The Allocation of Resources for Agricultural Research in Latin America

PROJECT "ARIAL"

The Colombian Case

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The Allocation of Resources for Agricultural Research in Latin America, (Project ARIAL)

March, 1979

INTERNATIONAL DEVELOPMENT RESEARCH CENTRE - IDRC

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I. INTRODUCTION

The ARIAL Project aims to identify and describe (not explain) some of the principal characteristics of the institucional structures, and the systems and criteria used for allocating resources for agricultural research. Therefore, right from the beginning the project in Colombia and in the other countries selected was orientated to obtain the necessary basic information from national sources.

Moreover, the project was interested in examining the possible correlation between the behaviour of agricultural production and how funds for research were allocated. Consequently, it was thought advisable to study each of the basic agricultural products and examine their behaviour by using a set of economic production indicators. In this way it is possible to justify allocating funds for undertaking descriptive analysis of the products which, relatively, are the most important in the country.

Finally, since research priorities tend to be defined in terms of the particular development model that the agricultural policy is based on and in terms of the measures for implementing this policy, it was decided to examine this framework by studying the sectorial development plans and by using a set of general economic variables and indicators. Then, the study could discover whether the areas that are defined as priority for research and the objectives of the agricultural development policies coincide.

Therefore, the information presented in the following chapters will attempt to fulfill these aims, although it was not always possible to collect complete information for different reasons. These include: the institutions did not have complete and trustworthy registers, the information was confidential and private, or the available data was not broken down according to specific products or programmes but only listed as general budget categories.

Chapter II presents a description of the institutional infrastructure for research. Basically, it is a detailed description of the Instituto Colombiano Agropecuario (ICA) (Colombian Agriculture Institute), as this is the institution in charge of agricultural research in the country. ICA's relationships with other entities that participate in research either directly or indirectly will be described briefly, and its position within the Ministry of Agriculture will be defined. In addition, the Chapter includes information on the participation of some private associational institutions with emphasis on two: the Federación de Cafeteros (Coffee Growers Federation) and the Federación de Arroceros (Rice Growers Federation), as it was possible to obtain information about them. The data available on the Instituto de

los Recursos Naturales Renovables (INDERENA) (Institute of Renewable Natural Resources), the Corporación Nacional de Investigación y Desarrollo Forestal (CONIF) (National Corporation of Forestry Research and Development) which is private, and on the Corporación Autónoma Regional del Valle del Cauca (CVC) (Regional Autonomous Corporation of the Valle del Cauca) which is attached to the National Planning Department, has also been included and there is some data on the Centro Internacional de Agricultura Tropical,(CIAT) (International Centre of Tropical Agriculture).

There are more than 40 institutions that participate in agricultural research in one way or another, either because they carry it out, they finance it or they may be only on the side lines. However, they have not all been described in this study for three basic reasons: first, although there are numerous institutions, at least eighty percent of the research work is centered in ICA as it is the official body responsible for this work. Consequently, the rest is less significant. Second, many of these institutions only participate in research sporadically and marginally and it is not their principal activity - for example the universities - and third, because the majority of these institutions were unable to provide information about their research activities as they do not keep records.

For the same reasons Chapters III and IV only give information on the resources allocated by ICA, INDERENA, FEDECAFE, FEDEARROZ, CONIF, CVC, CIAT, and the universities. These institutions are responsible for at least ninety percent of the resources allocated for agricultural research. In any case, this sample represents the public sector (ICA and INDERENA), the private sector (CONIF), the associations (FEDERACAFE and FEDEARROZ) and one international institution, (CIAT). Moreover, all the institutions are leaders in their category and their scope is national.

There will be little information on donor institutions except for those who channel their funds through the national budget. The global sums have been given but the amounts provided in each case or at different times have not been detailed because it was impossible to get this information, the institutions keep it very secret.

Chapter III also contains a brief description of some of the relations that could be identified between the institutions financing research and those that actually undertake it. The description does not include the formal aspects of the relationships (agreements, laws, contracts, etc.).

Finally, in the same Chapter there is a report of the interviews made to discuss the allocation of resources for research.

Several difficulties and problems were encountered during the course of the study. First of all, the very fact that the design, the planning and the method of applying the methodology was too formal to be easily applied in different countries with varying conditions was a problem in itself. As a result the design could not be applied uniformly in each country. Although the "Methodological Manual" proposes definitions and categories for choosing, classifying and ordering the data, and even lays down the contents and the format for the corresponding reports, it does not suggest alternative recommendations on how to solve the operative problems encountered during the "field work". These include: the data is often presented in the sources in different formats so that it must be adapted to the categories stipulated, the absence of some descriptive statistical series that other complementary sources could supply, training for the interviews was insufficient as were the explanations on how to conduct the interviews dealing with the allocation of resources, short comings in the selection and registration of some basic data about the principal agricultural products needed to prepare the minimum series that were requested.

A second problem was the selection and hiring of the local assistants in the countries. In the case of Colombia, a specific technical team was not created although three of the consultants belonging to the main technical team were based in the country. Their work dealt with the Project in general, above all with the planning stages and with the final analysis, but they were not involved in gathering information in Colombia. This meant that a large portion of the data collection stage in Colombia was only started when the reports from the other countries were already beginning to arrive. Moreover, at about this time, or very shortly afterwards, the national consultants' contracts expired, so there were far fewer people available to finish the work and prepare the final report.

A third problem that arose was that the time factor in programming the project was miscalculated so that some critical stages were allotted too little time. In fact, all the national teams were severely handicapped by the time factor, especially as far as the time necessary to finish collecting the data for the analysis and for preparing the reports. This was probably caused because the methodology and the general design were not integrated with the time factor.

This has probably been the most important problem the study in Colombia had to face. This has been especially true of the administrative and operative aspects of preparing the final report, principally in the preparation, revision and correction of the final figures in the various methods used to present them (tables, figures, etc.).

Lastly, a crucial methodological problem should be mentioned: the volume of the data being studied and handled. The methodological manual defined five large information groups for seven sub-categories, when these are broken down into variables and their corresponding transformations, we end up with nine categories and 83 items, concepts or sub-categories of data. Data on general economic indicators and on agricultural production was collected on the one hand, and on the other, data on institutional aspects and information about allocating/implementing funds was gathered. Problems arose when this information was analyzed and when these components were related within a methodological framework that lacked the necessary theoretical basis and which was not sufficiently planned in the initial stage of design.

Consequently, when the information presented in this document is used, the observations made above should be borne in mind, although it must be emphasized that the information is highly trustworthy as it has been carefully verified with the original sources, the data that has been transformed has been revised in detail and in general all the information has been presented with the strictest criteria possible.

II. THE INSTITUTIONAL STRUCTURE FOR AGRICULTURAL RESEARCH

1. General Organization: The Ministry of Agriculture

Decree No. 133 of 1976 determines that, in Colombia, the Ministry of Agriculture, in agreement with the President of the Republic, is responsible for deciding policy related to agriculture and the rational use of the renewable natural resources.

Therefore, the Ministry of Agriculture is in charge of making the Government's agricultural policy and for administering the sector, its general functions are to prepare global programmes to produce, finance and distribute agricultural products and coordinate and evaluate the implementation of these programmes.

As the agricultural sector is so important within the country's economy, the Ministry of Agriculture is an important member of the Government's economic team; it is one of the chief members of the Consejo Nacional de Política Económica y Social (the National Council of Economic and Social Policy) (CONPES), and plays a leading role on the Monetary Board and on the Comité Nacional de Cafeteros (the National Committee of Coffee Growers). The Ministry also participates, either directly or through a delegate, on the Board of Directors of several other bodies which implement the Government's economic and social policies, such as the Junta de Comercio Exterior (the Foreign Trade Board) and the Servicio Nacional de Aprendizaje (the National Apprenticeship Service) (SENA).

Decree No. 2420 of 1968 created various bodies within the Ministry of Agriculture whose function is to assess it, such as the Consejo Superior de Agricultura (the Higher Agricultural Council); the directors and managers of the principal bodies in the sector, representatives of the private sector and of the agricultural associations and farmers sit on the Council. They study the general policy of the agricultural sector and they revise and evaluate the annual plans and programmes in accordance with the recommendations presented by the Executive Committee of the Council.

The functions of the Consejo Asesor de la Política Agropecuaria (the Consultant Council for Agricultural Policy), that was created by Decree 133 of 1976, are to recommend to the Ministry which general agricultural development plans and which plans for exploiting the renewable natural resources should be adopted and to analyze the general policy of the sector and make recommendations concerning it. The Consultant Council has an Executive Coordination Committee made up of the Minister, the Vice-Minister, the General Secretary and the directors or managers of the principal organizations in the agricultural sector.

Three important bodies are directly dependent on the Minister's office, they are: the Fondo de Fomento Agropecuario (the Agricultural Promotion Fund) created in 1976, its task is to promote the production of primary agricultural products; the Fondo de Bienestar Veredal (the Village Welfare Fund), created in 1973, whose objective is to finance the programmes to integrate and expand educational, health, technical assistance, marketing, credit, recreation and electrification services and other social services in the peasant and village environment; the Fondo Financiero Agropecuario (the Agricultural Financing Fund) that is dependent on the Bank of the Republic (the Central Bank), and is the main financing body in the agricultural sector.

1.1 National Commissions for Agricultural Products

These were created by Decree 133 of 1976 to assess the Ministry in the specific production and promotional programmes that exist for the basic agricultural products. They include the Minister or his representative, representative of the producers and the processors of the products and the head of the Technical Regulation Division of the Ministry.

The regional committees for agricultural production, for inputs and renewable natural resources, with participation of the private and public sectors, fall into this category.

1.2 Public Establishments Dependent on the Ministry

These bodies were either created by law or they were authorized by law and their principal functions are administrative. They have legal status, administrative autonomy and an independent patrimony. They are responsible for the different aspects of implementing agricultural policy in accordance with the norms established by the Ministry of Agriculture.

The ones belonging to the agricultural sector are listed below: Instituto Colombiano Agropecuario (Colombian Agricultural Institute) ICA (research, rural development, technical assistance, control and supervision of agricultural inputs); Instituto Colombiano de la Reforma Agraria (Colombian Land Reform Institute) INCORA (land distribution and use, tenancy systems); Instituto Nacional de los Recursos Naturales Renovables (National Institute of Renewable Natural Resources) INDERENA (protection and conservation of the renewable natural resources); Instituto Colombiano de Hidrología, Meterologia y Adecuación de Tierras (Colombian Institute of Hydrology, Meteorology and Land Preparation) HIMAT (management and conservation of the water resources, recuperation and preparation of land).

1.3 Commercial and Industrial Companies Linked to the Ministry

These bodies engage in commercial or industrial activities within the free market system of private ownership, they have legal status, administrative autonomy and their capital is independent.

In the agricultural sector there are the Banco Cafetero (the Coffee Bank) (financing coffee production); the Instituto de Mercadeo Agropecuario (Agricultural Marketing Institute) IDEMA, (controlling the marketing of products).

1.4 Mixed Ownership Enterprises Linked to the Ministry

In these bodies the State and the private sector participate jointly in the same commercial enterprise, the State having the majority ownership. They have legal status, independent patrimony and administrative autonomy.

The following are in the agricultural sector: Almacenes Generales de Depósito de la Caja Agraria (General Deposits of the Agrarian Savings Bank), IDEMA, (- Banco Ganadero - (- Cattle Bank), INAGRARIO, S.A., Caja de Crédito Agrario, Industrial y Minero -) Agricultural, Industrial and Mining Savings Bank); Corporación Financiera de Fomento Agropecuario y de Exportaciones (Financing Corporation to Promote Agriculture and Exports) CONFIAGRO: Empresa de Comercialización de Productos Perecederos (Perishable Goods Marketing Company) EMCOPER: Empresa Colombiana de Productos Veterinarios (Colombian Veterinary Products Company) VECOL.

Figura I-1 illustrates this general organization of the Ministry.

2. Organization for Agricultural Research

2.1 Historical Outline*

The first agricultural research in the country can be traced back to the uncoordinated efforts of the first professors and students belonging to the agronomy departments of the universities. The first of these seems to have existed in Cundinamarca between 1874 and 1881. However, the first Government measures to organize and promote research date back to 1879 which General Julián Trujillo issued Decree 514 of November 26. This Decree established the first Experimental Agricultural Station near Union. It was to work on "adapting crops and experimenting with them". Article 7 of the same Decree set up the "National Agricultural Institute" that was

* Taken from Novoa B., Andrés R. and Osorio, Mario. Investigación Agropecuaria en Colombia: Bases para su Planeamiento. DNP/UEA-DP, December 1976 (unpublished).

annexed to the Experimental Station or Adaptation Farm. 1/

The same Decree "stimulated the local governments to promote and found agricultural schools in their districts". It also resolved to subsidize the establishments or schools for higher agricultural studies and their research and teaching activities in conformity with the terms of Executive Decree No. 636 of 1878.

This executive decree was especially significant because it set the precedent for the Government to give legal support to agricultural research from very early on. It established the relationship between higher education and research and finally, by deciding to organize, promote and finance research, it was the first clear indication of the Government's position regarding research.

In February 1880, the Agricultural Higher Institute and the Adaptation and Experimental Farm began to function with some research projects dealing with adapting potato, bean and wheat varieties. At first they worked on land belonging to the Botanical Gardens and later near the Picota on the outskirts of Bogotá.

In 1914, Law 38 was passed that authorized the Government to establish and finance the "National Agriculture and Veterinary Institute", it had an Agronomy Department and Experimental Centres and Stations. The Institute was closed in 1916 and was replaced by the Bogotá Higher School of Agriculture.

By that time the Ministry of Agriculture and Trade was responsible for the agricultural research that was being carried out in several experimental centres in the Departments of Valle del Cauca, Antioquia, Tolima, and Cundinamarca.

The orientation defined in Law 38 was confirmed in 1915 when Law 75 was passed. This law empowered the Government to create Experimental Stations in the three different climatic zones that are most characteristic of the country. The law specified that "... each station would undertake agricultural research including experiments and demonstrations, applications of chemical fertilizer and the cultivation and adaptation of plants, and they would exhibit agricultural machinery". It also said that "... each will have a special office in charge of agricultural meteorology, of studying harmful insects, analyzing soil and water, introducing and distributing seeds and

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1/ Mesa B.D. La Agronomía en Colombia. Bogotá, 1965, pp. 18-20.

live plants, importing fertilizers and special stock animals to improve the breeds and, in fact, anything else that might be necessary..."

Although few of the points in the law were actually put into practice, it emphasized several areas of research, promoted production - by importing and distributing improved seeds and breeds - and it underlined the need to use some agricultural imports for research purposes.

Moreover, the Law encouraged the creation of Regional Experimental Stations such as the one in San Lorenzo or Armero in Tolima (1919), the Tropical Agricultural and Livestock Centre annexed to the Palmira Farm in the Valle del Cauca, and the one in Rionegro, Antioquia (1916). Similarly, the Bogotá Agronomy Department, previously the Higher School of Agriculture, was established and functioned until it was closed in 1925.

In 1926, the Ministry of Agriculture created the bases of a programme on Agricultural Education, Demonstration and Research, it was the result of a report presented by the Austrian Botho A. Careth C., who the Government had hired for two years as an assessor. For the first time the programme divided research into different sections dealing with the agronomic aspects of each crop, pests and diseases, improved varieties (genetics); animal health, breed selection; soils and meteorology. The programme included criteria for regionalizing research and setting up Experimental Stations in the cold, temperate and hot climate zones, and regional demonstration farms were planned. Some of the oldest Experimental Stations, such as those in La Picota (Cundidinamarca), Armero (Tolima), Toluviejo (Bolivar), El Nus (Antioquia) and Iracá (Meta) were created as a result of this regionalization.

In 1928, the Ministry of Agriculture and Industry became the Ministry of National Economy, and the national departments of agriculture and livestock were created within it. These departments were responsible for orientating and managing agricultural research and for administering the Experimental Stations.

The Government's first step in organizing the research was to contract a mission of experts from Canada. The first three to arrive were a botanist, and expert in animal husbandry and an economist. The team began the research with projects to improve wheat, potatoes and barley, they gave a boost to the programmes the Ministry had already started on entomology, vegetable physiology, phytopathology and soils, and the work being done to improve and select livestock, principally beef and dairy cattle.

In the same year, the Government of the Department of the Valle del Cauca created the "Palmira Agricultural Experimental Station" in response to Law 41 of 1926. It functioned on land belonging to the regional farm that, since 1919, has been organized as an experimental unit annexed to the School of Agronomy and Industrial Mechanics that had been founded in 1913. Research programmes on sugar cane, rice, beans, and grass for forrage were established in the Palmira Agricultural Experimental Station. Simultaneously, the "La Picota" Farm was founded in Bogotá to do experiments with cold climate crops and livestock.

Law 132 of 1931 reflected the Government's growing interest in agricultural research, the more widespread acceptance that research benefitted production, the increased demand, especially from abroad, for agricultural products - coffee, cotton, sugar - which meant that certain problems had to be solved like crop improvement, pest and disease control, adaptation to chemical inputs - fertilizers, insecticides and weed killers - that were being developed and promoted on the international market. Law 132 confirmed all this by defining that the State should play a direct role in developing and promoting agricultural research. In fact, article 1 says that "the agricultural research, experimentation, demonstration, teaching, statistical and dissemination services must all conform to a general plan that the National Government is in charge of directing". Furthermore, Law 132 declares that the agricultural research programmes should be created and strengthened "so as to increase the yields of food crops and crops for industrial use". At the same time it established that the National Agricultural Institute should have one main agricultural centre and subcentres in the different climatic zones, a higher school of agriculture and a dissemination service.

It is important to underline the impact of Law 132 because it regionalized research, it placed its direction in the hands of the state, it harmonized its development by weighing the countries' agricultural production requirements and foreign trade needs.

Moreover, the Law re-confirmed the relationship that should exist between research and education, and it emphasized that the purpose of disseminating and promoting the research results is "to increase the yields of food crops".

The Government's initiative coincided with a period when the country was still suffering from the consequences of the 1929 economic crisis, which, according to Zuleta*, had favoured the agricultural sector as agricultural

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* Zuleta, E. Historia Económica de Colombia. U.T. Ediciones Ibague, 1970. pp. 87-88 (Mimeograph).

exports expanded between 1929-1934. This was also the time when crops other than coffee, such as rice, sugar cane, maize, beans and cacao began to develop and flourish both for the internal market and for export.

It was precisely in 1934 that the Departmental Government of the Valle del Cauca issued Decree No. 262 that authorized the creation of the Higher School of Tropical Agriculture and the Palmira Experimental Agricultural Station was annexed to it. The first research programmes in the organization dealt with cotton, sugar cane, rice, tabacco, plantain, cassava, maize, beans, soya beans and forage, Management techniques and beef cattle and pig production were also studied.

As it was soon discovered that the Cauca Valley was ideal for cultivating sugar cane, sugar production developed by leaps and bounds. Research into methods for processing sugar cane industrially - pressing techniques (machinery and equipment), the comparative production of sugars, irrigation and drainage, as well as aspects of plant health like the identification and control of mosaic were given great encouragement and strengthened.

During the following years the existing programmes were strengthened, the experimental stations were equipped and new programmes were started like the soils programme that has been in the hands of the Geographic Institute since 1931, and the genetic improvement programmes for potatoes in the Central Potato Station in Tabio (Cundinamarca). This latter has been created by the Ministry of Agriculture and Trade in 1930.

Beginning in 1943, agricultural research underwent a far reaching reorganization that was partly inspired by the report and recommendations made by the American Agricultural Mission that worked with the Government in the National Agricultural and Livestock Ministerial Departments. Moreover, the first Colombian students who had gone to study specializations abroad were returning home and they played a decisive part in modernizing research methodologies and techniques and in reorientating it towards evaluating and improving varieties, on the one hand, and introducing modern chemical agricultural inputs on the other.

One of the results of the reorganization of the Ministry of Agriculture between 1943-47 was that in September 1949, the Government, through the Ministry of Economy, informed the Rockefeller Foundation that "Colombia is interested in establishing an Agricultural Unit - Technical Mission - that, in association with our National Agricultural Department, would assist in some research programmes, such as, for example, improved potatoe, wheat

and maize seed..." As a result at the end of the year a contract was signed between the Foundation and the Ministry to establish a Unit in Medellin that would be an integral part of the Ministry of Agriculture and Livestock. Its objective was to develop research on genetics, soils, plant health and entomology. The agreement came into effect in December 1949, and the two parties, the Colombian Government and the Rockefeller Foundation, were to make equal contributions.

The Unit's operative centre was named Special Research Office (OIE) and research started at the beginning of 1950 with the maize programme in Medellin. The headquarters was set up in the Agronomy Department.

This marked the end of an important period in the development of agricultural research in Colombia which had had its most outstanding achievements during the decade 1940-1950 when the basic research on phytopathology, entomology, soil chemistry and meteorology, was carried out and when studies were done on productive capacity, introducing and adapting varieties, creating new varieties and hybrids in such crops as maize, wheat, potatoes, rice, sugar cane, tomatoes, cacao and some fruits.

This was when the principal Experimental Stations and Farms were equipped, they had originally been created by the local governments but they were subsequently rationalized and came under the Ministry of Agriculture.

At the same time, the cattle research and improvement programmes were started, they covered selection, crosses, feeding (pasture and forage), and animal health, and the work was mostly done on the Farms at Toluviejo, El Nus, Iracá and Armero.

In 1951, the Government purchased a piece of land in Mosquera (Cundinamarca) and created the Agricultural Experimental Farm, as it was the national pilot centre it became the headquarters for the principal cold climate agricultural research programmes and for the cattle improvement and promotion programmes. The farm was named Tibaitatá, and it was the first Centro Nacional de Investigaciones Agropecuarias (National Agricultural Research Centre) CNIA in the country. Tibaitatá began to function in 1952 with wheat, barley, maize and potatoe programmes.

The reorganizing of research, the scientific reorientation given to the programmes by OIE between 1950-1955 and the participation of their experts had the result of reinforcing the research work being done on potatoes, pastures and forage, entomology and soils at Tibaitatá and Palmira.

In 1950, Decree No. 962-Bis created the Department of Agricultural Research (DIA) in the Ministry of Agriculture, it promoted five of the most important Experimental Centres to National Research Centres. It reorganized another eight farms and established the first national research programmes. They studied "the principal food crops and domestic livestock". In this year, dairy cattle, poultry, sheep and animal pathology programmes were started.

The first of January, 1956, the agreement with the Rockefeller Foundation expired and all the assets were transferred to DIA, who became responsible for guiding and directing the research programmes that the OIE had managed previously. However, a few American experts continued to provide technical assistance to the research programmes as counterpart personnel to the national experts. This system was continued until 1967-69 when the majority of the experts belonging to the Foundation ceased to work directly on agricultural research programmes.

In June 1959, U.S. Grant was named director of Agricultural Sciences for the Rockefeller Foundation in Colombia and head of the OIE to succeed Lewis M. Roberts who had been director since 1948. The Agricultural Mission headed by Grant maintained effective control over various research programmes, especially in animal sciences, agricultural economy and some programmes of basic agriculture. In addition, it gave funds other than what had been stipulated in the original agreement, that have been very important in helping to finance DIA's work and later ICA's until recently.

It has frequently been said that the Rockefeller Foundation Agricultural Mission was, in its time, a landmark in the development and consolidation of agricultural research in Colombia. Its results and above all the results achieved by the national experts became obvious between 1959-60 when DIA put new improved varieties and local hybrids of maize, beans, barley and potatoes onto the market.

In 1960, DIA was promoted to a Division in the Ministry of Agriculture, and its achievements had been so encouraging that the Government decided to create a new decentralized nation-wide entity that would take charge of everything connected to agricultural research, education and extension. The Ministry of Agriculture and Education and the National University implemented the project and it received financial backing and technical assistance from a joint mission from the Rockefeller, Ford and Kellog Foundations, the University of Nebraska and the United States Department of Agriculture.

So, in the middle of 1960, the Government issued Decree No. 1562 of 1962 that created the Corporación Instituto Colombiano Agropecuario (The Colombian Agricultural Institute) ICA. This entity took over DIA's functions and responsibilities in agricultural research and it was assigned additional responsibilities including training highly qualified technical personnel in cooperation with the National University, and it was to promote agricultural production, dissemination and extension.

ICA began to function in February 1963, when the DIA resources, installations personnel and Experimental Farms and Centres were made over to it. Decree No. 3116/63 transformed the Corporation into an Institute dependent on the Ministry of Agriculture, defined its functions and organization and confirmed its role as the director of agricultural research in the country. On the 15th of February, 1963, when DIA became ICA it had 22 research programmes in progress and 1.523 employees, including 145 of its own experts and 15 experts of the Rockefeller Foundation who provided consultancy services for the research programmes. Up to 1963 DIA had given the farmers a total of 66 improved varieties: 36 maize varieties or hybrids, 5 beans, 2 peas, 6 wheat, 2 barley, 6 potato, 3 sugar cane for forage, 2 cacao and one each for rice, soy beans, industrial soy beans and soy beans for forage and castor bean.

Between 1963-67, ICA's position as the leader in agricultural research in the country was strengthened. During that period the programmes and projects were extended to cover new crops and new areas of agricultural research and research on animal sciences. The structures for carrying out research at a regional level in the Experimental Farms and Centres were fortified, the extension programmes ICA had inherited from the Ministry of Agriculture in 1963 were stimulated and special attention was given to post graduate education programmes, mainly in the United States with financial support from the Rockefeller, Ford, Kellog Foundations and the University of Nebraska.

In 1968 Decrees 2420 and 3120 were issued, they restructured and reorganized ICA and gave it new functions: control and supervision over agricultural inputs, promotion activities, certification of seeds, agricultural technical assistance and extension and rural development activities.

As part of this restructuring ICA was also given the functions, personnel and facilities and equipment that had previously belonged to the Instituto Zooprofilactico (the Animal Preservation Institute), the Instituto de Fomento Algodonero (Cotton Promotion Institute) and to the Instituto Tabacalero (the Tobacco Institute).

2.2 Public National Institute

2.2.1 ICA

As we have already said, the Instituto Colombiano Agropecuario, ICA is the body in charge of agricultural research in Colombia. ICA is a state entity, it is decentralized, its scope is national and it is dependent on the Ministry of Agriculture.

Decree 133 of the 26th of January, 1976, which restructured the agricultural sector, said that ICA's objective was to "carry out research, promote the application of the results, so as to develope the national agricultural sector".

Article 30 of the same Decree defines ICA's role in research more precisely. It says that the Institute should "... promote, coordinate and carry out, either directly or in collaboration with other entities, biological and physical and socio-economic studies, within the policies adopted by the national Government, with a view to increasing agricultural production.

ICA's present technical and administrative organization was basically decided on in December 1973. Within the Institute, it is the Sub-Director of Research who is directly responsible for agricultural research. In addition, the Sub-Directors of Production and Rural Development are running several socio-economic research programmes on animal and plant health and in other areas of agricultural production. In general terms, it can be said that the Sub-Director of Research works in basic research and the other dependencies work on applied research.

There are four levels in the area of planning and management, in their order of importance they are: Sub-Directors, Divisions, National Departments and National Programmes. Then, there is the operative organization run by the regional research directors - administratively, ICA is divided into nine regional areas - and the sectional programme heads and the technical personnel on the research farms, stations and centres. The organization is sub-divided into agricultural research, animal sciences, veterinary sciences, socio-economic sciences and support programmes, such as statistics (biometry).

This structure appears in Figures I-2 to I-6.

Ever since the old DIA was founded two types of national research programmes have been organized, one dealing with crops and animal species and the other basic and support research such as soils, physcology, entomology, parasitology, etc. Another element in the functional and operative organization of research in ICA is that the research centres, the national laboratories and the diagnosis centres are scattered throughout the country.

In December 1975, ICA owned 24 experimental farms with a total area of 31,238 hectares in 13 departments, they are between 3 and 2,600 meters above sea level. It has a Veterinary Medical Research Laboratory LIMV in Bogotá, the Veterinary Research Laboratory in Turipana (Córdoba) the National Soils Laboratory in Palmira (Valle del Cauca) and the Drugs and Biological Inputs Control that will be opened shortly in Mosquera (Cundinamarca). Further, research is also done on animal health in the 24 diagnosis centres which support the work done in the laboratories or principal centres.

It has already been explained that ICA is responsible for operating research with its national programmes. ICA has the programmes listed here:

- 18 dealing with agriculture (crops and support programmes).

- 11 in animal sciences (improving, animal health and production).

In addition there are support activities:

- 9 national research programmes in statistics, agricultural economy and social sciences.

In 1971, the Technical Sub-Director and the Research Division reorganized their activities and assigned particular projects to experimental centres, farms and stations. And this meant that the research methodology concerning the basic area used and the processes selected and to a certain degree the planning of these activities was modified as a result.

The following criteria were suggested:

a) Improvement of plant varieties and animal breeds should not be done in isolated ecological pockets, but over extensive areas.

b) The principles studied for the scientific activities in a few centres can, with some adjustments be applied to broader sectors.

c) Greater care must be taken to avoid(repeat) the non-technical experiments in centres and stations.

Based on these criteria the 5 experimental centres 20 demonstration centres and 11 demonstration stations were classified into pilot, satelite and demonstration centres. They had the following functions:

a) Generate technology, genetics, applied experimentation and basic studies.

b) Genetic studies and test of the results.

c) Demonstrate the results commercially or at a semi-commercial level.

Generally, when the particular research projects are being selected and approved for the different areas, the local and/or general probems affecting crop and livestock production are weighed, identified by the research expert and the professionals in the production and development Sub-Director offices collaborate with him in this preliminary diagnosis. The selection process is also based on the basic research "guidelines" or areas that are, fundamentally, aimed at improving crop varieties and livestock breed and develop prevention techniques for exotic pests and diseases.

At first the research "topics" that have been selected thus are prepared as projects within the national programmes and then they are taken to be analyzed, discussed and consolidated by the research committee. This committee assesses the corresponding sub-director and it determines the research area priorities and the initial allocation of funds is made. In this general procedure some things should be underlined, first, each National Programme is autonomous and the technical personnel are free to choose and define their own particular projects. Secondly, it is consolidated in terms of general policy by the upper levels, and finally, the problems that give rise to research are extremely diverse.

Recently, between 1974-1975, it was decided to create a Division of Socio-Economic Studies that would help design and implement ICA's biophysical research programmes so that the information obtained from them can be subjected to an economic analysis that will determine its feasibility and problems in relation to the supply of products, demand for inputs, use of labour, income distribution and community welfare.

We have already explained in the historical outline that ICA emerged from the Division de Investigaciones Agropecuarias (DIA) of the Ministry of Agriculture. Ever since its creation, DIA was exclusively a research body. All the promotion, control and extension work was carried out by other specialized dependencies of the Ministry.

When ICA was created in 1963, the aim was to bring together all the research, development and extension activities, this is why ICA was assigned these functions and why it was given the personnel, equipment and materials that had belonged to the specialized dependencies of the Ministry until then. Consequently, ICA had to be multi-disciplinary body whose activities would link all the essential elements for developing the agricultural sector.

Despite this ideal, at first, ICA, basically, followed the same orientation as the old DIA. Biophysical-agricultural research lead until about 1973-74. In effect, between 1950 and 1963 the whole of the DIA budget was spent on research; in 1964, 57.4% of the total budget was for research and in 1965 it was 87.4%. 1/ From then on, in relative terms, the share of the budget corresponding to research began to decline in favour of development activities more and more (funds,) especially after 1968, when the agricultural sector was reorganized and new functions were given to ICA, (were) and allocated to these activities. Therefore, between 1969 and 1973, the percentage of the budget spent on research dropped from 48.1% to 30.0%. 2/

In 1975 the Institute spent $245.5 millions on research which was 32.66% of the total budget. This percentage would be higher if we included the animal and plant health programmes, among others, which involve research, although it is applied and/or demonstrative at a commercial or semi-commercial level, and it is the production sub-directors who are responsible for it although they must coordinate it closely with the research sub-directors.

1/ Novoa, et al., 1976, op. cit.

2/ Novoa, et al., 1976, op. cit.

ICA has also received significant support for its research from international technical assistance and financial agencies. Even since the Institute was created the Rockefeller, Ford and Kellog Foundations and the University of Nebraska have provided valuable collaboration in the form of direct technical assistance for research programmes, they have donated equipment, facilitated graduate and post-graduate training and they have financed different projects in agronomy, animal sciences and socio-economic studies. This collaboration reached its high point between 1963-70, but it has continued for programmes that ICA is especially interested in. The total funds provided by these bodies is not know exactly.

ICA has had and still has cooperation programmes with various international bodies that specialize in research, development and technical assistance.

In 1974, the Institute was running 25 international technical cooperation programmes, and 14 of them were research. According to the report put by the Institute 1/, in that year a total of US$8.9 millions in aid was received to finance experts, scholarships, equipment and other expenses in technical cooperation programmes. For research projects the total was US$3.0 millions.

This data corresponds to the projects existing in that year but which lasted for longer periods, and it shows, in part, how significant the external technical assistance and financial resources that the Institute receives for its research work are.

So as to have a complete picture of the present organization and structure, the role played by industry and private enterprise in agricultural research in the country must be underlined. This role will be described further on in this study when the participation of the private sector and of some agricultural associations is discussed. The majority of the private associations of producers of agricultural products had in the past and still have their own research programmes and consequently, to a certain extent they free the State from this task which would fall on ICA.

The Universities also contribute to the non-state agricultural research work, the professors, researchers and students in the departments of

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1/ Informe de Gerencia 1973-74. Instituto Colombiano Agropecuario, ICA. Bogotá, 1974.

Agronomy, Veterinary Sciences, Animal Husbandry, Agricultural Engineering and others study the different technical problems that arise from agricultural development.

Similarly, the participation of the laboratories and/or companies that produce and import biological and agro-chemical products is important. They do local applied research to test their products, they develop new techniques and methods to use fertilizers, fungicides, herbicides, animal feed products, vaccinations, etc. They are also the main importers of technology developed by other countries that ICA is responsible for controlling and applying.

Bodies like the Instituto de Investigaciones Tecnologicas (Technological Research Institute) (IIT), Colciencias, CIAT and some multinational companies specializing in producing basic crops and in developing livestock products and sub-products, such as the Grace Company United Brands and Purina, depend on their own laboratories and experimental centres, most of which are abroad, for developing new techniques and processes, but they often have local applied research programmes. A few bodies, both private and semi-official, are either directly or indirectly controlled by ICA either because ICA is in charge of quality control and technical efficiency or because they have cooperative projects and in some cases simply because they exchange results and information.

Characteristics of the Organization

In matters of policy, national planning, allocation of resources, standarization, coordination and evaluation, the research system has been centralized and decentralized in everything connected with implementing, regional planning and administration.

This system or organization is considered to be the most effective for agricultural reserarch because it reconciles local and regional needs with government policies, it means that scientific disciplines are used to develope new vegetable and animal production systems, it provides integral solutions to the problems affecting producers, its results in savings in human and physical resources, because the research programmes not only consider the biophysical aspects but also the socio-economic aspects of the regions.

Activities: ICA carried out research in the following areas:

1) Agronomy: cotton, rice, cacao, sugar cane for "panela", (unrefined sugar leaves), minor cereales, vegetables, fruit grain legumes, annual oil seeds, maize sorghum, African palm, plantain and banana, potatoes, cassava and tobacco.

In these crops work is being done on plant improvement, entomology, physiology, soils, phytopathology and cultivation practices.

2) Animal Sciences: Beef and dairy cattle, pigs, sheep, poultry and minor species.

For these species the work is on genetics, nutrition, physiology, pastures and forage, and production systems.

3) Veterinary Sciences: Infectious diseases and epidemiology, vesicular diseases, parasitology and entomology, pathology and toxicology.

4) Agricultural Engineering: Developing water and land resources, agricultural processes and agricultural machinery.

5) Agricultural Economy and Rural Sociology: This division carries out regional and sectorial studies and supports biophysical research.

In 1975, the Research Sub-Director in ICA had 317 professionals for this research work, 44 had Ph.D degrees and 127 M.S.

Generating Research Projects

Any expert in the Institute can propose research but it must fit into the Institute's policy framework and solve a specific problem the cattle farmers or cultivators have to face. At a regional level, these projects are approved by the respective Regional Director's Committee and then they are forwarded to the respective division at a national level. The national division, the programme directors and the director in charge of the relevant breed or crop study them. Once they have been approved they are returned to the corresponding regional where they can be implemented.

As ICA plays such an exceptionally important role in agricultural research in Colombia, it is worth describing its functions, organization and activities in detail.

Experimental Programmes and Centres

Figures 1-7 y 1-8 show the location and some general characteristics of the experimental centres and stations belonging to ICA, the research programmes ICA has in each of the different centres and stations. A few comments are needed to highlight some of the facts in these Figures.

First of all, except for Cereté Farm that was founded in 1962, and which, certainly, has numerous (11) and important activities, no new experimental farms or centres were created during the sixties or seventies. Four of them, Tibaitatá (Cundinamarca), Espinal (Tolima), Rionegro (Antioquia), and Villavicencio (Meta) were all founded in the fifties. Another four were founded between 1926 (Cali) and 1946 (Pasto). No-one seems to know exactly when the others were created.

The 17 centres have a total of 34,320 hectares for research activities. If we exclude the Carimagua Farm in the Llanos (the Eastern Plains) which covers 20,090 hectares, there are 14,230 hectares for the 21 different research programmes. That means: 890 hectares per station and 678 per programme.

It is feasible that these averages are acceptable, naturally everything depends on the type of soil, the available water and the number of programmes per centre. As regards the last point it is worth mentioning that Figure 1-8 shows 21 different programmes in the 17 different centres and stations. They are:

- Apparently there are no programmes at Carimagua.
- Four farms have only one programme (San Jorge, Tulio Ospina, Elmira and El Arsenal).
- Two have two programmes (Tulenapa and Macagual).
- Two more have three programmes (El Nus and La Libertal)
- In one there are four programmes (Caribia).
- There are five programmes in two (La Selva and Motilona).
- There are six programmes at Nataima.
- In Abonuco there are eight programmes.
- There are eleven programmes each in Tibaitatá and Turipana.
- Palmira has fourteen programmes.

This degree of concentration or dispersion does not indicate anything special, moreover, there must be technical factors, the extension and technological demands, etc. that determine this distribution. However, one thing does stand out: the largest number of programmes are being conducted on the farms with the most fertile soil which is also the scarcest in Colombia (i.e. Palmira, Cereté, and Bogotá Sabana).

Certain programmes appear more frequently on the farms than others:

- Maize, sorghum and grain legumes in seven.
- Cotton, dairy cattle and tubers in six.
- Beef cattle, vegetables and fruit in five.
- Rice, plantain and bananas are studied on four farms.
- Cacao, perennial oil seeds, poultry and pigs are studied on five.
- Sugar cane for "panela", minor cereales, mixed crops, annual oil seeds and sheep on two.
- Tobacco and the minor species at only one centre or farm.

In summary, the Institution concentrates on maize, sorghum, cotton, fruit, vegetables, rice and cattle including pasture.

The picture becomes even clearer when we examine the human and financial resources corresponding to each programme and/or product.

2.2.2 INDERENA: Forestry Research

When discussing the Ministry of Agriculture it was mentioned that the Instituto Nacional de los Recursos Naturales Renovables (the National Institute of Renewable Natural Resources) INDERENA was created by Decree 2420 of 1968. It is a decentralized public body that is dependent on the Ministry of Agriculture.

INDERENA's function is to protect the environment and administer, conserve and manage the renewable natural resources throughout the country. Subsequently, the Reglamentary Decrees of the National Code of Natural Renewable Resources and the Environment that was adopted in Decree 2811 of 1974 assigned it additional duties.

The Institute is not strictly speaking a research body but its work is to promote, develope, conserve and look after the resources. Therefore, it does not have any exclusively research units, although it does operate various research projects on flora and fauna varieties and species, and especially in forestry, first independently, but since

1975-76 the Corporación Nacional de Investigación y Fomento Forestal (the National Corporation of Forestry Promotion and Research) CONIF has collaborated too.

The National Forestry Research Plan was created in 1976 and it aims "... with coordinated action using the human and economic resources that are at present available in the private, state and academic sectors, to solve the unforeseen problems that arise when the forested areas in the country are used rationally." 1/

The Plan divides research into four main fields: forestry areas, silviculture in man planted forests and forestry technology and products. It also has sub-programmes on: inventory and classification of land, with collaboration from the Instituto Geografico Agustin Codazzi (the Agustin Codazzi Geographic Institute) and the National University, prepare a map of forests, study the forestry areas where the population density is high and those that are suitable for reforestation, adapt forestry species, control pests and diseases, forestry improvement and diverse programmes to test technology.

2.3 Mixed Ownership Institutions

Although ICA is the main agricultural research body in the country and is responsible for the sector, there are other entities which are also active in research, but generally only in specialized areas like the Federación de Cafeteros in coffee, CONIF in forestry research and the Centro Nacional de Investigación de la Caña (the National Sugar Cane Research Centre) which is a private organization.

The bodies we will describe briefly in this section all have a mixed system of ownership, part private and part state. This system is typical of CONIF and CVC. Since 1928, the Federación de Cafeteros has been responsible for research on coffee and ICA collaborates in certain aspects, mostly plant health. The situation of CVC (Corporación Regional del Valle del Cauca) has been somewhat different, it started as a private regional body, the Departmental Government had some participation, but after 1975-76 it became an official body dependent on the National Planning Department.

1/ Flores Delgado Arturo, et. al. Plan Nacional de Investigaciones Forestales. Dirección General de Bosques, INDERENA. Bogotá, May, 1976.

Although, in reality the role played by these entities in agricultural research in the country is small, we should include at least a short account of them as they represent the private sector's participation and also because coffee and the forestry resources are so predominant in the economy.

2.3.1 Corporación Nacional de Investigación y Fomento Forestal (CONIF) (National Corporation for Forestry Research and Promotion)

The Corporación Nacional de Investigación y Fomento Forestal is a non-profit civil corporation. It was founded in 1974 by 18 forestry companies. INDERENA is the only state body belonging to the Corporation; it receives unofficial support from other state entities like the Ministry of Agriculture, ICA, INCORA and IDEMA, but so far there have been no financial contributions.

Objectives: The Corporation has three main objectives:

- Study reforestation methods and the natural regeneration of forests.
- Implement reforestation and forest management plans.
- Carry out economic and social development plans in the areas where forestry resources are being exploited.

Financing: All the members of CONIF pay a quota to the Corporation for each cubic meter of timber that they felled. The contributions are allocated as follows:

- 50% invested in reforestation programmes,
- 25% in research programmes,
- 25% in social and economic development programmes.

INDERENA also makes a contribution which is equal to a third of the total for the quotas for each cubic meter of timber felled and the funds for allocated thus: half for forestry research programmes, the other half will be used to implement social and economic development programmes in the areas where the forestry resources are being exploited.

Direction: The highest authority in CONIF is the General Assembly composed of representatives of the private members, and a representative of INDERENA. Normally, the General Assembly meets once a year in February or March. INDERENA has veto power in the Assembly.

Six people sit on the Board of Directors. Three are chosen from among the private members, the others represent the Government: one from

the Ministry of Agriculture or his delegate, the second is the President of INDERENA and the third is elected by the INDERENA Board of Directors.

The President, who is the legal representative of the Corporation is chosen by the Board of Directors. His job is to direct, coordinate, supervise and control the personnel and the programmes the entity undertakes in the course of its attempts to achieve its objectives.

Experimental Farms and Programmes: Of all the diverse activities CONIF is engaged in, such as reforestation, social development, information and documentation, research deserves special attention. It includes certain complementary tasks that we will mention because they make it easier to understand the scope of this research.

