499.371	41.025	12.986	532.770	36.000	11.583	417.000
Yucca	38.968	10.350	403.319	34.565	10.228	353.517	38.490	10.500	377.813	31.173	7.193	223.545
Lima Beans	14.850	785	11.652	18.873	828	15.627	14.130	898	12.900	15.100	530	8.000
Oranges	12.644	13.800	174.487	13.687	18.266	250.000	16.630	18.049	300.000	23.447	22.169	519.794
Plantains	57.895	7.373	426.887	75.420	5.381	405.820	72.875	5.628	410.062	97.900	7.862	976.714

APPENDIX III.1

JOB CATEGORIES

HIGHER ADMINISTRATION

Minister
Undersecretary
Coordinator-General
Director-General

Assistant Directors-General
Executive Director
Agricultural Zone Director
Chief Internal Auditor 4

PROFESSIONAL

Agronomist
Agricultural Engineer
Forester
Industrial Engineer
Chemical Engineer
Civil Engineer
Geologist and Mining Engineer
Chemist
Physician
Veterinarian
Dentist
Biologist
Lawyer
Counsellor
Architect
Hydrologist
Meteorologist
Economist

Sociologist
Personnel Director
Budget Director
Director of
Director of Accounting Services
Financial Director
Administrative Analyst
Financial Analyst
Director of Public Relations
Information Director
Director of Home Improvement
Statistician
Photograph Interpreter
Security Specialist
Magistrate
Recording Secretary
Internal Auditor
Provincial Director of Agriculture

TECHNICAL

Forestry Expert
Agronomy Technician
Livestock Technician
Cotton Harvest Inspector
Inspector of Banana Shipments
Mill Inspector
Veterinary Assistant
Assistant in Economics
Statistical Assistant
Administrative Assistant
Auditor's Assistant
Assistant Financial Analyst
Information Assistant
Laboratory Assistant
Legal Assistant
Soils Laboratory Assistant
Topographer
Draftsman
Cartographer

Architectural Assistant
Engineering Assistant
Sociology Assistant
Home Improvement Technician
Social Worker
Cooperatives Technician
Crafts Promotor
Nurse
Nurse's Aid
Handicrafts Instructor
Audivisual Equipment Operator
Photographer
Photoengraver
Audivisual Aids Technician
Diagrammer
Supervisor of Communes & Cooperatives
Cultural Promotor
Farm Manager
Wool Grader

Continuation of Appendix III.1

ADMINISTRATIVE

Office Manager
Administrative Chief
Administrative Coordinator
Stenographer
Bilingual Secretary

Clerk
Treasurer
Teller

Assistant Teller
Accountant
Accounting Assistant
Warehouse Keeper
Supplier
Warehouse Assistant

Office Assistant
Import Agent
Records Technician
Librarian
Director of Printing and
Publications
Radiotelegraph Operator
Curator
Documents Reproduction Equipment
Operator
Switchboard Operator-Receptionist
Photogrammetry Technician
Director of Transportation
Shop Supervisor
Warehouse Supervisor

SERVICE

Chief Mechanic
Mechanic
Service Assistant
Maintenance Assistant
Driver
Mechanic's Assistant
Janitor

Caretaker
Messenger
Boat Motorman
Marine Pilot
Heavy Equipment Operator
Agricultural Equipment Operator

APPENDIX III.2

SPECIALIZED SERVICES AND

TECHNICAL SUPPORT SERVICES ZONE 1

- San Mateo Farm - Esmeraldas
- Ernesto Molestina Farm - Santo Domingo
- Center for Mechanized Agriculture - Esmeraldas
- Swine Farm - Santo Domingo
- Molasses Tank - Esmeraldas
- Molasses Tank - Santo Domingo
- Ecology Reserve - Cayapas - Cotacachi
- Tree, Nursery Km. 3.5, Chone Rd. (Via Chone) - Santo Domingo
- Tree, Nursery Km. 28, Quevedo Rd. (Via Quevedo) - Santo Domingo
- La Propicia Nursery - Esmeraldas
- Forest Nursery of Quininde