Critical Analysis of Silviculture Research: A critical analysis was made of the foresty research being done by the Government, the universities and the private sector so as to establish the Corporation's research priorities. This analysis has been summarized in the document "Orientación de la Investigación Silvicultural en Colombia".

Establishing Research Priorities: The Corporation has decided on the following priorities for its activities:

1. Regenerate natural forests of mangrove, "Guandal", "Catival", the forests on low hills and mixed forests.

2. Silviculture in planted forests and in particular, experiments with species and plantation management.

3. Integral use of forests with emphasis on agroforestry systems, palm trees and different wood products.

Regeneration of Natural Forests: Five research projects were prepared and are being implemented: they are: Forests on low hills, "Guandal" * forests, forests in Carare-Opón, "Catival"* forests and Mangrove forests. The INDERENA/UNDP/FAO Project is collaborating with these projects.

Silviculture in Planted Forests: Two projects were prepared and are in progress: one experiments with the species Laurel, Oak, "Mascarey, Vainillo and Virola",* and the second is plantation management in Rio Mira (Tumaco), Rio Tocamo and Teresitas (Urabá) and Carare-Opón. The INDERENA/UNDP/FAO Project is also collaborating with these projects.

* Translator's Note: These are tropical tree species.

The Integral Use of Forests: Two projects were implemented. The first deals with agroforestry systems and includes production in nurseries and planting in plots in five community enterprises belonging to the Instituto Maria Mulumba in the Municipality of Buenaventura, they have plantations of combined crops (papachinan-mangostan), palm trees and trees for timber. The second is the basic study of silviculture and of the contents of products that was carried out with seven species (bamboo, royal palm, "guerregue and táparo palms"; "chontaduro"; and "almirajo" trees, chesnut and "balata" trees*). The Secretaría de Fomento y Desarrollo del Valle (the Secretariate of Promotion and Development of the Cauca Valley), the National University (Palmira), the University del Valle and the Instituto Maria Mulumba are collaborating with these projects.

Preparing a General Map of the Forests in the Country: The first state is being completed at present in the area around Urabá. INDERENA, the Instituto Geográfico Agustin Codazzi and the INDERENA/UNDP/FAO Project are all collaborating with this project.

Establishing Three Silviculture Stations: The following were selected:

- Los Sirios in Espriella (Tumaco).
- San Isidro (Buenaventura) and Sautatá (Urabá).

The plans and designs for building the stations have been done and building has started in San Isidro. Research work, using the facilities that already exist, has began in all three stations. This project also receives help from the INDERENA/UNDP/FAO Project.

2.3.2 Federación Nacional de Cafeteros (FEDECAFE) -(National Coffee Federation)

FEDECAFE is an association of the coffee growers from different regions of the country who have registered in it. The Federation is a private organization whose function is to develop and protect the coffee industry. The IX Coffee Congress, that was held in Bogotá, created CENICAFE on the 2nd of November 1938, so that it could undertake the research work necessary for the Federation to fulfill its objectives. The Centre is FEDECAFE's central experimental station

and it is the headquarters of the Research and Experimental Division under the Technical Director.

Its principal function is to study the technical and economic problems encountered in coffee cultivation and those connected to the other crops grown in the coffee zones, and produce technological innovations that will permit the farmers to increase their production and improve their living conditions.

CENICAFE has the experimental centres called Naranjal and Romelia and those in its principal Farm located 20 kilometers from Manizales in the Department of Caldas. Naranjal covers 89 hectares and it is the basic experimental field. Romelia, with 105 hectares, is the livestock experimental centre, and the Farm has 69 hectares. The Centre also has six experimental sub-stations in the mountains. CENICAFE is a division within the Federation that is dependent on the Technical Director (Figure 1-9). It has a management division and four departments: Agronomy and Technology, Biology and Soils, Administration and Personel Relations (Figure 1-10).

Each department is divided into sections, each has the personnel, the material and financial resources necessary to carry out the work programmes.

Research is being done on the subjects listed below: coffee culture systems and practices, vegetable physiology, entomology, vegetable health, plant improvement, agricultural chemistry, soils, agroclimatology, animal industries (cattle and pigs), technology for coffee, phytopathology, industrial chemistry and related crops.

2.3.3 Corporación Autónoma Regional del Cauca (CVC) - (Regional Autonomous Corporation of Cauca)

The CVC was founded in 1954. It is a public entity that is dependent on the National Planning Department. The institution's basic objective is to conserve and develop the land in the Upper Cauca River Basin and the adjacent areas.

Several of the functions the CVC has been entrusted with deserve to be mentioned here:

- Generate, transmit and distribute electricity.
- Regulate the rivers so as to prevent floods and provide water for irrigation.
- Conserve the soil, design suitable drainage systems and encourage reforestation.
- Regulate the use, exploitation and marketing of the renewable natural resources.
- Provide public services, promote the economy of the region and improve the natural resources.

CVC has given special emphasis to agricultural research as it is considered to be a way of achieving their goals. This research is carried out in the special programmes section of the Division of Natural Resources. The special programmes section consists of several sections: agricultural tests, forestry tests, fish development and, most recently, the flora and fauna section.

These agricultural experiments include the following activities: adapting crops, soils management in hilly areas, and adapting livestock species. This programme has been based on two fundamental criteria: respect the agricultural tradition of the region and promote crops that are not harmful for the soils. Basically, the fish development programme promotes pisciculture and the management of ichthyological resources.

The forestry experimentation programmes have been working in five areas: forestry areas, adapting species, silviculture in natural forests, silviculture in planted forests, and the establishment of a regional seed bank. The flora and fauna programme has begun to work with management techniques for the various species and their promotion.

2.4 Agricultural Research and the Private Sector: Brief Background of the Sector's Participation

It has already been pointed out that the Colombian Government took over the responsibility for managing, orientating and developing agricultural research in 1932. However, as this task became progressively more complex and had to cover new fields, some of which were highly specialized and of interest only to the growers of the particular crop or the raisers of one particular livestock species, cattle for instance, the private sector was forced to participate in research and carry out projects that the Government was not able to undertake fast enough.

At the beginning the producers associations only established modest research programmes, but as their particular crop became economically more important so did their research activities. Coffee, which has been the main crop of our agricultural economy ever since the end of the last century, was probably the first crop to need individual research programmes to study its specific problems. The Federación Nacional de Cafeteros was created after the Second Coffee Congress (1927) and the first research programme was started in Chinchiná (Caldas) in 1938. From then on the Federation has had the chief responsibility for this work. In effect, neither DIA, nor subsequently ICA have ever had coffee research programmes, although both institutions have made contributions to the research and have helped to solve specific problems, particularly regarding basic research.

In 1974, the Federación Colombiana de Cultivadores de Arroz (FEDEARROZ) (The Colombian Federation of Rice Farmers) was created like the other associations to encourage rice cultivation, promote exports and represent the interests of the producers. It was the Federation that imported some of the first varieties of rice, such as Bluebonnet 50 and Rexoro, into the country. As their yields were far higher, although they were susceptible to diseases, they have been especially important in developing the crop in Colombia.

Although FEDEARROZ does not actually have a research department as such, it has contributed and continues to contribute to ICA's research activities with rice both directly by providing funds for the Institute's projects or by financing regional tests, and indirectly by promoting and disseminating the results of ICA's work.

The Federation's most direct contribution has been to pay for an expert to work on the ICA rice research programme and, during the last five years (1970-75), it has paid almost $300,000 a year towards the cost of testing the new varieties ICA has produced in different regions. These contributions started after the programme to create the new variety Cica-6 produced results.

Cotton is another of the crops where the producers have helped with the research. Their association was founded in 1968, and twenty years earlier the Government had created the Instituto de Fomento Algodonero (the Cotton Promoting Institute) IFA. This Institute was responsible for promoting production, handling exports, supplying inputs and for a few research programmes until 1968 when, as a result of the administrative reform of the agricultural sector, it reverted, with all its programmes to ICA.

Today (1976), the Federación de Algodoneros (the Cotton Farmer's Federation) has a technical department employing 14 professionals. It has several applied research programmes in entomology, soils, weed control and agronomy with an annual budget (1976) of $15.0 millions. According to the Federation, they have managed to coordinate their research work with ICA to a certain extent, although since 1964, when the Department was created, some of their work has been duplicated. For example, the Federation has an Experimental Centre for cotton that is located right next to the ICA farm at Natagaima (Tolima) where ICA has its own national cotton programme. It is not unusual to find the same experiments being carried out at both centres and, sometimes, they even have the same objectives and similar designs.

In addition, the Federation also disembursed some $20 millions a year for promotion which ICA receives.

Probably, the private sector has contributed more to sugar research than to any other crop. About 12 years ago the principal sugar mills in the country, mostly in the Cauca Valley, began their own research programmes, and they ended by running all the projects. ICA worked with this crop and allocated large sums to it until 1975 when they changed their priorities and turned their attention to sugar cane for "panela" (unrefined sugar cane loaves, the poorest sectors consume their sugar in this form).

Private companies or groups have also been activive in specifid research dealing with oats, barley, cacao, perennial oil seeds, vegetables and fruit.

Between 1965-76, the Quaker Oats Company paid for an expert in the ICA oats programme, since 1963-64 there has been an agreement concerning barley between ICA and Procebada and Malterias Unidas and other breweries have also participated. At present Agrofomento S.A. has one applied research programme in improvement, and it also makes direct contributions to ICA in the form of money to pay researcher salaries, purchase materials, make regional tests, finance improvement work and especially work on plant health in oats.

Private producers have done isolated work in applied experimentation dealing with vegetables and fruits. The companies Fruco, Maizena and La Rosa are typical cases, they have set up small experimental farms on the coast and in the Cauca Valley. All efforts to integrate their work with ICA have failed and to a certain extent the private research has progressed further than the State's.

We cannnot confide too much in ICA's work with perennial oil seeds. The big companies, such as Indupalma, Coldesa and Oleaginosas Risaralda have established their own research programmes dealing with cultivation practices

and plant health problems. In addition, they have contracts with foreign entities, such as IRHO, for technical assistance in soil analysis, identifying pests and diseases and cultivation practices. Thus, the oil seed industry has, to all intents and purposes, assumed the responsibility for their own research, and the growers and processors of African Palm have never collaborated with ICA in this field.

Tobacco is one of the oldest export crops in Colombia. Typically, the light tobacco is grown with industrial methods while the small farmers on the coast and in the Department of Santander grow black tobacco. In 1968, IFA became part of ICA and since then ICA has supervised black tobacco research.

The Compañia Tabacos Rubios de Colombia S.A. has two small experimental farms and four researchers dedicated to evaluating varieties of light tobacco for the Company's own use. Furthermore, the Compañia de Tabaco has a technical Department with six researchers and most of their work is done in Santander and the Cauca Valley.

The inter-institutional agreement for studying cacao should be mentioned as well, the Compañia Luker S.A., the Nacional de Chocolate, the Federacional Nacional de Cacaoteros (the National Federation of Cacao Growers) and ICA all participate in it.

The agreement was signed in 1964 and in 1976 it was worth $5.500.00 and ICA did the research. It also includes dissemination activities for disease control. In addition to this, the Federación de Cacaoteros and Luker do research in their own three experimental farms. Similarly, Cofiagro and Cecora have helped private research projects with cacao too.

The private sector's participation in medicine and veterinary sciences has probably been even greater than in agronomy. The technical departments, the laboratories and the companies producing concentrates like Life, Hoechst, Purina, Pfizer, Ciba Geigy, Abbot, etc. all have research programmes which are very important in developing veterinary technology. They frequently help to finance the ICA research programmes that evaluate their products.

Traditionally, ICA has always had research programmes in the poultry and pig sectors and has aided the companies and the producers associations in these industries. This aid has been in the form of specific contracts to do follow up work that is hard to quantify because they are so specific and because they are often sporadic too, there have been concrete projects in nutrition, improvement, management, disease control and prevention and commercial testing and evaluation of biological products.

Moreover, Article 14 of Decree 615 of 1974 and Article 62 of Decree 135 of 1976 stipulated that the Empresa Colombiana de Productos Veterinarios (the Colombian Company of Veterinary Products) VECOL, should designate part of the legal reserves of its profits for ICA to spend on research projects and on introducing technologies related to animal health.

Finally, for many years now ICA has charged for some of the direct services it offeres to the public like soil analysis, seed certification and certain diagnosis tests on animals.

The Institute never received very much for these services and generally less than the real cost. In April 1974, Resolutions 041 and 070 of the National Prices Board authorized ICA to charge more realistic prices for some of the services they offer, including soil analysis, veterinary diagnosis, inspecting refrigerators for exporting meat, controlling animal feed. And Resolution 002 of the 26th of January, 1976, included control and supervision of agricultural inputs.

The money that ICA earns from these services is another indirect source of funds for its research costs, apart from what it receives from the producers associations and individuals.

2.5 Collaboration between ICA and CIAT in Research and Technology Transfer

One of the International Research Centres is located in Colombia, CIAT. It specializes in humid tropical agriculture. Below we will analyze the relationship between the Centre and ICA.

On the 15th of April, 1969, CIAT and ICA signed a General Agreement to collaborate in research and technology transfer. As a result they operated over several years a series of joint activities with rice, beef cattle, maize, beans and cassava.

The results of the cooperation between ICA and CIAT are already being used by farmers in Colombia and they have been very successful in increasing agricultural production and productivity, especially rice. They have also had more localized successes, although none as transcendental as those with rice, in the use of improved varieties and advanced technology in cassava, in certain types of tropical forages, like Stylosanthes Guyanensis, in understanding and controlling diseases.

In 1977, CIAT and ICA signed a series of letters of intent to regulate their joint activities on the beef cattle project in Carimagua, on cassava, beans, and there are two more letters still to be signed at the beginning of 1978 covering rice and the sanitary control of seeds and germplasm.

Below is a description of the functions and activities corresponding to ICA and CIAT in the different joint programmes they have so far reached an agreement on.

2.5.1 Beef Cattle

ICA has agreed to promote the Station at Carimagua to a National Research Centre that is directly dependent on the Research Subdirector in Bogotá. The director of the Station is an ICA employee, while the superintendent is an employee of CIAT. The work progammes of the two institutions have been closely coordinated from the planning stage right through to the implementation stage, so as to avoid duplications in planning the implementation and in interpreting the results of the individual projects.

Even more important, the two institutions have coordinated their human, physical and financial resources to ensure the maximum efficiency. Thus, the beef cattle project at Carimagua is essentially a cooperative programme.

CIAT also collects and introduces germplasm of gramineas and forage legumes and evaluates them. This work is done at the CIAT installations and at Santander de Quilichao. The first stage of the evaluations occurs after the quarentine period and examines morphological and agronomic characteristics, seed production, resistance to diseases, recuperation after cutting or mowing, capacity to adapt to acid soils and soils that are poor in phosphorous. Once this stage of evaluation is completed, the material is submitted to another evaluation in Cartagena in collaboration with ICA and this is part of the ICA/CIAT project.

On the whole, CIAT personnel do most of the genetic improvement, seed production, physiological studies, and soil-plant interaction studies. And pasture evaluation, tests to validate technology and interaction with other factors related to soils and animal management are basically the responsibility of the ICA personnel.

2.5.2 Beans

ICA and CIAT have been working in collaboration on developing new, high yield bean varieties that are resistent to the principal diseases and that will be accepted by the Colombian population. CIAT and ICA have agreed to divide up the functions related to establishing cultural practices, assistance for farmers, training scientists and subsequent extension activities.

It has been agreed that CIAT will be responsible for making the hybridizations and tests necessary to create superior material, for collecting and organizing the bean germplasm bank, for the preliminary tests of material that is genetically resistent to pests and diseases, for studying cultural practices so as to obtain the maximum benefit from the new varieties, for transferring technical information and genetic material to ICA and for keeping documentation on beans.

ICA is responsible for the genetic selection of material that has been adapted to the different conditions found in Colombia, they should use their own material and that supplied by CIAT for this work. They are also to develope and operate regional tests (with outstanding material supplied by CIAT and ICA) as part of a bean growing network in Colombia; make selection experiments with preliminary experiments with material provided by CIAT; produce large quantities of basic seed; study agricultural practices suited to the varying regions of Colombia and disseminate the new technologies to the farmers.

2.5.3 Cassava

The ICA-CIAT cooperative cassava programmes aim to produce high yielding, fast maturing, good quality varieties that are adapted to the principal producing zones in Colombia, and secondly, to generate technology that is practical for the cassava farmers reality, and finally, to disseminate new technology among the farmers.

CIAT is responsible for obtaining new varieties by using genetic improvement methods; for this, they will use the collections of cassava and hybrids; maintain and use the cassava germplasm bank; organize and develope the preliminary tests of promising types of cassava; organize regional tests of advanced cassava material, select cassava germplasm varieties and material under given conditions so as to reject those which are resistent to environmental conditions; develop profitable cultural practices, and do research on specific widespread problems, not those that are only localized.

ICA will organize and carry out regional experiments to test how adaptable promising cassava material is to the conditions prevailing in the different regions of the country where the crop is cultivated, it will name and register the new cassava varieties in accordance with governmental requirements; develope production technology at a regional level including multiple crops; hold demonstrative tests on how to use and adapt the technology generated by ICA and CIAT,

including camp days, short courses and consultation services for farmers and general recommendations in the communication media that is most likely to reach the cassava farmers; produce basic seeds and control commercial seed production.

2.5.4 Rice

The ICA/CIAT research and technology transfer cooperation programmes have been transcendental in raising the average rice yields in Colombia from 1,793 kilos/ha. in 1965 to 4,425 kilos/ha. in 1975. As a consequence, total production has increased approximately one million tons a year during the same ten years.

An agreement describing the future cooperative activities between ICA and CIAT will be signed shortly and it will define the responsibilities of both institutions. The agreement is based on their mutual desire to develope improved rice varieties and technology for cultivating rice on irrigated land and eventually on un-irrigated land, as this is the most popular in Colombia.

Each institute will select crosses for their own needs, but the selection process will be coordinated. Once the hybrids up to generations F-3 or F-4 have been achieved, they can be taken to different parts of Colombia where the conditions are the best for each cross, and where the selection work will be done by ICA and CIAT together. The two institutions will utilize the material selected from the generations F-4 or F-5 in the following manner: ICA will use it to produce varieties that suit the different conditions existing in the regions of Colombia, while CIAT will select for conditions in different regions in Latin America and for a few specific areas in Colombia. CIAT will continue to collect germplasm and will make this collection available to ICA. CIAT will also organize international tests with rice, if ICA is interested in any of these, it will specifically request to conduct the test within Colombia. CIAT will do the quality evaluations of the rice varieties that they have selected abroad in their own laboratories and ICA will evaluate their own selections. They will exchange information about these quality tests. ICA will carry out the regional tests on varieties of rice that have been improved in Colombia and the results will be communicated to CIAT. ICA will name and register the rice varieties in Colombia. ICA will be responsible for producing basic seeds and for disseminating the information among the farmers. Similarly, ICA will be responsible for research on rice cultural practices in Colombia.

So far, we have briefly described the general activities of the two institutions in their principal work programmes where their objectives coincide. Now their specific activities will be decided according to permanent reports on their research projects, so they will not compete but will complement their future work in research and technology transfer and make use of the advantages offered by their physical and economic resources and personnel.

The ultimate aim of the collaboration between ICA and CIAT should be for ICA to use the technology that can be utilized in Colombia, and develope it fully, adapt it, and then supply it to the farmers once it has been proved economically efficient, socially acceptable and biologically feasible.

2.6 Universities and Agricultural Research: General Description

As the universities in the United States and in some parts of Europe are important nuclei and generators of research, it is generally thought to be the same in underdeveloped countries.

Consequently, the universities are also thought to carry out an important share of the agricultural research.

In Colombia the research done by the universities is relatively unimportant, or at least in its volume, nor is agricultural research given priority in the university research programmes.

These conclusions were reached by a recent study prepared by the main government body promoting and orientating research.1/ In fact, the 1977 Colciencias study of the role of the universities in research is probably the most up to date, the most complete and the most exact. It covered 28 universities, 19 state ones and 9 private ones and examined a total of 606 research programmes that were in progress that year.

The study says "... the type of university and the type of university education that exists in Colombia, and in general in the rest of Latin America, tends to be no more than a mechanism for transmitting knowledge and techniques" and that "... there is little dynamic action between the university and university research on the one hand and the productive sector on the other" as occurs in the United States where a study of the National Science Foundation 2/ found that, so far as this century, industry has been the

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1/ Fondo Colombiano de Investigaciones Científicas y Proyectos Especiales, Colciencias. La Universidad en la Investigación Colombiana. Bogotá, Colciencias, August, 1978.

2/ National Science Foundation. Basic Research, a National Resource. Washington, N.S.F. 1957, p. 29.

largest source of financing for research and the universities the main researchers.

In Colombia "... the productive sector does not demand technology, only training for personnel to use imported technology, while the institutions of higher education do not provide a really scientific or technological education that will teach the students to understand the country's development needs or how to participate effectively in this development process." 1/

These comments are borne out by the fact that in 1977, the 30 universities and thirty five agricultural departments had very few research projects. Moreover, according to Colciencias "... in the majority of the cases, if not all of them, the Research Committee or Deans do not even have complete information about each research project and frequently, they do not have up to date information about all the research that is being done at the university at a given moment", and it adds, "apart from the odd exception, the Colombian universities do not have any mechanism or system capable of giving that type of information which is up to date, quickly."

It is precisely for these reasons, the study notes, that the universities in Colombia give little importance or support to research, and this fact becomes even more obvious if we compare the universities' total budget with what they spend on research and when we see how slowly research is growing. Between 1972-1977 research done by the public sector grew 3.9% a year and university research grew 13.2% over the same period. Although this growth rate was not insignificant it is not as high as it should be if we bear in mind that the universities are participating in 20 or 30% of the total research done in the country.

Nevertheless, despite this high university participation in research, agricultural research had the lowest priority for them, only 5.3% of the total, when the research was classified into five general areas*, it occupied fourth place, with 10.8% for agriculture, silviculture, hunting and fishing, out of ten (10) more specific "fields of application".

Although these percentages are surprisingly low, they are even more so when we see that in the public sector 45.9% of the total amount spent on research

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1/ Departamento Nacional de Planeación. Consideraciones para la Reforma de la Educación Superior. Bogotá, DNP, UDS/DE, 010, 1977. pp. 5-6.

* Basic Sciences, engineering sciences, social sciences, health sciences and agricultural sciences.

goes to agricultural research, and at a global national level, more than a third of what is spent on research (36.7%) by both the public sector and the universities is invested in agricultural research. 1/

This disparity can be partly explained by the presence of ICA in the public sector as it weights it heavily in favour of agricultural research, but in 1977, the 35 departments of agricultural sciences in 16 universities only participated in 32 agricultural research projects (of a total of 606) or 79 projects in 12 universities if we take the specific field of "agriculture silviculture, hunting and fishing".

However, in reality the universities' participation in "agriculture" research is probably more if we take into account several projects that could be classified as "Basic Sciences" as this concept includes physics, chemistry, mathematics, geology and biology, and it is possible that projects listed under these headings, especially the last two, are closely connected to agriculture.

However, a final point made by the Colciencias report should be mentioned here, when the years 1972 and 1977 were compared the share of agriculture in all research was consistently low, even in those universities with agronomy, veterinary sciences and animal husbandry departments and the growth rate during the period was practically nil.

Sources of Financing

If we are to fully understand the context of agricultural research in the universities, it is essential to examine the sources of financing; it will also supply us with additional information.

On the whole research is highly concentrated in four state universities (National, Valle, Antioquia and Industrial de Santander), and in three private ones (Andes, Javeriana and Bolivariana) and, as the Colciencias report noted, the subjects have been concentrated in some universities.

This framework will make it easier to understand the financing, as it is generally believed that government funds (the national budget) finance state universities, while private financing supports the private universities.

As far as research is concerned, 46% of the total funds are supplied by the universities themselves, and it is generally in kind (installations, salaries), Colciencias provides 16.3%, 15.8% comes from other national

1/ Fondo Colombiano de Investigaciones Científicas y Proyectos Especiales, Colciencias. Gasto Público en Ciencias y Tecnología, 1977. Bogotá, Colciencias, 1978.

sources (inter-university agreements, local governments, private foundations) and 21.9% from foreign sources.

In the case of agricultural sciences, the universities contribute 65.5%, Colciencias 12.0%, other national sources 3.2% and foreign sources 19.3%. If we only consider the national sources, Colciencias is the largest, with 78.8% of the total, the remaining national sources, among them IDEMA and INCORA, provide 21.2%.

The OAS and the National Science Foundation are the two main foreign sources of funds for agricultural research, although it must be noted that 25% corresponds to unidentified sources and, further, what was said above probably underestimating agricultural research as it is included in other categories such as basic sciences is valid for foreign financing too.

Figure I-1

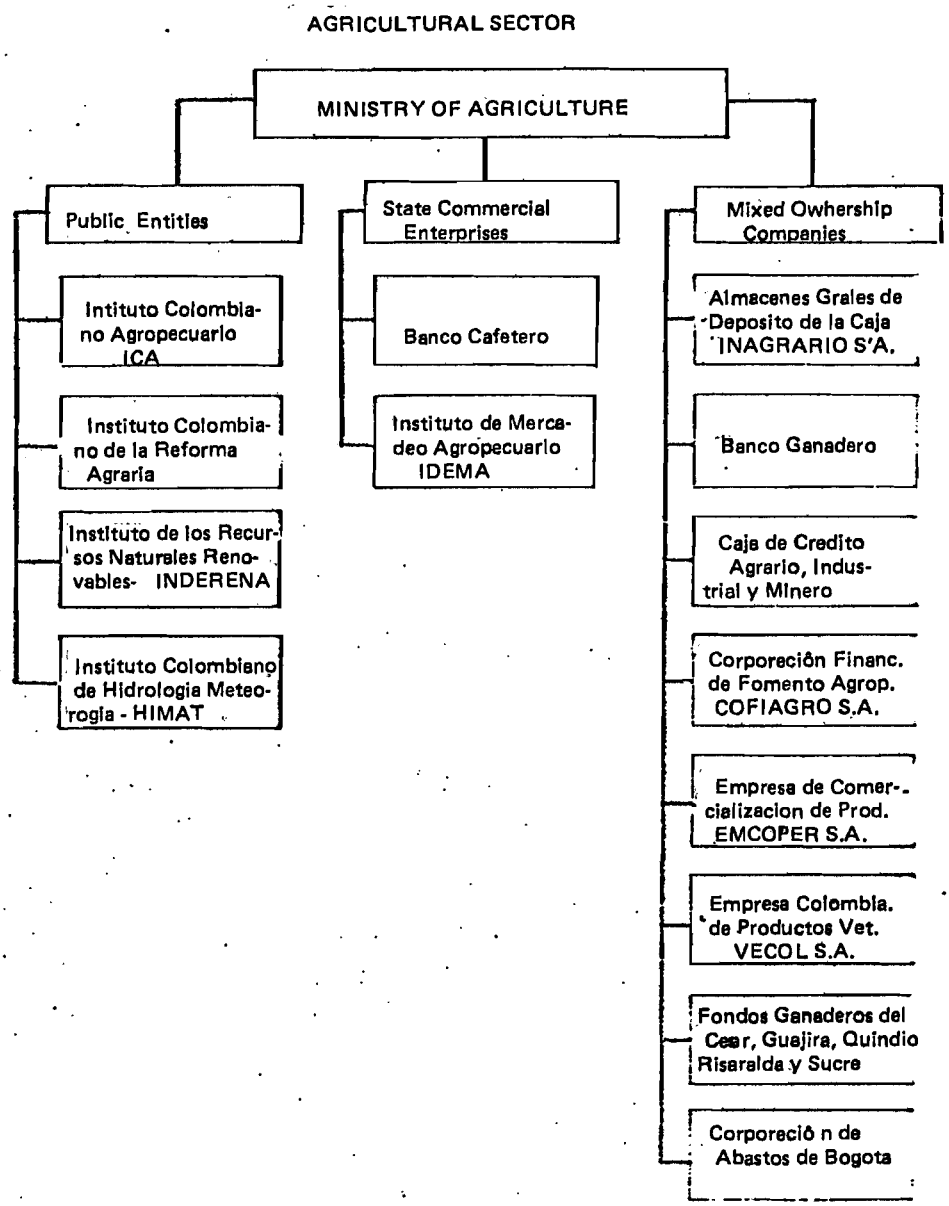
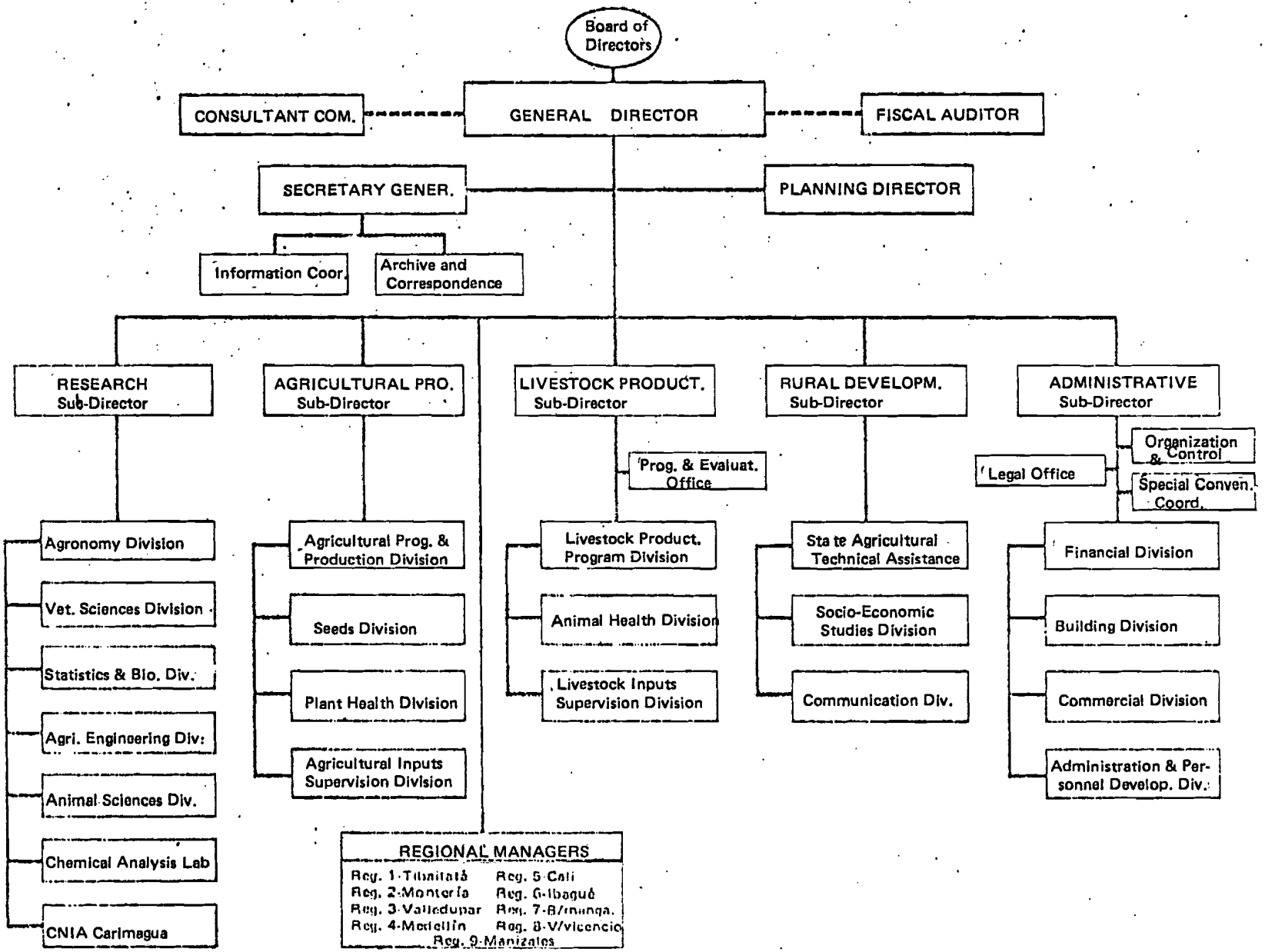

AGRICULTURAL SECTOR
MINISTRY OF AGRICULTURE
Public Entities
State Commercial Enterprises
Mixed Owhership Companies
Intituto Colombiano Agropecuario ICA
Instituto Colombiano de la Reforma Agraria
Instituto de los Recursos Naturales Renovables- INDERENA
Instituto Colombiano de Hidrologia Meteorogia - HIMAT
Banco Cafetero
Instituto de Mercadeo Agropecuario IDEMA
Almacenes Grales de Deposito de la Caja INAGRARIO S'A.
Banco Ganadero
Caja de Credito Agrario, Industrial y Minero
Corporeciôn Financ. de Fomento Agrop. COFIAGRO S.A.
Empresa de Comercializacion de Prod. EMCOPER S.A.
Empresa Colombia. de Productos Vet. VECOL S.A.
Fondos Ganaderos del Cesar, Guajira, Quindio Risaralda y Sucre
Corporeciô n de Abastos de Bogota

Figure I-2

Instituto Colombiano Agropecuario



ORGANIZATIONAL CHART OF THE RESEARCH SUB-DIRECTOR

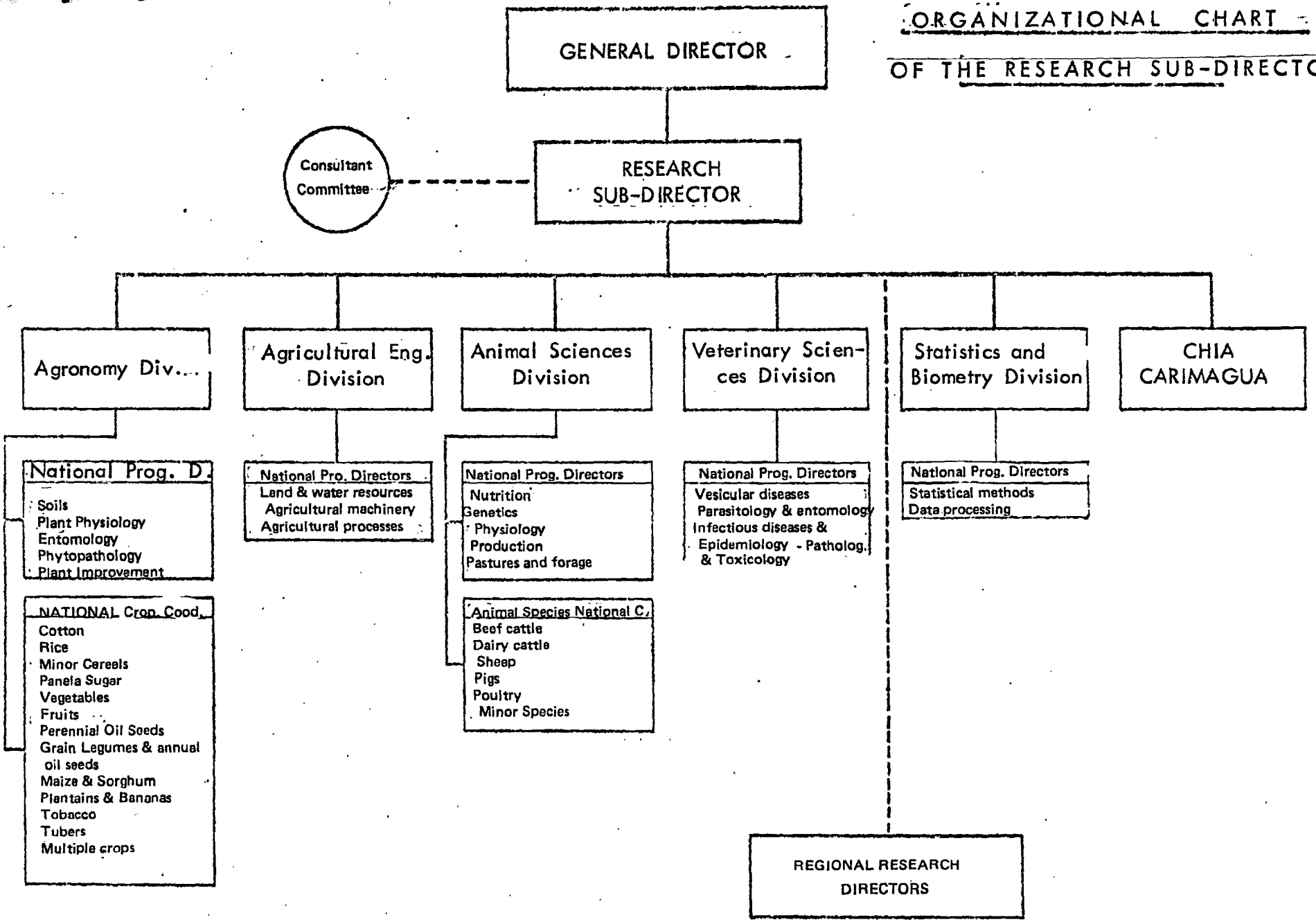


Figure I-4

ICA - Location and Areas of the Regional Offices

Regional No.	Location	Jurisdiction	Approximate Agricultural Area (Has.)*	Total Population 1974
1	Bogotá	Boyacá, Cundinamarca	6.077.933	5.388.783
2	Montería	Córdoba, Bolívar, Sucre, Atlántico	4.374.819	3.179.673
3	Valledupar	Cesar, Magdalena, Guajira	2.683.013	1.289.441
4	Medellín	Antioquia, Chocó	3.754.396	3.661.134
5	Cali	Cauca, Nariño y Valle	3.077.368	4.193.541
6	Ibagué	Huila, Tolima, Caquetá, Amazonas y Bajo Putumayo	2.912.595	1.731.618
7	Bucaramanga	Norte de Santander, Santander y Sur del Cesar	3.472.540	2.114.350
8	Villavicencio	Meta, Vichada, Casanare y Arauca	3.285.020	227.901
9	Manizales	Caldas, Quindío, Risaralda y Valle de la Dorada	1.449.956	2.004.443
	TOTAL:		31.087.640	23.740.884

* Source: DANE Census 1970

** Geometric approximations were made using population increases of 0.0325 for 1974 based on "Alvaro Lopez Toro, Inversiones Demográficas en una Economía Abierta". Revista de Planeación y Desarrollo. Vol. I. December 1969, No. 4. p. 23.

Figure I-5

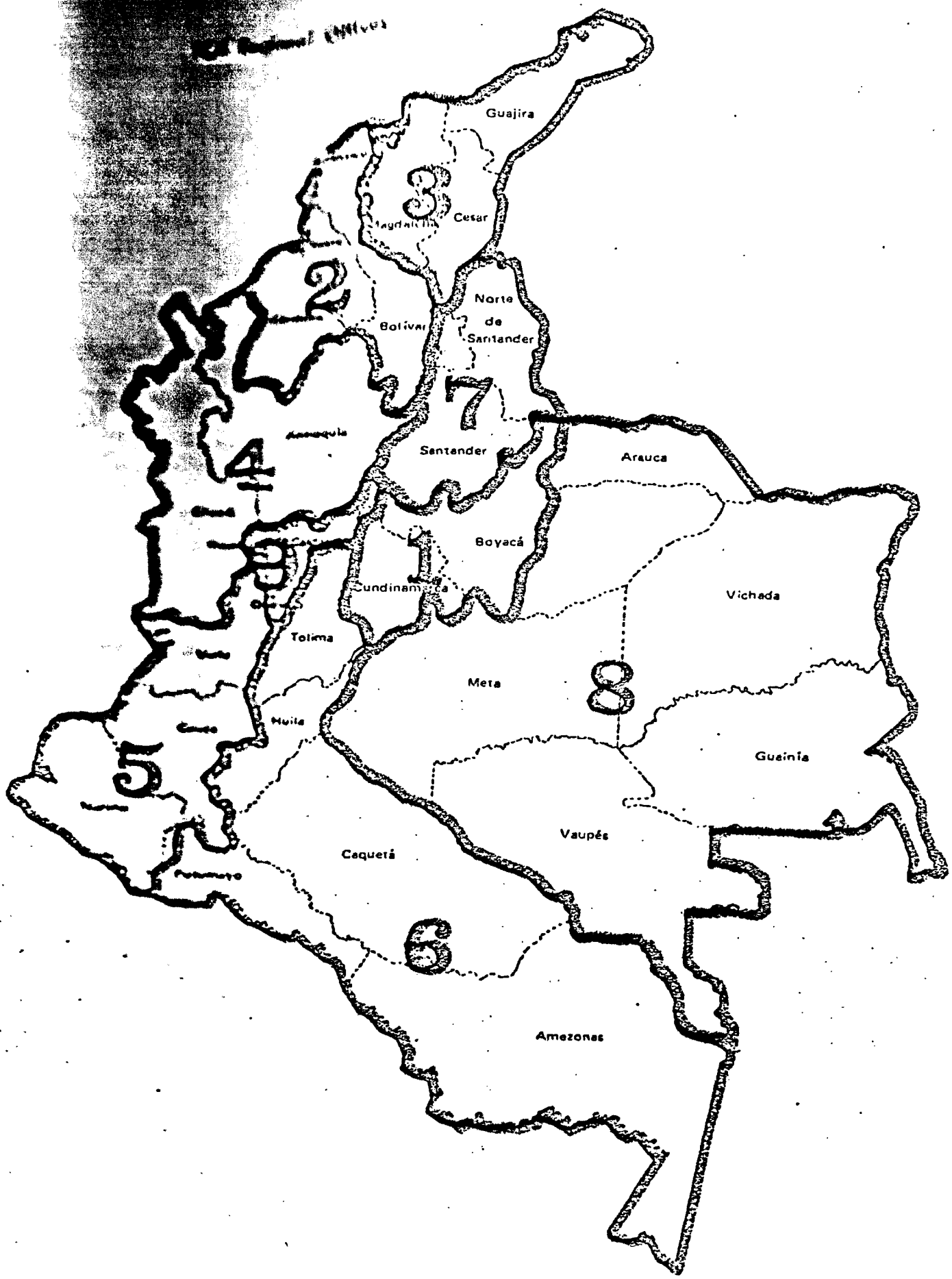

Guajira
Cesar
Norte de Santander
Bolivar
Santander
Arauca
Boyacá
Cundinamarca
Vichada
Tolima
Meta
Huila
Guainía
Vaupés
Caquetá
Amazonas
1
2
3
4
5
6
7
8

Figure 1-6

ICA National Agricultural Research Centres, Experimental Stations, Demonstration Centers

No.	Name	Municipio & Departament	Area (Has.)	Altitude Mts.	Temp. Average	Climate
1 (CNIA)	Tibaitatá	Mosquera Cundinamarca	550	2.600	14	Cold
2	Palmira	Palmira Valle	431	1.000	24	Medium hot
3	Turipaná	Cereté Córdoba	1.473	13	28	Humid hot
4	Nataima	El Espinal Tolima	263	322	28	Dry hot
5	Motilonia	Codazzi Cesar	646	132	28	
6 (EE)	Tulio Ospina	Medellín Antioquia	25*	1.500	21	Medium Warm
7	La Libertad	Villavicencio Meta	1.350	450	26	Hot
8	Carimagua	Puerto López Meta	20.090	182	27	Hot
9	Tulenapa	Chigorodó Antioquia	306	26	28	Humid Hot
10	Caribia	Sevilla Magdalena	424	20	30	Hot
11	El Mira	Tumaco Nariño	670	3	26	Humid hot
12	Obonuco	Pasto Nariño	556	2.710	13	Cold
13	Surbatá	Duitama Boyacá	70	2.600	15	Cold
14	El Nus	Rionegro Antioquia	1.800	1.200	23	Medium Warm
15	Macagual	Florencia Caquetá	382	450	25	Humid Hot
16	San Jorge	Soacha Cundinamarca	801	2.000	13	Cold
17	Yamboró	Pitalito Huila	625	1.400	24	Medium Warm
18 (CD)	La Selva	Rionegro Antioquia	44	2.200	17	Humid cold
19	El Carmen de Bolívar	El Carmen Bolívar	77	154	27	Hot Savanha
20	Santa Lucía	Santa Lucía Atlántico	25	4	28	Tropical Semi-Humid
21	San Juan de la Costa	Tumaco Nariño	160	4	24	Humid Hot
22	Balboa	Buga Valle	102	970	25	Hot
23	El Paraíso	Acacías Meta	23	420	25	Hot
24	Iracá	San Martín Meta	480	300	25	Hot
25	El Arsenal	Enciso Santander	40	1.400	23	Medium Warm
		TOTAL	31.863			

Figure I-7

Location and General Characteristics of the Experimental Centres and Stations of ICA

NAME	LOCATION	Year Founded	Area Has.	Altitude	Temp. °C.	Rainfall mm/year	Ecological Classification
NATIONAL OFFICES	BOGOTA						
Carimagua	Puerto López, Dpto. Meta		20.090	182	27	2.000	bh/BAT
REGIONAL 1:	BOGOTA						
Tibaitatá	Mosquera, Dept. Cundinamarca	1951	550	2.600	12,8	751	bs MBT
San Jorge	Soacha, Dept. Cundinamarca						
REGIONAL 2:	MONTERIA						
Turipaná	Cereté, Dept. Córdoba	1962	1.473	15	27,5	1.200	bs BAT
REGIONAL 3:	VALLEDUPAR						
Motilonia	Codazzi, Dept. Cesar		646	132	28	1.250	bs BAT
Caribia	Sevilla, Dept. Magdalena		424	20	30	1.372	bs BAT
REGIONAL 4:	MEDELLIN						
Tulenapa	Chigorodó, Dept. Antioquia		306	26	28	2.800	bh BAT
El Nus	San José, Nus, Dept. Antioquia	1936	1.800	1.200	23	2.000	bh/bmh/PMT
La Selva	Río Negro, Dpt. Antioquia	1956	44	2.200	17	2.089	bmh MBT
Tulio Ospina	Medellín, Dpt. Antioquia	1942	25	1.500	21	1.462	bh PMT
REGIONAL 5:	CALI						
Palmira	Palmira, Dpto. Valle	1926	481	1.000	24	1.000	bs BAT
El Mira	Tumaco, Dpto. Nariño		670	16	26	3.000	bh BAT
Obonuco	Pasto, Depto. Nariño	1946	556	2.700	13	970	bh MT
REGIONAL 6:	IBAGUE						
Macagual	Florencia, Depto. Caquetá		392	450	25	4.318	bmh BAT
Nataima	El Espinal, Depto. Tolima	1953	263	1.000	24	1.348	[illegible] T

Figure 1-7

(Continuation)

NAME	LOCATION	Year Founded	Area Has.	Altitude	Temp. °C	Rainfall mm/year	Ecological Classification
REGIONAL 7:	BUCARAMANGA						
El Arsenal	Enciso, Depto. Santander		40	1.400	23	1.500	bh PMT
REGIONAL 8:	VILLAVICENCIO						
La Libertad	Villavicencio, Depto. Meta	1959	1.350	450	26	4.000	bh/bmh/BAT
REGIONAL 9: *	MANIZALES						

Regional Office 9 does not have Centers or Experimental Stations; the experiments are carried out in other Institutions.

Figure I-8

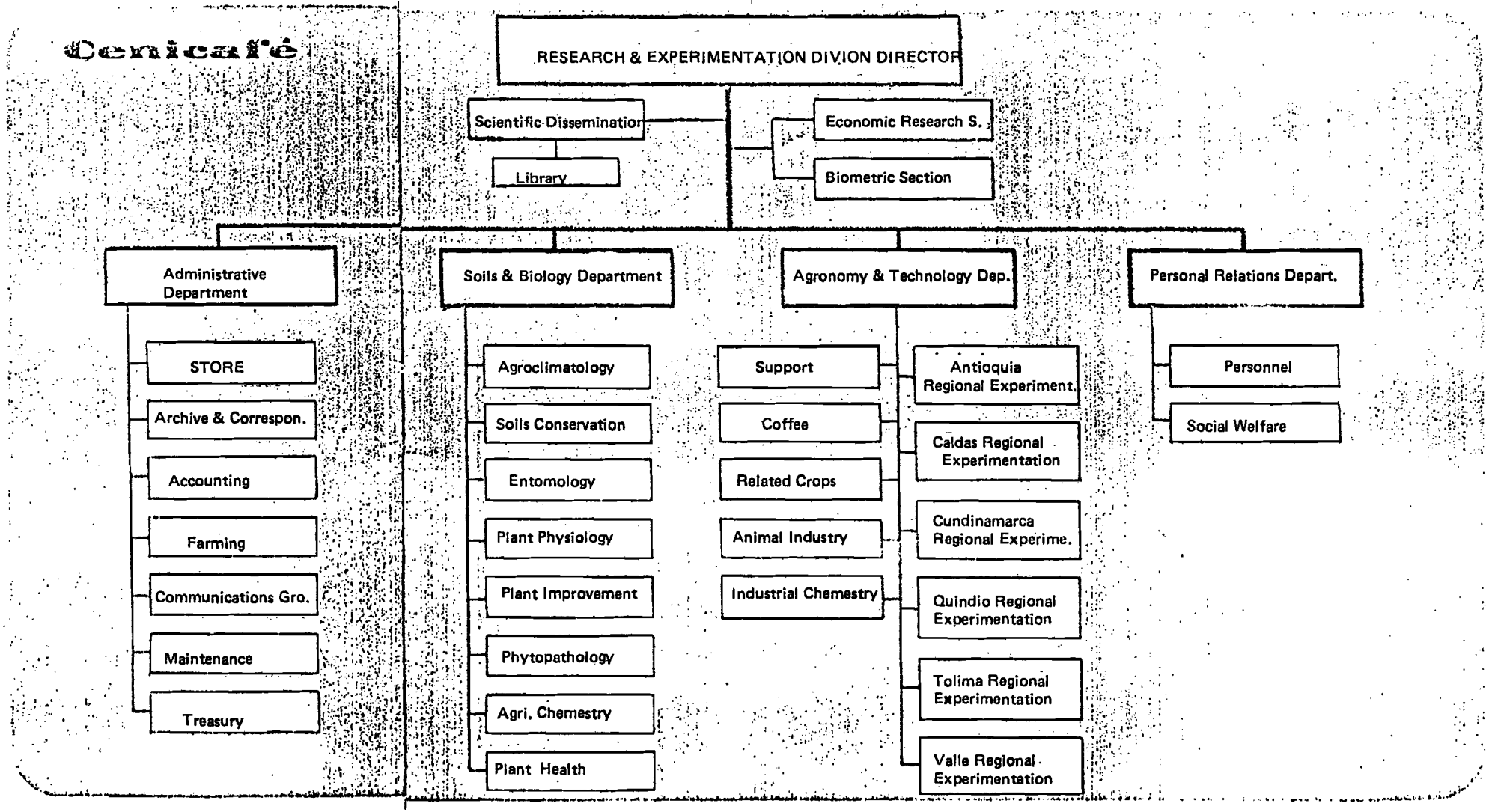
ICA's Activities in the Different Centres and Experimental Stations

PROGRAM.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Cotton		x		x	x						x				x		x
Rice				x							x				x		x
Cacao						x	x				x						
"Panela" Sugar								x			x						
Minor Cereals		x											x				
Multiple Crops		x											x				
Fruits				x		x			x		x				x		
Vegetables		x							x	x	x		x				
Grain Legumes		x		x	x				x		x		x		x		
Annual Oil Seeds											x				x		
Maize and Sorghum		x		x	x				x		x		x		x		
Perennial Oil Seeds				x		x						x					
Bananas and Plantains						x	x				x			x			
Tubers		x	x	x					x		x		x				
Tobacco																x	
Beef Cattle				x	x			x						x			x
Dairy Cattle		x		x	x			x			x		x				
Poultry		x		x							x						
Pigs		x		x							x						
Sheep			x										z				
Minor Species		X															

1. Carimagua
2. Tibaitatá
3. San Jorge
4. Turipaná
5. Motilonia
6. Caribia
7. Tulenapa
8. El Nus
9. La Selva
10. Tulio Ospina
11. Palmira
12. El Mira
13. Obonuco
14. Macagual
15. Nataima
16. El Arsenal
17. La Libertad

Figure 1-9

Organization



III. THE PROCESS OF PLANNING AND ALLOCATING RESOURCES FOR AGRICULTURAL RESEARCH

Depending on the sector, be it the official bodies in the agricultural sector, the universities or the private institutions, varying methods and criteria are used for allocating resources to agricultural research in Colombia.

We have already noted that the Instituto Colombiano Agropecuario, ICA, is responsible for all the agricultural research in the state sector. Consequently, as ICA implements the official policies, it must keep within the general framework of sectorial planning and it is subject to the formal mechanisms for allocating government funds since the majority of its financing comes from the national budget. However, the Institute has its own system for assigning its fund to its different research programmes.

Therefore, the Chapter will begin by describing the process of agricultural planning with emphasis on those aspects related to the allocation of resources for research. This description will include the different institutional stages of the process and the relationship between them.

1. General Criteria: Aspects of Agricultural Planning

In Colombia several state entities participate in the agricultural planning process and there are varying degrees of planning.

If we are to understand the long and the short term planning and programming process and how this general process affects research, we must first examine the Government bodies that are responsible for deciding policy and for administration.

First, we have the President of the Republic who, with his consultant bodies - the Council of Ministers, the National Economic and Social Planning Council (CONPES), the National Planning Department (DNP), etc. - defines the general guidelines of the national development plan at the beginning of each presidential term. This plan will orientate the specific activities in the different socio-economic sectors in the country.

The organizations listed below participate in the initial stage of preparing this development plan: the President of the Republic, principally through the General Secretary and the Council of Ministers; CONPES which is one of the President's consultant bodies, the President himself presides over it and the Ministers of

Finance, Economic Development, Agriculture, Labour and Social Security and Foreign Affairs sit on it, the Managers of the Bank of the Republic, of the Export Promotion Fund (PROEXPO), of the Foreign Trade Institute (INCOMEX) and of the National Coffee Growers Federation also participate. The Head of the National Planning Department participates too, and in addition, this Department is the Technical Secretary of the Council.

Every four years the General Development Plan is prepared for the social and economic sectors of the country by the National Planning Department in close collaboration with the Presidency. The Plan is based on the general guidelines that CONPES has set.

The next step corresponds to the Ministries who are responsible for preparing the individual policies for each sector. For the agricultural sector it is the Ministry of Agriculture which works through the Agricultural Planning Office (OPSA). This body is in charge of the specific programming for the sector, generally this touches on crops, investment needs, process policy, marketing and credit and fiscal needs, and it is coordinated with the organizations belonging to the sector.

The National Planning Department (DNP) determines the global objectives, regulates foreign credit together with the Ministry of Finance, controls the International Technical Cooperation Agreements and regulates foreign private investment. The Department does this work through its technical units that specialize in each sector - in the case of the agricultural sector, it is the Unit of Agrarian Studies (UEA).

The Unit of Agrarian Studies has several mechanisms for coordinating the activities of the sector. First, it is the unit that assesses the DNP on agriculture and CONPES in the preparation of the pertinent technical studies. Secondly, it belongs to the Assessment Council for Agricultural Policy and the Higher Agricultural Council. In addition, the head of the Unit of Agrarian Studies sits on the ICA Board of Directors as the representative of the National Planning Department.

Finally, the entities who actually implement the activities in the sector have their respective planning units that coordinate with the Ministry of Agriculture through OPSA and with the National Planning Department through UEA.

In summary, in very general terms, the process begins with the preparation of the government's policy, later, it is enacted in the general development plan which includes global guidelines for the different economic sectors and social sectors in

the country. In accordance with these guidelines, the respective Ministers decide on the specific plans for their own sectors, including the general policy norms that the National Planning Department will, in turn, bear in mind when the Unit of Agrarian Studies, in coordination with the Planning Office of the Agricultural Sector, (OPSA) formulates the specific aspects, such as budget, expenses, investments, credit, technical assistance, etc. The entities in the sector and their planning offices use these guidelines to prepare their own annual programme of activities. The activities are coordinated by following the two way process that have been described. (See Table No. 1).

2. Short Term Agricultural Planning or Programming

The present agricultural programming process began with the 1968 Constitutional Reform which re-structured the organization and planning in the agricultural sector. 1/ The Planning Office of the Agricultural Sector (OPSA) is the main axis of the new structure, it is responsible for planning the investment needs of the organizations that are dependent on the Ministry of Agriculture, for prices, marketing, credit and fiscal policies 2/ and for coordinating with the Planning office of the different bodies in the sector, and, above all, with the Unit of Agrarian Studies of the National Planning Department.

Later on, statistics of the Colombian agricultural sector were gathered with the help of a foreign mission 3/ and the methodological bases to continue collecting and analyzing this information on a year to year were established. Thus, information on the area under cultivation and total production for the principal products for the years between 1969 and 1971 was gathered and put into tables, although, the Ministry of Agriculture's official publication called "Programas Agrícolas" did not begin to appear until 1972. 4/ Since then, the report has been published yearly, and the group in charge of collecting the data has been strengthened from the institutional point of view, first in 1974, when the national level inter-institutional groups and the regional agricultural production committees were created.

It should be emphasized that although neither research nor the need to plan for research are explicitly mentioned in the reform, ICA was re-structured at the same time as the 1968 reform. The new structure was based on the model of

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1/ Fedesarrollo. Antecedentes Constitucionales y Legales de la Planeación en Colombia. In: Lecturas sobre Desarrollo Económico Colombiano. Bogotá, 1974.

2/ Organización Internacional del Trabajo, OIT. Hacia el Pleno Empleo. Geneva, 1970, pp. 326.

3/ USDA. Changes in Agricultural Production and Technology in Colombia. Foreign Agricultural Circular, No. 52. 1970.

4/ Colombia, Ministerio de Agricultura. Programas Agrícolas. OPSA, 1972 and 1974. (presentation).

the new organization of the agricultural sector, production was emphasized, and two new sub-directorships were created in ICA, one for agricultural production and the other for livestock production. Obviously, this new emphasis had repercussions on the research, as it had to compete in the budget with the Institute's other activities and coordinate with them in choosing research that would agree with the production needs. Furthermore, it was only natural that the statistical information on the agricultural sector collected by OPSA should help research to plan its development needs better, and it changed from being basic research to applied research.

The Objectives of the Programming

The principal goal of the programming system was to increase the volume of production, especially by raising the physical yields per hectare. This in itself already established specific priorities for research, it had to concentrate on those aspects of production that research could improve and thereby raise the yields. Also, the programming stresses "... those agricultural products that grow best in the country, but also bearing in mind domestic and foreign demand." 1/

In addition, priority would also be given to "... significantly raising the yields per hectare ... and estimulating a wider use of the existing production technology and any new technology that research may develope in the future..." 2/ So, although it was not actually specified which research should be given priority there are numerous comments that ICA should consider when planning its research. And that is how it should be, because even before the 1968 administrative reform that re-confirmed this role, ICA was supposed to be the leader in agricultural research in the country; therefore, it should decide, in agreement with the Ministry of Agriculture, the general guidelines for agricultural research and especially since a certain level of technical specialization is required for this, and the Institute has it. In other words, general models for research that meet the production needs will be fixed, but the specific aspects of the short and long term planning will be left to the entity with the necessary technical and scientific resources, and ICA was specifically created for this job.

The Contents and the Mechanisms of the Programming

On the whole, the agricultural programmes are published at the end of each year or during the first quarter of the following year. Traditionally, the first part of

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1/ Programas Agrícolas, OPSA, Op. cit.

2/ Programas Agrícolas, OPSA, Op. cit.

the document describes the objectives of the programming, calculates the production and the demand for agricultural goods for the coming year, indicates the priorities the Government should have in credit, supplies of seeds, fertilizers and insecticides and determines the research and technical assistance needs. The second section includes an analysis of the areas, yields and production per product during the foregoing period, it evaluates to what extent the programme for the year was accomplished, and the perspectives for the coming year.

So as to facilitate the participation of the different groups involved in agricultural planning and production, the Ministry of Agriculture created the Agricultural Production Seminars. At these seminars the results of the previous year's programme are discussed and evaluated and the input, credit, technical assistance, etc. needs for the next year are examined. Normally, these seminars have been held each year, they last a week and analyze each crop. Representatives of the producers' associations, private enterprise and the financing and technical assistance, etc. needs for the next year are examined. Normally, these seminars have been held each year, they last a week and analyze each crop. Representatives of the producers' associations, private enterprise and the financing and technical assistance entities participate. These meetings produce a proposal for each product that is based on the statistical information collected by OPSA. OPSA examines the technical aspects of the proposal and lines it up with the Ministry's policies and priorities. The production, planting, export import, etc. programmes for each period are prepared with this information. Inter-institutional groups that are organized by products, and that are supported by the Ministry of Agriculture and representatives of the National Planning Department, the producers' associations and from private enterprise help to adjust these programmes.

Although the OPSA agricultural programmes are generally published between the first and second quarter of the year, when planting has already begun, their goals and projections are taken into account for two reasons: firstly, they are prepared scientifically and are based on factors that are accepted in agricultural economics and statistics: secondly, producers and other relevant groups have participated during the programming seminars we mentioned above where the basic principles of the programming are defined and they have provided many of the figures for the previous year, and have estimated the general agricultural inputs needed for each of the products they are interested in.

One of the most important objectives of the Ministry's agricultural programmes is research and the dissemination of agricultural technology and innovations. In fact, the first three objectives are concerned with encouraging these tasks, and technical personnel participate in each stage of the programming, before, during

and afterwards. More specifically, it is the personnel from the research sub-director who participate so they can explain what contribution research can make to production, to preventing and curing diseases that affect production (for example, factors such as pest and disease control and the corresponding plant health and animal health campaigns) and this contribution is weighed during the analysis.

3. The Formal Criteria: the Case of ICA

The planning process briefly described above implies a system of allocating scarce resources to the competing interests. It begins by obtaining and measuring the results of the socio-economic activity, so that a diagnosis can be made and the criteria necessary to prepare plans can be chosen. Then comes the coordination and promotion stages so that the daily decisions are based on uniform criteria.

The planning mechanism or system in the public sector uses the sources of the financing for ICA's expenses as a total, which is expressed in the investment plans of the different entities by means of criteria that reflect the state's policies. This tool is called direct planning since it obliges the public entities to fulfill the government's plans.

The public investment plans and the private sector's plans are the totality of the public and private spending. Once the funds have been spent and when the period is up, the results are again measured and the process begins all over again for the next period.

For the Government funds this process begins in the National Economic and Social Policy Council (CONPES) and in the National Planning Department (DNP), they decide on the government's policies and fix the value of the public investments. With these general guidelines, the Planning Office for the Agricultural Sector (OPSA) chooses the policies for the sector. ICA's Planning Office then analyzes these policies, to decide on the Institute's own policies, how to implement them and to establish the general objectives of its activities. Now that we have a very general picture of the process, it is possible to describe, in more detail, the planning process and the process for allocating funds within ICA. ICA is a case study of how a government institution carries out these functions, and in this case it is the principal agricultural research entity in Colombia. (See Figure 1).

Within ICA research has to compete for its share of the budget with the other activities the Institute is engaged in such as, rural development, agricultural production, livestock production and general administration. And within the field

of research itself there is competition between the sections of crops and livestock, and between the different programmes (of crop or livestock production) within each section. Generally, they can be classified as follows:

a) Vegetable Species: Genetic improvement, regional tests, cultivation practices, quality tests, special studies, training, dissemination and promotion and technical assistance.

b) Animal Species: Genetic improvement, nutrition studies, management studies, physiology and endocrinology, animal production, promotion and technical assistance.

Basically, there are several levels of decision-making and of the allocation of funds. Figure 2 illustrates this.

Furthermore, the mechanism for allocating resources has two stages: the global programming and the detailed programming. The global programming consists of an annual revision of the four-year investment plan and the simultaneous preparation of a pre-project for the budget for the coming year. The General Budget Management (DGP) of the Ministry of Finance and the State Investment Unit (UIP) of the National Planning Department, make a preliminary estimate of the government's revenue, then the UIP and the heads of the sectorial units in the National Planning Department assign each sector its quota of this income and prepare instructions for the annual budget pre-project for the country. Next, the Agrarian Studies Unit (UEA) of the National Planning Department and the Planning Office of the Agricultural Sector OPSA) assign financial quotas to the entities and the programmes within the sector, and finally, UIP prepares a report for CONPES about how the quotas were assigned. Once the project of assigning the quotas has been approved, OPSA informs the ICA Planning Office how much all the quotas for the sector totalled in money. This data is then used to prepare the corresponding investment plan and the request for funds for the budget which is submitted for study to the Director's Committee of the Institute (which is made up of the Director, the Planning Director and five sub-directors). As soon as the investment plan and the budget have been approved they are forwarded to OPSA and UEA where they are revised and amended and sent to CONPES and the Ministry of Finance to be subsequently presented to the National Congress for the final review and their approval.

The stage of the detailed programming is the responsibility of the Programming Division of the ICA Planning Management and it begins as soon as they receive the final quotas that have been approved in the budget bill. The Institute's

programming is adjusted to these quotas and the final estimates are submitted for approval to the Management Committee. Once the figures have been accepted, the funds are distributed to each project, to each activity and region. The sub-directors, the division directors, the programme directors and the regional managers participate actively in this stage. At the end of the process the figures are united and the Board of Directors' Agreement and the Budget Resolution are prepared, and the Budget and Financial Division of the Administrative Sub-Director are in charge of implementing the budget.

Obviously, the detailed programming process necessitates regional and national action programmes as can be seen in Figure 3.

In addition, when the experts in each programme discover how much money has been approved, they have already prepared a series of research projects and have justified their costs and their priorities, these must be studied and approved by the Regional Research Director, the National Director of the programme and the Consultant Committee of the Research Sub-Director. This process has been illustrated in Figure 4.

The above description refers to the formal process for assigning resources for research. In this process there are several different levels of decision-making that deal with distributing the money from the national budget, which is ICA's main source of funds. Basically, the decision-making process at a national level is the following: the National Economic and Social Policy Council (CONPES), the Ministry of Finance, the National Planning Department and the Ministry of Agriculture through the Planning Office for the Agricultural Sectos (OPSA). Now, two of these affect agricultural research more than the others, first, the National Planning Department, specifically, its Agrarian Studies Unit, as it is very specialized it deals with the technical criteria for defining in general terms the priorities of ICA's research. Moreover, it has already been pointed out that the Head of this Unit is a member of the ICA Board of Directors which must also approve the project. Secondly, there is the Planning Office of the Agricultural Sector (OPSA), it is probably the most specialized unit in the short term programming process, and it incorporates the Ministry's policies in the plans. As this unit coordinates the plan directly with ICA, of the national units, it is the one that plays the most important role in allocating funds for research.

ICA has the following decision-making sections: General Director, Director's Committee, Planning Office, Research Sub-Director, Division Directors, National Programme Directors and Regional Research Directors. Finally, there are the Institute's experts who help to prepare specific projects, and the sum of these produce the national programmes.

4. The Sources of the Funds, Criteria and Changes in the Allocation

The Institute's financial resources come from the following sources:

a) The National Budget: Resources that the Government allocates in the annual budget through the process described above.

b) Own Resources: These are received from the sale of research products and sub-products and from the commercial demonstrative tests.

c) Resources Stipulated in Law No. 5: In 1974, the Government created a fund to provide technical assistance for the small farmer, it is financed by the Tax Credit Certificates (CAT) which are awarded for the export of products that originate in the agricultural sector, by an additional one percent on the interests of the Agricultural Financing Fund (FFA) loans and with 15% of the FFA profits at the end of each year. This money is to finance ICA's rural development programmes.

d) Foreign Credit: For the period between 1971-1976 this mostly came from the IDB, it was destined for physical investment in research, extension and animal health.

e) Domestic Credit: This is principally used to finance the commercial demostrative tests.

f) Contributions from National and International Entities: These funds are received through contracts, in the form of donations and joint research and development projects, from the National Coffee Growers Federation, the Ford Foundation, USDA, IDRC, etc.

g) Other Resources.

According to Ardila and Londoño 1/ the following trends have been manifested in the income up to 1972. More money was received from the national budget each year and after that date it declined. After 1971 the importance of the funds from the national budget dropped 30%. In 1975, the Institute financed 50% of its budget requirements from its own resources.

Budgetary Allocations for Programmes

In the budget the Institute's activities are divided into six programmes: Research, Rural Development, Agricultural Production, Livestock Production, Administration,

1/ The following data and analyses have been authorized by the authors. Taken from Ardila V., Jorge and Diego Londoño R. La Asignación de Recursos para la Investigación Agropecuaria en Colombia. In: IICA/PROTAAL. Asignación de Prioridades y Recursos a la Investigación Agrícola.

and Debt Service.

Between 1969-1976, Rural Development increased in importance. After 1972 Livestock Production has been virtually static in terms of the budget, the smallest amount of funds are allocated to Agricultural Production, it receives even less than administration, which, contrary to what is generally supposed, has been expanding. The amount spent on Servicing the debt has grown considerably as several international loans have fallen due.

An animal health campaign that was started in 1971 with a loan from the IDB has accounted for most of the increase in the Livestock Production budget. Similarly, the Debt Service rose so rapidly because of this loan and to a lesser extent because of the payments on national credits for commercial demonstrations.

The priorities in the budgetary allocation seem to reflect the general belief that research has produced sufficient technology for the present market and that consequently, the technology transfer programmes must be strengthened so that the research results will be applied and utilized.

The shrinking funds for research coincides with the drop in the budget the Government assigns to ICA. However, the percentage of the funds that the research sub-director has received has declined faster than ICA's financial resources. What is happening is that research is being replaced by the rural development and agricultural and livestock production programmes.

One of the possible reasons for this phenomena is the so called "technological gap", that is defined as the difference between the results achieved by the experiments and those achieved by the farmers, this means that the supply of technology is greater than the demand and this justifies putting more resources into technology transfer programmes and less into research. However, if the size of the technological gap had really been the criteria for determining how much should be allocated to research, then the budget for the products with the widest technological gap, like maize, should have been reduced more than for those products where the gap is relatively smaller, such as rice of irrigated land, and this has not been the case.

It has been said that another reason why research funds have decreased is that it is felt that the results have not been proportional with the State's investment in research. Nevertheless, the assessment of the social benefits produced by research investment, this was measured by estimating the social cost benefit of the rice, soya bean, cotton and barley programmes, has shown that research has had positive economic results and that the Government's investment in ICA has

been paid back several times. For example, the profits from research on only three crops represented 82.2% of the total budget allocated to ICA between 1964 and 1971 and 1.87 times the total amount spent on research during the same period.* Consequently, the hypothesis that it is justified to assign less money to research because its results have dwindled is not valid, on the contrary, there is evidence that the research yields are increasing and that too little is being invested in this activity.

Other explanations have been given to account for the reduction in the funds allocated for research apart from those listed above. For example, it is claimed to be more economical to increase the supply of foodstuffs by reducing the post-harvest losses, than to create new technology for the crops. With this criteria, priority would be given in the budget to marketing programmes as opposed to research programmes. Furthermore, it has also been claimed that an adequate supply of foodstuffs can be guaranteed by imports, and that this is a cheaper way to raise the national production levels. There seems to be some evidence of this if we bear in mind that there is a negative correlation between the budget assigned to ICA and the price of food imports.

Finally, some people argue that as the international research centres have large budgets, the individual countries can spend less on their own centres, since the technology generated internationally can be applied to the conditions prevailing in different countries. However, none of the foregoing reasons seems at first to be a sufficiently powerful argument to justify the budget cuts suffered by research in ICA. The next chapter will study the trends in the allocations for and the costs of research by product and by programme with an aim to identify which the Institute has given priority to.

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* Jaramillo, F. Evaluación económica de las inversiones en investigación sobre el cultivo de la cebada. ICA. Boletín de Investigación No. 42, 1976. Ardila, J. Rentabilidad social de las inversiones en investigación de arroz en Colombia. Thesis M.S. UN-ICA, 1973. Montes, G. Evaluación de un programa de investigación agrícola: el caso de la soya. M.S. Thesis. University of los Andes, 1973. Rocha A. Rentabilidad en las inversiones en investigación de algodón. M.S. Thesis UN-ICA, 1973.

TABLE I

Levels of Decision Making and Allocation of Funds for Research

Decision-Making Levels \ Allocation Levels	Inter-sectorial	Sectorial	ICA Activities	Research Programs	Research Projects
a) Nacional					
CONPES *	X	X			
DNP/DGP**	X	X	X	X	
OPSA***		X	X	X	
b) Institutional					
Director's Committee			X	X	
Sub-Director's Committee				X	X
Programme Directors ****					X
Programme Technicians					X

* Consejo Nacional de Política Económica y Social
** Departamento Nacional de Planeación; Dirección General de Presupuesto
*** Oficina de Planeación del Sector Agropecuario
**** This refers to the ICA National Programme Directors

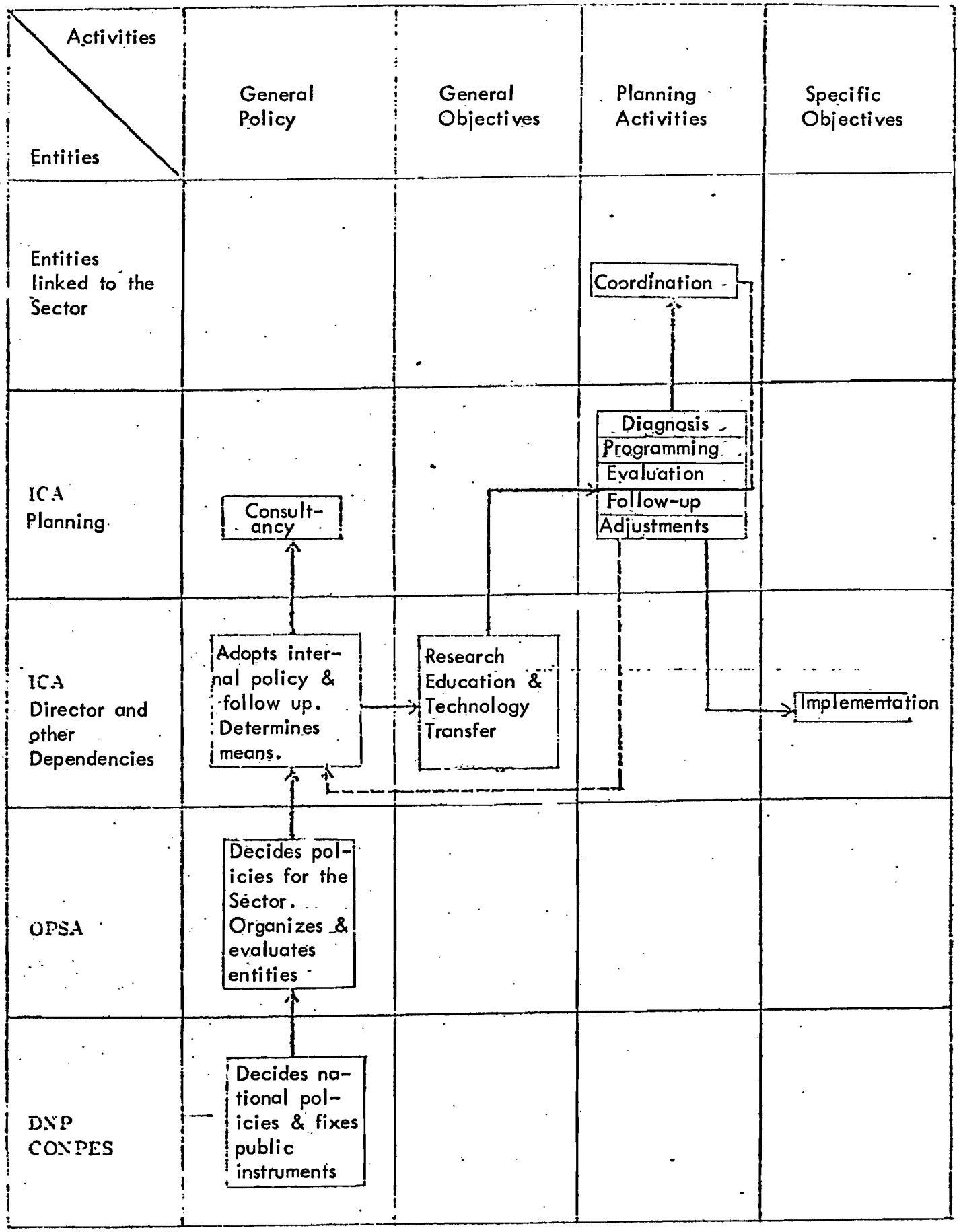
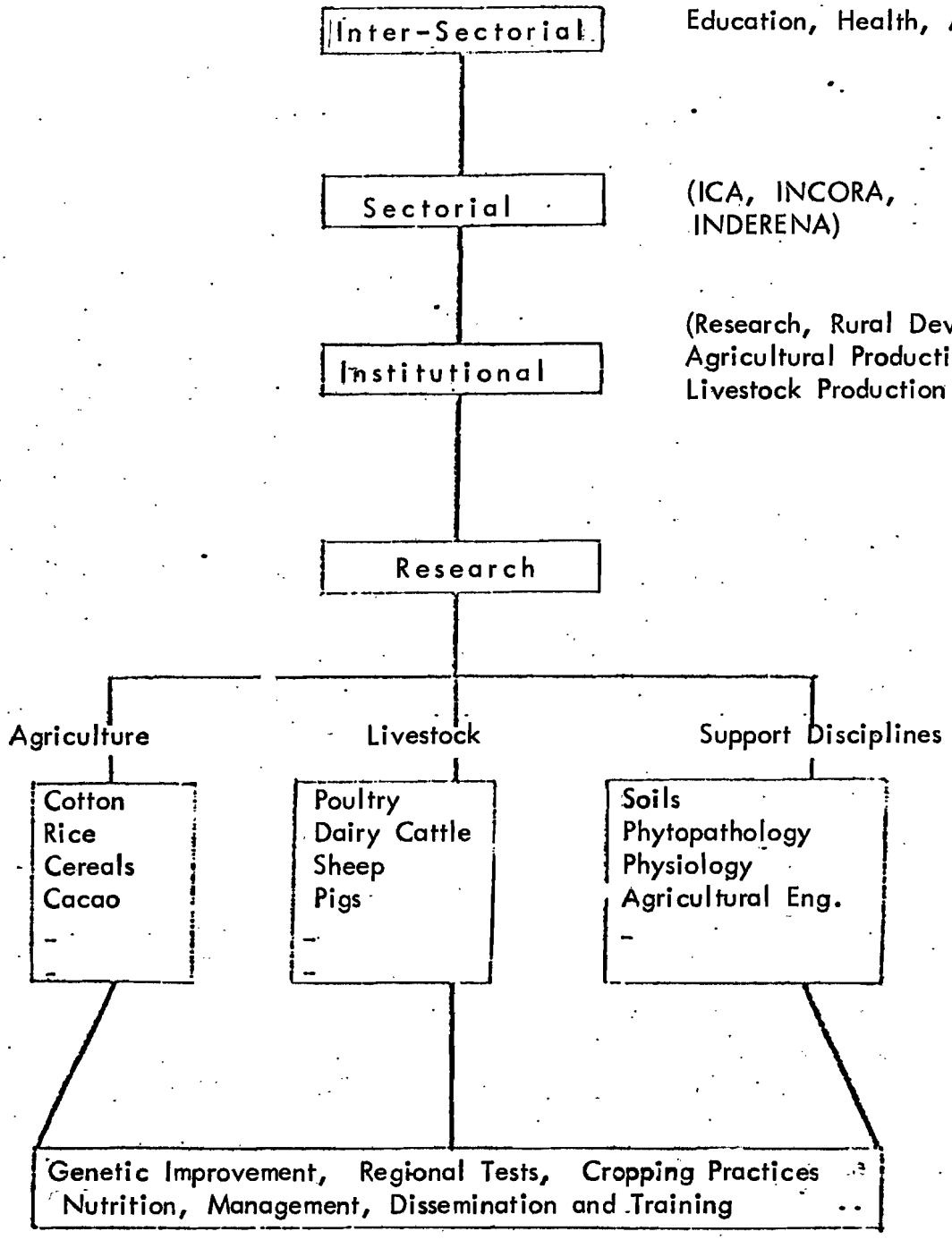


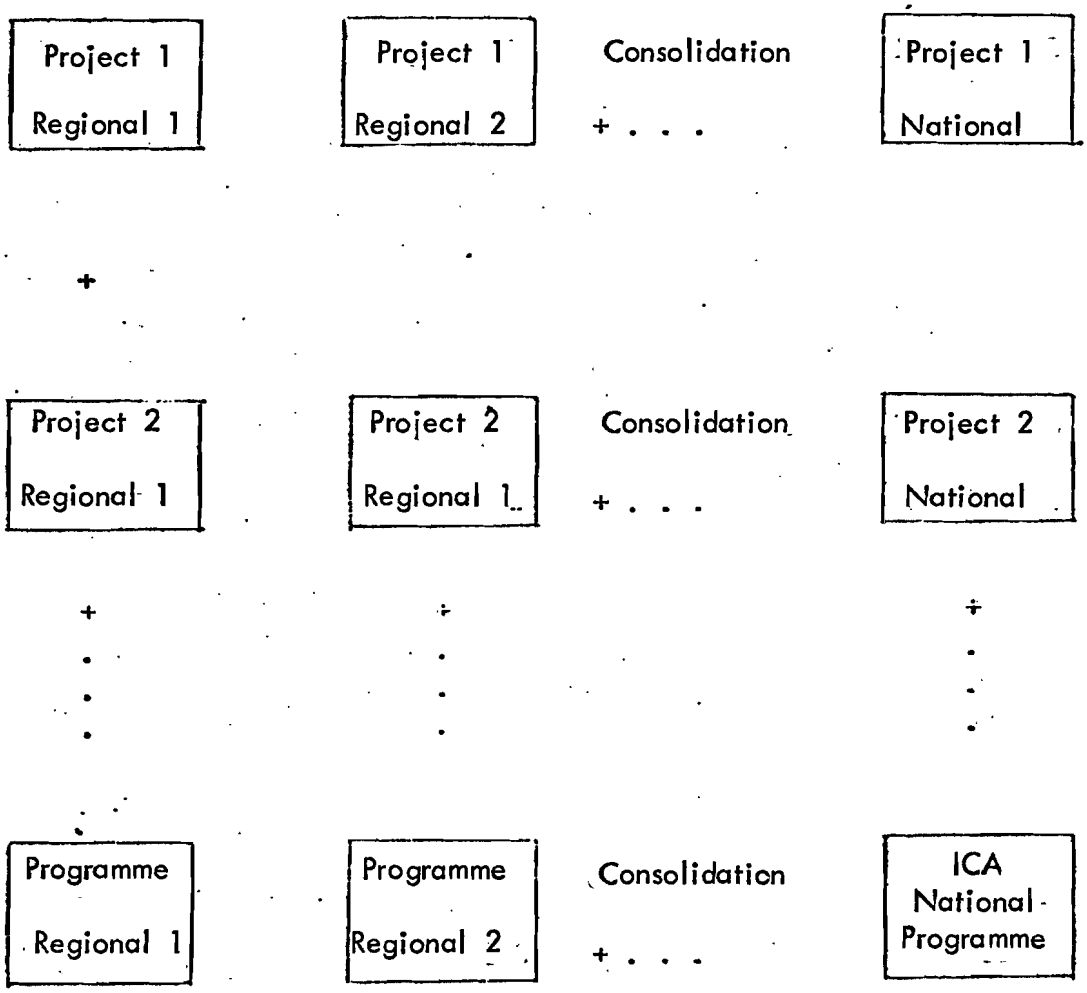
FIGURE 1 - ICA. PLANNING PROCESS

FIGURE 2



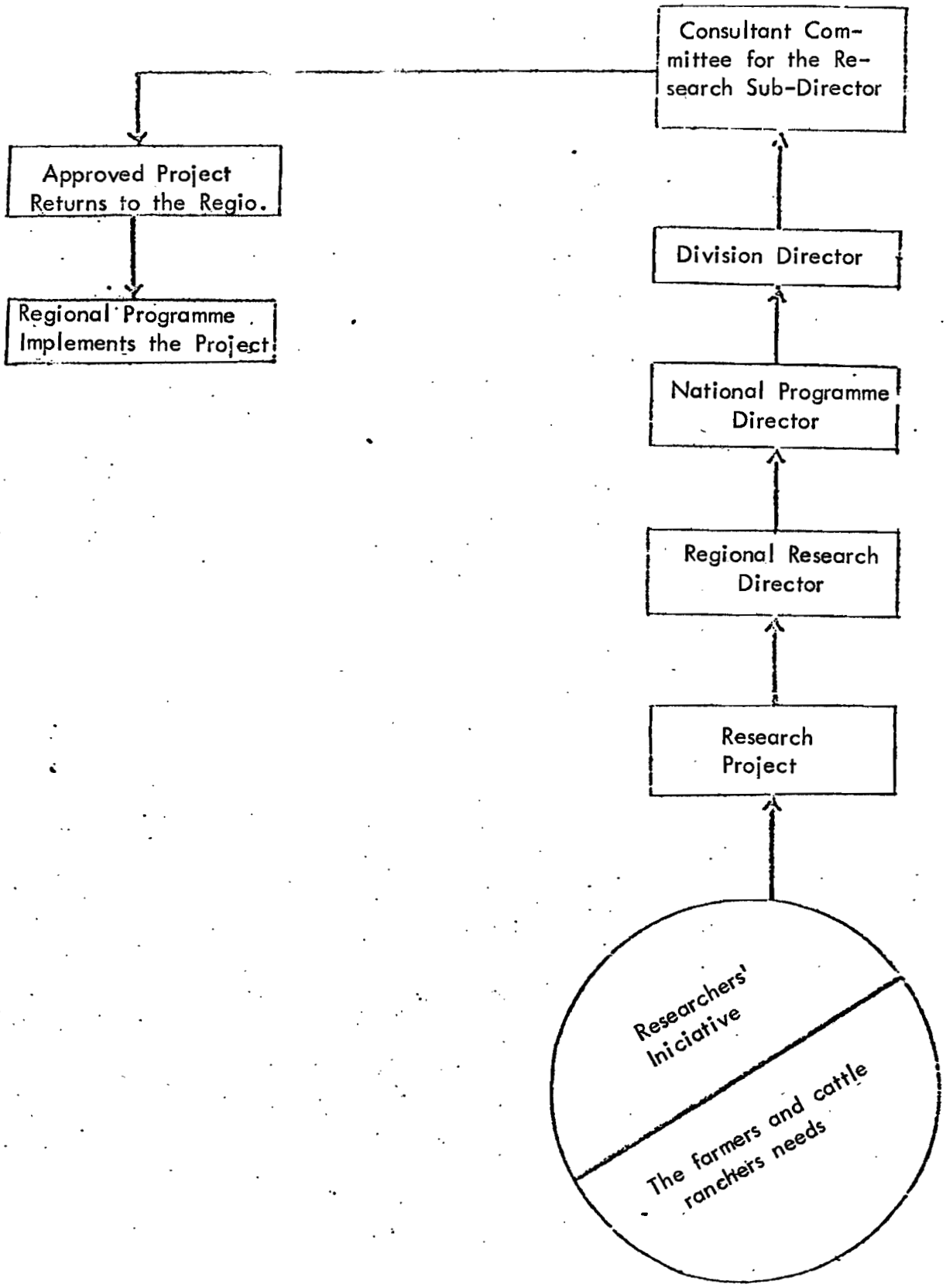
COMPETITION FOR BUDGET FUNDS

FIGURE 3



NATIONAL AND REGIONAL PROGRAMMES AND PROJECTS

FIGURE 4



GENERATION OF RESEARCH PROJECTS

IV. SPENDING ON AGRICULTURAL RESEARCH

The methodology in the Operations Manual for this project says that the research programmes should be classified according to products and according to disciplines, and this is the framework that will be used here to study the allocation of funds for research. For this study on Colombia, we followed the general list of research programmes in ICA, however, if the other institutions examined in this study had named their research programmes differently, their systems were also respected.