SPECIALIZED SERVICES AND

TECHNICAL SUPPORT SERVICES ZONE 2

- La Teodomira Farm - Portoviejo
- Machinery Center - Portoviejo
- Port Office of Plant Pathology - Manta
- Port Office of Animal Health - Manta
- Molasses Tank - Chone
- Molasses Tank - Santa Ana
- Molasses Tank - Calceta
- Molasses Tank - Bahia
- Molasses Tank - Jipijapa
- Machalilla National Park - Puerto Lopez
- Lodana Tree Nursery

SPECIALIZED SERVICES AND

TECHNICAL SUPPORT SERVICES ZONE 3

- Plant Pathology Laboratory - Guayaquil
- El Socabon Farm - Galapagos
- El Vainillo Farm - Galapagos
- Center for Mechanized Agriculture - Balzar
- Airport Plant Quarantine Office - Guayaquil

Continuation of Appendix III.2

- Port Plant Quarantine Office - Guayaquil
- Airport Animal Health Office - Guayaquil
- Port Animal Health Office - Guayaquil
- Quevedo Molasses Tank
- Guayaquil Molasses Tank
- Babahoyo Molasses Tank
- El Triunfo Molasses Tank
- Molasses Tank - Balzar
- National Park - Galapagos
- Manglar Ecology Reserve - Churute
- Daule Tree Nursery
- Loma Alta Tree Nursery
- Quevedo Tree Nursery
- Villamil Rural Training Center - Guayaquil
- Airport Forestry Control - Guayaquil

SPECIALIZED SERVICES AND

TECHNICAL SUPPORT SERVICES ZONE 4

- Center for Mechanized Agriculture - Machala
- Molasses Tank - Machala
- Molasses Tank - Arenillas
- Molasses Tank - Zaruma
- Tree Nursery - Machala
- Tree Nursery - Arenillas

SPECIALIZED SERVICES AND

TECHNICAL SUPPORT SERVICES ZONE 5

- Plant Pathology Laboratory - Ibarra
- Plant Pathology Laboratory - Tulcan
- La Portada Farm - Ibarra
- El Ejido Farm - Ibarra
- La Pradera Farm - Ibarra
- Mira Crop Farm
- Mira Agricultural Training Center
- Mira Center for Mechanized Agriculture
- Ibarra Center for Mechanized Agriculture
- San Isidro Sheep Production Center - Carchi
- San Rafael Sheep Production Center - Carchi
- Tulcan Swine Farm
- Ibarra Swine Farm
- Tulcan Molasses Tank
- San Gabriel Molasses Tank
- El Angel Molasses Tank
- Tulcan Tree Nursery
- La Paz Tree Nursery
- Ibarra Tree Nursery
- Otavalo Tree Nursery
- Topo Tree Nursery
- Rumipamba Rural Training Center - Ibarra

Continuation of Appendix III.2

SPECIALIZED SERVICES AND
TECHNICAL SUPPORT SERVICES ZONE 6

- Tumbaco Plant Pathology Laboratory - Quito
- Tumbaco Crop Farm - Quito
- Nagzichi Crop Farm - Salcedo
- Conocoto Agricultural Training Center - Quito
- Tumbaco Center for Mechanized Agriculture - Quito
- Airport Plant Quarantine Office - Quito
- Lloa Sheep Production Center - Quito
- Pifo Sheep Production Center - Quito
- Tumbaco Wool Warehouse - Quito
- Tumbaco Mineral Salt Processing Plant - Quito
- Airport Office of Animal Health - Quito
- Cayambe Molasses Tank
- Sangolqui Molasses Tank
- Cotopaxi Molasses Tank
- El Boliche National Recreation Area - Cotopaxi
- Cayambe Ecology Reserve - Coca
- Conocoto Tree Nursery - Quito
- Aychapichu Tree Nursery - Machachi
- Latacunga Tree Nursery
- Airport Forestry Control - Quito
- Conocoto 4-H Training Center - Quito

SPECIALIZED SERVICES AND
TECHNICAL SUPPORT SERVICES ZONE 7

- Pillaro Crop Farm
- Center for Mechanized Agriculture - Ambato
- Molasses Tank - Ambato
- Guanujo Molasses Tank - Guranda
- Tree Nursery - Ambato
- Tree Nursery - Pillaro
- Tree Nursery - Guaranda