On the whole, each basic product has a research "programme" (for example, the potato programme, the rice programme), so what happens is that the list of product-programmes is the same as the list of products that the institutions study. Nevertheless, the support disciplines should also be considered for the data collection and for the analysis, because sometimes they included data about the products (for example, phytopathology, entomology, etc.), it was usually impossible to breakdown these disciplines by-products on account of how the institutions register their data, so this project chose the other alternative, take the programmes as programme per se.

However, the basic criteria for this study is that the primary category for research programmes should be the product research programmes, and all the groups of animal or vegetable products that are being research should be measured separately. Many institutions classify their research by disciplines, and this information should be kept for possible future use, to measure the institutional variations, and to determine if certain groups of disciplines are over or under represented in any institution.

For ICA, the institution with the largest number of research programmes, the data was classified into the following categories: Agricultural Product-Programme, which consists of cereals, starchy crops, oil seeds and other crops. Basic Agricultural Research, which includes four support disciplines. Other Non-Classifiable Agricultural Research, which includes those programmes that do not fall into either the products or the disciplines categories, but which belong to the area of agriculture. Livestock Product-Programme, which covers six products that are ordered according to animal species. Basic Livestock Research, which includes eight discipline programmes. And finally, Other Livestock Research. In all 38 research programmes were classified for this study.

The research in the other Institutions was classified in accordance with their own areas of research. This was the case, for example, with coffee research, research on marine products and sciences and for forestry research.

Data was collected for the period 1960-1976, this meant that there was sufficient data to identify the trends and changes that occurred, and, in the case of Colombia, this

period corresponds to ICA's life span. The period spans four different governmental administrations, which have had different and even contradictory development policies that obviously had repercussions on the priorities for allocating funds for research.

However, it is impossible to obtain complete information for these years. ICA only began to keep records in 1964, and in other institutions the situation was even more critical, in some of them information was only available for a few years, or maximum for five, and sometimes they were not even consecutive years, and for the others, as will be seen further on, it was only possible to obtain a few odd bits of information, mostly for the years between 1976 and 1978.

Consequently, the data used for the analysis has been presented in double entry tables, one for the product-programme categories and sub-categories and the other for the years with information. In each case the original source gave the data in current pesos, the amounts were first converted into constant pesos, calculated by using the price index implicit in the Gross National Product (GNP) for 1970. Then the annual indexes, the annual percentage variations, the proportional participation of each product-programme within the institutions' total budgets for each year, the annual growth rate and the growth rates for the longer periods were worked out.

The Institutions and the years for which we have information were: Colombian Agricultural Institute (ICA) (1964-1976), the Institute of Renewable Natural Resources INDERENA, (1972-1975), the National Federation of Coffee Growers, FEDECAFE (1973-1976), the National Corporation of Forestry Research and Promotion, CONIF, (1975-1976), the Regional Corporation of the Cauca Valley CVC, (1975-1976), the International Centre for Tropical Agriculture CIAT, (1972-1976) and finally, 16 universities for varying periods.

As the information refers to different periods and as the institutions group their programmes and the products they work on differently, it was impossible to calculate exactly how much is spent on research in all, in the country. To this we must add the fact that a further problem arose because the figures are sometimes for funds allocated and other times for funds spent.

Finally it must be made clear that the source of the funds has not been given, as this information was not available at the programme level in any of the institutions.

1. Institutional Analysis: Case Studies

1.1 Colombian Agricultural Institute (ICA)

ICA has different kinds of research: agricultural and livestock research, agro-economic research and social research, and basic and applied research for the same four categories as above.

Now, although, according to the organizational structure, the Research Sub-Director is responsible for all research activities, other units also conduct research. For example, the Rural Development Sub-Director is in charge of agricultural economy, rural sociology and social communication research, as well as applied production research that is done in the districts where technical assistance is provided for the DRI (Integrated Rural Development) programme, this is coordinated in the Institute with the respective sub-director through the inter-disciplinary committees and the regional research directors.

As this project will only study agro-biological research we will only include those research programmes in the Institute that comply with this criteria and all the programmes in the fields of agricultural economy, social communication, rural sociology, agricultural engineering and statistics or biometrics have been excluded.

Since this project was interested in identifying research spending for each agricultural or livestock products and for the basic disciplines, and although the programmes in the support areas normally refer to different products and disciplines, it was not possible to break them down by these categories. Therefore, it should be clear that the results do not refer to all the research the Institute does, but only to the programmes that can be considered "agro-biological research".

Information on 38 research programmes was collected, they were classified into six general categories and 10 sub-categories. As we have already said, the programmes correspond to the agricultural and livestock products that ICA is working on and to the basic research programmes in agriculture and livestock.

Throughout the period under study, agricultural research was allocated more funds than livestock research, in 1967 it accounted for 54.77% of the total spent on research, and that was the lowest year, and the high point was in 1975 with 64.74% (Table No. IV-4). This fact shows a first priority in the Institution, and the same trend could be observed in the growth rates, the funds assigned to agricultural research increased all during the period, as a whole, and for each five year period, faster than the funds given to livestock research. However, for the total period 1964-1976, the growth rates for agricultural products were higher than for livestock products and the opposite was the case with basic research (Table No. IV-6). This will explain in part why there are only four basic agricultural research programmes as opposed to eight basic livestock research programmes. As a result of the loans received from the IDB for the anti-foot and mouth disease campaign, several of the basic livestock research programmes expanded significantly after 1972,

especially, in the areas of microbiology, vesicular diseases and animal pathology.

The most important section within agricultural research was basic research with 22.21% of the budget in 1968 and 11.59% in 1973, and within this section the Soils research programme had the largest share of the budget every year (Table No. IV-4). But Phytopathology was the basic research programme with the highest growth rate (9.22% a year), followed by Soils (8.40% a year); and Entomology and Vegetable Physiology had the lowest growth rates (Table No. VI-6) and they also received the smallest amount of funds of all the programmes in basic agricultural research.

After basic agricultural research the most important group of the products was Cereals with 24.54% in 1965 and 8.76% in 1972 and the Maize and Sorghum programmes, these two crops are included in one programme, was the most important single product-programme in monetary terms, it headed the list every year except 1975-1976 when Perennial Oil Seeds took its place, it had more than 5% of the total budget in constant terms (Table No. IV-4).

The Sugars (two products) group of products received the least funds and in 1967-1968 the Oil Seeds. And the least important products were Plantain, Bananas and Oats.

Although the Cereals group had the highest percentage of the budget it also had the lowest growth rate for the whole period (6.61% a year) principally because in the five years 1971-1976 it had a high negative rate (-9.84% a year). During these five years all the Cereals products, except Oats, had negative growth rates (Table No. IV-6). In fact, if we revise the figures for these five years we can see that almost all the research programmes, both agricultural and livestock, had negative growth rates, this fits in with what was noted in the last chapter about research being replaced by rural development and technology transfer in the ICA budget.

The three products receiving the smallest percentages of the budget, Plantain, Bananas and Oats, likewise had the lowest growth rates. In fact Oats actually had negative growth rates, except for 1971-1976 when they were positive but only 1.45% a year. Plantain and Bananas began to figure as a programme in 1964, during the first five year period they were static, their growth rates where high in 1966-1971 (100.04% a year) they fell sharply during the subsequent period and ended with a 31.39% annual growth rate for the period as a whole (Table No. VI-6). This exceptionally high growth rate for the Plantain and Bananas programme really occurred in 1968 to 1969 when the funds the programme received jumped from forty thousand pesos to

more than half a million in constant pesos, then it continued to receive the same amount or only slightly more until the end of the period (Table No. IV-1).

As we have already pointed out, the other big section, Animal Sciences or Livestock Research always received less than half the total research budget all during the period.

Of the two sub-divisions within the Livestock Research section, products, in this case animal species, was always the most important, which means that the priority was the opposite to the agricultural section (Table No. IV-4). Similarly, the Non-Classifiable Livestock Programmes (Pastures, and Forages, Centres and Stations, Special Agreements), when it appeared as a separate item in the budget, received more than its corresponding number in agriculture.

After 1969, the basic programmes in the Livestock Research section with the highest share of the budget were: Pathology and Microbiology and the Programmes receiving the least were: Toxicology, Epidemiology and Vesicular Diseases for the years when they appear. However, within the basic research division, Nutrition is the programme with the smallest share for the whole period (Table No. IV-4).

The most important livestock product-programme was Dairy Cattle and the second Pigs. And the least important in monetary terms was Sheep and for 1975-1976 Minor Species, this programme only appears for these two years. Poultry has had a very modest share too, going from 5.60% (1964) to a low of 1.68% in 1974 (Table No. IV-4).

These apparent priorities are modified a bit if we look at the growth rates, since Minor Species had the highest growth rate (33.6%) despite having the lowest share in absolute terms, followed by one of the largest programmes: Pigs (11.27% a year). Similarly, Sheep also had a rather erratic behaviour pattern, it had the highest growth rates in the sub-periods 1964-1966 and 1966-1971, but then it fell sharply to have a negative rate in 1971-1976, Dairy Cattle also declined and lost its leading position to Pigs (Table No. IV-6), in the same five years.

Therefore, to summarize we could say that for the budget the research priorities in ICA are:

a) Of the two big sections in research, Agricultural Research has been given priority with between 55 and 64 percent of the total research funds, the

balance corresponds to Livestock Research.

b) In Agriculture more emphasis has been put on basic research while in Animal Sciences products have been emphasized.

c) In Agricultural Research, Cereals has been the most important group of products and the Maize and Sorghum programme the most important product, however, this priority has been diminishing as Maize and Sorghum had one of the lowest growth rates.

d) The agricultural products with the least priority are Plantain and Bananas, which are one programme, Oats and Sugars (both cane and sugar for "panela").

e) In Livestock Research the products (Animal Species) were always given priority over basic research. The products with priority were Cattle (dairy and beef, in that order) and Pigs. And those with lowest priority were Sheep and Minor Species although the latter had the highest growth rate when it figured as a programme.

f) To sum up, two agricultural products, Maize and Sorghum and two Livestock products, Cattle and Pigs are given highest priority in research funds and those with least priority are respectively: Plantain, Bananas and Oats and Sheep and Minor Species.

g) There is more basic research in Animal Sciences (eight programmes as opposed to four in Agriculture) notwithstanding the fact that in agriculture basic research was given priority in monetary terms, although not in terms of growth rate.

h) The basic research programmes in Agriculture that had priority were Soils and Phytopathology and Pathology and Microbiology in Livestock. Consequently, aspects dealing with health, both plant and animal were given priority.

i) The least important basic research programmes were Entomology and Vegetable Physiology in Agriculture, and Toxicology, Epidemiology and Nutrition in the Livestock Division.

1.2 The Institute of Renewable Natural Resources (INDERENA)

INDERENA has five research programmes all connected to fish. Fish Biology, Ichthyology, Aquaculture, "Talasacultura"*and Pisciculture. There was data

*Translator's note: This is the culture of a higher algae that is called Talasios.

on these programmes for the years 1972 to 1975.

During these four years, Ichtyology was the programme receiving most funds, between 52.1% and 85.6% (Table No. IV-9) and this represented an absolute majority both in terms of current and constant pesos. (Tables Nos. IV-7 and IV-8). Despite having this enormous share of the total, the programme's growth rate was negative -48.4% a year. This can be explained, because, despite growing 646.0% during the first two years (1972-1973), it had negative rates for the other years, dropping to as low as -96.4% in 1974-1975 (Table No. IV-11).

This decline was present in the other programmes too, which had begun with moderate budgets compared to Ichthyology. In fact, Fish Biology and Aquaculture had equal budgets (4.5 millions in current pesos) for each year, so they had negative growth rates for each two years and for the period as a whole (Tables Nos. IV-7, IV-8 and IV-11).

The two other programmes, "Talasocultura" and Pisciculture only figures in two and one year respectively. "Talasocultura" never went above 13.0% and Pisciculture had 40.4% in the year (1973) and it was the most important research programme that year (Table No. IV-9).

In general, after 1973, INDERENA allocated less and less to research so that the period 1972-1976 ended with a negative annual growth rate of -45.7% (Tables No. IV-11).

From all this we can deduce that research is not one of INDERENA's principal activities. First of all, although the Institution was created in 1968, they only have records of research budgets dating back to 1972, secondly, there are five programmes, but only three of them received money during the four years studied, and two of them received the same amount each year which means that their priority decreased, furthermore, in no year, not even 1975 which was the highest, did they get more than 15% of the total. Finally, the only important research programme seems to be Ichthyology, as it was always allocated more than 50% of the total although this programme also declined steadily each year.

1.3 National Federation of Coffee Growers (FEDECAFE)

In CENICAFE, which is the Federation's experimental farm at Chinchiná, Caldas, they have ten research programmes, nine in Basic Agronomy Research and one in Animal Husbandry. All the Agronomy programmes deal with coffee as the Federation is not concerned with any other crops, and the aim of the

Animal Husbandry programme is to find alternatives for the coffee growers in the marginal zones so that they can improve their incomes.

It was only possible to obtain information on the sums spent on these programmes for four years, 1973-1976 inclusive.

The total budget increased each year from 11.4 millions in 1973 to 17.6 millions in 1976 in current pesos. In constant terms the budget grew from 7.4 millions to 6.0 millions during the same four years (Tables Nos. IV-13 and IV-14). The growth rate for the period in constant terms was -6.9% a year, which means that in real terms the funds allocated to research programmes in the Federation actually diminished (Table No. IV-16).

Seven of the ten programmes received similar sums in current pesos during the four years, Plant Improvement was slightly higher and Agro-climatology and Soils were also a little higher in 1975 and 1976 (Table No. IV-13). However, when we examine the allocations in real or constant terms the situation changes, four programmes stand out as having had more than 10% of the total budget every year, they are: Agro-climatology, Soils, Agricultural Chemistry, Related Crops and Plant Improvement. The latter was the most important every year, closely followed by the Coffee Cultivation Practices Programme (Table No. IV-15). Entomology and Animal Husbandry are the two least important programmes because in no year did they receive more than 5.7% of the total.

From their importance in the budget, there seem to be three or four programmes that have priority, but the picture changes completely if we look at their growth rates. In fact, although Agro-climatology and Animal Husbandry which are of medium and low priority respectively in absolute monetary terms, they are the only two programmes with a positive growth rate throughout the period, 5.4% and 18.3% annually (Table No. IV-16). Therefore, Animal Husbandry is being promoted more than other programmes such as Plant Improvement and Soils which had negative growth rates, in the case of the former this was mainly the result of a sharp fall (-37.7%) in 1975-1976. (Table No. IV-16).

So, to sum up we can say that in the Federation the research budget had the following characteristics:

a) Basically it concentrates on Agronomy with nine programmes, all dealing with coffee, and the most important were Plant Improvement and Culture Practices.

b) All the other programmes received very similar percentages of the total budget. And Entomology and Animal Husbandry had the smallest shares, although the latter programme had a continual positive growth rate all during the period studied and ended with the highest of all the programmes.

c) If we take the ten programmes together the highest growth rate occurred between 1974-1975, during the remaining pair of years research was given less priority, and had negative growth rates, principally in 1975-1976.

1.4 National Corporation of Forestry Research and Promotion (CONIF)

We could only find information about this entity for the years 1975 and 1976, and it was not divided into specific programmes as the Institute does not keep that kind of records. However, we do know that all the research deals with forestry experiments, studies of varieties and renovation and conservation of forests. It is worth mentioning these fields, even if only very briefly because this is the most important forestry research entity in the country, INDERENA studies a few isolated aspects in coordination with CONIF, CVC and the Jorge Tadeo Lozano University in Bogotá.

In 1975 CONIF spent 3.0 millions of pesos on forestry research and 2.8 millions in 1976, which is the equivalent to a fall of 25% (Table No. IV-17).

1.5 Regional Corporation of the Cauca Valley, CVC

This Corporation is an autonomous body that mostly functions in the centre western part of the country. Its principal work is regional development and promotion, especially in rural, agricultural and forestry infrastructure.

Between 1975 and 1976 CVC had three research programmes in its Special Studies Section, they were: Forestry Experiments, Fish Development and Agricultural Experiments. In 1975 it spent 1.9 millions of pesos on them and 3.1 millions in 1976.

The most important programme in monetary terms was Fish Development with 45.8% and 39.1% of the total research budget for each of the two years. The other two programmes divided the rest of the budget almost equally between them (Table No. IV-20).

The growth rate from one year to the next was high, 74.8% for Forestry Experiments, the highest, and 12.4% for Fish Development, the lowest.

1.6 International Centre for Tropical Agriculture, CIAT

Between 1972 and 1976 CIAT had eight research programmes, two in animal species (beef cattle and pigs), four in crops (beans, rice, cassava and maize) and two in general areas (production systems for the small farmer and special projects).

If we discount ICA, CIAT had one of the highest research budgets of all the entities studied here. Between 1972 and 1976 it spent more than 249.5 millions of current pesos on research, starting with 33.1 millions in 1972 and rising to 96.7 millions in 1976 (Table No. IV-25).

If we study the budget in constant terms, the first thing that catches our attention is that the global amount grew year by year, if 1972 is 100, by 1976 it was 125.3, this represents an annual growth rate of 5.8% (Tables No. IV-27 and IV-29).

Over the whole period three research programmes stand out: Beef Cattle (27.5% minimum and 32.2% maximum), this project had the largest share of the budget; Cassava (14.6% and 20.6%) and Rice (6.6% and 15.8%) and this latter was the one that grew least (Table No. IV-28).

The Beans research programme was the one with the fastest rate of expansion in terms of constant pesos, if we take 1972 as 100, 1976 was 417.7. Both Beef Cattle and Cassava had over 100 (135.9 and 126.5 respectively) and the other programmes had lower growth rates (Table No. IV-27). So Beef Cattle and Cassava had the largest shares of the budget but the Bean programme was the only one with a steady growth rate for each year, it started the period with 7.5% of the budget and ended it with 25.0% (Table No. IV-28).

These priorities are confirmed when we examine the growth rates although the order varies a little. The programme with the highest overall growth rate, 43.0% a year, was Beans. Beef Cattle, despite being the most important programme had negative rates in 1973-1974 and 1975-1976 which indicates that the priority moved from Beef Cattle to Beans and Cassava (Table No. IV-29). In any case, by the end of the period 1972-1976 four programmes (cattle, cassava, beans and systems) had had positive growth rates, the highest was Beans and the lowest was Production Systems.

In summary we can say:

a) Of the eight research programmes at CIAT, Beef Cattle, Cassava and Beans stand out as having been given priority, both in terms of total

funds and growth rates. Maize, Rice and Special Projects were given the lowest priority.

b) Although the Beef Cattle programme received the largest sums of money in the budget, other indicators show that after 1973-1974 the priority shifted to Beans and Cassava.

c) Finally, if we consider all the programmes as a whole, it becomes obvious that research in CIAT was not given uniform priority over the whole period. In fact the annual growth rate was modest (5.8%) the highest was in 1972-1973 with 19.8% and the lowest 1974-1975 with -5.3%.

d) Finally, the contribution made by the ICA-CIAT Rice programme that was implemented by the Federation of Rice Farmers should be emphasized. Between 1973-1976 it increased each year in current terms but not in constant terms -7.5%, if 1973=100, 1976=79.1 (Table No. IV-18).

1.7 The Universities' Budgets for Agricultural Research

It has already been explained in an earlier chapter that the Colombian universities are thought to undertake far more research than they actually do.

Table No. IV-21 illustrates the spending on research, fundamentally the information was obtained from the cards of the inventory carried out by Colciencias. 1/ It gives the total amounts spent by each university on each of the product-programmes for the years when data was available. Although we do not have enough data to make annual comparisons of how much each university spent, this comparison can be made for the whole period. In this way we can get a picture of the priorities in each university and evaluate how the funds are distributed between the universities.

The National University in Bogotá accounted for 51.0% of the total amount spent by all 16 universities, so research is heavily concentrated in that University. The University has 21 programmes stretching over many years. Of the sums spent on agricultural research, 49.4% goes to agricultural research as such and 45.4% was for research on different aspects of fish.

Second comes the University of Córdoba with 19.8% of the total funds that the Colombian universities spend on research. 84.2% of their resources go

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1/ The two inventories were made in 1972 and 1977 and published in 1972-1978, respectively.

to fish research.

These two universities account for 70.8% of the total and the balance is distributed between the other 14.

If we take all the universities, we will find that in terms of budget, priority was given to Fish research with 47.0% of the total and 9 programmes, they include Ichthyology (13.87%) in four of the 16 universities; followed by Plantain and Bananas (11.76%) and Legumes (7.03%) in the field of Crop research. As regards fields of research the most important was Agricultural Research with 24 programmes and 27.43% of the total, then Livestock Research with 8 programmes and 3.4% of the total (Table No. IV-23).

Thirty-one programmes which is the equivalent to 50% of all the programmes, only receive 1.0% of the funds, 17 of these are Agricultural Research, 9 Livestock and 5 Fish. The category of Other Un-Specified Programmes in all the research fields represents 28.9% of the total, and 85.3% of this 28 percent corresponds to Other Un-Specified Programmes in Fish Research (Table No. IV-23).

To sum up we can say of agricultural research in the universities:

a) It is very varied, with the different universities having very disimilar programmes in many fields.

b) The main fields, according to the budgets and the number of programmes, are Fish Research and Agricultural Research, both crops and livestock.

c) The three principal programmes are Ichthyology, Plantain and Bananas and Legumes.

d) The category un-specified Other Programmes appears as important, which means that many of the universities do not have up to date records that detail the research projects they finance.

Chart No. IV-1

Colombia. ICA Budget Per Research Programme
1964-76
(Based on constant 1970 pesos)

(In Thousands of Pesos)

	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
I. Agricultural Product-Programme:													
1. Cereals:													
Rice	312	444	532	1.244	1.460	2.296	2.615	2.826	2.256	1.944	1.479	1.859	1.864
Oats	-	-	-	-	-	554	369	214	605	1.091	588	258	230
Barley	-	-	-	-	-	699	956	1.059	605	668	460	378	230
Maize and Sorghum	1.453	3.096	3.559	3.437	3.090	4.371	4.387	4.837	3.941	3.666	3.180	2.857	2.583
Wheat	1.152	2.119	1.421	1.694	2.306	2.398	1.867	1.621	1.199	1.264	1.431	1.548	1.381
Sub-Total	2.917	5.659	5.512	6.375	6.856	10.318	10.194	10.557	8.606	8.633	7.138	6.900	6.288
2. Starchy Crops:													
Potatoe and Cassava	959	1.310	1.328	1.453	2.044	2.496	3.025	3.284	3.234	2.746	2.201	2.544	2.309
Plantain and Banana	27	24	27	44	40	554	556	865	760	889	712	752	715
Sub-Total	986	1.334	1.355	1.497	2.084	3.050	3.581	4.149	3.994	3.635	2.913	3.296	3.024
3. Sugars:													
"Panela" sugar	-	-	-	-	-	-	-	-	-	-	-	752	1.631
Sugar Cane	267	420	432	728	652	543	464	687	878	830	549	711	-
Sub-Total	267	420	432	728	652	543	464	687	878	830	549	1.463	1.631
4. Oil Seeds:													
Perennial Oil Seeds	-	-	-	-	-	2.864	5.098	4.160	3.241	3.349	2.645	3.148	2.673
Cotton	538	534	551	488	533	1.743	2.420	2.369	1.946	1.478	1.061	1.114	1.034
Sub-Total	538	534	551	488	533	4.607	7.518	6.529	5.187	4.827	3.706	4.262	3.707
5. Other Crops:													
Cacao	653	557	686	690	773	1.229	1.695	2.041	2.208	2.369	1.683	1.947	1.631
Vegetables and Fruit	-	-	-	-	-	2.905	3.106	3.670	3.317	2.617	1.832	2.409	2.096
Grain Legumes/Annual Oil Seeds	722	957	989	1.317	1.678	2.739	2.892	3.009	2.256	2.063	1.904	1.735	1.474
Tobacco	-	-	-	-	-	-	1.127	961	877	719	665	875	724
Sub-Total	1.375	1.514	1.675	2.007	2.451	6.873	8.820	9.681	8.658	7.768	6.084	6.966	5.925
Total Agricultural Products Research	6.083	9.461	9.525	11.095	12.576	25.391	30.577	31.603	27.323	25.693	20.390	22.887	20.575
II. Basic Agricultural Research													
Entomology	816	1.064	931	585	2.361	2.986	2.540	2.805	2.271	1.370	1.649	1.546	1.620
Plan Physiology	-	-	-	-	-	1.712	2.732	3.106	2.070	1.957	1.547	1.579	1.492
Phytopathology	834	1.106	1.251	1.557	2.394	2.405	2.675	2.944	2.930	2.952	2.519	2.701	2.404
Soils	1.381	1.844	1.887	2.746	2.999	4.236	4.528	4.989	4.410	4.300	3.687	4.574	3.638
Sub-Total	3.031	4.014	4.069	4.888	7.754	11.339	12.475	13.844	11.681	10.579	9.402	10.400	9.154
III. Other Non-Classi Agric. Research													
Crop Production	-	-	-	-	-	-	720	501	-	-	-	-	481
Centres and Stations	-	-	-	-	-	-	17.667	21.213	18.694	16.904	14.327	5.901	758
Sub-Total	-	-	-	-	-	-	18.387	21.714	18.694	16.904	14.327	5.901	1.239
Total Agricultural Research	9.114	13.475	13.594	15.983	20.330	36.730	61.439	67.161	57.698	53.176	44.119	39.188	30.968
IV. Livestock Product-Programme													
Beef Cattle	1.345	1.733	1.629	2.202	2.161	3.918	3.719	3.900	2.826	2.442	2.059	2.942	2.529
Dairy Cattle	2.080	3.211	3.115	3.104	4.157	5.553	5.828	6.313	4.136	3.932	2.820	3.021	2.846
Pigs	844	1.314	1.166	1.085	1.099	2.519	2.305	2.379	2.054	2.228	1.318	1.898	3.042
Sheep	356	728	716	786	849	1.838	2.074	1.847	1.505	1.395	1.005	1.094	1.006
Poultry	897	1.105	1.014	1.025	1.144	1.810	2.394	2.708	2.167	2.216	1.251	2.392	1.641
Minor Species	-	-	-	-	-	-	-	-	-	-	-	122	163
Sub-Total	5.522	8.091	7.640	8.202	9.410	15.638	16.320	17.147	12.768	12.213	8.453	11.469	11.227
V. Basic Livestock Research													
Animal Physiology	138	259	329	378	379	379	562	591	531	575	597	614	584
Microbiology	-	-	-	-	-	1.000	1.928	2.159	2.362	2.927	2.345	2.346	2.343
Nutrition	101	201	435	628	710	2.114	554	587	554	598	509	466	412
Parasitology	-	-	-	-	-	307	175	1.149	1.022	1.279	754	1.057	632
Pathology	1.131	1.034	916	853	861	841	1.780	1.454	1.512	1.639	1.081	1.241	1.229
Toxicology	-	-	-	-	-	-	281	274	286	301	357	271	308
Epidemiology	-	-	-	-	-	-	-	-	-	-	-	91	196
Vesicular Diseases	-	-	-	-	-	-	-	-	-	-	-	648	714
Sub-Total	1.370	1.494	1.680	1.859	1.950	4.641	5.280	6.214	6.267	7.319	5.643	6.734	6.418
VI. Other Non-Classi. Livestock Research													
Posture and Forage	-	-	-	3.136	3.218	3.229	2.983	3.414	2.014	824	1.122	1.574	1.690
Centres and Stations	-	-	-	-	-	-	17.667	21.213	18.705	16.904	14.327	1.541	758
Special Agreements	-	-	-	-	-	-	-	-	750	820	839	975	1.126
Sub-Total	-	-	-	3.136	3.218	3.229	20.650	24.627	21.469	18.548	16.288	4.090	3.574
Total Livestock Research	6.892	9.585	9.320	13.197	14.578	23.508	42.250	47.988	40.524	38.080	30.384	22.293	21.219
TOTAL RESEARCH	16.006	23.060	22.914	29.180	34.908	60.238	103.689	115.149	98.222	91.256	74.503	61.481	52.187

Source: ICA. Planning Director, 1977.

Chart No. IV-2

Colombia. Indexes of the ICA Budget by Research Programmes

1964-1976

(Based on constant 1970 Pesos

	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
I. Agricultural Product-Programme													
1. Cereals													
Rice	100.0	142.3	170.5	398.7	467.9	735.9	838.1	905.7	723.0	623.0	474.0	595.8	597.4
Oats	-	-	-	-	-	100.0	66.6	38.6	109. 2	196.9	106.1	46.6	41.5
Barley	-	-	-	-	-	100.0	136.8	151.5	86.6	95.6	65.8	5 4.1	32.9
Maize and Sorgtum	100.0	213.0	244.9	236.5	212.6	300.8	301.9	332.9	271.2	252.3	218.8	196.6	177.7
Wheat	100.0	183.9	123.3	147.0	200.1	208.1	162.0	140.7	104.0	109.7	124.2	134.3	119.8
Sub-Total	100.0	194.0	188.9	218.5	235.0	353.7	349.4	361.9	295.0	295.9	244.7	236.5	215.5
2. Starchy Crops													
Potatoe and Cassava	100.0	136.6	138.4	151.5	213.1	260.2	315.4	342.4	337.2	286.3	229.5	265.2	240.7
Plantain and Banana	100.0	88.8	100.0	162.9	148.1	2,051.8	2,059.2	3,203.7	2,814.8	3,292.5	2,637.0	2,785.1	2,649.1
Sub-Total	100.0	135.2	137.4	151.8	211.3	309.3	363.1	420.7	405.0	368.6	295.4	334.2	306.6
3. Sugars													
"Panela" sugar	-	-	-	-	-	-	-	-	-	-	-	100.0	216.9
Sugar Cane	100.0	157.3	161.8	272.6	244.1	203.3	173.7	257.3	328.8	310.8	205.6	266.2	-
Sub-Total	100.0	157.3	161.8	272.6	244.1	203.3	173.7	257.3	328.8	310.8	205.6	547.9	610.8
4. Oil Seeds													
Perennial Oil Seeds	-	-	-	-	-	100.0	178.0	145.3	113.2	116.9	92.4	109.9	93.3
Cotton	100.0	99.2	102.4	90.7	99.0	323.9	449.8	440.3	361.7	274.7	197.2	207.0	192.1
Sub-Total	100.0	99.2	102.4	90.7	99.0	856.3	1,397.3	1,213.5	964.1	897.2	688.8	792.1	689.0
5. Other Crops													
Cacao	100.0	85.3	105.0	105.6	118.3	188.2	259.5	312.5	338.1	362.7	257.7	298.1	249.7
Vegetables and Fruit	-	-	-	-	-	100.0	106.9	126.3	114.2	90.1	63.1	82.9	72.2
Grain Legumes/An. oil seeds	100.0	132.5	136.9	182.4	232.4	379.3	400.5	416.7	312.4	285.7	263.7	240.3	204.1
Tobacco	-	-	-	-	-	-	100.0	85.3	77.8	63.8	59.0	77.6	64.2
Sub-Total	100.0	110.1	121.8	145.9	178.2	499.8	641.4	704.0	629.6	564.9	442.4	506.6	430.9
Total Agricultural Products Research	100.0	155.5	156.6	182.4	206.7	417.4	502.7	519.5	449.2	422.4	335.2	376.3	338.2
II. Basic Agricultural Research													
Entomology	100.0	130.3	114.0	71.6	289.3	365.9	311.2	343.7	278.3	167.8	202.0	189.4	198.5
Plan Physiology	-	-	-	-	-	100.0	159.6	181.4	120.9	114.3	90.4	92.2	87.1
Phytopathology	100.0	132.6	150.0	186.6	287.0	288.3	320.7	353.0	351.3	353.9	302.0	323.8	288.2
Soils	100.0	133.5	136.6	198.8	217.1	306.7	327.8	361.2	319.3	311.3	266.9	331.2	263.4
Sub-Total	100.0	132.4	134.2	161.2	255.8	374.1	411.5	456.7	385.3	349.0	310.1	343.1	302.0
III. Other Non-Class. Agr. Research													
Crop Production	-	-	-	-	-	-	100.0	69.6	-	-	-	-	66.8
Centres and Stations	-	-	-	-	-	-	100.0	120.1	105.8	95.7	81.1	33.4	4.3
Sub-Total	-	-	-	-	-	-	100.0	118.1	101.7	91.9	77.9	32.1	6.7
Total Agricultural Research	100.0	147.9	149.2	175.4	223.1	403.0	674.1	736.9	633.1	583.5	484.1	430.0	339.8
IV. Livestock Product-Programme													
Beef Cattle	100.0	128.8	121.1	163.7	160.6	291.3	276.5	289.9	210.1	181.5	153.0	218.7	188.0
Dairy Cattle	100.0	154.3	149.7	149.2	199.8	266.9	280.1	303.5	203.6	189.0	135.5	145.2	136.8
Pigs	100.0	155.6	138.1	128.5	130.2	298.4	273.1	281.8	243.3	263.9	156.1	224.8	360.4
Sheep	100.0	204.4	201.1	220.7	238.4	516.2	582.5	518.8	422.7	391.8	282.3	307.3	282.5
Poultry	100.0	123.1	113.0	114.2	127.5	201.7	266.8	301.9	241.5	247.0	139.4	266.6	182.9
Minor Species	-	-	-	-	-	-	-	-	-	-	-	100.0	133.6
Sub-Total	100.0	146.5	138.3	148.5	170.4	283.1	295.5	310.5	231.5	221.1	153.0	207.7	203.3
V. Basic Livestock Research													
Animal Physiology	100.0	187.6	238.4	273.9	274.6	274.6	407.2	428.2	384.7	416.6	432.6	444.9	423.1
Microbiology	-	-	-	-	-	100.0	192.8	215.9	236.2	292.7	234.5	234.6	234.3
Nutrition	100.0	199.0	430.6	621.7	702.9	2,093.1	548.5	581.1	548.5	592.0	503.9	461.3	407.9
Parasitology	-	-	-	-	-	100.0	57.0	374.3	332.9	416.6	245.6	344.3	205.9
Pathology	100.0	91.4	80.9	75.4	76.1	74.3	157.3	128.5	133.6	144.9	95.5	109.7	108.6
Toxicology	-	-	-	-	-	-	100.0	97.5	101.8	107.1	127.1	96.4	109.6
Epidemiology	-	-	-	-	-	-	-	-	-	-	-	100.0	215.4
Vesicular Diseases	-	-	-	-	-	-	-	-	-	-	-	100.0	110.2
Sub-Total	100.0	109.0	122.6	135.6	142.3	338.7	385.4	453.5	457.4	534.2	411.9	491.5	468.4
VI. Other Non-Class. Livestock Res.													
Pasture and Forage	-	-	-	100.0	102.6	103.0	95.1	108.9	64.2	26.3	35.8	50.2	53.9
Centres and Stations	-	-	-	-	-	-	100.0	120.1	105.9	95.7	81.1	8.7	4.3
Special Agreements	-	-	-	-	-	-	-	-	100.0	109.3	111.9	130.0	150.1
Sub-Total	-	-	-	100.0	102.6	103.0	658.5	785.3	684.6	591.5	519.4	130.4	114.0
Total Livestock Research	100.0	139.1	135.2	191.5	211.5	341.1	613.0	696.3	588.0	552.5	440.9	323.5	307.9
TOTAL RESEARCH	100.0	144.0	143.1	182.3	218.0	376.3	647.8	719.4	613.6	570.1	465.4	384.1	326.0

Source: Chart No. IV-1.

Chart No. IV-3

Annual Percentage of Variation of the ICA Budget by Research Programme
1965-1976

(Based on constant 1970 Pesos)

	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
I. Agricultural Product-Programme												
1. Cereals												
Rice	42.31	19.82	133.83	17.36	57.26	13.89	8.07	-20.17	-13.83	-23.92	25.69	0.27
Oats	-	-	-	-	-	-33.39	-42.01	182.71	80.33	-46.10	-56.12	-10.85
Barley	-	-	-	-	-	36.77	10.77	-42.87	10.41	-31.14	-17.83	-39.15
Maize & Sorghum	113.08	14.95	-3.43	-10.10	41.46	0.37	10.26	-18.52	- 6.98	-13.26	-10.16	- 9.59
Wheat	83.94	-32.94	19.21	36.13	3.99	-22.14	-13.18	-26.08	5.42	13.21	8.18	-10.79
Sub-Total	94.00	- 2.60	15.66	7.55	50.50	- 1.20	3.56	-18.48	0.31	-17.32	- 3.33	- 8.87
2. Starchy Crops												
Potatoe & Cassava	36.60	1.37	9.41	40.67	22.11	21.19	8.56	- 1.52	-15.09	-19.85	15.58	- 9.24
Plantain & Banana	-11.11	12.50	62.96	- 9.09	1.285.00	0.36	55.58	-12.14	16.97	-19.91	5.62	- 4.92
Sub-Total	35.29	1.57	10.48	39.21	46.35	17.41	15.86	- 3.74	- 8.99	-19.86	13.15	- 8.25
3. Sugars												
"Panela" sugar	-	-	-	-	-	-	-	-	-	-	-	116.89
Sugar Cane	57.30	2.86	68.52	-10.44	-16.72	-14.55	48.06	27.80	- 5.47	-33.86	29.51	-
Sub-Total	57.30	2.86	68.52	-10.44	-16.72	-14.55	48.06	27.80	- 5.47	-33.86	166.48	11.48
4. Oil Seeds												
Perennial Oil Seeds	-	-	-	-	-	78.00	-18.40	-22.09	3.33	-21.02	19.02	-15.09
Cotton	- 0.74	3.18	-11.43	9.22	227.02	38.84	- 2.11	-17.86	-24.05	-28.21	5.00	- 7.18
Sub-Total	- 0.74	3.18	-11.43	9.22	764.35	63.19	-13.16	-20.55	- 6.94	-23.22	15.00	-13.02
5. Other Crops												
Cocoa	-14.70	23.16	0.58	12.03	58.99	37.92	20.41	8.18	7.29	-28.96	15.69	-16.23
Vegetables & Fruits	-	-	-	-	-	6.92	18.16	- 9.62	-21.10	-30.00	31.50	-12.99
Grain Leg./Annual oil seeds	32.55	3.34	33.16	27.41	63.23	5.59	4.05	-25.02	- 8.55	- 7.71	- 8.88	-15.04
Tobacco	-	-	-	-	-	-	-14.73	- 8.74	-18.02	- 7.51	31.58	-17.26
Sub-Total	10.11	10.63	19.82	22.12	180.42	28.33	9.76	-10.57	-10.28	-21.68	14.50	-14.94
Total Agricultural Products Research	55.53	0.68	16.48	13.35	101.90	20.42	3.36	-13.54	- 5.97	-20.64	12.25	-10.10
II. Basic Agricultural Research												
Entomology	30.39	-12.50	-37.16	303.59	26.47	-14.94	10.43	-19.04	-39.67	20.36	-6.25	4.79
Plant Physiology	-	-	-	-	-	59.58	13.69	-33.35	- 5.46	-20.95	2.07	- 5.51
Phytopathology	32.61	13.11	24.46	53.76	0.46	11.23	10.06	- 0.48	0.75	-14.67	7.23	-11.00
Soils	33.53	2.33	45.52	9.21	41.25	6.89	10.18	-11.61	- 2.49	-14.26	24.06	-20.46
Sub-Total	32.43	1.37	20.13	58.63	46.23	10.02	10.97	-15.62	- 9.43	-11.13	10.61	-11.98
III. Other Non-Class. Agri. Res.												
Crop Production	-	-	-	-	-	-	-30.42	-	-	-	-	- 0.81*
Centres & Stations	-	-	-	-	-	-	20.07	-11.87	- 9.58	-15.24	-58.81	-97.15
Sub-Total	-	-	-	-	-	-	18.09	-13.91	- 9.58	-15.24	-58.51	-79.00
TOTAL AGRICULTURAL RESEARCH	47.85	0.88	17.57	27.20	80.67	67.27	9.31	-14.09	- 7.84	-17.03	-11.18	-20.98
IV. Livestock Product-Programme												
Beef Cattle	28.85	- 6.00	35.17	- 1.86	81.30	- 5.08	4.87	-27.54	-13.59	-15.68	42.88	-14.04
Dairy Cattle	54.38	- 2.99	- 0.35	33.92	33.58	4.95	8.32	-32.90	- 7.18	-28.28	7.13	- 5.79
Pigs	55.69	-11.26	- 6.95	1.29	129.21	- 8.50	3.21	-13.66	8.47	-40.84	44.01	60.27
Sheep	104.49	- 1.65	9.78	8.02	116.49	12.84	-10.95	-18.52	- 7.31	-27.96	8.86	- 8.04
Poultry	23.19	- 8.24	1.08	11.61	58.22	32.27	13.12	-19.98	2.26	-43.55	91.21	-31.40
Minor Species	-	-	-	-	-	-	-	-	-	-	-	33.61
Sub-Total	46.52	- 5.57	7.36	14.73	66.18	4.36	5.07	-25.42	- 4.50	-30.79	35.60	- 2.11
V. Basic Livestock Research												
Animal Physiology	87.68	27.03	14.89	0.26	0.00	48.28	5.16	-10.15	8.29	3.83	2.85	- 4.89
Microbiology	-	-	-	-	-	92.80	11.98	9.40	23.92	-19.88	0.04	- 0.13
Nutrition	99.01	116.42	44.37	13.06	197.75	-73.79	5.96	- 5.62	7.94	-14.88	- 8.45	-11.59
Parasitology	-	-	-	-	-	-43.00	556.57	-11.05	25.15	-41.05	40.19	-40.21
Pathology	- 8.58	-11.41	- 6.88	0.94	- 2.32	111.65	-18.31	3.99	8.40	-34.05	14.80	- 0.97
Toxicology	-	-	-	-	-	-	- 2.49	4.38	5.24	18.60	-24.09	13.65
Epidemiology	-	-	-	-	-	-	-	-	-	-	-	115.38
Vesicular Diseases	-	-	-	-	-	-	-	-	-	-	-	10.19
Sub-Total	9.05	12.45	10.65	4.90	138.00	13.77	17.69	0.85	16.79	-22.90	19.33	- 4.69
VI. Other Non-Class. Livestock Res.												
Pasture and Forage	-	-	-	2.61	0.34	- 7.62	14.45	-41.01	-59.09	36.17	40.29	7.37
Centres and Stations	-	-	-	-	-	-	20.07	-11.82	- 9.63	-15.24	-89.24	-50.81
Special Agreements	-	-	-	-	-	-	-	-	9.33	2.32	16.21	15.49
Sub-Total	-	-	-	2.61	0.34	539.52	19.26	-12.82	-13.61	-12.18	-74.89	-12.62
TOTAL LIVESTOCK RESEARCH	39.07	-2.76	41.60	10.46	61.26	79.73	13.58	-15.55	- 6.03	-20.21	-26.63	- 4.82
TOTAL RESEARCH	44.07	-0.63	27.35	19.63	72.56	72.13	11.05	-14.70	- 7.09	-18.36	-17.48	-15.12

* This percentage variation refers to period 1971-1976.

Source: Chart No. IV-1

Chart No. IV-4

Colombia. Percentage Participation of Each Programme and Group of Programmes in the Total ICA Research Budget
1964-1976

(Based on constant 1970 pesos)

	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
I. Agricultural Product-Programme													
1. Cereals													
Rice	1.95	1.93	2.32	4.26	4.18	3.81	2.52	2.45	2.30	2.13	1.99	3.02	3.57
Oats	-	-	-	-	-	0.92	0.36	0.19	0.62	1.20	0.79	0.42	0.44
Barley	-	-	-	-	-	1.16	0.92	0.92	0.62	0.73	0.62	0.61	0.44
Maize & Sorghum	9.08	13.43	15.53	11.78	8.85	7.26	4.23	4.20	4.01	4.02	4.27	4.65	4.95
Wheat	7.20	9.19	6.20	5.81	6.61	3.98	1.80	1.41	1.22	1.39	1.92	2.52	2.65
Sub-Total	18.22	24.54	24.06	21.85	19.64	17.13	9.83	9.17	8.76	9.46	9.58	11.22	12.05
2. Starchy Crops													
Potatoe and Cassava	5.99	5.68	5.80	4.98	5.86	4.14	2.92	2.85	3.29	3.01	2.95	4.14	4.42
Plantain & Banana	0.17	0.10	0.12	0.15	0.11	0.92	0.54	0.75	0.77	0.97	0.96	1.22	1.37
Sub-Total	6.16	5.78	5.91	5.13	5.97	5.06	3.45	3.60	4.07	3.98	3.91	5.36	5.79
3. Sugars													
"Panela" sugar	-	-	-	-	-	-	-	-	-	-	-	1.22	3.13
Sugar Cane	1.67	1.82	1.89	2.49	1.87	0.90	0.45	0.60	0.89	0.91	0.74	1.16	-
Sub-Total	1.67	1.82	1.89	2.49	1.87	0.90	0.45	0.60	0.89	0.91	0.74	2.38	3.13
4. Oil Seeds													
Perennial Oil Seeds	-	-	-	-	-	4.75	4.92	3.61	3.30	3.67	3.55	5.12	5.12
Cotton	3.36	2.32	2.40	1.67	1.53	2.89	2.33	2.06	1.98	1.62	1.42	1.81	1.98
Sub-Total	3.36	2.32	2.40	1.67	1.53	7.65	7.25	5.67	5.28	5.29	4.97	6.93	7.10
5. Other Crops													
Cocoa	4.08	2.42	2.99	2.36	2.21	2.04	1.63	1.77	2.25	2.60	2.26	3.17	3.13
Vegetables and Fruits	-	-	-	-	-	4.82	3.00	3.19	3.38	2.87	2.46	3.92	4.02
Grain Legumes/													
Annual Oil Seeds	4.51	4.15	4.32	4.51	4.81	4.55	2.79	2.61	2.30	2.26	2.56	2.82	2.82
Tobacco	-	-	-	-	-	-	1.09	0.83	0.89	0.79	0.89	1.42	1.39
Sub-Total	8.59	6.57	7.31	6.88	7.02	11.41	8.51	8.41	8.81	8.51	8.17	11.33	11.35
Total Agricultural Products Research	38.0	41.03	41.57	38.02	36.03	42.15	29.49	27.45	27.82	28.15	27.37	37.23	39.43
II. Basic Agricultural Research													
Entomology	5.10	4.61	4.06	2.00	6.76	4.96	2.45	2.44	2.31	1.50	2.21	2.81	3.10
Plant Physiology	-	-	-	-	-	2.84	2.63	2.70	2.11	2.14	2.08	2.57	2.86
Phytopathology	5.21	4.80	5.46	5.34	6.86	3.99	2.58	2.56	2.98	3.23	3.38	4.39	4.61
Soils	8.63	8.00	8.24	9.41	8.59	7.03	4.37	4.33	4.49	4.71	4.95	7.44	6.97
Sub-Total	18.94	17.41	17.76	16.75	22.21	18.82	12.03	12.02	11.89	11.59	12.62	16.92	17.54
III. Other Non-Class. Agri. Research													
Crop Production	-	-	-	-	-	-	0.69	0.44	-	-	-	-	0.92
Centres and Stations	-	-	-	-	-	-	17.04	18.42	19.03	18.52	19.23	9.60	1.45
Sub-Total	-	-	-	-	-	-	17.73	18.86	19.03	18.52	19.23	9.60	2.37
TOTAL AGRICULTURAL RESEARCH	56.94	58.43	59.33	54.77	58.24	60.97	59.25	58.33	58.74	58.27	59.22	63.74	59.34
IV. Livestock Product-Programme													
Beef Cattle	8.40	7.52	7.11	7.55	6.19	6.50	3.59	3.39	2.88	2.68	2.76	4.79	4.85
Dairy Cattle	13.00	13.92	13.59	10.64	11.91	9.22	5.62	5.48	4.31	4.31	3.79	4.91	5.45
Pigs	5.27	5.70	5.09	3.72	3.15	4.18	2.22	2.07	2.09	2.44	1.77	3.09	5.83
Sheep	2.22	3.16	3.12	2.69	2.43	3.05	2.00	1.60	1.53	1.53	1.35	1.78	1.93
Poultry	5.60	4.79	4.43	3.51	3.28	3.00	2.31	2.35	2.21	2.43	1.68	3.89	3.14
Minor Species	-	-	-	-	-	-	-	-	-	-	-	0.20	0.31
Sub-Total	34.50	35.09	33.34	28.11	26.96	25.96	15.74	14.89	13.02	13.38	11.35	18.65	21.51
V. Basic Livestock Research													
Animal Physiology	0.86	1.12	1.44	1.30	1.09	0.63	0.54	0.51	0.54	0.63	0.80	1.00	1.12
Microbiology	-	-	-	-	-	1.66	1.86	1.87	2.40	3.21	3.15	3.82	4.49
Nutrition	0.63	0.87	1.90	2.15	2.03	3.51	0.53	0.51	0.56	0.66	0.68	0.76	0.79
Parasitology	-	-	-	-	-	0.51	0.17	1.00	1.04	1.40	1.01	1.72	1.21
Pathology	7.07	4.48	4.00	2.92	2.47	1.40	1.72	1.26	1.54	1.80	1.45	2.02	2.35
Toxicology	-	-	-	-	-	-	0.27	0.24	0.29	0.33	0.48	0.44	0.59
Epidemiology	-	-	-	-	-	-	-	-	-	-	-	0.15	0.38
Vesicular Diseases	-	-	-	-	-	-	-	-	-	-	-	1.05	1.37
Sub-Total	8.56	6.48	7.33	6.37	5.59	7.70	5.09	5.40	6.38	8.02	7.57	10.95	12.30
VI. Other Non-Class. Livestock Res.													
Pasture and Forage	-	-	-	10.75	9.22	5.36	2.88	2.96	2.05	0.90	1.51	2.56	3.24
Centres and Stations	-	-	-	-	-	-	17.04	18.42	19.04	18.52	19.23	2.51	1.45
Special Agreements	-	-	-	-	-	-	-	-	0.76	0.90	1.13	1.59	2.16
Sub-Total	-	-	-	10.75	9.22	5.36	19.92	21.39	21.86	20.33	21.86	6.65	6.85
Total Livestock Research	43.06	41.57	40.67	45.23	41.76	39.03	40.75	41.67	41.26	41.73	40.78	36.26	40.66
TOTAL RESEARCH	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: Chart No. IV-1.

Chart No. IV-5

Colombia. Percentage Participation of Each Research Programme Within the Budget for Each Group of Programmes in ICA

1964-1976

	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
I. Agricultural Product Programme													
1. Cereals													
Rice	10.70	7.85	9.65	19.51	21.30	22.25	25.65	26.77	26.21	22.52	20.72	26.94	29.64
Oats	-	-	-	-	-	5.37	3.62	2.03	7.03	12.64	8.24	3.74	3.66
Barley	-	-	-	-	-	6.77	9.38	10.03	7.03	7.74	6.44	5.48	3.66
Maize & Sorghum	49.81	54.71	64.57	53.91	45.07	42.36	43.04	45.82	45.79	42.46	44.55	41.41	41.08
Wheat	39.49	37.44	25.78	26.57	33.63	23.24	18.31	15.35	13.93	14.64	20.05	22.43	21.96
Sub-Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
2. Starchy Crops													
Potatae and Cassava	97.26	98.20	98.01	97.06	98.08	81.84	84.47	79.15	80.97	75.54	75.56	77.18	76.36
Plantain and Banana	2.74	1.80	1.99	2.94	1.92	18.16	15.53	20.85	19.03	24.46	24.44	22.82	23.64
Sub-Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
3. Sugars													
"Panela" Sugar	-	-	-	-	-	-	-	-	-	-	-	51.40	100.0
Sugar Cane	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	48.60	-
Sub-Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
4. Oil Seeds													
Perennial Oil Seeds	-	-	-	-	-	62.17	67.81	63.72	62.48	69.38	71.37	73.86	72.11
Cotton	100.0	100.0	100.0	100.0	100.0	37.83	32.19	36.28	37.52	30.62	28.63	26.14	27.89
Sub-Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
5. Other Crops													
Cacao	47.49	36.79	40.96	34.38	31.54	17.88	19.22	21.08	25.50	30.50	27.66	27.95	27.53
Vegetables and Fruits	-	-	-	-	-	42.27	35.22	37.91	38.31	33.69	30.11	34.58	35.38
Grain Leg./Annual oil Seeds	52.51	63.21	59.04	65.62	68.46	39.85	32.79	31.08	26.06	26.56	31.30	24.91	24.68
Tobacco	-	-	-	-	-	-	12.78	9.93	10.13	9.26	10.93	12.56	12.22
Sub-Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
II. Basic Agricultural Research													
Entomology	26.92	26.51	22.88	11.97	30.45	26.23	20.36	20.26	19.44	12.95	17.54	14.87	17.70
Plan Physiology	-	-	-	-	-	15.10	21.90	22.44	17.72	18.50	16.45	15.18	16.30
Phytopathology	27.52	27.55	30.74	31.85	30.87	21.21	21.44	21.27	25.08	27.90	26.79	25.97	25.26
Soils	45.56	45.94	46.38	56.18	38.68	37.36	36.30	36.04	37.75	40.65	39.22	43.98	39.74
Sub-Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
III. Other Non-Class. Agri. Research													
Crop Production	-	-	-	-	-	-	3.92	2.31	-	-	-	-	38.82
Centres and Stations	-	-	-	-	-	-	96.08	97.69	100.0	100.0	100.0	100.0	61.18
Sub-Total	-	-	-	-	-	-	100.0	100.0	100.0	100.0	100.0	100.0	100.0
IV. Livestock Product-Programme													
Beef Cattle	24.36	21.42	21.32	26.85	22.96	25.05	22.79	22.74	22.10	20.00	24.36	25.65	22.53
Dairy Cattle	37.67	39.69	40.77	37.84	44.18	35.51	35.71	36.82	33.12	32.20	33.36	26.34	25.25
Pigs	15.28	16.24	15.26	13.23	11.68	16.11	14.12	13.87	16.06	18.24	15.59	16.55	27.10
Sheep	6.45	9.00	9.37	9.58	9.02	11.75	12.71	10.77	11.77	11.42	11.89	9.54	8.96
Poultry	16.24	13.66	13.27	12.50	12.16	11.57	14.67	15.79	16.95	18.14	14.80	20.86	14.62
Minor Species	-	-	-	-	-	-	-	-	-	-	-	1.06	1.45
Sub-Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
V. Basic Livestock Research													
Animal Physiology	10.07	17.34	19.58	20.33	19.44	8.17	10.64	9.51	8.47	7.86	10.58	9.12	9.10
Microbiology	-	-	-	-	-	21.55	36.52	34.74	37.69	39.99	41.56	34.84	36.51
Nutrition	7.37	13.45	25.89	33.78	36.41	45.55	10.49	9.45	8.84	8.17	9.02	6.92	6.42
Parasitology	-	-	-	-	-	6.61	3.31	18.49	16.31	17.48	13.36	15.70	9.85
Pathology	82.55	69.21	54.52	45.88	44.15	18.12	33.71	23.40	24.13	22.39	19.16	18.43	19.15
Toxicology	-	-	-	-	-	-	5.32	4.41	4.56	4.11	6.33	4.02	4.80
Epidemiology	-	-	-	-	-	-	-	-	-	-	-	1.35	3.05
Vesicular Diseases	-	-	-	-	-	-	-	-	-	-	-	9.62	11.12
Sub-Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
VI. Other Non-Class. Livestock Res.													
Pasture and Forage	-	-	-	100.0	100.0	100.0	14.45	13.86	9.38	4.44	6.89	38.48	47.29
Centres and Stations	-	-	-	-	-	-	85.55	86.14	87.13	91.14	87.96	37.68	21.21
Special Agreements	-	-	-	-	-	-	-	-	3.49	4.42	5.15	23.84	31.51
Sub-Total	-	-	-	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Chart No. IV-1.

Chart No. IV-6

Colombia. Growth Rates for the Period 1964-1976 and for each Five Years in the Funds Executed by ICA in Research Programmes

Programs \ Period	1964-66	1966-71	1971-76	1964-76
1. Agricultural Product-Programme				
1. Cereals:				
Rice	30.58	39.65	- 7.98	16.06
Oats	-	-37.84 1/	1.45	-11.80 2/
Barley	-	23.08 1/	-26.31	-14.68 2/
Maize and Sorghum	56.50	6.32	-11.79	4.91
Wheat	11.06	2.66	- 3.15	1.52
Sub-Total Cereals	37.46	13.87	- 9.84	6.61
2. Starchy Crops:				
.Potatoe and Cassava	17.67	19.85	- 6.80	7.59
.Plantain and Banana	0.00	100.04	- 3.73	31.39
Sub-Total Starchy Crops	17.22	25.08	- 6.12	9.78
3. .Sugars:				
"Panela" sugar	-	-	-	116.88 3/
Sugar Cane	27.19	9.72	0.86	9.31
Sub-Total Sugars	27.19	9.72	18.87	16.27
4. Oil Seeds:				
Perennial Oil Seeds	-	20.52 1/	- 8.46	- 0.98
. Cotton	1.20	33.86	-15.27	5.59
Sub-Total Oil Seeds	1.20	63.96	-10.70	17.45
5. Other Crops:				
Cacao	2.49	24.36	- 4.38	7.92
Vegetables and Fruits	-	12.39 1/	-10.59	- 4.55
Grain/Legumes/Annual Oil Seeds	17.03	24.92	-13.30	6.12
Tobacco	-	-	-	- 7.10 4/
Sub-Total Other Crops	10.37	42.03	- 9.35	12.94
Total Research Agricultural Products	25.13	27.10	- 8.22	10.68

	1964-66	1966-71	1971-76	1964-76
II. Basic Agricultural Research:				
Entomology	6.81	24.67	-10.39	5.88
Plant Physiology	-	34.69 1/	-13.63	- 1.94
Phytopatology	22.47	18.66	- 3.97	9.22
Soils	16.89	21.46	- 6.12	8.40
Sub-Total Basic Agricultural Research	15.86	27.74	- 7.94	9.64
III. Other Non-Classificable Agricultural Research				
Crop Production	-	-	-	- 6.50 4/
Stations and Centres	-	-	-	-40.83 4/
Sub-Total Other Non-Classifiable Agricultural Research	-	-	-	-36.20 4/
IV. Livestock Product Programme				
Beef Cattle	10.05	19.07	- 8.29	5.40
Dairy Cattle	22.37	15.17	-14.72	2.64
Pigs	17.53	15.32	5.03	11.27
Sheep	41.81	20.86	-11.44	9.04
Poultry	6.32	21.70	- 9.53	5.16
Minor Species	-	-	-	33.60 3/
Sub-Total Livestock Product Programme	17.62	17.54	- 8.12	6.09
V. Basic Livestock Research				
Animal Physiology	54.40	12.42	- 0.23	12.77
Microbiology	-	46.93 1/	1.64	12.93 2/
Nutrition	107.53	6.17	- 6.83	12.42
Parasitology	-	93.45 1/	-11.26	10.86 2/
Pathology	-10.00	9.68	- 3.30	0.69
Toxicology	-	-	-	1.54 4/
Epidemiology	-	-	-	115.38 3/
Vesicular Diseases	-	-	-	10.18 3/
Sub-Total Basic Livestock Research	10.73	29.90	0.64	13.73
VI. Other Non-Classifiable Livestock Research				
Pastures and Fo[illegible]		[illegible] 5/		
Centres				
Speci[illegible]				
Sub[illegible]				

Chart No. IV-7

Colombia. Funds INDERENA Spent on Marine Sciences Research Programmes

1972 - 1975

(In thousands of current pesos)

PROGRAM \ YEAR	1972	1973	1974	1975
. Fish Biology	4.5	4.5	4.5	4.5
. Ichthyology	46.7	515.7	438.0	22.5
. Aquaculture	4.5	4.5	4.5	4.5
. "Talasculture"	-	56.0	65.0	-
Pisciculture	-	400.0	-	-
TOTAL	55.7	989.7	512.0	31.5

Source: Colciencias. "Marine Sciences Research Projects that are in Progress . 1973-1975". Scientific Technological Division. Bogotá, September 1976.

Chart No. IV-8

Colombia. Funds INDERENA Spent on Marine Science Research Programmes, 1972-1975

(In thousands of 1970 constant pesos)

PROGRAMA \ YEAR	1972	1973	1974	1975
Fish Biology	2.9	1.9	1.2	0.8
Ichthyology	29.8	222.3	115.2	4.1
Aquaculture	2.9	1.9	1.2	0.8
"Talasculture"	-	28.0	17.1	-
Pisciculture	-	172.5	-	-
TOTAL	35.5	426.7	134.6	5.7

Note: In order to obtain the data in constant prices, it was deflacted by the price index implicit in the G.N.P. Chart No. VI-1 gives the indexes used.

Source: Chart No. IV-7.

Chart No. IV-9

Colombia. Percentage Participation of Each Programme in the Funds INDERENA Spent on Marine Science Research

1972 - 1975

(Based on constant 1970 pesos)

YEAR / PROGRAM	1972	1973	1974	1975
Fish Biology	8.1	0.5	0.9	14.3
Ichthyology	83.8	52.1	85.6	71.4
Aquaculture	8.1	0.5	0.9	14.3
"Talasculture"	-	6.6	12.7	-
Pisciculture	-	40.4	-	-
TOTAL	100.0	100.0	100.0	100.0

Source: Chart No. IV-8

Chart No. IV.10

Colombia. Indexes of the Funds INDERENA Spent on Research Programmes, 1972-1975

(Based on constant 1970 pesos)

PROGRAM \ YEAR	1972	1973	1974	1975
Fish Biology	100.0	65.5	41.4	28.0
Ichthyology	100.0	746.0	386.6	13.6
Aquaculture	100.0	65.5	41.4	28.0
"Talasculture"	-	100.0	61.1	-
Pisciculture	-	100.0	-	-
TOTAL	100.00	1.202.0	379.2	16.1

Source: Chart No. IV-8.

Chart No. IV-11

Colombia. Annual and Periodic Growth Rates of the Funds INDERENA Spent on Marine Sciences Research Programmes

(Based on constante 1970 pesos)

YEAR / PROGRAM	1972-1973	1973-1974	1974-1975	Total Periodo 1972-1975
Fish Biology	- 34.5	- 36.8	- 33.3	- 34.9
Ichthyology	646.0	- 48.2	- 96.4	- 48.4
Aquaculture	- 34.5	- 36.8	- 33.3	- 34.9
"Talasculture"	-	- 38.9	-	-
Pisciculture	-	-	-	-
TOTAL	1.102.0	- 68.5	- 95.8	- 45.7

Source: Chart No. IV-8.

Chart No. IV-12

Colombia. Funds the "Federación Nacional de Cafeteros" Spent on Research Programmes

1973 - 1976

(In thousands of current pesos)

PROGRAM \ YEAR	1973	1974	1975	1976
Agro-climatology	1.246.2	1.797.6	2.167.9	2.783.1
Soils 1/	1.360.6	1.531.1	1.936.5	2.174.8
Entomology	453.4	558.3	599.7	648.1
Vegetabla Physiology	675.4	909.3	1.203.8	995.9
Plant Improvement	1.910.0	2.259.9	3.424.3	2.636.3
Phytopathology	1.135.8	1.388.8	1.553.6	1.597.5
Agricultural Chemistry	1.455.1	1.660.8	1.980.5	2.368.7
Related Crops	1.200.7	1.532.0	2.034.9	1.409.1
Animal Industry	433.9	756.1	986.7	1.367.8
Coffee 2/	1.568.8	1.837.8	2.590.9	1.635.3
TOTAL	11.439.9	14.231.7	18.478.8	17.616.6

1/ Includes Biology and Soil Conservation

2/ Corresponds to crop research practices.

Source: CENICAFE. Administrative Department. 1978.

Chart No. IV-13

Colombia. Funds the "Federación Nacional de Cafeteros" Spent on Research Programmes

1973 - 1976

(In thousands of constant 1970 pesos)

PROGRAM \ YEAR	1973	1974	1975	1976
Agro-climatology	815.6	921.8	920.2	955.7
Soils 1/	890.4	785.2	821.9	746.8
Entomology	296.7	286.3	254.5	222.8
Vegetable Physicology	442.0	466.3	511.0	342.0
Plant Improvement	1.250.0	1.158.9	1.453.4	905.3
Phytopathology	743.3	712.2	659.4	548.6
Agricultural Chemistry	952.3	851.7	840.6	813.4
Related Crops	785.8	785.6	863.7	483.9
Animal Industries	284.0	387.7	418.8	469.7
Coffee 2/	1.026.7	942.5	1.099.7	561.6
TOTAL	7.486.8	7.298.3	7.843.3	6.049.7

1/ Includes biology and soil conservation.

2/ Corresponds to crop research practices.

Note: In order to obtain the data in constant prices, it was deflacted by the price index implicit in the G.N.P. Chart VI-1 with the general economic indicators gives the indexes used.

Source: Chart No. IV-12.

Chart No. IV-14

Colombia. Indexes of the Funds Spent by the "Federación Nacional de Cafeteros" on Research Programmes - 1973-1976

(Based on constant 1970 pesos)

PROGRAM \ Year	1973	1974	1975	1976
Agro-climatology	100.0	113.0	112.8	117.2
Soils 1/	100.0	88.2	92.3	83.9
Entomology	100.0	96.5	85.8	75.1
Vegetable Physiology	100.0	105.5	115.6	77.4
Plant Improvement	100.0	92.7	116.3	72.4
Phytopathology	100.0	95.8	88.7	73.8
Agricultural Chemistry	100.0	89.4	88.3	85.4
Related Crops	100.0	99.9	109.9	61.6
Animal Industry	100.0	136.5	147.5	165.4
Coffee 2/	100.0	91.8	107.1	54.7
TOTAL	100.0	97.5	104.8	80.8

1/ Includes Biology and Soil Conservation

2/ Corresponds to crop research practices.

Source: Chart No. IV-13.

Chart No. IV-15

Colombia. Percentage Participation of Each Programme in the Funds the "Federación Nacional de Cafeteros" Spent on Research - 1973 - 1976

(Based on constant 1970 pesos)

PROGRAM \ YEAR	1973	1974	1975	1976
Agro-climatology	10.9	12.6	11.7	15.8
Soils 1/	11.9	10.8	10.5	12.3
Entomology	4.0	3.9	3.2	3.7
Vegetable Physicology	5.9	6.4	6.5	5.7
Plant Improvement	16.7	15.9	18.5	15.0
Phytopathology	9.9	9.8	8.4	9.1
Agricultural Chemistry	12.7	11.7	10.7	13.5
Related Crops	10.5	10.8	11.0	8.0
Animal Industries	3.8	5.3	5.3	7.8
Coffee 2/	13.7	12.9	14.0	9.3
TOTAL	100.0	100.0	100.0	100.0

1/ Includes biology and soil conservation.

2/ Corresponds to crop research practices.

Source: Chart No. IV-13

Chart No. IV-16

Colombia. Annual and Periodic Growth Rates in the Funds the Federation of Coffee Growers Spent on Research Programmes

(In 1970 Constant Pesos)

PROGRAM \ YEAR	1973-1974	1974-1975	1975-1976	1973-1976
Agro-climatology	13.0	- 0.2	3.9	5.4
Soils 1/	-11.8	4.7	- 9.1	- 5.7
Entomology	- 3.5	-11.1	-12.5	- 9.1
Vegetable Physiology	5.5	9.6	-33.1	- 8.2
Plant Improvement	- 7.3	25.4	-37.7	-10.2
Phytopathology	- 4.2	- 7.4	-16.8	- 9.6
Agricultural Chemistry	-10.6	- 1.3	- 3.2	- 5.1
Related Crops	- 0.1	9.9	-44.0	-14.9
Animal Industries	36.5	8.0	12.2	18.3
Coffee 2/	- 8.2	16.7	-48.9	-18.2
TOTAL	- 2.5	7.5	-22.9	- 6.9

1/ Includes biology and soil conservation.

2/ Corresponds to research in crop practices.

Source: Chart No. IV-13

Chart No. IV-17

Colombia. Funds CONIF Spent on Research Programmes

1975 - 1976

Year	Thousands of Current Pesos	Thousands of 1970 Constant Pesos 1/	Annual Percentage Variation (Based on Constant Pesos)
1975	3.052.5	1.295.6	-
1976	2.812.5	965.8	- 25.5

1/ In order to obtain the data in constant prices, the figures were deflacted by the price index in the GNP.

Source: CONIF. President's Report, 1975 and 1976.

Chart . No. IV-18

Colombia. Funds Spent by the National Federation of Rice Farmers on the ICA-CIAT Research Programme

1973 - 1976

Years	Thousands of Current Pesos	Thousands of 1970 Constant Pesos 1/	Index (Based on Constant Pesos)	Annual Growth Rate (Based on Constant Pesos)
1973	626.531	410.033.4	100.0	-
1974	666.070	341.574.4	83.3	-16.7
1975	733.020	311.129.0	75.9	- 8.9
1976	944.081	324.203.6	79.1	4.2

1/ In order to obtain the data in constant prices the figures were deflacted by the price index of the GNP. See Table No. VI-1.

Growth Rate for the Period 1973-1976 (Based on Constant Pesos)	- 7.5

Source: Information supplied By FEDEARROZ for the project: "Modelo Institucional de Generación de Tecnología Agropecuaria". OFISEL, 1978.

Chart No. IV-19

Colombia. Funds Spent by C.V.C on Research Programmes

(In thousands of current pesos)

Program \ Year	1975	1976
Forestry Experiments	448.5	969.5
Fish Development	883.1	1.226.5
Agricultural Experiments	595.8	939.4
TOTAL	1.927.4	3.135.4

Source: Corporación Autónoma Regional del Cauca (C.V.C.) - Special Programmes Section 1977.

Chart No. IV-20

Colombia. Funds Spent by C.V.C. on Research Programmes, Percentage Share and Growth Rates

(In thousands of 1970 constant pesos)

	1975		1976		1975-1976
	Thousands of Pesos	%	Thousands of Pesos	%	Growth Rate
Forestry Experiments	190.4	23.3	332.9	30.9	74.8
Fish Development	374.8	45.8	421.2	39.1	12.4
Agricultural Experiments	252.9	30.9	322.6	30.0	27.6
TOTAL	818.1	100.0	1.076.7	100.0	31.6

Note: In order to obtain the data in constante pesos it was deflacted by the price index implicit in the G.N.P. See Chart No. VI-1.

Source: Chart No. IV-19.

Chart No. IV-21

Colombia. Funds Spent in the Universities per Research Product Programme

1967 - 1978

(In thousands of current pesos)

PROGRAMS \ UNIVERSITY	Cartagena Univ. 61-77	Tolima University 67-72	Nariño University 68-76	Bogotá National Univ. 68-77	Caldas University 69-73	Valle University 69-77	Pedag. & Technol. Univ. 69-77	Santander Industrial Univ. 69-72	Atlantico Univ. 70-72	Jorge T. Lozano Univ. 71-77	Cordoba University 71-77	Antioquia University 73-77	Medellín National Univ. 73-77	Fco. de P. Santander Univ. 1977	Pamplona Univ. 1977	Palmira University 77-78
Agricultural Research																
1. Crops:																
Cotton	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	32.6
Rice	-	60.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Oats and Barley	-	-	-	68.4	-	-	-	-	-	-	-	-	-	-	-	-
Bananas and Plantain	-	-	250.0	-	-	-	-	-	-	-	-	-	120.0	-	-	18.3
Coffee	-	-	-	6.788.7	-	-	-	-	-	-	-	-	-	-	-	15.7
Cane (Sugar/"Panela")	-	-	-	-	-	-	-	-	-	-	-	-	-	144.9	-	92.5
Sisal Hemp	-	-	-	-	-	-	-	-	-	-	-	-	250.0	-	-	-
Fruits	-	-	-	905.0	-	105.9	-	-	-	-	1.808.0	-	86.0	-	-	141.3
Vegetables	-	100.0	-	-	-	69.1	-	-	3.00	-	-	-	-	-	42.8	18.7
Legumes (Beans, etc.)	-	-	-	3.172.0	-	660.0	-	-	-	-	-	-	42.0	-	-	193.1
Maize and Sorghum	-	-	-	10.0	-	-	-	-	-	-	-	-	-	-	-	49.3
Potatoe, other tubers	-	-	-	-	15.0	-	-	-	-	-	-	-	-	-	-	12.0
Pasture and Forage	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.1
Tea	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11.2
Cassava	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.6
Others, unspecified	-	-	-	210.0	-	-	-	-	300.0	-	-	-	-	-	-	67.1
Sub-Total	-	160.0	250.0	11.154.1	15.0	835.0	-	-	303.0	-	1.808.0	-	498.0	144.9	42.8	662.5
2. Basic Agricultural Research																
Entomology	-	50.0	-	-	-	160.0	119.0	677.0	-	-	-	-	-	-	-	-
Plant Physiology	-	-	-	150.0	50.0	-	-	-	-	-	-	-	-	-	-	-
Phytopathology	-	-	-	-	-	120.0	-	2.680.0	-	-	-	-	35.0	-	-	-
Agricultural Chemistry	-	-	-	1.080.0	-	-	700,0	306.2	-	-	-	-	-	-	-	-
Soils (Edaphyology)	-	-	120.0	2.190.0	-	-	-	-	-	374.0	-	-	-	-	-	86.7
Others, unspecified	-	-	400.0	-	-	-	-	-	-	-	-	-	-	-	-	-
Sub-Total	-	50.0	520.0	3.420.0	50.0	280.0	819.0	3.663.2	-	374.0	-	-	35.0	-	-	86.7
3. Applied Agricultural Research																
Pest control	-	-	-	-	-	128.6	-	-	-	-	-	-	-	-	-	31.1
Crop Systems/Associated	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20.0
Others, unspecified	-	30.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sub-Total	-	30.0	-	-	-	128.6	-	-	-	-	-	-	-	-	-	51.1
TOTAL AGRICULTURAL RESEARCH	-	240.0	770.0	14.574.1	65.0	1.243.6	819.0	3.663.2	303.0	374.0	1.808.0	-	533.0	144.9	42.8	800.3
II. Livestock Research																
1. By Animal Species:																
Dairy Cattle	-	-	-	-	5.0	-	-	-	-	-	-	-	-	-	-	12.2
Beef Cattle	-	-	-	24.0	5.0	-	-	-	-	-	-	-	-	-	-	-
Sheep	-	-	-	5.0	-	-	-	-	-	-	-	-	-	-	-	-
Pigs	-	-	-	73.0	15.0	-	-	-	-	-	-	436.8	66.0	-	-	-
Minor Species	-	-	240.0	256.8	-	-	-	-	-	-	-	45.0	-	-	-	-
Poultry	-	-	-	35.0	-	194.6	-	-	-	-	-	-	96.0	-	-	126.6
Others unspecified	-	-	-	-	-	331.0	-	-	-	-	-	-	-	-	-	-
Sub-Total	-	-	240.0	393.8	25.0	525.6	-	-	-	-	-	481.8	162.0	-	-	138.8
2. Basic Livestock Research:																
Bromatology	-	-	-	150.0	-	-	-	-	-	-	-	-	-	-	-	-
Microbiology	-	-	-	-	-	-	-	-	-	-	-	-	1.656.8	-	-	-
Others, unspecified	-	-	-	29.0	-	-	-	-	-	-	-	-	-	-	-	-
Sub-Total	-	-	-	179.0	-	-	-	-	-	-	-	-	1.656.8	-	-	-
3. Applied Livestock Research																
3.3 Animal Industry	-	-	-	387.2	-	-	-	-	-	-	-	-	-	-	-	-
Sub-Total	-	-	-	387.2	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL LIVESTOCK RESEARCH	-	-	240.0	960.0	25.0	525.6	-	-	-	-	-	481.8	1.818.8	-	-	138.8
III. Fish Research																
Marine Biology	45.0	-	-	869.3	-	50.0	-	-	-	60.0	-	-	-	-	-	-
Crab Sciences	-	-	-	-	-	-	-	-	-	130.0	-	-	-	-	-	-
Hydrobiology	-	-	-	-	-	-	-	-	-	15.0	-	-	-	-	-	-
Malacology	-	-	-	-	-	-	-	-	-	242.0	3.318.0	-	-	-	-	-
Ichthyology	634.5	-	-	6.196.9	-	-	-	-	-	399.6	600.0	191.3	-	-	-	-
Marine Invertebrates	-	-	-	-	-	-	-	-	-	50.0	-	-	-	-	-	-
Plankton	-	-	-	-	-	-	-	-	-	15.0	-	-	-	-	-	-
Talasaculture	-	-	-	-	-	-	-	-	-	88.0	-	-	-	-	-	-
Others unclassified (Ocean and Continental Fish)	-	-	616.5	6.320.6	-	1.269.6	-	-	80.0	170.0	5.714.0	108.4	-	-	-	-
TOTAL FISH RESEARCH	679.5	-	616.5	13.386.8	-	1.319.6	-	-	80.0	1.169.6	9.632.0	299.7	-	-	-	-
Forestry Research																
Seeds	-	20.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Others unspecified	-	72.0	-	589.0	150.0	-	-	-	-	-	-	266.4	-	-	-	-
Sub-Total	-	92.0	-	589.0	150.0	-	-	-	-	-	-	266.4	-	-	-	-
TOTAL RESEARCH	679.5	332.0	1.626.5	29.509.9	240.0	3.088.8	819.0	3.663.2	383.0	1.543.6	11.440.0	1.047.9	2.351.8	144.9	42.8	939.1

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Chart No. IV-22

Colombia. Percentage Participation of Each Product-Programme in the Research Budget of Each University

1967 - 1978

PROGRAMS \ UNIVERSITY	Cartagena Univ. 61-77	Tolima University 67-72	Nariño University 68-76	Bogotá Nal. Univ. 68-77	Caldas University 69-73	Valle University 69-77	Pedag. & Tech. 69-77	Santander Industrial Univ. 69-77	Atlantico University 70-72	Jorge T. Lozano Univ. 71-77	Cordoba University 71-77	Antioquia University 73-79	Medellin Nal. Univ. 73-77	Fco. de P. Santander Univ. 1977	Pamplona University 1977	Palmira University 77-78
I. Agricultural Research																
1. Crops:																
Cotton (Fibre and unprocessed)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.47
Rice	-	18.07	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Oats and Barley	-	-	-	0.23	-	-	-	-	-	-	-	-	-	-	-	-
Bananas and Pla	-	-	15.37	-	-	-	-	-	-	-	-	-	5.10	-	-	1.95
Coffee	-	-	-	23.00	-	-	-	-	-	-	-	-	-	-	-	1.67
Sugar Cane (Sugar/"Panela)	-	-	-	-	-	-	-	-	-	-	-	-	-	100.00	-	9.85
Sisal Hemp	-	-	-	-	-	-	-	-	-	-	-	-	10.63	-	-	-
Fruits	-	-	-	3.07	-	3.43	-	-	-	-	15.80	-	3.66	-	-	15.05
Vegetables	-	30.12	-	-	-	2.24	-	-	0.78	-	-	-	-	-	100.00	1.99
Legumes (Beans, etc.)	-	-	-	10.75	-	21.37	-	-	-	-	-	-	1.79	-	-	20.57
Maize and Sorghum	-	-	-	0.03	-	-	-	-	-	-	-	-	-	-	-	5.25
Potatoe, other Tubers	-	-	-	-	6.25	-	-	-	-	-	-	-	-	-	-	1.28
Pasture and Forage	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.44
Tea	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.19
Cassava	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.70
Others unspecified	-	-	-	0.71	-	-	-	-	78.33	-	-	-	-	-	-	7.15
Sub-Total	-	48.19	15.37	37.79	6.25	27.03	-	-	79.11	-	15.80	-	21.18	100.00	100.00	70.55
2. Basic Agricultural Research																
Entomology	-	15.06	-	-	-	5.18	14.53	18.48	-	-	-	-	-	-	-	-
Plant Physiology	-	-	-	0.51	20.83	-	-	-	-	-	-	-	-	-	-	-
Phytopathology	-	-	-	-	-	3.89	-	73.16	-	-	-	-	1.49	-	-	-
Agricultural Chemistry	-	-	-	3.66	-	-	85.47	8.36	-	-	-	-	-	-	-	-
Soils (Edaphyology)	-	-	7.38	7.42	-	-	-	-	-	24.23	-	-	-	-	-	9.23
Others unspecified	-	-	24.59	-	-	-	-	-	-	-	-	-	-	-	-	-
Sub-Total	-	15.06	31.97	11.59	20.83	9.07	100.00	100.00	-	24.23	-	-	1.49	-	-	9.23
3. Applied Agricultural Research																
Pest Control	-	-	-	-	-	4.16	-	-	-	-	-	-	-	-	-	3.31
Crop Systems/Associated	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.13
Others unspecified	-	9.04	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sub-Total	-	9.04	-	-	-	4.16	-	-	-	-	-	-	-	-	-	5.44
TOTAL AGRICULTURAL RESEARCH	-	72.29	47.34	49.38	27.08	40.26	100.00	100.00	79.11	24.23	15.80	-	22.66	100.00	100.00	85.22
II. Livestock Research																
1. By Animal Species																
Dairy Cattle	-	-	-	-	2.08	-	-	-	-	-	-	-	-	-	-	1.30
Beef Cattle	-	-	-	0.08	2.08	-	-	-	-	-	-	-	-	-	-	-
Sheep	-	-	-	0.02	-	-	-	-	-	-	-	-	-	-	-	-
Pigs	-	-	-	0.25	6.25	-	-	-	-	-	-	41.68	2.81	-	-	-
Minor Species	-	-	14.76	0.87	-	-	-	-	-	-	-	4.29	-	-	-	-
Poultry	-	-	-	0.12	-	6.30	-	-	-	-	-	-	4.08	-	-	13.48
Others unspecified	-	-	-	-	-	10.72	-	-	-	-	-	-	-	-	-	-
Sub-Total	-	-	14.76	1.34	10.41	17.02	-	-	-	-	-	45.98	6.89	-	-	14.78
2. Basic Livestock Research																
Bromatology	-	-	-	0.51	-	-	-	-	-	-	-	-	-	-	-	-
Microbiology	-	-	-	-	-	-	-	-	-	-	-	-	70.45	-	-	-
Others unspecified	-	-	-	0.10	-	-	-	-	-	-	-	-	-	-	-	-
Sub-Total	-	-	-	0.61	-	-	-	-	-	-	-	-	70.45	-	-	-
3. Applied Livestock Research																
Animal Industry	-	-	-	1.31	-	-	-	-	-	-	-	-	-	-	-	-
Sub-Total	-	-	-	1.31	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL LIVESTOCK RESEARCH	-	-	14.76	3.25	10.41	17.02	-	-	-	-	-	45.98	77.34	-	-	14.78
III. Fish Research																
Marine Biology	6.62	-	-	2.95	-	1.62	-	-	-	3.89	-	-	-	-	-	-
Crab Sciences	-	-	-	-	-	-	-	-	-	8.42	-	-	-	-	-	-
Hydrobiology	-	-	-	-	-	-	-	-	-	0.97	-	-	-	-	-	-
Malacology	-	-	-	-	-	-	-	-	-	15.68	29.00	-	-	-	-	-
Ichthyology	93.38	-	-	21.00	-	-	-	-	-	25.89	5.24	18.26	-	-	-	-
Marine Invertebrates	-	-	-	-	-	-	-	-	-	3.24	-	-	-	-	-	-
Plankton	-	-	-	-	-	-	-	-	-	0.97	-	-	-	-	-	-
Talasaculture	-	-	-	-	-	-	-	-	-	5.70	-	-	-	-	-	-
Others unclassified (Ocean & Continental Fish)	-	-	37.90	21.42	-	41.10	-	-	20.89	11.01	49.95	10.34	-	-	-	-
TOTAL FISH RESEARCH	100.00	-	37.90	45.36	-	42.72	-	-	20.89	75.77	84.19	28.60	-	-	-	-
V. Forestry Research																
Seeds	-	6.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Others unspecified	-	21.69	-	2.00	62.50	-	-	-	-	-	-	25.42	-	-	-	-
Sub-Total	-	27.71	-	2.00	62.50	-	-	-	-	-	-	25.42	-	-	-	-
TOTAL RESEARCH	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: Chart No. IV-22

Chart No. IV-23

Colombia. Funds Spent by all the Universities on Research Programmes and their Share of the Total in Percentages

1967 - 1978

PROGRAMS	TOTALS	
	$000	%
I. Agricultural Research		
1. Crops		
1.1 Cotton (Fibre and Seed)	32.6	0.06
1.4 Rice	60.0	0.10
1.5 Oats and Barley	68.4	0.12
1.6 Bananas and Plantains	388.3	0.67
1.7 Coffee	6.804.4	11.76
1.8 Sugar Cane (Sugar/"Panela")	237.4	0.41
1.12 Sisal Hemp	250.0	0.43
1.13 Fruits	3.046.2	5.27
1.14 Vegetables	233.6	0.40
1.15 Legumes (Beans, etc.)	4.067.1	7.03
1.16 Maize and Sorghum	59.3	0.10
1.18 Potatoe, other Tubers	27.0	0.05
1.19 Pastures and forage	4.1	0.01
1.21 Tea	11.2	0.02
1.23 Cassava	6.6	0.01
1.24 Others unspecified	577.1	1.00
Sub-Total	15.873.3	27.43
2. Basic Agricultural Research		
2.3 Entomology	1.006.0	1.74
2.5 Vegetable Physiology	200.0	0.35
2.6 Phytopathology	2.835.0	4.90
2.8 Agricultural Chemistry	2.086.2	3.61
2.9 Soils (Edaphology)	2.770.7	4.79
2.11 Others unspecified	400.0	0.69
Sub-Total	9.297.9	16.07
3. Applied Agricultural Research		
3.2 Pest Control	159.7	0.28
3.4 Crop Systems/Associated	20.0	0.03
3.8 Others unspecified	30.0	0.05
Sub-Total	209.7	0.36
TOTAL AGRICULTURAL RESEARCH	25.380.0	43.87

PROGRAMS	TOTALS	
	$000	%
II. Livestock Research		
1. Per Animal Species		
1.1 Cattle/Dairy	17.2	0.03
1.2 Cattle/Beef	29.0	0.05
1.4 Sheep	5.0	0.01
1.5 Pigs	590.8	1.02
1.6 Minor Species	541.8	0.94
1.7 Poultry	452.2	0.78
1.8 Others unspecified	331.0	0.57
Sub-Total	1.967.0	3.40
2. Basic Livestock Research		
2.1 Bromatology	150.0	0.26
2.3 Microbiology	1.656.8	2.86
2.11 Others unspecified	29.0	0.05
Sub-Total	1.835.8	3.17
3. Applied Livestock Research		
3.3 Animal Industry	387.2	0.67
Sub-Total	387.2	0.67
TOTAL LIVESTOCK RESEARCH	4.190.0	7.24
III. Fish Research		
4.1 Marine Biology	1.024.3	1.77
4.2 Crab Sciences	130.0	0.22
4.3 Hydrobiology	15.0	0.03
4.4 Malacology	3.560.0	6.15
4.5 Ichthyology	8.022.3	13.87
4.6 Marine Invertebrates	50.0	0.09
4.7 Plankton	15.0	0.03
4.8 Talasaculture	88.0	0.15
4.9 Others unclassified (Ocean and Continental Fish)	14.279.1	24.68
TOTAL FISH RESEARCH	27.183.7	46.99

PROGRAMS	TOTALS	
	$000	%
IV. Forestry Research		
4.1 Seeds	20.0	0.03
4.5 Others unspecified	1.077.4	1.86
Sub-Total	1.097.4	1.89
TOTAL RESEARCH	57.852.0	100.0

Source: Chart No. IV-21

Chart No. IV-24

Colombia. Funds CIAT Spent on Research Programmes

1972 - 1976

(In thousands of U.S. Dollars)

PROGRAM / YEAR	1972	1973	1974	1975	1976
Beef Cattle	417	661	724	813	831
Pigs	177	202	230	211	150
Cassava	309	330	399	413	573
Beans	114	262	374	517	698
Rice	240	135	133	201	206
Maize	150	121	83	78	-
Systems for Small Farmers	110	36	185	160	-
Special Projects	-	305	602	240	329
TOTAL	1.517	2.052	2.730	2.633	2.787

Source: CIAT. Financial Statements 1972-1976
CIAT. Annual Reports 1974-1975-1976
CIAT. Program and Budget Proposal 1976

Chart No. IV-25

Colombia. Funds CIAT Spent on Research Programmes

1972-1976

(In thousands of current pesos)

PROGRAM / YEAR	1972	1973	1974	1975	1976
Beef Cattle	9.119.8	15.626.0	18.867.4	25.146.1	28.835.7
Pigs	3.871.0	4.775.3	5.993.8	6.526.2	5.205.0
Cassava	6.757.8	7.801.2	10.398.0	12.774.1	19.883.1
Beans	2.493.2	6.193.7	9.746.4	15.990.8	24.220.6
Rice	5.248.8	3.191.4	3.466.0	6.216.9	7.148.2
Maize	3.280.5	2.860.4	2.163.0	2.412.5	-
Systems for Small Farmers	2.405.7	815.0	4.821.1	4.948.8	-
Special Projects	-	7.210.2	15.688.1	7.423.2	11.416.3
TOTAL	33.176.8	48.509.2	71.143.8	81.438.6	96.708.9

Source: Chart No. IV-24.