SPECIALIZED SERVICES AND
TECHNICAL SUPPORT SERVICES ZONE 8

- Gauslan Crop Farm - Riobamba
- Pachamama Sheep Production Center - Riobamba
- Gauslan Rabbit Farm - Riobamba
- Riobamba Molasses Tank
- Chunchi Molasses Tank
- Sangay National Park
- Macaji Tree Nursery - Riobamba
- Guamote Tree Nursery
- Gauslan Rural Training Center - Riobamba

SPECIALIZED SERVICES AND
TECHNICAL SUPPORT SERVICES ZONE 9

- Center for Mechanized Agriculture - Biblian
- Biblian Molasses Tank
- Cuenca Molasses Center
- Cajas National Recreation Area - Cuenca
- Cuenca Forest Nursery

SPECIALIZED SERVICES AND
TECHNICAL SUPPORT SERVICES ZONE 10

- Loja Plant Pathology Laboratory
- Chunchiun Crop Farm - Loja
- Consacola Crop Farm - Loja
- Jipiro Crop Farm - Loja
- Yamburara Crop Farm - Loja
- Bomboiza Crop Farm - Loja
- El Pangui Crop Farm - Loja
- Center for Mechanized Agriculture - Loja
- Loja Swine Farm
- Loja Molasses Tank
- Macara Molasses Tank
- Gonzanama Molasses Tank
- Zamora Molasses Tank
- Yantzatza Molasses Tank
- Gualaquiza Molasses Tank
- Catacocha Forest Nursery
- Jipiro Forest Nursery - Loja
- Gonzanama Forest Nursery

APPENDIX IV.1

Example of an
Administrative Internship With
Emphasis on Administration of
Research and Extension Programs

Title of Project: Internship in Division of Agriculture

Advisory Committee:

Dean of Agriculture

Agriculture Education Dept. & International Programs

Representative of International Programs Office

Assistant Director Agriculture Experiment Station

Associate Director Cooperative Extension Service

Academic Advisor

Academic Department Head

The intern would have the opportunity for observation and explanation of the following activities and processes:

1. Research project development and review.
2. Overall fiscal management and administration of the Experiment Station.
3. Management and operation of one or more field stations.
4. Management and administration of an academic department.
5. Extension project and program development.
6. Management and operation of one or more county extension offices.
7. Overall fiscal management and administration of the Cooperative Extension Service.
8. General review of land grant University philosophy of research instruction and extension programs.
9. Auditing of specific academic courses as appropriate.
10. Travel to research stations within the state, selected Agri business operations and agricultural related cooperatives and/or training institutions.
11. Out of state travel to research stations, landgrant universities and other appropriate agencies or businesses.

APPENDIX IV.2

AN EXAMPLE OF AN
ADMINISTRATIVE INTERNSHIP WITH EMPHASIS ON ADMINISTRATION OF
EXTENSION (TECHNOLOGY TRANSFER) AND VOCATIONAL-TECHNICAL
EDUCATION PROGRAMS

Title of Project: Internship in Agricultural Extension and
Vocational Education

Advisory Committee: Dean of Agriculture
Dean of Home Economics
Director of International Programs
Associate Director or Assistant Director
of Cooperative Extension
Representative of the State Department
of Vocational and Technical Education
Head of Department of Agriculture Education
Head of Department of Home Economics Education
Academic Advisor of the Intern

The Intern would have the opportunity for observation and
explanation of the following activities and processes:

1. Extension program and project development and review.
2. Management and operation of county extension offices.
3. Overall fiscal management and administration of the Cooperative
Extension Service
4. The Development and utilization of clientele advisory committees
5. The development of working relationships with special or unique
clientele
6. The development of vocational and technical education programs
7. Management and administration of vocational and technical
education programs
8. Coordination of programs and projects with cooperating agencies
and organizations.
9. General review of land grant university philosophy of extension,
research and instruction programs

10. Planning, coordination and implementation of overlapping extension and research projects and programs.
11. Auditing of specific academic courses as appropriate
12. Travel to selected extension, research and vocational institutions, selected agri-business operations and agriculturally related cooperatives.
13. Travel to appropriate national or international institutions or to unique institutions agencies or businesses in other states
14. General management and operation of an academic administrative unit such as a department or an extension district
15. Leadership training for extension and vocational-technical education programs