Note: The exchange rate in Chart No. VI-2 was used to convert dollars into pesos.

Chart No. IV-26

Colombia. Funds CIAT Spent on Research Programmes

1972 - 1976

(In thousands of constant 1970 pesos)

PROGRAM / YEAR	1972	1973	1974	1975	1976
Beef Cattle	7.284.2	10.226.4	9.675.6	10.673.2	9.902.4
Pigs	3.091.9	3.125.2	3.073.7	2.770.0	1.787.4
Cassava	5.397.6	5.105.5	5.332.3	5.421.9	6.828.0
Beans	1.991.4	4.053.5	4.998.2	6.787.3	8.317.5
Rice	4.192.3	2.088.6	1.777.4	2.638.8	2.454.7
Maize	2.620.2	1.872.0	1.109.2	1.024.0	-
Systems for Small Farmers	1.921.5	556.9	2.472.4	2.100.5	-
Special Projects	-	4.718.7	8.045.2	3.150.8	3.920.4
TOTAL	26.499.0	31.746.9	36.484.0	34.566.5	33.210.5

Source: Chart No. IV-25

Note: In order to obtain the data in constant prices it was deflacted by the price index implicit in the G.M.P. The indexes used can be found in the general economic indicators in Chart No. VI-1.

Chart No. IV-27

Colombia. Indexes of the Funds CIAT Spent on Research Programmes

1972 - 1976

(Based on constant 1970 pesos)

YEAR / ROGRAMA	1072	1973	1974	1975	1976
Beef Cattle	100.0	140.4	132.8	146.5	135.9
Pigs	100.0	101.1	99.4	89.6	57.8
Cassava	100.0	94.6	98.8	100.5	126.5
Beans	100.0	203.6	251.0	340.8	417.7
Rice	100.0	49.8	42.4	62.9	58.6
Maize	100.0	71.4	42.3	39.1	-
Systems for Small Farmers	100.0	29.0	128.7	109.3	-
Special Projects	-	100.0	170.5	66.8	83.1
TOTAL	100.0	119.8	137.7	130.4	125.3

ource: Chart No. VI-26

Chart No. IV-28

Colombia. Percentage Share of Each Programme of the Total Funds CIAT Spent on Research Programmes

1972 - 1976

(Based on constant 1970 pesos)

PROGRAM / YEAR	1972	1973	1974	1975	1976
Beef Cattle	27.5	32.2	26.5	30.9	29.8
Pigs	11.7	9.8	8.4	8.0	5.4
Cassava	20.4	16.1	14.6	15.7	20.6
Beans	7.5	12.8	13.7	19.6	25.0
Rice	15.8	6.6	4.9	7.6	7.4
Maize	9.9	5.9	3.0	3.0	-
Systems for Small Farmers	7.3	1.8	6.8	6.1	-
Special Projects	-	14.9	22.1	9.1	11.8
TOTAL	100.0	100.0	100.0	100.0	100.0

Source: Chart No. IV-26

Chart No. IV-29

Colombia. Annual and Periodic Growth Rates of the Funds CIAT Spent on Research Programmes

(Based on constant 1970 pesos)

YEAR / PROGRAMA	1972-1973	1973-1974	1974-1975	1975-1976	Total Período 1972-1976
Beef Cattle	40.4	- 5.4	10.3	- 7.2	8.0
Pigs	1.1	- 1.7	- 9.9	-35.5	-12.8
Cassava	- 5.4	4.4	1.7	25.9	6.1
Beans	103.6	23.3	35.8	22.6	43.0
Rice	-50.2	-14.9	48.5	- 7.0	-12.5
Maize	-28.6	-40.8	- 7.7	-	-26.9 1/
Systems for Small Farmers	-71.0	344.0	-15.0	-	3.0 1/
Special Projects	-	70.5	-60.8	24.4	- 6.0 2/
TOTAL	19.8	14.92	- 5.3	- 3.9	5.8

1/ Refers to the period 1972-1975

2/ Refers to the period 1973-1976

Source: Chart No. IV-26

V. PERSONNEL WORKING ON RESEARCH

1. Preliminary Comments

For this analysis of the personnel engaged on research we managed to obtain information about one state institution: ICA, one institution with mixed ownership: the National Federation of Coffee Growers, 13 universities and one international institution: CIAT.

The case studies of ICA and CIAT could be analyzed best because the information covered several years. For the Federation of Coffee Growers there was only data for the year 1977 and the data on the universities corresponds to 1976. For the section on universities we have included some of the information published in the Colciencias study about research in the Colombian universities as well as the data from this study.

2. Institutional Analysis: Case Studies

2.1 The Colombian Agricultural Institute (ICA)

Between 1970 and 1978, the number of people working on research programmes increased considerably. In 1970, the Institute only had 26 professionals, but in 1978 it has 388. 1976 was the year when there were the highest number of professionals, a total of 410.

Throughout the period we are studying there have been more personnel dedicated to agricultural research than to research on livestock, however, it should be emphasized, that while, in 1970, 76.9% of the personnel worked on agricultural research, in 1978 it was only 59.0%.

2.1.1 Personnel Working on Agricultural Research

Between 1970 and 1972, the majority of the research personnel was working on basic research, but after 1973 more people were assigned to research programmes dealing with specific products. In 1970, 75% of the personnel dedicated to product-programmes were working with cereals, and 66.7% of them were working on the maize and sorghum programme. But this situation has been gradually changing as other crops were stressed. In 1975, 36.7% of the research personnel was in the group of other crops, this large percentage can be put down to the fact that the vegetables and fruit and cacao programmes were assigned more people. In 1976, the largest number of researchers working on products was in the other group, this was a result of the emphasis on vegetables and fruit. Next

in order of importance were the cereals, where the position of rice, oats and barley, and maize and sorghum increased significantly. It should be noted that in that same year more people were assigned to the starchy crop programmes, in particular potatoes and cassava.

If we take the number of people working on them as the measure of the importance of the product-programmes, in 1978 their order was the following: Vegetables and Fruit, Potatoes and Cassava, Cotton, Maize and Sorghum, Oats and Barley, Plantain and Bananas, Grain Legumes and Annual Oil Seeds, Rice, and the other crops trailed a long way behind.

2.1.2 Personnel Working on Livestock Research

In this field the research has always concentrated on product-programmes, the sole exception being 1973. But after 1976 basic research was dominant. Until 1975, the product-programme with the most personnel was the sheep programme. In 1976, the beef cattle and the dairy cattle programmes, in that order, absorbed the largest number of personnel. And this continued to be the case until 1978.

After 1976, the personnel working on basic livestock research concentrated on pathology, toxicology and epidemiology.

2.1.3 The Level of Academic Training of the Research Personnel

In 1970 the Institute had 4 Ph.Ds, 12 people with Masters degrees and 10 with university graduate degrees. In 1978, there were 195 with university graduate degrees, 133 with Masters and 60 with Ph.D. degrees, all working on research. Two different periods can be distinguished within this general increase, the year 1976 marks them. In that year the Institute had 197 people with university graduate degrees, 173 with Masters degrees and 40 with Ph.Ds. The next year, in 1977, the number of university graduates continued to increase, but fell off in 1978. But the number of professionals with Masters or Ph.D. degrees started to decrease in 1977, but picked up again in 1978. One fact deserves mention, of the Masters and Ph.D. graduates, only the former have increased in number in 1978 to beyond the 1977 figure.

2.2 National Federation of Coffee Growers

Table V-3 gives the information we have for 1977. As we have no other data available at the moment, it is impossible to make any comparisons as regards

the evolution and changes in the personnel by disciplines. In 1977, 77.4% of the personnel working on coffee research was dedicated to basic agronomic research. Virtually nobody was assigned to livestock research. Based on the number of people assigned to each subject, we can conclude that the most important activity is agricultural chemistry, followed by phytopathology, plant improvement and agro-climatology.

It should be mentioned that only 38.7% of the research personnel had post graduate degrees.

2.3 Universities

The data about the research personnel working in the universities in Colombia was taken from the inventory made by Colciencias. 1/ The methodology of this study defines a "researcher" as someone with a university degree who was participating in a research project at the time when the inventory was made. He could either be working as one of the principal researchers or as a co-researcher. Obviously, here we have only counted the persons working on agro-biological projects as defined in the Operations Manual. Consequently, the data included here and the coverage this study gives to the universities, does not coincide with the Colciencias data for the agricultural sector because it includes projects that are not being considered for this study. 2/ Despite this, the information supplied by the Colciencias study will be used as an indicator as it will enable us to make comparisons with the 1977 inventory. The Colciencias inventory enumerated a total of 1,055 researchers in 28 universities which had research projects.

From the data in Table V-5 we can see that 16.6% of the research personnel in the 13 universities are working on agricultural research. If we take the data supplied by the Colciencias study on agricultural sciences as a basis for a comparison between 1972 and 1977, we find that in 1972, 25 professionals were working on agricultural research, which was 8.8% of the total research personnel. In 1977 there were 64 researchers, or 6% of the total, working in agricultural projects. 3/ So, the researchers in agriculture increased in number more slowly than those in other fields, because, although, the ab-

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1/ The results of the inventory taken in 1977 have been published by Colciencias in the document "La Investigación en la Universidad Colombiana". August, 1978.

2/ In addition, the Colciencias agricultural sector does not cover projects that are agro-biological but that are being done by other disciplines.

3/ Colciencias. "La Investigación en la Universidad Colombiana". Bogotá, August, 1978. Table No. 1-16, page 95.

solute number increased in those five years, they represented a smaller portion of the total. The Table V-4 also shows that of the 175 researchers, only 19 (10.9%) are working full time on research and the others (49.1%) are only part time.

As far as their academic training is concerned, Table V-5 shows that 15.4% have Ph.D. degrees, 42.9% have Masters degrees or other post-graduate studies, and 41.7% are simple university graduates.

Finally it should be emphasized that university research in Colombia is concentrated almost exclusively in four universities, they are: the National University (including its sectional branches), the University of Antioquia, and the Industrial University of Santander. 84.5% of the personnel working on agricultural research are at these universities.

2.4 CIAT

Table V-6 shows that both the number of researchers and the amount of time spent on research increased between 1974 and 1977. The institution gave priority to the following areas of research as far as the number of personnel and the time factor are concerned: the Beef Cattle programme heads the list, followed order of importance by the beans, cassava and pig programmes.

Chart No. V-1

Colombia. Distribution of Professional Staff by Research Program in ICA, 1970-1978

	1970				1971				1972				1973				1974				1975				1976				1977				1978			
	NU	MS	PhD	Total	NU	MS	PhD	Total	NU	MS	PhD	Total	NU	MS	PhD	Total	NU	MS	PhD	Total	NU	MS	PhD	Total	NU	MS	PhD	Total	NU	MS	PhD	Total	NU	MS	PhD	Total
Agricultural Product Program																																				
1. Cereals:																																				
Rice	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	3	1	-	-	1	3	-	-	3	7	5	1	13	6	1	1	8	3	4	3	10
Minor Cereals (Oats & Barley)	1	-	1	2	1	-	1	2	1	-	1	2	2	-	1	3	2	-	2	4	-	1	1	2	5	8	1	14	7	2	1	10	5	4	2	11
Maize & Sorghum	1	2	1	4	-	1	1	2	-	1	1	2	-	2	1	3	2	1	1	4	-	1	1	2	8	2	1	11	7	2	2	11	7	2	3	12
Sub-Total	2	2	2	6	1	1	2	4	1	1	2	4	2	4	3	9	5	1	3	9	3	2	2	7	20	15	3	38	20	5	4	29	15	10	8	33
2. Starchy Crops:																																				
Potatoe / Cassava	-	1	-	1	-	1	-	1	-	1	-	1	-	2	1	3	1	2	-	3	3	2	-	5	7	9	2	18	6	4	1	11	9	6	1	16
Plantains & Bananas	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	1	1	-	2	4	3	2	9	4	1	-	5	4	7	-	11
Sub-Total	-	1	-	1	-	1	-	1	-	1	-	1	-	2	1	3	1	3	-	4	4	3	-	7	11	12	4	27	10	5	1	16	13	13	1	27
3. Sugars:																																				
"Panela" Sugar Cane	-	-	-	-	-	-	-	-	1	1	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	3	-	1	-	1	-	1	2	3
	-	-	-	-	-	-	-	-	1	1	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	3	-	1	-	1	-	1	2	3
4. Oil Seeds																																				
Perennial Oil Seeds	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-	-	2	-	-	2	5	3	1	9	4	1	1	6	5	2	-	7
Cotton	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	3	6	4	-	10	6	4	-	10	4	3	6	13
Sub-Total	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-	-	5	-	-	5	11	7	1	19	10	5	1	16	9	5	6	20
5. Other Crops:																																				
Cocoa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	3	5	4	-	9	5	1	-	6	-	3	4	7
Vegetables & Fruits	1	-	-	1	-	1	-	1	1	-	-	1	2	-	-	2	2	1	-	3	3	1	-	4	7	14	-	21	6	7	-	13	3	9	4	16
Grain Leg./Annual Oil	-	-	-	-	-	-	-	-	1	-	-	1	2	-	-	2	1	1	-	2	3	-	-	3	5	5	-	10	6	1	-	7	4	1	6	11
Tobacco	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	3	3	1	7	3	1	-	4	3	3	-	6
Sub-Total	1	-	-	1	-	1	-	1	2	-	-	2	4	-	-	4	3	2	-	5	10	1	-	11	20	26	1	47	20	10	-	30	10	16	14	40
Sub-Total By Products	3	3	2	8	1	3	2	6	4	3	2	9	7	6	4	17	9	6	3	18	22	6	2	30	62	63	9	134	60	26	6	92	47	45	31	123
Basic Agricultural Research																																				
Entomology	1	1	1	3	-	2	1	3	-	-	1	1	2	1	1	4	2	2	1	5	7	8	1	16	8	11	2	21	10	4	1	15	9	5	4	18
Vegetal Physiology	1	1	-	2	1	1	-	2	2	1	1	4	1	1	-	2	2	-	1	3	3	-	1	4	8	9	3	20	7	5	7	19	8	3	2	13
Physiopathology	-	1	1	2	-	1	1	2	-	5	2	7	4	1	2	7	1	1	2	4	3	-	2	5	9	11	6	26	13	2	3	18	8	7	4	19
Soils	2	-	-	2	2	-	-	2	3	1	-	4	1	-	2	3	3	-	1	4	4	1	-	5	15	7	3	25	15	5	2	22	16	12	1	29
Sub-Total	4	3	2	9	3	4	2	9	5	7	4	16	8	3	5	16	8	3	5	16	17	9	4	30	40	38	14	92	45	16	13	74	41	27	11	79
Other Non-Classified Agricultural Research																																				
Special Agreements	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	1	4	-	-	-	-	3	1	1	5
Other Programs	1	1	-	2	1	1	-	2	3	10	1	14	6	4	2	12	3	3	1	7	5	4	-	9	13	9	1	23	12	10	2	14	14	5	1	20
Associated Crops	-	1	-	1	-	1	-	1	-	1	-	1	-	-	1	1	-	-	1	1	-	-	1	1	-	2	1	3	-	2	-	2	2	1	1	4
Sub-Total	1	2	-	3	1	2	-	3	3	11	1	15	6	4	3	13	3	3	2	8	5	4	1	10	13	14	3	30	12	12	2	26	19	7	3	29
Sub-Total Agricultural Research	8	8	4	20	5	9	4	18	12	21	7	40	21	13	12	46	20	12	10	42	44	19	7	70	115	115	26	256	117	54	21	192	107	79	45	231
Livestock Product-Program																																				
Beef Cattle	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-	1	-	1	2	2	-	1	3	7	6	2	15	7	2	-	9	5	6	1	12
Dairy Cattle	-	-	-	-	-	-	-	-	-	1	-	1	2	-	1	3	-	-	-	-	1	-	-	1	11	5	2	18	11	2	-	13	16	2	-	18
Pigs	-	-	-	-	-	-	-	-	-	1	-	1	1	-	-	1	-	-	-	-	2	-	-	2	4	4	2	10	4	4	1	9	1	4	1	6
Sheep	1	1	-	2	1	1	-	2	1	1	-	2	1	1	-	2	1	1	-	2	1	5	1	7	2	3	-	5	2	3	-	5	4	6	-	10
Poultry	-	-	-	-	-	-	-	-	-	1	1	2	-	-	-	-	-	-	-	-	3	1	-	4	4	3	1	8	4	2	-	6	2	3	1	6
Minor Species	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	-	1	-	1	-	1	-	1	-	1	-	1	1	1	-	2	1	1	-	2
Sub-Total	1	1	-	2	1	1	-	2	1	5	1	7	4	2	1	7	2	2	1	5	9	7	2	18	28	22	7	57	29	14	1	44	29	22	3	54
Basic Livestock Research																																				
Physiology	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	2	-	-	-	-	1	-	-	1	1	2	1	4	1	1	-	2	3	1	1	5
Microbiology	-	-	-	-	-	-	-	-	1	-	-	1	4	-	1	5	1	-	1	2	-	-	-	-	1	1	-	2	1	1	-	2	-	1	-	1
Nutrition	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	1	1	1	3	2	1	1	4	1	1	2	4
Parasitology	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-	-	1	-	-	1	2	8	-	10	2	2	-	4	1	5	-	6
Pathology & Toxicology	-	-	-	-	-	-	-	-	2	-	-	2	-	-	1	1	-	1	-	1	1	1	-	2	7	7	2	16	8	3	-	11	8	6	1	15
Epidemiology	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	2	-	-	2	10	4	-	14	10	3	-	13	10	6	3	19
Vesicular Diseases	-	-	-	-	-	-	-	-	1	-	-	1	3	1	-	4	-	-	-	-	4	-	-	4	9	2	2	13	9	1	1	11	7	1	2	10
Sub-Total	-	1	-	1	-	-	-	-	4	-	-	4	10	1	2	13	2	1	1	4	9	2	-	11	31	25	6	62	33	12	2	47	30	21	9	60
Other Non-Classified Livestock Research																																				
Pastures and forage	-	1	-	1	-	1	-	1	-	3	-	3	-	2	1	3	-	1	-	1	3	2	-	5	9	3	-	12	9	4	-	13	12	6	1	19
Other research non-classified	1	1	-	2	1	1	-	2	3	10	1	14	5	4	1	10	2	2	-	4	4	4	1	9	14	8	1	23	14	9	1	24	14	5	2	21
Special Agreements	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	3
Sub-Total	1	2	-	3	1	2	-	3	3	13	1	17	5	6	2	13	2	3	-	5	7	6	1	14	23	11	1	35	23	13	2	37	29	11	3	43
Sub-Total Livestock Research	2	4	-	6	2	3	-	5	8	18	2	28	19	9	5	33	6	6	2	14	25	15	3	43	82	58	14	154	85	39	4	128	88	54	15	157
TOTAL RESEARCH	10	12	4	26	7	12	4	23	20	39	9	68	40	22	17	79	26	18	12	56	69	34	10	113	197	173	40	410	202	93	25	320	195	133	60	388

Source: ICA. Planning Direction, 1978.

Chart No. V-2

Colombia. Professionals in the ICA Agricultural Research Programmes

1970-1978

	1970		1971		1972		1973		1974		1975		1976		1977		1978	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
ricultural Research																		
Product-Programme	8	30.8	6	26.1	9	13.2	17	21.5	18	32.1	30	26.6	134	32.6	92	28.8	123	31.7
Basic	9	34.6	9	39.1	16	23.5	16	20.3	16	28.6	30	26.6	92	22.4	74	23.1	79	20.3
Other unspecified	3	11.5	3	13.0	15	22.0	13	16.4	8	14.3	10	8.9	30	7.3	26	8.1	29	7.5
Total	20	76.9	18	78.2	40	58.8	46	58.2	42	75.0	70	62.0	256	62.4	192	60.0	231	59.5
estock Research																		
Product-Programme	2	7.7	2	8.7	7	10.3	7	8.8	5	8.9	18	15.9	57	13.9	44	13.8	54	13.9
Basic	1	3.9	-	-	4	5.8	13	16.4	4	7.1	11	9.7	62	15.1	47	14.7	60	15.5
Other unspecified	3	11.5	3	13.0	17	25.0	13	16.4	5	8.9	14	12.4	35	8.5	37	11.6	43	11.1
Total	6	23.1	5	21.7	28	41.1	33	41.7	14	25.0	43	38.1	154	37.5	128	40.0	157	40.5
al Agricultural Research	26	100.0	23	100.0	68	100.0	79	100.0	56	100.0	113	100.0	410	100.0	320	100.0	388	100.0

ce: Figures based on data in Chart No. V-1.

Chart No. V-3

Colombia. "Federación Nacional de Cafeteros" - Personnel Working on Research by Discipline - 1977 1/

Departments & Sections \ Level	M.S.		Total
Biology and Soils:	1	-	1
- Agro-Climatology	-	3	3
- Soils	1	-	1
- Entomology	-	1	1
- Vegetable Physiology	1	1	2
- Plant Improvement	3	-	3
- Phytopathology	2	1	3
- Agricultural Chemistry	3	1	4
- Plant Health	-	1	1
Technology and Agronomy:	-	1	1
- Coffee - Cultural Practices	-	2	2
- Related Crops	-	2	2
- Animal Industry	1	1	2
Experimental Sub-Stations	-	5	5
TOTAL	12	19	31

Source: Cenicafe. Administrative Department 1978.

1/ Full time researcher.

Chart No. V-4

Colombia. Personnel Working on Research in the Colombian Universities, According to their Training and Dedication Time, 1976

	Ph.D				M.S.				Nivel Universitario				Otros*			
	TC	TM	TP	Total	TC	TM	TP	Total	TC	TM	TP	Total	TC	TM	TP	Total
Nal de Bogotá	3	2	7	12	3	6	13	22	7	2	15	24	-	-	6	6
Nal de Medellín	-	-	1	1	-	4	1	5	-	3	5	8	1	2	-	3
de Antioquia	-	-	1	1	-	-	4	4	-	-	3	3	-	2	-	1
del Valle	2	-	5	7	-	-	3	3	2	-	1	3	-	-	-	-
Industrial de Santander	-	-	-	-	-	1	3	4	-	-	3	3	-	-	-	-
de Nariño	-	-	-	-	-	-	2	2	1	-	2	3	-	-	-	-
de Córdoba	-	1	-	1	-	3	-	3	-	1	-	1	-	-	-	-
de Cartagena	-	-	-	-	-	-	1	1	-	-	3	3	-	-	-	-
Pedagógica y Tecnológica Colombia	-	-	-	-	-	1	-	1	-	2	3	5	-	-	-	-
Fco. de Paula Santander	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-
de Pamplona	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-
Jorge Tadeo Lozano	-	1	-	1	-	2	1	3	-	1	-	1	-	-	-	-
Nal de Palmira 1/	-	-	-	4	-	-	-	15	-	-	-	18	-	-	1	1

* Others: Professionals with post graduate studies that are neither Ph.D. nor M.S.

1/ This refers to the personnel - Thesis directors or advisers - without specifying their dedication time.

TC: Full Time TM: Half Time TP: Part Time

Source: Colciencias. 1978.

Chart No. V-5

Colombia. Distribution of Research Personnel in the Colombian Universities - 1976

	Ph.D		M.S.		Univ. Graduates		Others		Total Personnel 2/	
	#	%	#	%	#	%	#	%	#	%
Nal de Bogotá	12	44.4	22	34.4	24	32.9	6	54.5	64	36.6
Nal de Medellín	1	3.7	5	7.8	8	11.0	3	27.2	17	9.7
e Antioquia	1	3.7	4	6.3	3	4.1	1	9.9	9	5.1
el Valle	7	25.9	3	4.7	3	4.1	-	-	13	7.4
ndustrial de Santander	-	-	4	6.3	3	4.1	-	-	7	4.0
e Nariño	-	-	2	3.1	3	4.1	-	-	5	2.9
e Córdoba	1	3.7	3	4.7	1	1.4	-	-	5	2.9
e Cartagena	-	-	1	1.6	3	4.1	-	-	4	2.3
edagógica y Tecnológica de lombia	-	-	1	1.6	5	6.9	-	-	6	3.4
co. de Paula Santander	-	-	-	-	1	1.4	-	-	1	0.6
e Pamplona	-	-	1	1.6	-	-	-	-	1	0.6
orge Tadeo Lozano	1	3.7	3	4.7	1	1.4	-	-	5	2.9
Nal de Palmira 1/	4	14.8	15	23.4	18	24.7	1	9.9	38	21.7
AL UNIVERSIDADES	27	100.0	64	100.0	73	100.0	11	100.0	175	100.0

1/ Refers to personnel - Thesis directors and advisros.

2/ Includes: Ph.D., M.S., University graduates and others.

Source: Chart No. V-4.

Chart No. V-6

Colombia. Researchers Working at CIAT, 1974-1977

1974						1975						1976						1977					
Seniors		Scientists		Total		Seniors		Scientists		Total		Seniors		Scientists		Total		Seniors		Scientists		Total	
#	Ded. M.Y.	#	Ded. M.Y.	#	Ded. M.Y.	#	Ded. M.Y.	#	Ded. M.Y.	#	Ded. M.Y.	#	Ded. M.Y.	#	Ded. M.Y.	#	Ded. M.Y.	#	Ded. M.Y.	#	Ded. M.Y.	#	Ded. M.Y.
11.3	9.0	16	12.1	27.3	21.1	11.3	9.0	20	16.9	31.3	25.9	12.0	8.1	24	17.1	36.0	25.2	16.0	13.6	30	25.3	46.0	38.9
3.6	3.2	6	3.8	9.6	7.0	3.2	3.1	5	3.9	8.2	7.0	2.0	2.0	4	3.4	6.0	5.4	2.0	2.0	4	3.8	6.0	5.8
6.0	6.0	13	12.2	19.0	18.2	6.5	6.4	12	10.8	18.5	17.2	7.5	6.9	15	11.0	22.5	17.9	7.5	6.6	15	14.3	22.5	20.9
5.5	4.9	17	13.8	22.5	18.7	6.5	6.4	21	17.7	27.5	24.1	9.5	7.5	21	19.9	30.5	27.4	9.5	9.0	23	22.0	32.5	31.0
2.0	2.0	3	1.3	5.0	3.3	3.0	2.9	2	1.0	5.0	3.9	3.0	2.4	2	2.9	5.0	4.4	4.0	3.3	8	6.3	12.0	9.6
1.0	0.8	7	5.5	8.0	6.3	1.0	1.0	4	4.0	5.0	5.0	-	-	-	-	-	-	-	-	-	-	-	-
2.5	2.3	9	3.3	11.5	5.8	2.0	2.0	6	5.5	8.0	7.5	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.0	1.5	5	4.0	7.0	5.5
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.0	0.8	4	3.8	5.0	4.6
31.5	28.2	71	52.2	102.5	80.4	33.5	30.8	70	59.8	103.5	90.6	34	26.9	66	53.4	100.0	80.3	42	36.8	89	79.5	131	116.3

leports 1976-1977

ion Man Year

VI. THE CHARACTERISTICS OF THE AGRICULTURAL SECTOR

1. The Agricultural Sector's Contribution to the General Economic Development

Historically, agriculture has made an important contribution to the Gross National Product in Colombia - as illustrated in Tables VI-4 and VI-5 - and this has continued to be the case for the period we are studying, but over the years this contribution has shrunk. In 1960, agricultural products accounted for 30.4% of the GNP and by 1975 this percentage has dropped to 24.1% because the agricultural GNP grew more slowly than the total GNP. If we take 1960 as 100 for the total GNP, by 1975 it had expanded to 227.1 while the agricultural GNP only grew from 100 to 180.1 in the same time span. These two different growth rates for the GNPs prevailed during each of the five year periods included in this study.

A study done by the National Planning Department points out that: "The downward trend shown by agricultural products in the GNP cannot be considered, by itself, as a sign of a problem, since it is natural within the development process where the sectors that supply demands that are not elastic like the income, their position gradually declines". 1/

2. The Structure of Agricultural Production

This description of the structure of agricultural production will include the evolution of the production, of the value of the production, the area and the productivity for those crops with sufficient information to make statistical series. These appear in the tables found in this chapter. These crops, the most important in the country, have been grouped into six general categories: cereals, starchy crops, sugars, oil seeds, beverages and stimulants and others. When studying the crops in each of these categories we must bear in mind Atkinson's breakdown and classification 2/ so:

a) Cash crops: cotton, sesame, rice, barley, sorghum, soya beans, sugar and peanuts.

b) Traditional crops: "Panela" sugar, beans, plantain, cassava and yams.

1/ D.N.P. La Economía Colombiana 1950-1975. In Revista de Planeación y Desarrollo. Vol. IX, Number 3, October-December, 1977. Page 149.

2/ J. Atkinson. Changes in Agricultural Productivity and Technology in Colombia. AID. Ministry of Agriculture, 1969. Taken from "La Agricultura en Colombia, 1950-1972. S. Kalmanovitz.

c) Plantation crops: Bananas, cacao, African palm.

d) Mixed crops: Maize, potatoes, tabacco, wheat, oats.

e) Coffee.

Table VI-11 shows that the total area under cultivation grew from 3,108,100 hectares in 1960 to 4,050,800 hectares in 1976. So the annual increase for the period was 1.7%; the growth rate was fastest for the period 1970-1976. - See Table VI-15.

Of all the crops, cereals come first as far as area is concerned, both in absolute figures and in terms of growth rate. They are followed, in order of importance, by beverages and stimulants, starchy crops, sugars, oil seeds and finally the other groups. This order of importance persisted all during the period except for the years 1970-1973 when beverages and stimulants headed the list in area under cultivation. Notwithstanding, cereals had the highest growth rate for the whole period under study (Table VI-12 and VI-15).

The total physical production for the crops grew 3.61% a year between 1960 and 1976. 1/ The groups oil seeds, starchy crops and cereals, in that order, have contributed most towards increasing the total physical production.

1/ From Tables VI-20 and VI-25 it looks as though the physical production declined, however, we must not forget that the 1975 and 1976 figures are underestimates as the information about sugar cane, sugar cane for "panela", coffee and vegetables was incomplete.

According to Fedesarrollo's calculations - although the source is not one hundred percent comparable with these statistical series - coffee production for 1976 was 510,000 tons; sugar cane production was 8,892,000 and 8,819,200 tons for 1975 and 1976 respectively. As there is no statistical information available on the production of sugar cane for "panela", we have taken the same figure as the previous year.

.... By using these figures and comments it is possible to calculate the growth rates for the different periods that have been underestimated. Total production: for the period 1970-1976 the growth rate was 3.98% a year. - Sugars: for 1970-1976 the growth rate was 0.13% a year and for 1960-1976 it was 2.58% a year. - Beverages and stimulants: for the period 1970-1976 there was a negative growth rate of 1.15% a year, and for 1960-1976 it was 0.88% annually.

3. Analysis of the groups of crops

For this section we will use the same groups as appear in the statistical information, and each crop within each group will be analyzed. Atkinson's classification, that we mentioned above, was also taken into account.

3.1 Cereals:

There are two categories of products within the cereals group: the cash crops (rice, barley and sorghum) and the mixed crops (oats, maize and wheat).

Rice: The annual growth rate for the physical rice production was 8.07% between 1960-1976 and this rate was highest from 1970 to 1976. In 1960 rice accounted for 9.4% of the total production and by 1976 this had risen to 12.2%. 1/ The area under cultivation expanded 3.0% a year.

Sorghum: The area, the yields and the production, both physical and in terms of value have all grown more for this crop than for any other. In 1960, 0.45% of the area cultivated was down to sorghum and by 1976 it was 4.30%. This crop had 0.06% of the total production in 1960 and 3.19% in 1976.

Barley: This is the least dynamic of the cereal crops. Its physical production grew between 1960 and 1964 - Table VI-20 - but it began to decline in 1965. The increased demand has mostly been met by imports.

Oats: Only a minute percentage - 0.01% - of the total area cultivated is down to oats. And for the years for which there is information available, this crop has not varied hardly at all.

Maize and Wheat: The relative importance of these cereals within the groups of crops being examined here has deceased. The area planted with maize dropped from 23.49% of the total in 1960 to 15.99% in 1976. The situation has been the same as far as the participation of this crop in the total production. This

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1/ This percentage is an overestimate as sugar production was not included in this calculation of the total production. According to Fedesarrollo, the real value of the rice production in thousands of constant 1970 pesos was: 1973: 685.0, 1974: 744.4, 1975: 827.0, 1976: 820.2. Based on these estimates rice would represent 11.7% of the total value of the production.

decline in the importance of maize can above all be put down to the fact that other crops fill the uses maize once dominated and local production has been substituted by imports.

The demand for wheat has been met with imports which has adversely affected domestic production. If we look at Tables VI-15, VI-25 and VI-34 we can see that wheat has had the largest negative growth rates in area, and physical production and the value of the production of all the groups of crops.

3.2 Starchy Crops

In this group we find traditional crops (plantain, cassava and yams) and potatoes that has been classed as a mixed crop.

Potato: This crop has had an upward trend. Between 1960 and 1976 the annual growth rate was 5.4%. During the first ten years the growth rate was more or less constant but accelerated during the last six years. The trend for the growth in area and production in terms of value was the same. It should be noted that the increases in production was due to more land being planted with the crop between 1960 and 1970 as the actual yields fell, although the yields improved slightly between 1970 and 1976. If we analyze the whole period - Table VI-19 - we can see that the annual growth rate was nil.

Plantain and Cassava: These two traditional crops had positive growth rates in area, physical production and in the value of the production for the period 1960 to 1976. Of the two, cassava grew more than the other. The increase recorded in plantain production is due to more area as the yields decreased while the increases in cassava are more due to better yields than to more land under cultivation.

Yams: We only have enough figures to make a comparative study of the physical production over the whole period, and it declined 1.97% annually. We have information on physical production and yields for the years after 1971, and for the value of the production we have have data going back to 1973. Since 1971 the area, production and yields for this crop have increased slightly. It is the least important of the starchy crops.

3.3 Sugars

This group includes sugar cane that is classed as a cash crop and sugar cane for "panela" which is a traditional crop.

Sugar Cane: The physical production increased 6.3% a year for the period 1960-1976, and its share of the real value of the production went up from 2.4% in 1960 to 4.4% in 1976. 1/

Sugar Cane for "Panela": The increases in the physical production have occurred only because more land was planted with this crop, as the yields went down for the period. It represented a steady 7% of the area cultivated all during the period. 2/

3.4 Oil Seeds

This group consists of soya beans, peanuts, sesame and cotton which are all cash crops and African palm which is a plantation crop.

Cotton: In all the indicators, cotton is the most important of the oil seeds. The figures show that the real value of cotton production increased 6.1% a year throughout the period. In 1960 it accounted for 7.5% of the real value of the total production and in 1976 this share had expanded to 13.15%, and its share of the area cultivated rose from 4.8% to 7.1% in the same period.

Soya Beans: This has been the most dynamic of the oil seeds. The growth rates during the period for area, yields, the value of the production and the production itself have been 6.0%, 1.9%, 10.1% and 8.9% respectively. Tables VI-15, VI-19, VI-25 and VI-34 show that there was a clear difference between the sub-periods 1960-1970 and 1970-1976. During the latter period there was a drop in the indicators.

African palm: We only have information since 1971 on this plantation crop. The production has increased because more area was put down to the tree, since the yields per hectare fell 2.1% between 1971 and 1976. The largest part of this fall occurred in the last two years.

3.5 Beverages and Stimulants:

Coffee: This is the country's most important agricultural product, throughout the period it has had around 27% of the value of the production, although it should be mentioned that this share has dropped from 37.79% in 1960 to 24.25% in 1975. On average more than a quarter (27%) of the land cultivated was planted with coffee for the whole period. It must not be forgotten though, that the great majority of the production is destined for export, the importance of this crop must be measured as an export.

1/ This growth rate was calculated with the figures appearing in Note 1/ on page 69.
2/ This percentage was arrived at by weighing the figure in Note 1/ on page 70.

Tabacco: This crop has been classified as a mixed crop. The increases in the production have resulted from the increased area under cultivation since the yields have decreased 0.6%. Although this negative rate is applicable for the whole period it was most pronounced during the sub-periods 1960-65 and 1970-76.

Cacao: The domestic production of this crop has been gradually substituting the imports. According to a DNP study 1/ "in 1950-54 imports supplied 44% of the country's demand and this percentage declined to 36% in 1970-74. Its share of the total area, the physical production and the value of the production has likewise been going up.

3.6 Other Crops

Beans: Beans are a traditional crop. The area planted with this crop has increased from 1.78% of the total area cultivated to 3.05% in 1976. The value of the production went from 1.89% to 2.85%. 2/

Bananas: Between 1960 and 1976 the physical production of this plantation crop grew 3.64% a year. This increase was mostly concentrated in the last six years when the annual growth rate shot up to 9.18%. Since the area planted with bananas was only increased 0.9% a year, the rapid growth rate was due to improved yields. The study by the National Planning Department that we have already quoted says that 40% of the demand for bananas is from abroad.

4. The Structure of Livestock Production

Livestock raising is practiced over very extensive areas in the country. In 1960 there were 17.4 millions of hectares of pasture land while only 3.1 millions of hectares was cultivated. This means that livestock raising uses almost 85% of the arable land in Colombia that is being used. By 1972 the pasture land had been expanded to cover 22.0 million hectares, and 3.7 millions was being cultivated, so livestock occupied 86% of the land being used by the agricultural sector. So, the pasture land has increased faster than the land used for crops.

1/ La Economía Colombiana 1950-1975. Revista de Planeación y Desarrollo. DNP. October-December, 1977.

2/ The 1976 percentage includes the changes in the total production that were derived from the figures in Note 1/ on page 70.

4.1 Cattle

Between 1960 and 1976 - Table VI-35 - the cattle population increased by 9.7 million head, which represents a total increase of 64.5% and an annual growth rate of 3.16%. But the stocking rate (head of cattle per hectare) is less than 1.

4.1.1 Beef Production

The commercial consumption of beef - internal slaughter and exports - has grown 89.2% during the period covered by this study. The consumption rate (that is the quotient of the commercial consumption divided by the total cattle population) in 1960 was 12.5% and 14.4% in 1976, this means that the rate of consumption is higher than the growth rate of the cattle population.

4.1.2 Milk Production

According to a study done by DANE 1/ 60% of the cattle population is female, and almost 72% of these are over two years old, so they have reached calf bearing age and are potential milk producers. But only a few of them are milked.

The same study comments that "on the very extensive ranches the cattle are to a large extent abandoned and the same occurs with milking".

Between 1960 and 1976 milk production increased a total of 57% and went from 1.4 million tons to 2.2 million tons.

4.2 Pigs

During the period covered here the pig population dropped from 1,870,000 animals to 1,868,000. In 1960 the rate of consumption was 61.7% and in 1975 it increased to 88.4%.

It should be underlined that 80% of the pigs in the country are raised on completely un-technified family farms.

1/ S. Kalmanosvitz. "El Desarrollo de la Ganadería en Colombia, 1950-1972". DANE No. 253-54. 1972.

4.3 Poultry

The poultry population dropped 18% between 1960 and 1975 from 26.2 millions to 21.6 millions. But the production, both the meat production and the egg production has more than doubled over the same years. Table VI-48 shows that the egg production index between 1962 and 1973 was higher than meat production, in 1974 the opposite was the case and after that year the situation continued as before.

5. The Agricultural Sector's Contribution to Foreign Trade

Tables VI-6 and VI-7 show that the percentage of exports coming from the agricultural sector has declined, but at the same time agricultural imports have also diminished as domestic production has progressed. In 1960 78% of the total exports were agricultural, while in 1976 this percentage had dropped to 58%. 1/ And agricultural imports fell from being 12% of total imports to 6.1% during the same time span. And despite the drop in agricultural exports they continue to be the largest category.

As can be seen in Table VI-10, coffee is still the principal export, although in 1976 coffee was only 77.5% of the total agricultural exports, whereas in 1960 it had represented 91.7%.

The same study by the National Planning Department that we quoted above, and Tables VI-9 and VI-10 show that there has been import substitution or increased exports of some cash and mixed crops, and other have been exported for the first time, and this has played an important role in foreign trade. Cotton, tabacco, sugar cane and rice deserve special mention in this context.

According to Fedesarrollo, there are today only three products that can be considered as constant imports, they are: wheat, cacao and cooking oils, together they account for over 80% of the agricultural imports.

1/ It should be clarified that the sharpest drop in the percentage of agricultural exports as part of the whole occurred between 1975 and 1976, since they were still 70% in 1975.

Chart No. VI-1

Colombia. Index of the Prices Used to Deflate the Current Values

Year	Index
1960	34.3
1961	37.0
1962	39.5
1963	48.8
1964	56.5
1965	62.2
1966	71.2
1967	72.2
1968	84.2
1969	91.1
1970	100.0
1971	110.4
1972	125.2
1973	152.8
1974	195.0
1975	235.6
1976	291.2

Source: Banco de la República.

Chart No. VI-2

Colombia. U.S. Dollars Exchange Rates

Average

1970	18.45
1971	19.94
1972	21.87
1973	23.64
1974	26.06
1975	30.93
1976	34.70

Source: Banco de la República

Chart No. VI-3

Colombia. Per Capita G.N.P. Total and Per Capita National Income, Indexes and Growth Rates

1960 - 1975

(Based on constant 1970 pesos)

Year	Per Capita G.N.P.			Total National Income			Per Capita National Income		
	In 000.000	Index (1960=100)	Annual Growth	In 000.000	Index (1960=100)	Annual Growth	Millions of 1970 $	Index (1960=100)	Annual Growth
1960	5.088	100.0	-	64.225	100.0	-	4.205.0	100.0	-
1961	5.193	102.0	2.0	-	-	-	-	-	-
1962	5.304	104.2	2.1	-	-	-	-	-	-
1963	5.275	103.7	-0.5	-	-	-	-	-	-
1964	5.439	106.9	3.1	-	-	-	-	-	-
1965	5.484	107.8	0.8	81.236	126.5	4.8	4.547.5	108.1	1.6
1966	5.640	110.8	2.8	-	-	-	-	-	-
1967	5.736	112.7	1.7	-	-	-	-	-	-
1968	5.930	116.6	3.4	-	-	-	-	-	-
1969	6.138	120.6	3.5	-	-	-	-	-	-
1970	6.372	125.2	3.8	10.6096	165.2	5.5	5.185.8	123.3	2.7
1971	6.559	128.9	2.9	11.2358	174.9	5.9	5.344.9	127.1	3.1
1972	6.881	135.2	4.9	12.3418	192.2	9.8	5.724.4	136.1	7.1
1973	7.119	139.9	3.5	13.4348	209.2	8.9	6.008.1	142.9	5.0
1974	7.354	144.5	3.3	14.2255	221.5	5.9	6.198.5	147.4	3.2
1975	7.942	147.2	1.9	15.0756	234.7	6.0	6.400.6	152.2	3.3

Source: Departamento Nacional de Planeación. "Cuentas Regionales de Colombia 1960-1975". November 1977

Note: The indexes and growth rates were calculated for this study.

Chart No. VI-4

Colombia. Total G.N.P. Agricultural G.N.P. and Their Percentage Relationship, Index and Growth Rates - 1960-1975

(Based on constant 1970 pesos)

Year	Total G.N.P.			Agricultural G.N.P.			Agricultural G.N.P./ Total G.N.P.		
	In 000.000	Index 1960=100	Annual Growth	In 000.000	Index 1960=100	Annual Growth	%	Index 1960=100	Annual Growth
1960	77.714.4	100.0	-	23.637.1	100.0	-	30.4	100.0	-
1961	81.934.6	105.4	5.4	24.690.6	104.5	4.5	30.1	99.0	-1.0
1962	86.436.5	111.2	5.5	25.481.1	107.8	3.2	29.5	97.0	-2.0
1963	88.795.3	114.3	2.7	25.649.2	108.5	0.7	28.9	95.1	-2.0
1964	94.561.2	121.7	6.5	27.051.6	114.4	5.5	28.6	94.1	-1.0
1965	97.967.9	126.1	3.6	27.077.4	114.5	0.1	27.6	90.8	-3.5
1966	103.523.0	133.2	5.7	27.990.9	118.4	3.4	27.0	88.8	-2.2
1967	108.181.0	139.2	4.5	29.428.0	124.5	5.1	27.2	89.5	0.7
1968	114.920.0	147.9	6.2	31.419.8	132.9	6.8	27.3	89.8	0.4
1969	122.218.0	157.3	6.3	32.486.1	137.4	3.4	26.6	87.5	-2.6
1970	130.361.0	167.7	6.7	33.002.8	139.6	1.6	25.3	83.2	-5.0
1971	137.899.0	177.4	5.8	33.818.1	143.1	2.5	24.5	80.6	-3.2
1972	148.628.0	191.2	7.8	35.797.1	151.4	5.8	24.1	79.3	-1.6
1973	159.194.0	204.8	7.1	37.246.5	157.6	4.0	23.4	77.0	-2.9
1974	168.786.0	217.2	6.0	39.923.1	168.9	7.2	23.6	77.6	-0.8
1975	176.477.0	227.1	4.6	42.565.1	180.1	6.6	24.1	79.3	2.1

Source: DNP. Op. cit.

Chart No. VI-5

Colombia. Growth Rates of the Total G.N.P. and the Agricultural G.N.P. for 1960-1975 and for Each Five Years and the Agricultural G.N.P.'s Share of the Total

(Data based on 1970 pesos)

PERIODS / CONCEPTS	Five Years 1960-1965	Five Years 1965-1970	Five Years 1970-1976	Period 1960-1975
Total National Income	4.8	5.5	7.3	5.8
Per-Capita National Income	1.6	2.7	4.3	2.8
Per Capita G.N.P.	1.5	3.0	3.3	2.6
Total G.N.P.	4.7	5.9	6.2	5.6
Agricultural G.N.P.	2.7	4.0	5.2	4.0
Hunting & Fishing G.N.P.	19.3	17.3	6.6	14.3
Timber G.N.P.	2.4	6.0	6.6	5.0
Agricultural GNP/Total GNP	- 1.9	- 1.7	- 1.0	- 1.5

Source: Calculations based on Charts Nos. VI-3 and VI-4.

Chart No. VI-6

Colombia. Value of the Total and Agricultural Imports and Exports and Their Percentage Relationship
1960 - 1976

(In thousands of current dollars)

Year	Value Total (1) Exports 000 $ U.S.	Value Agri. (2) Exports 000 $ U.S.	% Agricultural Exports/ Total Exports	Value Total Imports (1) 000 $ U.S.	Value Agricultural Imports 000 $U.S.(2)	% Agricultural Imports/ Total Imports
1960	464.600	362.200	78.0	518.585	62.400	12.0
1961	434.800	342.800	79.0	556.807	62.800	11.3
1962	463.200	374.000	80.9	540.351	54.000	10.0
1963	446.700	342.100	76.6	506.022	42.600	8.4
1964	548.100	428.400	78.1	586.291	65.100	11.1
1965	539.100	399.500	74.1	453.501	56.400	12.4
1966	507.600	381.700	75.2	674.146	93.600	13.9
1967	509.900	387.600	76.0	496.862	47.700	9.6
1968	558.300	428.500	76.7	643.300	59.600	9.3
1969	607.400	449.000	73.9	685.300	63.100	9.2
1970	735.600	572.206	73.2	843.000	32.322	3.8
1971	690.000	504.726	73.4	929.400	54.490	5.9
1972	866.000	589.290	68.0	859.900	42.427	4.9
1973	1.191.400	908.849	76.3	1.061.500	86.154	8.1
1974	1.416.900	853.393	60.2	1.597.200	142.626	8.9
1975	1.465.000	1.025.848	70.0	1.494.800	90.112	6.1
1976	1.881.600	1.090.061	58.0	1.709.600	103.342	6.1

Sources : (1) International Monetary Fund. "International Financial Statistics". Several Numbers.
(2) 1960-69 from Bennet Gar A. "Colombia's Agriculture Production and Trade." USDA - FAER, 343, 1973.
1970-76 from Ministry of Agriculture - OPSA. "Cifras del Sector Agropecuario". 1976 and 1977.

Chart No. VI-7

Colombia. Indexes and Growth Rates of the Value of the Total and Agricultural Imports and Exports

1960-1976
(Data based on thousands of current dollars)

	Total Exports		Agricultural Exports		Total Exports/ Agricultural Exports		Total Imports		Agricultural Imports		Agricultural Imports / Total Imports	
	Index 1960=100	Annual Growth	Index	Growth	%	Annual Growth	Index	Annual Growth	Index	Annual Growth	%	Annual Growth
60	100.00	-	100.0	-	77.9	-	100.0	-	100.00	-	12.00	-
61	93.59	-6.4	94.6	-5.4	78.8	1.2	107.4	7.4	100.64	0.6	11.30	-5.8
62	99.70	6.5	103.3	9.1	80.7	2.4	104.2	-3.0	86.54	-14.0	10.00	-11.5
63	96.15	-3.6	94.4	-8.5	76.6	-5.1	97.6	-6.3	68.27	-21.1	8.40	-16.0
64	117.97	22.70	118.3	25.2	78.1	2.0	113.1	15.9	104.33	52.8	11.10	32.1
65	116.04	-1.6	110.3	-6.7	74.1	-5.1	87.4	-22.6	90.38	-13.4	12.40	11.7
66	109.26	-5.8	105.4	-4.5	75.2	1.5	130.0	48.6	150.00	66.0	13.90	12.1
67	109.75	0.4	107.0	1.5	76.0	1.1	95.8	-26.3	76.44	-49.0	9.60	-30.9
68	120.17	9.5	118.3	10.5	76.7	0.9	124.0	29.5	95.51	-25.0	9.30	-3.1
69	130.74	8.8	124.0	4.8	73.9	-3.6	132.1	6.5	101.12	5.9	9.20	-1.1
70	158.33	21.1	158.0	27.4	73.2	-1.0	162.6	23.0	51.80	48.8	3.80	-58.7
71	148.51	6.2	139.3	-11.8	73.4	0.3	179.2	10.2	87.32	68.6	5.90	55.3
72	186.40	25.5	162.7	16.7	68.0	-7.4	165.6	-7.6	67.99	-22.1	4.90	-16.9
73	256.44	37.6	250.9	54.2	76.3	12.2	204.7	23.6	138.07	103.1	8.10	65.3
74	304.97	18.9	235.6	-6.1	60.2	21.1	308.0	50.5	228.57	65.5	8.90	10.0
75	315.52	3.5	283.2	20.2	70.0	16.3	288.2	-6.41	144.4	-36.8	6.10	-31.5
76	404.99	28.4	301.0	6.3	58.0	-17.1	329.7	14.4	165.61	14.7	6.10	0.00

Source: Calculations based on the data in Chart No. VI-6.

Chart No. VI-8

Colombia. Growth Rate of the Foreign Trade in Agricultural Products Indicators for the Period 1960-1970 and for Each Five Years

(Data based on thousands current dollars)

	1960-65	1965-70	1970-76	1960-76
Total Exports	3.0	6.4	16.9	9.1
Agricultural Exports	2.0	7.5	11.3	7.1
Total Imports	-2.6	13.2	12.5	7.7
Agricultural Imports	-2.0	-10.6	21.4	3.2
Agricultural Exports/Total Exports	-1.0	-0.2	-3.8	-1.8
Agricultural Imports/Total Imports	0.6	-21.1	8.2	-4.1

Source: Calculations based on the data in Charts Nos. VI-6 and VI-7.

Chart No. VI-9

Colombia. Value of Some Agricultural Exports, 1960-1976

(In thousands of dollars)

s1/	Coffee 2/	Sugar 3/	Cotton 4/	Tobacco 5/	Rice 6/	Potatoe	Sub-Total Crops	Cattle (live)	Beef	Fish	Other Agricult. Prod.	Total Agricultural Products
0.0	332.260.0	-	12.712.0	2.376.0	-	-	361.028.0	-	-	-	1.172.0	362.200.0
9.0	308.016.0	5.208.0	10.617.0	4.044.0	-	-	341.954.0	-	-	-	846.0	342.800.0
1.0	332.220.0	7.383.0	15.786.0	5.690.0	-	-	371.690.0	-	-	-	2.310.0	374.000.0
1.0	303.117.0	5.480.0	9.461.0	7.167.0	-	-	338.456.0	-	-	-	3.644.0	342.100.0
6.0	394.361.0	3.271.0	6.369.0	9.437.0	-	-	425.844.0	-	-	-	2.556.0	428.400.0
6.0	343.901.0	7.597.0	8.061.0	7.205.0	-	-	385.390.0	-	-	-	14.110.0	399.500.0
8.0	328.266.0	8.257.0	2.249.0	5.551.0	-	-	364.321.0	-	-	-	17.379.0	381.700.0
3.0	322.372.0	11.256.0	15.429.0	4.390.0	-	-	378.450.0	-	-	-	9.150.0	387.600.0
2.0	351.474.0	14.206.0	28.051.0	4.903.0	-	-	423.326.0	-	-	-	5.174.0	428.500.0
1.0	343.942.0	14.747.0	32.597.0	7.256.0	-	-	417.913.0	-	-	-	31.087.0	449.000.0
4.8	466.741.6	14.029.8	34.323.6	7.168.5	613.5	27.8	540.979.6	17.215.4	4.620.8	4.633.8	4.756.4	572.206.0
7.3	395.432.5	16.434.2	29.689.6	9.154.2	665.4	5.1	466.038.3	16.079.1	12.103.5	5.869.9	4.635.2	504.726.0
3.1	429.761.0	29.178.0	51.245.9	9.879.0	544.3	3.6	534.304.9	13.682.2	24.026.5	9.861.8	7.414.6	589.290.0
0.7	597.920.0	30.187.6	38.138.5	15.271.4	1.204.0	186.3	698.328.5	2.736.8	40.129.2	10.555.6	20.507.9	772.258.0
7.1	622.287.0	72.291.6	48.609.9	19.227.5	451.3	418.1	788.572.5	2.745.2	32.164.6	12.002.7	17.908.0	853.393.0
2.3	673.977.0	95.052.7	76.147.7	12.809.6	20.206.0	2.312.6	912.117.9	26.610.5	22.868.9	12.391.5	51.851.2	1.025.840.0
7.5	845.052.0	24.059.8	57.371.4	24.871.9	20.760.2	1.523.2	1.013.686.0	14.331.4	20.082.6	19.175.7	22.784.3	1.090.060.0

Plantains and Bananas

ned sugar plus panela plus beet sugar plus refined and semi-refined
The 1970 figure is only for un-refined sugar.

obacco plus light tobacco. The 1970 figure only refers to leaft
co.

2/ Coffee (un-roasted) and ground and soluble. The 1970 figure only includes un-roasted coffee.

4/ Un-carded long fibre cotton plus un-carded short fibre cotton plus lint plus carded cotton. The 1970 figure only includes long and short fibre cotton.

6/ Rice for consumption and seed rice.

U.S.D.A. Agricultural Production and Trade of Colombia. 1973, for 1960-69; and the Ministry of Agriculture, Cifras del Sector Agropecuario, for 976 and 1977.

Chart No. VI-10

Colombia. Percentage share of Each Product and Group of Products of the Total Value of Agricultural Exports

Banana	Coffee	Sugar	Cotton	Tobacco	Rice	Potatoe	Sub-Total Crops	Live Cattle	Beef	Fish	Others	TOTAL
3.78	91.73	-	3.51	0.66	-	-	99.68	-	-	-	0.33	100.0
4.10	89.85	1.52	3.10	1.18	-	-	99.75	-	-	-	0.23	100.0
2.84	88.83	1.97	4.22	1.52	-	-	99.38	-	-	-	0.61	100.0
3.67	88.60	1.60	2.77	2.10	-	-	98.93	-	-	-	1.05	100.0
2.90	92.05	0.76	1.49	2.20	-	-	99.40	-	-	-	0.61	100.0
4.66	86.08	1.90	2.02	1.80	-	-	96.47	-	-	-	3.53	100.0
5.24	86.00	2.16	0.59	1.45	-	-	95.45	-	-	-	2.99	100.0
6.45	83.17	2.90	3.98	1.13	-	-	97.64	-	-	-	2.37	100.0
5.76	82.02	3.32	6.55	1.14	-	-	98.79	-	-	-	1.05	100.0
4.31	76.60	3.28	7.26	1.62	-	-	93.08	-	-	-	6.84	100.0
3.16	81.57	2.45	6.00	1.25	0.11	-	94.54	3.01	0.81	0.81	0.83	100.0
2.90	78.35	3.26	5.88	1.81	0.13	-	92.33	3.19	2.40	1.16	0.92	100.0
2.33	72.93	4.95	8.70	1.68	0.09	-	90.67	2.32	4.08	1.67	1.26	100.0
2.00	77.42	3.91	4.94	1.98	0.16	0.02	90.43	0.35	5.20	1.37	2.66	100.0
2.97	72.92	8.46	5.70	2.25	0.05	0.05	92.40	0.32	3.77	1.41	2.10	100.0
3.08	65.70	9.27	7.42	1.25	1.97	0.23	88.91	2.59	2.23	1.21	5.05	100.0
3.67	77.52	2.21	5.26	2.28	1.90	0.14	92.99	1.31	1.84	1.76	2.09	100.0

rce: Calculations based on the data in Chart No. VI-9.

Chart No. VI-11

Colombia: Area Planted with Agricultural Crops, 1960-1976

(Thousands of Hectares)

PRODUCTS	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Rice	227.0	237.0	280.0	254.0	302.0	375.0	350.0	291.0	277.0	250.0	257.0	242.0	258.0	291.0	355.0	373.0	365.0
Oats	-	-	-	-	-	-	-	-	-	-	-	0.4	0.4	0.4	0.4	0.4	3.3
Barley	56.0	48.0	49.0	58.0	58.0	45.0	55.0	61.0	52.0	52.0	51.0	56.0	64.0	52.0	59.0	76.0	68.0
Maize	730.0	711.0	697.0	689.0	772.0	869.0	846.0	790.0	778.0	855.0	661.0	666.5	624.5	580.3	570.1	572.7	647.6
Sorghum	14.0	18.0	21.0	25.0	33.0	40.0	35.0	43.0	45.0	50.0	54.0	92.0	84.0	135.0	151.0	134.0	174.0
Wheat	160.0	160.0	150.0	113.0	100.0	120.0	110.0	68.0	105.0	73.0	45.4	46.9	60.7	56.3	45.1	30.1	32.8
Sub-Total Cereals	1.187.0	1.174.0	1.197.0	1.139.0	1.265.0	1.449.0	1.396.0	1.253.0	1.257.0	1.280.0	1.068.8	1.103.8	1.091.6	1.115.2	1.180.6	1.186.2	1.290.7
Potatoe	54.0	49.0	75.0	69.0	76.0	67.0	67.0	79.0	95.0	83.0	84.0	88.0	90.0	99.0	92.0	110.0	125.0
Plantains	185.0	187.0	189.0	192.0	197.0	171.0	225.0	230.0	230.0	236.0	242.0	325.0	325.0	327.0	328.0	341.0	374.0
Cassava	120.0	115.0	138.0	142.0	125.0	142.0	144.0	152.0	164.0	160.0	148.0	145.0	155.0	181.0	165.0	165.0	165.0
Yam	-	-	-	-	-	-	-	-	-	-	-	6.7	7.0	7.0	7.2	7.3	8.1
Sub-Total Starchy Crops	359.0	351.0	402.0	403.0	398.0	380.0	436.0	461.0	489.0	479.0	474.0	476.7	577.0	614.0	592.2	623.3	672.1
Sugar Cane	62.8	62.7	65.0	64.9	71.6	80.5	91.6	89.6	91.7	91.7	69.0	64.0	72.9	78.6	75.1	75.7	85.3
"Panela" sugar cane	227.0	231.0	228.0	252.0	254.0	246.0	235.0	271.0	278.0	287.0	296.0	300.0	307.0	305.0	304.0	303.0	303.0
Sub-Total Sugars	289.8	293.7	293.0	316.9	325.6	326.5	326.6	360.6	369.7	378.7	365.0	364.0	379.9	383.6	379.1	378.7	388.3
Soybeans	15.0	14.0	15.0	20.0	26.0	33.0	35.0	48.0	47.0	56.0	67.0	55.0	54.0	54.0	57.0	88.0	38.0
Peanuts	-	-	-	-	-	-	-	-	-	-	-	0.5	0.6	0.6	0.7	1.8	1.9
African Palm	-	-	-	-	-	-	-	-	-	-	-	13.8	15.0	16.5	18.2	15.7	16.8
Sesame	32.0	35.0	42.0	52.0	70.0	75.0	88.0	64.0	50.0	60.0	40.0	47.0	43.2	37.0	82.2	41.6	36.1
Cottan	150.0	161.0	182.0	162.0	150.0	165.0	163.0	174.0	233.0	282.0	226.0	219.0	242.0	250.8	258.4	280.7	285.6
Sub-Total Oil Seeds	197.0	210.0	239.0	234.0	246.0	273.0	286.0	286.0	330.0	398.0	333.0	335.3	354.8	358.9	366.5	427.8	378.4
Cacao	32.0	33.0	34.0	35.0	35.0	37.0	38.0	37.0	38.0	38.0	46.0	49.0	52.0	55.0	58.0	53.0	56.0
Tobacco	14.0	14.0	19.0	22.0	22.0	25.0	27.0	23.0	22.0	24.0	23.0	23.0	26.0	26.0	26.0	34.0	33.0
Coffee	893.0	831.0	824.0	810.0	813.0	812.0	811.0	811.0	816.0	816.0	1.055.3	1.055.3	1.055.3	1.055.3	1.055.3	1.055.3	1.055.3
Sub-Total Beverages & Stim.	939.0	878.0	877.0	867.0	870.0	874.0	876.0	871.0	876.0	878.0	1.124.3	1.127.3	1.133.3	1.136.3	1.139.3	1.142.3	1.144.3
Beans	86.3	82.0	87.0	75.1	76.0	76.0	64.0	69.0	70.0	72.5	70.0	68.8	84.6	87.0	90.7	120.7	101.0
Bananas	50.0	51.0	49.0	56.0	58.0	58.0	58.0	58.0	58.0	57.0	55.0	54.0	55.0	54.0	55.0	57.0	58.0
Fruits	-	-	-	-	-	-	-	-	-	-	-	13.5	14.0	14.7	15.4	15.7	18.0
Sub-Total Other Crops	136.3	133.0	136.0	131.1	134.0	134.0	122.0	127.0	128.0	129.5	125.0	136.3	153.6	155.7	161.1	193.4	177.0
TOTAL CULTIVATED AREA	3.108.1	3.039.7	3.144.0	3.091.0	3.238.6	3.436.5	3.442.6	3.358.6	3.449.7	3.543.2	3.489.7	3.631.4	3.690.2	3.763.5	3.818.8	3.951.7	4.050.8

Source: DNP. Unidad de Estudios Agrarios, 1978 (un-published). Basically it combines two sources: USDA. Agricultural Production and Trade of Colombia (1950-69), and Ministry of Agriculture. Cifras del Sector Agropecuario, OPSA, 1977.

The data for sugar cane, "panela" sugar and sesame are taken from: Kalmanovitz, S. La Agricultura en Colombia (1960-69). For 1970-1977 from: Ministry of Agriculture. Cifras del Sector Agropecuario, OPSA, 1977.

The data for cassava for 1970-76 are taken from: Fedesarrollo. Coyuntura Económica. October 1976.

Chart No. VI-12

Colombia. Indexes of the Area Planted with Agricultural Products
1960-1976

1960 = 100

Products	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Rice	100.0	104.4	123.4	111.9	133.0	165.2	154.2	128.2	122.0	110.1	113.2	106.6	113.7	128.2	156.4	164.3	160.8
Oats	-	-	-	-	-	-	-	-	-	-	-	100.0	100.0	100.0	100.0	100.0	825.0
Barley	100.0	85.7	87.5	103.6	103.6	80.4	98.2	108.9	92.9	92.9	91.1	100.0	114.3	92.9	105.4	135.7	121.4
Maize	100.0	97.4	95.5	94.4	105.8	119.1	115.9	108.2	106.6	117.1	90.6	91.3	85.6	79.5	78.1	78.5	88.7
Sorghum	100.0	128.6	150.0	178.6	235.7	285.7	250.0	307.1	321.4	357.1	385.7	657.1	600.0	964.3	1.078.6	957.1	1.242.9
Wheat	100.0	100.0	93.8	70.6	62.5	75.0	68.8	42.5	65.6	45.6	28.4	29.3	37.9	35.2	28.2	18.8	20.5
Sub-Total Cereals	100.0	98.9	100.8	96.0	106.6	122.1	117.1	105.6	105.9	107.8	90.0	93.0	92.0	93.9	99.5	99.9	108.7
Potatoes	100.0	90.7	138.9	127.8	140.7	124.1	124.1	146.3	175.9	153.7	155.6	163.0	166.7	183.3	170.4	203.7	231.5
Plantains	100.0	101.1	102.2	103.8	106.5	92.4	121.6	124.3	124.3	127.6	130.8	175.7	175.7	176.8	177.3	184.3	202.2
Cassava	100.0	95.8	115.0	118.3	104.2	118.3	120.0	126.7	136.7	133.3	123.3	120.8	129.2	150.8	137.5	137.5	137.5
Yam	-	-	-	-	-	-	-	-	-	-	-	100.0	104.5	104.5	107.5	109.0	120.9
Sub-Total Starchy Crops	100.0	97.8	112.0	112.3	110.9	105.9	121.5	128.4	136.2	133.4	132.0	157.3	160.7	171.0	165.0	173.6	187.2
Sugar Cane	100.0	99.8	103.5	103.3	114.0	128.2	145.9	142.7	146.0	146.0	109.9	101.9	116.1	125.2	119.6	120.5	135.8
"Panela" sugar cane	100.0	101.8	100.4	111.0	111.9	108.4	103.5	119.4	122.5	126.4	130.4	132.2	135.2	134.4	133.9	133.5	133.5
Sub-Total Sugars	100.0	101.4	101.1	109.4	112.4	112.7	112.8	124.4	127.6	130.7	126.0	125.6	131.1	132.4	130.8	130.7	134.0
Soybeans	100.0	93.3	100.0	133.3	173.3	220.0	133.3	320.0	313.3	373.3	446.7	366.7	360.0	360.0	380.0	586.7	253.3
Peanuts	-	-	-	-	-	-	-	-	-	-	-	100.0	120.0	120.0	140.0	360.0	380.0
African Palm	-	-	-	-	-	-	-	-	-	-	-	100.0	108.7	119.6	131.9	113.8	121.7
Sesame	100.0	109.4	131.3	162.5	218.8	234.4	275.0	200.0	156.3	187.5	125.0	146.8	135.0	115.6	100.6	130.0	112.8
Cotton	100.0	107.3	121.3	108.0	100.0	110.0	108.7	116.0	155.3	188.0	150.7	146.0	161.3	167.2	172.3	187.1	190.4
Sub-Total Oil Seeds	100.0	106.6	121.3	118.8	124.9	138.6	145.2	145.2	167.5	202.0	169.0	170.2	180.1	182.2	186.0	217.2	192.1
Cacao	100.0	103.1	106.3	109.4	109.4	115.6	118.8	115.6	118.8	118.8	143.8	153.1	162.5	171.9	181.3	165.6	175.0
Tobacco	100.0	100.0	135.7	157.1	157.1	178.6	192.9	164.3	157.1	171.4	164.3	164.3	185.7	185.7	185.7	242.9	235.7
Coffee	100.0	93.1	92.3	90.7	91.0	90.9	90.8	90.8	91.4	91.4	118.2	118.2	118.2	118.2	118.2	118.2	118.2
Sub-Total Beverages & Stim.	100.0	93.5	93.4	92.3	92.7	93.1	93.3	92.3	93.3	93.5	119.7	120.1	120.7	121.0	121.3	121.7	121.9
Beans	100.0	95.0	100.8	87.0	88.1	88.1	74.2	80.0	81.1	84.0	81.1	79.7	98.0	100.8	105.1	139.9	117.0
Bananas	100.0	102.0	98.0	112.0	116.0	116.0	116.0	116.0	116.0	114.0	110.0	108.0	110.0	108.0	110.0	114.0	116.0
Fruits	-	-	-	-	-	-	-	-	-	-	-	100.0	103.7	108.9	114.1	116.3	133.3
Sub-Total Other Crops	100.0	97.6	99.8	96.2	98.3	98.3	89.5	93.2	93.9	95.0	91.7	100.0	112.7	114.2	118.2	141.9	122.9
TOTAL CULTIVATED AREA	100.0	97.8	101.2	99.5	104.2	110.6	110.8	108.1	111.0	114.0	112.3	116.8	118.7	121.1	122.9	127.1	130.3

Source: Calculations based on the data in Chart No. VI-11.

Chart No. VI-13

Colombia. Annual Percentage Variation in the Area Planted with Agricultural Crops, 1960-1976

Products	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Rice	4.4	18.1	- 9.3	18.9	24.2	- 6.7	-16.9	- 4.8	- 9.7	2.8	- 5.8	6.6	12.8	22.0	5.0	- 2.1
Oats	-	-	-	-	-	-	-	-	-	0.0	0.0	0.0	0.0	0.0	0.0	725.0
Barley	-14.3	2.1	18.4	0.0	-22.4	22.2	10.9	-14.7	0.0	1.9	9.8	14.3	-18.7	13.4	28.8	-10.5
Maize	- 2.6	- 2.0	- 1.1	12.0	12.6	- 2.6	- 6.6	- 1.5	9.2	-22.7	0.8	- 6.3	- 7.1	- 1.7	0.4	13.0
Sorghum	28.6	16.7	19.0	32.0	21.2	-12.5	22.9	4.6	11.1	8.0	70.4	- 8.7	60.7	11.8	-11.3	29.8
Wheat	0.0	- 6.2	-24.7	-11.5	20.0	- 8.3	-38.2	54.4	-30.5	-37.8	3.3	29.4	- 7.2	-19.9	-33.3	8.9
Sub-Total Cereals	- 1.1	2.0	- 4.9	11.1	14.6	- 3.7	-10.2	0.3	1.8	-16.5	3.3	- 1.1	2.1	5.9	0.5	8.8
Potatoe	- 9.3	53.1	- 8.0	10.1	-11.8	0.0	17.9	20.2	-12.6	1.2	4.8	2.2	10.0	7.0	19.6	13.6
Plantains	1.1	1.1	1.6	2.6	-13.2	31.6	2.2	0.0	2.6	2.5	34.3	0.0	0.6	0.3	3.9	9.6
Cossava	4.2	20.0	2.9	-12.0	13.6	1.4	5.6	7.9	- 2.4	- 7.5	- 2.0	6.9	16.8	- 8.8	0.0	0.0
Yam	-	-	-	-	-	-	-	-	-	-	-	4.4	0.0	2.8	1.4	10.9
Sub-Total Starchy Crops	- 2.2	14.5	0.3	- 1.2	- 4.5	14.7	5.7	6.1	- 2.0	- 1.0	19.1	2.2	6.4	- 3.6	- 5.3	7.8
Sugar Cane	0.2	3.7	- 0.1	10.3	12.4	13.8	- 2.2	2.3	0.0	-24.7	- 7.2	13.9	7.8	- 4.4	0.8	12.6
"Panela" sugar cane	1.8	- 1.3	10.5	0.8	- 3.1	- 4.5	15.3	2.6	3.2	3.1	1.3	2.3	- 0.6	- 0.3	- 0.3	0.0
Sub-Total Sugars	1.4	- 0.2	8.2	2.8	0.3	0.0	10.4	2.5	2.4	- 3.6	- 0.3	4.4	1.0	- 1.2	- 0.1	2.5
Soybeans	- 6.6	7.1	33.3	30.0	26.9	6.0	37.1	- 2.0	19.1	19.6	-17.9	- 1.8	0.0	5.5	54.3	-56.8
Peanuts	-	-	-	-	-	-	-	-	-	-	-	20.0	0.0	16.6	157.1	5.5
African Palm	-	-	-	-	-	-	-	-	-	-	-	8.7	10.0	10.3	-13.7	7.0
Sesame	9.3	20.0	23.8	34.6	7.1	17.3	-27.3	-21.8	20.0	-33.3	17.5	8.0	-14.3	-12.9	29.1	-13.2
Cotton	7.3	13.0	-11.0	- 7.4	10.0	- 1.2	6.7	33.9	21.0	-19.8	- 3.1	10.5	3.6	3.0	8.6	1.7
Sub-Total Oil Seeds	6.6	13.8	- 2.1	5.1	11.0	4.8	0.0	15.4	20.6	-16.3	0.7	5.8	1.2	2.1	16.7	-11.6
Cacao	3.1	3.0	2.9	0.0	5.7	2.7	- 2.6	2.7	0.0	21.0	6.5	6.1	5.7	5.4	- 8.6	5.6
Tobacco	0.0	35.7	15.7	0.0	13.6	8.0	-14.8	- 4.3	9.0	- 4.1	0.0	13.0	0.0	0.0	30.7	- 2.9
Coffee	- 6.9	- 0.8	- 1.7	0.3	- 0.1	- 0.1	0.0	0.6	0.0	29.3	0.0	0.0	0.0	0.0	0.0	0.0
Sub-Total Beverages & Stimulants	- 6.5	- 0.1	- 1.1	0.4	0.5	0.2	- 0.6	0.6	0.2	28.1	0.3	0.5	0.3	0.3	0.3	0.2
Beans	- 4.9	6.1	-13.6	1.2	0.0	-15.7	7.8	1.4	3.5	- 3.4	- 1.7	22.9	2.8	4.2	33.0	-16.3
Bananas	2.0	- 3.9	14.2	3.5	0.0	0.0	0.0	0.0	- 1.7	- 3.5	- 1.8	1.8	- 1.8	1.8	3.6	1.7
Fruits	-	-	-	-	-	-	-	-	-	-	-	3.7	5.0	4.7	1.9	14.6
Sub-Total Other Crops	- 2.4	2.3	- 3.6	2.2	0.0	- 9.0	4.1	0.8	1.2	- 3.5	9.0	12.7	1.4	3.5	20.1	- 8.5
TOTAL CULTIVATED AREA	- 2.2	3.4	- 1.7	4.8	6.1	0.2	- 2.4	2.7	2.7	- 1.5	4.1	1.6	2.0	1.5	3.5	2.5

Source: Calculations based on data in Chart No. VI-11.

Chart No. VI-14

Colombia. Percentage Participation of Each Product and Group of Products in the Area Planted, 1960-1976

Products	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Rice	7.30	7.80	8.91	8.22	9.33	10.91	10.17	8.66	8.03	7.06	7.36	6.66	7.99	7.73	9.30	9.44	9.01
Oats	-	-	-	-	-	-	-	-	-	-	-	0.01	0.01	0.01	0.01	0.01	0.08
Barley	1.80	1.58	1.56	1.88	1.79	1.31	1.60	1.82	1.51	1.47	1.46	1.54	1.73	1.38	1.54	1.92	1.68
Maize	23.49	23.39	22.17	22.29	23.84	25.29	24.57	23.52	22.55	24.13	18.94	18.35	16.92	15.42	14.93	14.49	15.99
Sorghum	0.45	0.59	0.67	0.81	1.02	1.16	1.02	1.28	1.30	1.41	1.55	2.53	2.28	3.59	3.95	3.39	4.30
Wheat	5.15	5.26	4.77	3.66	3.09	3.49	3.20	2.02	3.04	2.06	1.30	1.29	1.64	1.50	1.18	0.76	0.81
Sub-Total Cereals	38.19	38.62	38.07	36.85	39.06	42.16	40.55	37.31	36.44	36.13	30.62	30.40	29.58	29.63	30.92	30.02	31.86
Potatoe	1.74	1.61	2.39	2.23	2.35	1.95	1.95	2.35	2.75	2.34	2.41	2.42	2.44	2.63	2.41	2.78	3.09
Plantains	5.95	6.15	6.01	6.21	6.08	4.98	6.54	6.85	6.67	6.66	6.93	8.95	8.81	8.69	8.59	8.63	9.23
Cossava	3.86	3.78	4.39	4.59	3.86	4.13	4.18	4.53	4.75	4.52	4.24	3.99	4.20	4.81	4.32	4.18	4.07
Yam	-	-	-	-	-	-	-	-	-	-	-	0.18	0.19	0.19	0.19	0.18	0.20
Sub-Total Starchy Crops	11.55	11.55	12.79	13.04	12.29	11.06	12.66	13.73	14.18	13.52	13.58	15.55	15.64	16.31	15.51	15.77	16.59
Sugar Cane	2.02	2.06	2.07	2.10	2.21	2.34	2.66	2.67	2.66	2.59	1.98	1.76	1.98	2.09	1.97	1.92	2.11
"Panela" sugar cane	7.30	7.60	7.25	8.15	7.84	7.16	6.83	8.07	8.06	8.10	8.48	8.26	8.32	38.10	7.96	7.67	7.48
Sub-Total Sugars	9.32	9.66	9.32	10.25	10.05	9.50	9.49	10.74	10.72	10.69	10.46	10.02	10.29	10.19	9.93	9.58	9.59
Soybeans	0.48	0.46	0.48	0.65	0.80	0.96	1.02	1.43	1.36	1.58	1.92	1.51	1.46	1.43	1.49	2.23	0.94
Peanuts	-	-	-	-	-	-	-	-	-	-	-	0.01	0.02	0.02	0.02	0.05	0.05
African Palm	-	-	-	-	-	-	-	-	-	-	-	0.38	0.41	0.44	0.48	0.40	0.41
Sesame	1.03	1.15	1.34	1.68	2.16	2.18	2.56	1.91	1.45	1.69	1.15	1.29	1.17	0.98	0.84	1.05	0.89
Cotton	4.83	5.30	5.79	5.24	4.63	4.80	4.73	5.18	6.75	7.96	6.48	6.03	6.56	6.66	6.77	7.10	7.05
Sub-Total Oil Seeds	6.34	6.91	7.60	7.57	7.60	7.94	8.31	8.52	9.57	11.23	9.54	9.23	9.61	9.54	9.60	10.83	9.34
Cacao	1.03	1.09	1.08	1.13	1.08	1.08	1.10	1.10	1.10	1.07	1.32	1.35	1.41	1.46	1.52	1.34	1.38
Tobacco	0.45	0.46	0.60	0.71	0.68	0.73	0.78	0.68	0.64	0.68	0.66	0.63	0.70	0.69	0.68	0.86	0.81
Coffee	28.73	27.34	26.21	26.21	25.10	23.63	23.56	24.15	23.65	23.03	30.24	29.06	28.60	28.04	27.63	26.70	26.05
Sub-Total Beverages & Stimulants	30.21	28.88	27.89	28.05	26.86	25.43	25.45	25.93	25.39	24.78	32.22	31.04	30.71	30.19	29.83	28.91	28.25
Beans	2.78	2.70	2.77	2.43	2.35	2.21	1.86	2.05	2.03	2.05	2.01	1.89	2.29	2.31	2.38	3.05	2.49
Bananas	1.61	1.68	1.56	1.81	1.79	1.69	1.68	1.73	1.68	1.61	1.58	1.49	1.49	1.43	1.44	1.44	1.43
Fruits	-	-	-	-	-	-	-	-	-	-	-	0.37	0.38	0.39	0.40	0.40	0.44
Sub-Total Other Crops	4.39	4.38	4.33	4.24	4.14	3.90	3.54	3.78	3.71	3.65	3.58	3.75	4.16	4.14	4.22	4.89	4.37
TOTAL AREA	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: Calculations based on data in Chart No. VI-11.

Chart No. VI-15

Colombia. Total and Five Yearly Growth Rates of the Area Cultivated

Product \ Period	1960-65	1965-70	1970-76	1960-76
Rice	10.6	- 7.3	6.0	3.0 1/
Oats	-	-	-	32.5 1/
Barley	- 4.3	2.5	4.9	1.2
Maize	3.5	- 5.3	- 0.3	- 0.7
Sorghum	23.4	6.2	21.5	17.1
Wheat	- 5.6	-17.7	- 5.3	- 9.4
Sub-Total Cereals	4.1	- 5.9	3.2	0.5
Potatoe	4.4	4.6	6.8	5.4
Plantains	- 1.6	7.2	7.5	4.5
Cassava	3.4	0.8	1.8	2.0
Yam	-	-	-	3.9 1/
Sub-Total Starchy Crops	1.1	4.5	6.0	4.0
Sugar Cane	5.1	- 3.0	3.6	1.9
"Panela" sugar	1.6	3.8	0.4	1.8
Sub-Total Sugars	2.4	2.3	1.0	1.9
Soybean	17.1	15.2	- 9.0	6.0
Peanuts	-	-	-	30.6 1/
African Palm	-	-	-	4.0 1/
Sesame	18.6	-11.8	- 1.7	0.8
Cotton	1.9	6.5	4.0	4.1
Sub-Total Oil Seeds	6.7	4.1	2.2	4.2
Cacao	2.9	4.5	3.3	3.6
Tobacco	12.3	- 1.7	6.2	5.5
Coffee	- 1.9	5.4	0.0	1.0
Sub-Total Beverage & Stimulants	- 1.4	5.2	0.3	1.2
Beans	- 2.5	- 1.6	6.3	1.0
Bananas	3.0	- 1.1	0.9	0.9
Fruts	-	-	-	5.9 1/
Sub-Total Other Crops	- 0.3	- 1.4	6.0	1.7
TOTAL AREA	2.0	0.3	2.5	1.7

1/ Refers to the period 1971-1976.

Source: Calculations based on the data in Chart No. VI-11.

Chart No. VI-16

Colombia. Yields of Agricultural Crops

1960-1976

(In Kgs./Has.)

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
1. Cereals:																	
Rice	1.980	2.000	2.090	2.170	1.990	1.790	1.940	2.270	2.840	2.780	2.729	3.523	3.683	3.956	4.345	4.333	4.267
Oats	-	-	-	-	-	-	-	-	-	-	-	1.750	1.750	2.000	2.000	2.000	2.000
Barley	1.900	2.100	2.200	2.030	1.900	2.000	1.730	1.560	1.630	1.440	1.705	1.928	1.543	1.555	1.640	1.611	1.050
Maize	1.190	1.070	1.080	1.130	1.250	1.000	1.000	1.080	1.030	1.100	1.326	1.228	1.291	1.274	1.388	1.261	1.459
Sorghum	710	830	1.140	1.320	1.670	1.630	1.710	2.090	2.220	2.000	2.201	2.601	2.500	2.069	2.226	2.500	2.463
Wheat	890	890	1.080	800	850	920	1.140	1.180	1.190	1.100	1.183	1.184	1.140	1.281	1.304	1.292	1.381
2. Starchy Crops:																	
Potatoe	12.090	11.240	11.630	8.290	11.410	11.370	11.340	10.130	10.000	10.240	10.851	9.840	9.200	10.451	11.000	12.000	12.126
Plantains	6.780	6.820	6.840	6.820	6.830	8.090	6.320	6.910	6.960	6.950	6.923	4.667	4.806	5.055	5.119	5.255	4.497
Cassava	5.670	5.650	5.650	5.630	5.600	5.630	5.920	5.900	5.920	6.100	8.000	7.993.	8.000	7.993	8.503	7.873	8.027
Yam	-	-	-	-	-	-	-	-	-	-	-	9.418	10.057	9.971	10.250	10.027	10.506
3. Sugar Cane	52.300	58.500	61.800	57.500	59.800	58.600	50.600	65.700	70.200	75.000	87.100	111.800	118.200	96.800	99.300	-	-
Sugar	5.231	5.779	6.174	5.669	5.969	6.026	5.864	6.658	7.233	10.371	9.800	11.625	11.300	10.304	11.915	12.810	11.120
"Panela" sugar cane	31.300	41.800	38.300	32.200	28.500	28.400	34.500	31.300	31.400	31.700	31.900	33.000	31.521	28.675	26.085	27.062	-
"Panela"	2.510	3.350	3.070	2.580	2.290	2.280	2.760	2.910	2.910	3.500	2.489	2.620	2.820	3.055	3.174	3.293	3.405
4. Oil Seeds:																	
Soybeans	1.270	1.430	1.470	1.500	1.540	1.520	1.490	1.670	1.850	1.790	1.983	1.828	1.937	1.800	2.000	1.924	1.997
Peanuts	-	-	-	-	-	-	-	-	-	-	-	1.400	1.500	1.500	1.714	1.611	1.158
African Palm	-	-	-	-	-	-	-	-	-	-	-	2.623	2.760	2.667	2.791	2.497	2.363
Sesame	620	740	670	670	630	690	670	630	600	650	700	668	655	489	534	498	562
5. Stimulants:																	
Cacao	440	450	410	400	460	460	450	490	470	390	405	338	380	401	397	403	428
Tobacco	1.790	2.000	2.000	1.910	1.860	1.600	1.630	1.830	1.910	1.830	1.850	1.709	1.373	1.515	1.610	1.689	1.624
Coffee	520	560	550	610	560	610	560	590	580	620	540	540	540	540	540	601	-
6. Other Crops:																	
Cotton Fibre	450	480	450	450	430	390	530	580	600	450	550	513	596	453	564	494	496
Un-processed Cotton	1.213	1.298	1.230	1.228	1.200	1.090	1.306	1.224	1.184	1.148	1.716	1.473	1.701	1.325	1.626	1.428	1.431
Beans	461	539	547	584	553	526	547	551	571	579	628	706	722	654	740	745	669
Bananas	11.640	11.220	10.590	10.370	9.660	11.250	12.430	13.290	13.240	12.370	11.760	12.840	11.860	12.810	15.850	18.680	18.560
Sisal Hemp	-	-	-	-	-	-	-	-	-	-	-	1.249	1.302	1.401	1.500	1.378	1.349

Source: DNP. Unidad de Estudios Agrarios. Un-published, 1978. Initially taken from USDA. "Agricultural Production and Trade of Colombia", for 1960-69, and from the Ministry of Agriculture. "Cifras del Sector Agropecuario 1977", for 1970-76.

The data for sugar cane, "panela" and sesame were taken from Kalmanovitz, S. "La Agricultura en Colombia".

Chart No. VI-17

Colombia. Indexes of the Yields of the Agricultural Products, 1960-1976

(1960 = 100)

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
1. Cereals:																	
Rice	100.0	101.0	105.5	109.6	100.5	90.4	97.9	114.6	143.4	140.4	137.8	177.9	195.1	199.8	214.4	218.8	215.5
Oats	-	-	-	-	-	-	-	-	-	-	-	100.0	100.0	114.3	114.3	114.3	114.3
Barley	100.0	110.5	115.7	106.8	100.0	105.2	91.0	82.1	85.7	75.7	89.7	101.4	81.2	81.8	86.3	84.7	55.2
Maize	100.0	89.9	90.7	94.9	105.0	84.0	84.0	90.7	86.5	92.4	111.4	103.1	108.4	107.0	116.6	105.9	122.6
Sorghum	100.0	116.9	160.5	185.9	235.2	229.5	240.8	294.3	312.6	281.6	310.0	366.3	352.1	291.4	313.5	352.1	346.9
Wheat	100.0	100.0	121.3	69.8	95.5	103.3	128.0	132.5	133.7	123.6	132.9	133.0	128.0	143.9	146.5	145.1	155.1
2. Starchy Crops:																	
Potatoe	100.0	92.9	96.2	68.5	94.3	94.0	93.8	83.7	82.7	84.7	89.7	81.3	76.1	86.4	90.9	99.2	100.3
Plantains	100.0	100.5	100.8	100.5	100.7	119.3	93.2	101.9	102.6	102.5	102.1	68.8	70.8	74.5	75.5	77.5	66.3
Cassava	100.0	99.6	99.6	99.2	98.7	99.2	104.4	104.0	104.4	107.5	141.0	140.9	141.0	140.9	149.9	138.8	141.5
Yams	-	-	-	-	-	-	-	-	-	-	-	100.0	106.8	105.9	108.8	106.5	111.6
3. Sugars:																	
Sugar Cane	100.0	111.8	118.1	109.9	114.3	112.0	96.7	125.6	134.2	143.4	166.5	213.7	226.0	185.0	189.8	-	-
Sugar	100.0	110.4	118.0	108.3	114.1	115.2	112.1	127.2	138.2	198.2	187.3	222.2	216.0	196.9	227.7	244.8	212.5
"Panela" sugar cane	100.0	133.5	122.3	102.8	91.0	90.7	110.2	100.0	100.3	101.2	101.9	105.4	100.7	91.6	83.3	86.4	-
"Panalo"	100.0	133.4	122.3	102.7	91.2	90.8	109.9	115.9	115.9	139.4	99.1	104.3	112.3	121.7	126.4	131.2	135.6
4. Oil Seeds:																	
Soybeans	100.0	112.6	115.7	118.1	121.2	119.6	117.3	131.5	145.6	140.9	156.1	143.9	152.5	141.7	157.4	151.5	157.2
Peanuts	-	-	-	-	-	-	-	-	-	-	-	100.0	107.1	107.1	122.4	115.1	82.7
African Palm	-	-	-	-	-	-	-	-	-	-	-	100.0	105.2	101.7	106.4	95.2	90.1
Sesame	100.0	119.3	108.0	108.0	101.6	111.2	108.0	101.6	96.7	104.8	112.9	107.7	105.6	78.8	86.1	80.3	90.6
5. Stimulants:																	
Cacao	100.0	102.2	93.1	90.9	104.5	104.5	102.2	111.3	106.8	88.6	92.0	76.8	86.3	91.1	90.2	91.5	97.2
Tobacco	100.0	111.7	111.7	106.7	103.9	89.3	91.0	102.2	106.7	102.2	103.3	95.4	76.7	84.6	84.9	94.3	90.7
Coffee	100.0	107.6	105.7	117.3	107.6	117.3	107.6	113.4	111.5	119.2	103.8	103.8	103.8	103.8	103.8	115.5	-
6. Other Crops:																	
Cotton Fibre	100.0	106.6	100.0	100.0	95.5	86.6	117.7	128.8	133.3	100.0	122.2	114.0	132.4	100.6	125.3	109.7	110.2
Un-processed Cotton	100.0	107.0	101.4	101.2	98.9	89.8	107.6	100.9	97.6	94.6	141.4	121.4	140.2	109.2	134.0	117.7	117.9
Beans	100.0	116.9	118.6	126.6	119.9	114.1	118.6	119.5	123.8	125.6	136.2	153.0	156.6	141.8	160.4	161.5	145.1
Bananas	100.0	96.3	90.9	89.0	82.9	96.6	106.7	114.1	113.7	106.2	101.0	110.3	101.8	110.0	136.1	160.4	159.4
Sisal hemp	-	-	-	-	-	-	-	-	-	-	-	100.0	104.2	112.2	120.1	110.3	108.0

Source: Calculations based on the data in Chart No. VI-16.

Chart No. VI-18

Colombia: Annual Percentage Variation in the Yields of the Agricultural Products

1960-1976

	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
1. Cereals:																
Rice	1.01	4.50	3.83	- 8.29	-10.05	8.38	17.01	25.11	- 2.11	- 1.83	29.09	9.65	2.41	9.83	- 0.28	- 1.52
Oats	-	-	-	-	-	-	-	-	-	-	-	0.00	14.29	0.00	0.00	0.00
Barley	10.53	4.76	- 7.73	- 6.40	5.26	-13.50	- 9.83	4.49	-11.66	18.40	13.08	-19.97	0.78	5.47	- 1.77	-34.82
Maize	-10.08	0.93	4.63	10.62	-20.00	-	8.00	- 4.63	6.80	20.55	- 7.39	5.13	- 1.32	8.95	- 9.15	15.70
Sorghum	16.90	37.35	15.79	26.52	- 2.40	4.91	22.22	6.22	- 9.91	10.05	18.17	- 3.88	-17.24	7.59	12.31	- 1.48
Wheat	0.00	21.35	-25.93	6.25	8.24	23.91	3.51	0.85	- 7.56	7.55	0.08	- 3.72	12.37	1.80	- 0.92	6.89
2. Starchy Crops:																
Potatoe	- 7.03	3.47	-28.72	37.64	- 0.35	- 0.26	-10.67	- 1.28	2.40	5.97	- 9.32	- 6.50	13.60	5.25	9.09	1.05
Plantains	0.59	0.29	- 0.29	0.15	18.45	-21.88	9.34	0.72	- 0.14	- 0.39	-32.59	2.98	5.18	1.27	2.66	-14.42
Cassava	- 0.35	0.00	- 0.35	- 0.53	0.54	5.15	- 0.34	0.34	3.04	31.15	- 0.09	0.09	- 0.09	6.38	- 7.41	1.96
Yam	-	-	-	-	-	-	-	-	-	-	-	6.78	- 0.86	2.80	- 2.18	4.78
3. Sugars:																
Sugar Cane	11.85	5.64	- 6.96	4.00	- 2.01	-13.65	29.84	6.85	6.84	16.13	28.36	5.72	-18.10	2.58	-	-
Sugar	10.48	6.84	- 8.18	5.29	0.95	- 2.69	13.54	8.64	43.38	- 5.51	18.62	- 2.80	- 8.81	15.63	7.51	-13.19
"Panela" sugar cane	33.55	- 8.37	-15.93	-11.49	- 0.35	21.48	- 9.28	0.32	0.96	0.63	3.45	- 4.48	- 9.03	- 9.03	3.75	-
"Panela"	33.47	- 8.36	-15.96	-11.24	- 0.44	21.05	5.43	-	20.27	-28.89	5.26	7.63	8.33	3.90	3.75	3.40
4. Oil Seeds:																
Soybeans	12.60	2.80	2.04	2.67	- 1.30	- 1.97	12.08	10.78	- 3.24	10.78	- 7.82	5.96	- 7.07	11.11	- 3.80	3.79
Peanuts	-	-	-	-	-	-	-	-	-	-	-	7.14	0.00	14.27	- 6.01	-28.12
African Palm	-	-	-	-	-	-	-	-	-	-	-	5.22	- 3.37	4.65	-10.53	- 5.37
Sesame	19.35	- 9.46	-	- 5.97	9.52	- 2.90	- 5.97	- 4.76	8.33	7.69	- 4.57	- 1.95	-25.34	9.20	- 6.74	12.85
5. Stimulants:																
Cacao	2.27	- 8.89	- 2.44	15.00	0.00	- 2.17	8.89	- 4.08	-17.02	3.85	-16.54	12.43	5.53	- 1.00	1.51	6.20
Tobacco	11.73	0.00	- 4.50	- 2.62	-13.98	1.88	12.27	4.37	- 4.19	1.09	- 7.62	-19.66	10.34	6.27	4.91	- 3.85
Coffee	7.69	- 1.79	10.91	- 8.20	8.93	- 8.20	5.36	- 1.69	6.90	-12.90	0.00	0.00	0.00	0.00	11.30	-
6. Other Crops:																
Cotton Fibre	6.67	- 6.25	0.00	- 4.44	- 9.30	35.90	9.43	3.45	-25.00	22.22	- 6.73	16.18	-23.99	24.50	-12.41	0.40
Un-processed Cotton	7.01	- 5.24	- 0.16	- 2.28	- 9.17	19.82	- 6.28	- 3.27	- 3.04	49.48	-14.16	15.48	-22.10	22.72	-12.18	0.21
Beans	16.92	1.48	6.76	- 5.31	- 4.88	3.99	0.73	3.63	1.40	8.46	12.36	2.35	- 9.44	13.12	0.68	-10.14
Bananas	- 3.61	- 5.61	- 2.08	- 6.85	16.46	10.49	6.92	- 0.38	- 6.57	- 4.93	9.18	- 7.63	8.01	23.73	17.85	- 0.64
Sisal Hemp	-	-	-	-	-	-	-	-	-	-	-	4.24	7.60	7.07	- 8.13	- 2.10

Source: Calculations based on the data in Chart No. VI-16.

Chart No. VI-19

Colombia. Total and Five Yearly Growth Rates in the Yields of Agricultural Products

1960-1976

PRODUCT \ PERIOD	1960-65	1965-70	1970-76	1960-76
1. Cereals:				
Rice	-2.0	8.8	7.7	4.9
Oats	-	-	-	2.7 1/
Barley	1.0	-3.1	-7.8	-3.6
Maize	-3.4	5.8	1.6	1.3
Sorghum	18.1	6.2	1.9	8.1
Wheat	0.7	5.2	2.6	2.8
2. Starchy Crops:				
Potatoe	-1.2	-0.9	1.9	0.0
Plantains	3.6	-3.1	-6.9	-2.5
Cassava	-0.1	2.3	0.1	2.2
Yam	-	-	-	2.2 1/
3. Sugars:				
Sugar Cane	2.3	8.2	3.3 2/	4.7 3/
Sugar	2.9	10.2	2.1	4.8
"Panela" Sugar Cane	-1.9	2.4	-3.2 2/	-1.0 3/
"Panela" sugar	-1.9	1.8	5.4	1.9
4. Oil Seeds:				
Soybean	3.7	5.5	0.1	2.9 1/
Peanuts	-	-	-	-3.7 1/
African Palm	-	-	-	-2.1 1/
Sesame	2.2	0.3	-3.6	-0.6
5. Stimulants:				
Cacao	0.9	-2.5	0.9	-0.2
Tobacco	-2.2	2.9	-2.1	-0.6
Coffee	3.2	-2.4	2.2 2/	1.0 3/
6. Others:				
Fibre Cotton	-2.8	7.1	-1.7	0.6
Seed Cotton	-2.1	9.5	-3.0	1.0
Beans	2.7	3.6	1.1	2.4
Bananas	-0.7	0.9	7.9	3.0
Sisal Hemp	-	-	-	1.6 1/

1/ Refers to the period 1971-1976

2/ Refers to the period 1970-1975

3/ Refers to the period 1960-1975

Source: Calculations based on the data in Chart No: VI-16.

Chart No. VI-20

Colombia: Physical Production of the Agricultural Products, 1960-1976

(In thousands of Tons)

PRODUCTS	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Rice	450.0	474.0	585.0	550.0	600.0	672.0	680.0	662.0	786.0	695.0	702.0	852.0	998.0	1.515.0	1.540.0	1.614.0	1.560.0
Oats (grain)	-	-	-	-	-	-	-	-	-	-	-	0.7	0.7	0.8	0.8	0.8	0.6
Barley	106.0	101.0	108.0	118.0	110.0	90.0	95.0	95.0	85.0	75.0	87.0	107.0	98.0	82.0	97.0	122.0	71.0
Maize	866.0	758.0	754.0	782.0	988.0	871.0	850.0	850.0	800.0	940.0	876.0	818.5	806.2	739.1	791.5	722.6	883.7
Sorghum	10.0	15.0	24.0	33.0	55.0	65.0	60.0	90.0	100.0	100.0	118.0	240.0	210.0	280.0	337.0	335.0	426.0
Wheat	142.0	142.0	162.0	90.0	85.0	110.0	125.0	80.0	125.0	80.0	53.7	53.2	69.2	72.4	58.8	38.9	45.3
Sub-Total Cereals	1.574.0	1.490.0	1.633.0	1.573.0	1.838.0	1.808.0	1.810.0	1.777.0	1.896.0	1.890.0	1.836.7	1.071.4	2.182.1	2.689.3	2.825.1	2.833.3	2.986.6
Potatoe	653.0	551.0	872.0	572.0	867.0	762.0	760.0	800.0	950.0	850.0	913.0	869.0	823.0	1.031.0	1.012.0	1.320.0	1.516.0
Plantains	1.255.0	1.275.0	1.292.0	1.309.0	1.346.0	1.384.0	1.423.0	1.590.0	1.600.0	1.640.0	1.690.0	1.517.0	1.562.0	1.653.0	1.679.0	1.792.0	1.808.0
Cassava	580.0	650.0	780.0	800.0	700.0	800.0	840.0	850.0	900.0	1.000.0	1.200.0	1.990.4	2.008.0	1.998.0	2.125.9	2.021.1	1.926.0
Yam	117.1	118.2	122.7	126.0	129.5	133.2	139.0	144.0	-	-	-	63.1	70.4	69.8	73.8	73.2	85.1
Sub-Total Starchy Crops	2.605.1	2.594.2	3.066.7	2.807.0	3.042.5	3.079.2	3.162.0	3.384.0	3.450.0	3.490.0	3.803.0	4.439.5	4.463.4	4.751.8	4.890.7	5.206.3	5.335.1
Sugar Cane	3.298.0	3.685.0	4.016.0	3.737.0	4.309.0	4.749.0	4.651.0	5.792.0	6.440.0	6.883.0	6.015.0	7.157.0	7.449.0	7.653.0	7.452.0	-	-
"Panela" sugar cane	7.125.0	9.675.0	8.750.0	8.125.0	7.250.0	7.000.0	8.125.0	8.500.0	8.750.0	9.100.0	9.462.2	10.000.0	9.677.0	8.746.6	7.904.0	8.200.0	-
Sugar	328.8	326.6	401.9	368,1	427.6	485.2	537.3	596.6	663.3	708.7	672.2	744.0	823.7	809.9	894.8	969.7	945.5
"Panela"	569.0	773.0	699.0	650.0	581.0	560.0	648.0	788.0	808.0	1.004.0	737.0	785.0	886.0	880.0	795.0	753.0	1.841.0
Sub-Total Sugars	11.320.8	14.459.6	13.866.9	12.880.1	12.567.6	12.794.2	13.961.3	15.676.6	16.661.3	17.695.7	16.886.4	18.686.0	18.835.7	18.089.5	17.045.8	9.922.7	2.786.5
Soybeans	19.0	20.0	22.0	30.0	40.0	50.0	52.0	80.0	87.0	100.0	132.0	101.0	105.0	97.0	114.0	169.0	75.0
Peanuts	-	-	-	-	-	-	-	-	-	-	-	0.7	0.9	0.9	1.2	1.9	2.2
African Palm (Oil)	-	-	-	-	-	-	-	-	-	-	-	36.2	41.4	44.0	50.8	39.2	39.7
Sesame	20.0	26.0	28.0	35.0	44.0	52.0	59.0	40.0	30.0	39.0	28.0	31.4	28.3	18.1	17.2	20.7	20.3
Cotton Seed	182.0	209.0	224.0	199.0	180.0	180.0	213.0	213.0	276.0	324.0	376.0	322.0	412.0	334.0	420.0	400.9	408.6
Sub-Total Oil Seeds	221.0	255.0	274.0	264.0	264.0	282.0	324.0	333.0	393.0	463.0	536.0	491.3	587.6	494.0	603.2	631.7	545.8
Cocoa	14.0	15.0	14.0	14.0	16.0	17.0	17.0	18.0	18.0	15.0	18.0	19.0	20.0	22.0	23.0	21.0	24.0
Tobacco	25.0	28.0	38.0	42.0	41.0	40.0	44.0	42.0	42.0	44.0	42.0	39.0	36.0	40.0	41.0	58.0	54.0
Coffee	472.0	462.0	450.0	492.0	456.0	492.0	456.0	480.0	474.0	507.0	570.3	570.3	570.3	570.3	607.0	643.8	-
Sub-Total Beverages & Stim.	511.0	505.0	502.0	548.0	513.0	549.0	517.0	540.0	534.0	566.0	630.3	628.3	626.3	632.3	671.0	722.8	78.0
Beans	39.8	44.1	47.6	43.9	42.0	40.0	35.0	38.0	40.0	42.0	44.0	48.5	61.1	56.9	67.1	89.9	67.6
Cotton Fibre	67.0	78.0	82.0	73.0	65.0	65.0	87.0	101.0	139.0	128.0	118.0	112.0	145.0	116.0	146.0	139.0	142.0
Bananas	557.0	572.0	519.0	581.0	560.0	653.0	721.0	764.0	770.0	677.0	583.0	593.0	600.0	621.0	743.0	705.0	988.0
Fruits	463.6	470.0	488.4	502.0	516.0	530.7	545.8	562.3	-	-	-	304.7	320.3	349.1	392.0	375.6	430.6
Legumes	142.3	144.3	149.9	154.0	152.4	162.9	167.5	173.2	-	-	-	-	610.0	630.0	1.477.0	1.260.0	-
Sub-Total Other Crops	1.269.7	1.308.4	1.286.9	1.354.0	1.335.4	1.451.6	1.556.3	1.638.5	949.9	847.0	745.0	1.058.2	1.736.4	1.773.0	2.825.1	2.569.5	1.628.2
TOTAL CROP PRODUCTION	17.501.6	20.612.2	20.629.5	19.426.1	19.560.5	19.964.0	21.330.6	23.349.1	23.883.3	24.951.7	24.437.4	27.374.7	28.431.5	28.429.9	28.860.9	21.886.3	13.360.2

Source: Op. cit. Chart No. VI-11.

Chart . No. VI-21

Colombia. Indexes of the Physical Production of the Agricultural Products

(Percentages)

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
1. Cereals:																	
Rice	100.0	105.3	130.0	122.2	133.3	149.3	151.1	147.1	174.6	154.4	156.0	189.3	221.7	336.6	342.2	358.6	346.6
Oats	-	-	-	-	-	-	-	-	-	-	-	100.0	100.0	114.3	144.3	114.3	85.7
Barley	100.0	95.2	101.8	111.3	103.7	84.9	89.6	89.6	80.1	70.7	82.0	100.9	92.4	77.3	91.5	115.0	66.9
Maize	100.0	87.5	87.0	90.3	114.0	100.5	98.1	98.1	92.3	108.5	101.1	94.5	93.0	85.3	91.4	83.4	102.0
Sorghum	100.0	150.0	240.0	330.0	550.0	650.0	600.0	900.0	1000.0	1000.0	1180.0	2400.0	2100.0	2800.0	3370.0	3350.0	4620.0
Wheat	100.0	100.0	114.0	63.3	59.8	77.4	88.0	56.3	88.0	56.3	37.8	37.4	48.7	50.9	41.4	27.3	31.9
Sub-Total	100.0	94.6	103.7	99.9	116.7	114.8	114.9	112.9	120.4	120.0	116.6	131.6	138.6	170.8	179.4	180.0	189.7
2. Starchy Crops:																	
Potatoes	100.0	84.3	133.5	87.6	132.7	116.6	116.3	122.5	145.4	130.1	139.8	133.0	126.0	157.8	154.9	202.1	232.1
Plantains	100.0	101.5	102.9	104.3	107.2	110.2	113.3	126.6	127.4	130.6	134.6	120.8	124.4	131.7	133.7	142.7	144.0
Cassava	100.0	112.0	134.4	137.9	120.6	137.9	144.8	146.5	155.1	172.4	206.9	343.1	346.2	344.4	366.5	348.4	332.0
Yam	100.0	100.9	104.7	107.6	110.5	113.7	118.7	122.9	-	-	-	53.8	60.1	59.6	63.0	62.5	72.6
Sub-Total	100.0	99.5	117.7	107.7	116.7	118.2	121.3	129.9	132.4	133.9	145.9	170.4	171.3	182.4	187.7	199.8	204.7
3. Sugars:																	
Sugar Cane	100.0	111.7	121.7	113.3	130.6	144.0	141.0	175.6	195.2	208.7	182.3	271.0	225.8	232.0	225.9	-	-
"Panela" sugar	100.0	135.7	122.8	114.0	101.7	98.2	114.0	119.3	122.8	127.7	132.8	140.3	135.8	122.7	110.9	115.0	-
Sugar	100.0	99.3	122.2	111.9	130.0	147.5	163.4	181.4	201.7	215.5	204.4	226.2	250.5	246.3	272.1	294.9	287.5
"Panela"	100.0	135.8	122.8	114.2	102.1	98.4	113.8	138.4	142.0	176.4	129.5	137.9	155.7	154.6	139.7	132.3	323.5
Sub-Total	100.0	127.7	122.4	113.7	111.0	113.0	123.3	138.4	147.1	156.3	149.1	165.0	166.3	159.7	150.5	87.6	24.6
4. Oil Seeds:																	
Soybeans	100.0	105.2	115.7	157.8	210.5	263.1	273.6	421.0	457.8	526.3	694.7	531.5	552.6	510.5	600.0	889.4	394.7
Peanuts	-	-	-	-	-	-	-	-	-	-	-	100.0	128.6	128.6	171.4	271.4	314.3
African Palm	-	-	-	-	-	-	-	-	-	-	-	100.0	114.4	121.6	140.3	108.3	109.7
Sesame	100.0	130.0	140.0	175.0	220.0	260.0	295.0	200.0	150.0	195.0	140.0	157.0	141.5	90.5	86.0	103.5	101.5
Seed Cotton	100.0	114.8	123.0	109.3	98.9	98.9	117.0	117.0	151.6	178.0	206.5	176.9	226.3	183.5	230.7	220.2	224.5
5. Stimulants:																	
Cacao	100.0	107.1	100.0	100.0	114.2	121.4	121.4	128.5	128.5	107.1	128.5	135.7	142.8	157.1	164.2	150.0	171.4
Tobacco	100.0	112.0	152.0	168.0	164.0	160.0	176.0	168.0	168.0	176.0	168.0	156.0	144.0	160.0	164.0	232.0	216.0
Coffee	100.0	97.8	95.3	104.2	96.6	104.2	96.6	101.6	100.4	107.4	120.8	120.8	120.8	120.8	128.6	136.4	-
Sub-Total	100.0	98.8	98.2	107.2	100.3	107.4	101.1	105.6	104.5	110.7	123.3	122.9	122.5	123.7	131.3	141.4	15.2
6. Others:																	
Beans	100.0	110.8	119.6	110.3	105.5	100.5	87.9	95.4	100.5	105.5	110.5	121.8	153.5	142.9	168.5	225.8	169.8
Bananas	100.0	102.6	93.1	104.3	100.5	117.2	129.4	137.1	138.2	121.5	104.6	106.4	107.7	111.4	133.3	126.5	177.3
Cotton Fibre	100.0	116.4	122.3	108.9	97.0	97.0	129.8	150.7	207.4	191.0	176.1	167.1	216.4	173.1	217.9	207.4	211.9
Fruits	100.0	101.3	105.3	108.2	111.3	114.4	117.7	121.2	-	-	-	65.7	69.0	75.3	84.5	81.0	92.8
Legumes	100.0	101.4	105.3	108.2	107.1	114.4	117.7	121.7	-	-	-	-	428.6	442.7	1037.9	885.4	-
Sub-Total	100.0	103.0	101.3	106.6	105.1	114.3	122.5	129.0	74.7	66.7	58.6	83.3	136.7	139.6	222.5	202.3	128.2
TOTAL	100.0	117.7	117.8	111.0	111.7	114.0	121.8	133.4	136.4	142.5	139.6	156.4	162.4	162.4	164.9	125.0	76.3

Source: Calculations based on data in Chart VI-20.

Chart . VI-22

Colombia. Annual Percentage Variation in the Physical Production of Agricultural Products

	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
1. Cereals:																
Rice	5.33	23.42	-5.98	9.09	12.00	1.19	-2.65	18.73	-11.58	1.01	21.37	17.14	51.80	1.65	4.81	-3.35
Oats	-	-	-	-	-	-	-	-	-	-	-	0.00	14.29	0.00	0.00	-25.00
Barley	-4.72	6.93	9.26	-6.78	-18.18	5.56	0.00	-10.53	-11.76	16.00	22.99	-8.41	-16.33	18.29	25.77	-41.80
Maize	-12.47	-0.53	3.71	26.34	-11.84	-2.41	0.00	-5.88	17.50	-6.81	-6.56	-1.50	-8.32	7.09	-8.70	22.29
Sorghum	50.00	60.00	37.50	66.67	18.18	-7.69	50.00	11.11		18.00	103.39	-12.50	33.33	20.36	-0.59	27.16
Wheat		14.08	-44.44	-5.56	29.41	13.64	-36.00	56.25	-36.00	-32.88	-0.93	30.08	4.62	-18.78	-33.84	16.45
Sub-Total	-5.3	9.6	-3.6	16.8	-1.6	0.1	-1.8	6.7	-0.3	-2.8	12.7	5.3	23.2	5.0	0.2	5.4
2. Starchy Crops:																
Potatoes	-15.62	58.26	-34.40	51.57	-12.11	-0.26	5.26	18.75	-10.53	7.41	-4.82	-5.29	25.27	-1.84	30.43	14.85
Plantains	1.59	1.33	1.32	2.83	2.82	2.82	11.74	0.63	2.50	3.05	-10.24	2.97	5.83	1.57	6.73	0.89
Cassava	12.07	20.00	2.56	-12.50	14.29	5.00	1.19	5.88	11.11	20.00	65.87	0.88	-0.50	6.40	-4.93	-4.71
Yams	0.94	3.81	2.69	2.78	2.86	4.35	3.60	-18.64	-18.64	-18.64	-18.64	11.57	-0.85	5.73	-0.81	16.26
Sub-Total	-0.4	18.2	-8.4	8.3	1.2	2.6	7.0	1.9	1.1	8.9	16.7	0.5	6.4	2.9	6.4	2.4
3. Sugars:																
Sugar Cane	11.73	8.98	-6.95	15.31	10.21	-2.06	24.53	11.19	6.88	-12.61	18.99	4.08	2.74	-2.63	-	-
"Panela" cone	35.79	-9.56	-7.14	-10.77	-3.45	16.07	4.62	2.94	4.00	3.98	5.68	-3.23	-9.61	-9.63	3.74	-
Sugar	-0.67	23.06	-8.41	16.16	13.47	10.74	11.04	11.18	6.84	-5.15	10.68	10.71	1.68	10.48	8.37	-2.50
"Panela"	35.85	-9.57	-7.01	-10.62	-3.61	15.71	21.60	2.54	24.26	-26.59	6.51	12.87	-0.68	-9.66	-5.28	144.49
Sub-Total	27.7	-4.1	-7.1	-2.4	1.8	9.1	12.2	6.2	6.2	-4.5	10.6	0.8	-3.9	-5.7	-41.7	-71.9
4. Oil Seeds:																
Soybeans	5.26	10.00	36.36	33.33	25.00	4.00	53.85	8.75	14.94	32.00	-23.48	3.96	-7.62	17.53	48.25	-55.62
Peanuts	-	-	-	-	-	-	-	-	-	-	-	28.57	0.00	33.33	58.33	15.79
African Palm	-	-	-	-	-	-	-	-	-	-	-	14.36	6.28	15.45	-22.83	1.28
Sesame	30.00	7.69	25.00	25.71	18.18	13.46	-32.20	-25.00	30.00	-28.21	12.14	-9.87	-36.04	-4.97	20.35	-1.93
Seed Cotton	14.84	7.18	-11.16	-9.55	0.00	18.33	0.00	29.58	17.39	16.05	-14.36	27.95	-18.93	25.75	-4.55	1.92
Sub-Total	15.3	7.4	-3.6	0.0	6.8	14.8	2.7	18.0	17.8	15.7	-8.3	19.6	15.9	22.1	4.7	13.6
5. Stimulants:																
Cacao	7.14	-6.67	0.00	14.29	6.25	0.00	5.88	-	-16.67	20.00	5.56	5.26	10.00	4.55	-8.70	14.29
Tobacco	12.00	35.71	10.53	-2.38	-2.44	10.00	-4.55	0.00	4.76	-4.55	-7.14	-7.69	11.11	2.50	41.46	-6.90
Coffee	-2.12	-2.60	9.33	-7.32	7.89	-7.32	5.26	-1.25	6.96	12.49	0.00	0.00	0.00	6.44	6.06	-
Sub-Total	-1.1	-0.5	9.1	-6.3	7.0	-5.8	4.4	-1.1	5.9	11.3	-0.3	-0.3	0.9	6.1	7.7	-89.2
6. Others:																
Beans	10.80	7.94	-7.77	-4.33	-4.76	-12.50	8.57	5.26	5.00	4.76	10.23	25.98	-6.87	17.93	33.98	-24.81
Bananas	2.69	-9.27	11.95	-3.61	16.61	10.41	5.96	0.79	-12.08	-13.88	1.72	1.18	3.50	19.65	-5.11	40.14
Cotton Fibre	16.42	5.13	-10.98	-10.96	0.00	33.85	16.09	37.62	-7.91	-7.81	-5.08	29.46	-20.00	25.86	-4.79	2.16
Fruits	1.38	3.91	2.78	2.79	2.85	2.85	3.02	-	-	-	-14.20 1/	5.12	8.99	12.29	-4.18	14.64
Legumes	1.41	3.88	2.80	-1.10	6.89	2.82	3.40	-	-	-	-	28.63 2/	3.28	134.44	-14.69	-
Sub-Total	3.0	-1.6	5.2	-1.3	8.7	7.2	5.2	-42.0	-10.7	-12.0	42.0	64.0	2.1	59.3	9.0	-36.6
TOTAL	17.7	0.0	-5.8	0.6	2.0	6.8	9.4	2.2	4.4	-2.0	12.0	3.8	0.0	1.5	-24.1	-38.9

Note: 1/ This variation refers to the period 1967-1971.

2/ This variation refers to the period 1967-1972.

Chart No. VI-23

Colombia. Percentage Participation of Each Product or Group of Products in the Total Physical Crop Production

1960-1976

PRODUCTS \ YEAR	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Rice	2.57	2.30	2.84	2.83	3.07	3.37	3.19	2.84	3.29	2.79	2.87	3.11	3.51	5.33	5.34	7.37	11.68
Oats (Grain)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Barley	0.61	0.49	0.52	0.61	0.56	0.45	0.45	0.41	0.36	0.30	0.36	0.39	0.34	0.29	0.34	0.56	0.53
Maize	4.95	3.68	3.65	4.03	5.05	4.36	3.98	3.64	3.35	3.77	3.58	2.99	2.84	2.60	2.74	3.30	6.61
Sorghum	0.06	0.07	0.12	0.17	0.28	0.33	0.28	0.39	0.42	0.40	0.48	0.88	0.74	0.98	1.17	1.53	3.19
Wheat	0.81	0.69	0.79	0.46	0.43	0.55	0.59	0.34	0.52	0.32	0.22	0.19	0.24	0.25	0.20	0.18	0.34
Sub-Total Cereals	8.99	7.23	7.92	8.10	9.40	9.06	8.49	7.61	7.94	7.57	7.52	7.57	7.67	9.46	9.79	12.95	22.35
Potatoes	3.73	2.67	4.23	2.94	4.43	3.82	3.56	3.43	3.98	3.41	3.74	3.17	2.89	3.63	3.51	6.03	11.35
Plantains	7.17	6.19	6.26	6.74	6.88	6.93	6.67	6.81	6.70	6.57	6.92	5.54	5.49	5.81	5.82	8.19	13.53
Cassava	3.31	3.15	3.78	4.12	3.58	4.01	3.94	3.64	3.77	4.01	4.91	7.27	7.06	7.03	7.37	9.23	14.42
Yam	0.67	0.57	0.59	0.65	0.66	0.67	0.65	0.62	-	-	-	0.23	0.25	0.25	0.26	0.33	0.64
Sub-Total Starchy Crops	14.88	12.59	14.87	14.45	15.55	15.42	14.82	14.49	14.45	13.99	15.56	16.22	15.70	17.71	16.95	23.79	39.93
Sugar Cane	18.84	17.88	19.47	19.24	22.03	23.79	21.80	24.81	26.96	27.59	24.61	26.14	26.20	26.92	25.82	-	-
"Panela" cane	40.71	46.94	42.41	41.83	37.06	35.06	38.09	36.40	36.64	36.47	38.72	36.53	34.04	30.77	27.39	37.47	-
Sugar	1.88	1.58	1.95	1.89	2.19	2.43	2.52	2.56	2.78	2.84	2.75	2.72	2.90	2.85	3.10	4.43	7.08
"Panela" sugar	3.25	3.75	3.39	3.35	2.97	2.81	3.04	3.37	3.38	4.02	3.02	2.87	3.12	3.10	2.75	3.44	13.78
Sub-Total Sugars	64.68	70.15	67.22	66.30	64.25	64.09	65.45	67.14	69.76	70.92	69.10	68.26	66.25	63.63	59.06	45.34	20.86
Soybeans	0.11	0.10	0.11	0.15	0.20	0.25	0.24	0.34	0.36	0.40	0.54	0.37	0.37	0.34	0.39	0.77	0.56
Peanuts	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.01	0.02
African Palm (Oil)	-	-	-	-	-	-	-	-	-	-	-	0.13	0.15	0.15	0.18	0.18	0.30
Sesame	0.11	0.13	0.14	0.18	0.22	0.26	0.28	0.17	0.13	0.16	0.11	0.11	0.10	0.06	0.06	0.09	0.15
Cotton Seed	1.04	1.01	1.09	1.02	0.92	0.90	1.00	0.91	1.16	1.30	1.54	1.18	1.45	1.17	1.46	1.83	3.06
Sub-Total Oil Seeds	1.16	1.24	1.33	1.36	1.35	1.41	1.52	1.43	1.65	1.86	2.19	1.79	2.07	1.74	2.09	2.89	4.09
Cacao	0.08	0.07	0.07	0.07	0.08	0.09	0.08	0.08	0.08	0.06	0.07	0.07	0.07	0.08	0.08	0.10	0.18
Tobacco	0.14	0.14	0.18	0.22	0.21	0.20	0.21	0.18	0.18	0.18	0.17	0.14	0.13	0.14	0.14	0.27	0.40
Coffee	2.70	2.24	2.18	2.53	2.33	2.46	2.14	2.06	1.98	2.03	2.33	2.08	2.01	2.01	2.10	2.94	-
Sub-Total Beverages & Stimulants	2.92	2.45	2.43	2.82	2.62	2.75	2.42	2.31	2.24	2.27	2.58	2.30	2.20	2.22	2.32	3.30	0.58
Beans	0.38	0.38	0.40	0.38	0.33	0.33	0.41	0.43	0.58	0.51	0.48	0.41	0.51	0.41	0.51	0.64	1.06
Cotton Fibre	0.23	0.21	0.23	0.23	0.21	0.20	0.16	0.16	0.17	0.17	0.18	0.18	0.21	0.20	0.23	0.41	0.51
Bananas	3.18	2.78	2.52	2.99	2.86	3.27	3.38	3.27	3.22	2.71	2.39	2.17	2.11	2.18	2.57	3.22	7.40
Fruits	2.65	2.28	2.37	2.58	2.64	2.66	2.56	2.41	-	-	-	1.11	1.13	1.23	1.36	1.72	3.22
Legumes	0.81	0.70	0.73	0.79	0.78	0.82	0.79	0.74	-	-	-	-	2.15	2.22	5.12	5.76	-
Sub-Total	7.25	6.35	6.24	6.97	6.83	7.27	7.30	7.02	3.97	3.39	3.05	3.87	6.11	6.24	9.79	11.74	12.19
TOTAL CROP PRODUCTION	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: Calculations based on data in Chart No. VI-20.

Chart No. VI-24

Colombia. Percentage Participation of Each Product within the Total Physical Production of Each Group of Products

1960-1976

PRODUCTS \ YEAR	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Rice	28.59	31.81	35.82	34.97	32.64	37.17	37.57	37.25	41.46	36.77	38.22	41.13	45.74	56.33	54.51	56.97	52.23
Oats (Grain)	-	-	-	-	-	-	-	-	-	-	-	0.03	0.03	0.03	0.03	0.03	0.02
Barley	6.73	6.78	6.61	7.50	5.98	4.98	5.25	5.35	4.48	3.97	4.74	5.17	4.49	3.05	3.43	4.31	2.38
Maize	55.02	50.87	46.17	49.71	53.75	48.17	46.96	47.83	42.19	49.74	47.69	39.51	36.95	27.48	28.02	25.50	29.59
Sorghum	0.64	1.01	1.47	2.10	2.99	3.60	3.31	5.06	5.06	5.29	6.42	11.59	9.62	10.41	11.93	11.82	14.26
Wheat	9.02	9.53	9.92	5.72	4.62	6.08	6.91	4.50	4.50	4.23	2.92	2.57	3.17	2.69	2.08	1.37	1.52
Sub-Total Cereals	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Potatoes	25.07	21.24	28.43	20.38	28.50	24.75	24.04	23.64	27.54	24.36	24.01	19.57	18.44	21.70	20.69	25.35	28.42
Plantains	48.17	49.15	42.13	46.63	44.24	44.95	45.00	46.99	46.38	46.99	44.44	34.17	35.00	34.79	34.33	34.42	33.89
Cassava	22.26	25.06	25.43	28.50	23.01	25.98	26.57	25.12	26.09	28.65	31.55	44.83	44.99	42.05	43.47	38.82	36.10
Yam	4.50	4.56	4.00	4.49	4.26	4.33	4.40	4.26	-	-	-	1.42	1.58	1.47	1.51	1.41	1.60
Sub-Total Starchy Crops	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Sugar Cane	29.13	25.48	28.96	29.01	34.29	37.12	33.31	36.95	38.65	38.90	35.62	38.30	39.55	42.31	43.72	-	-
"Panela" sugar cane	62.94	66.91	63.10	63.08	57.69	54.71	58.20	54.22	52.52	51.42	56.03	53.52	51.38	48.35	46.37	82.64	-
Sugar	2.90	2.26	2.90	2.86	3.40	3.79	3.85	3.81	3.98	4.00	3.98	3.98	4.37	4.48	5.25	9.77	33.93
"Panela"	5.03	5.35	5.04	5.05	4.62	4.38	4.64	5.03	4.85	5.67	4.36	4.20	4.70	4.86	4.66	7.59	66.07
Sub-Total Sugars	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Soybeans	8.60	7.84	8.03	11.36	15.15	17.73	16.05	24.02	22.14	21.60	24.63	20.56	17.87	19.64	18.90	26.75	13.74
Peanuts	-	-	-	-	-	-	-	-	-	-	-	0.14	0.15	0.18	0.20	0.30	0.40
African Palm (Oil)	-	-	-	-	-	-	-	-	-	-	-	7.37	7.05	8.91	8.42	6.21	7.27
Sesame	9.05	10.20	10.22	13.26	16.67	18.44	18.21	12.01	7.63	8.42	5.22	6.39	4.82	3.66	2.85	3.28	3.72
Cotton Seed	82.35	81.96	81.75	75.38	68.18	63.83	65.74	63.96	70.23	69.98	70.15	65.54	70.12	67.61	69.63	63.46	74.86
Sub-Total Oil Seeds	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Cocao	2.74	2.97	2.79	2.55	3.12	3.10	3.29	3.33	3.37	2.65	2.86	3.02	3.19	3.48	3.43	2.91	30.77
Tobacco	4.89	5.54	7.57	7.66	7.99	7.29	8.51	7.78	7.87	7.77	6.66	6.21	5.75	6.33	6.11	8.02	69.23
Coffee	92.37	91.49	89.64	89.78	88.89	89.62	88.20	88.89	88.76	89.58	90.48	90.77	91.06	90.19	90.46	89.07	-
Sub-Total Beverages & Stimul.	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Beans	5.28	5.96	6.37	5.39	4.87	4.48	5.59	6.16	14.65	15.11	15.84	10.58	8.35	6.54	5.17	5.41	8.72
Cotton Fibre	3.13	3.37	3.70	3.24	3.15	2.76	2.25	2.32	4.21	4.96	5.91	4.58	3.52	3.21	2.38	3.50	4.15
Bananas	43.87	43.87	40.33	42.91	41.94	44.98	46.33	46.63	81.14	79.93	78.26	54.04	34.55	35.03	26.30	27.44	60.68
Fruits	36.51	35.92	37.95	37.08	38.64	36.56	35.07	34.32	-	-	-	28.79	18.45	19.69	13.88	14.62	26.45
Legumes	11.21	11.03	11.65	11.38	11.41	11.22	10.76	10.57	-	-	-	-	35.13	35.53	52.28	49.04	-
Sub-Total Other Crops	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: Calculations based on data in Chart No. VI-20.

Chart No. VI-25

Colombia. Total and Five Years Growth Rates of the Physical Production of Agricultural Products

1960-1976

PRODUCTS \ PERIOD	1960-65	1965-70	1970-76	1960-1976
1. Cereals:				
Rice	8.35	0.87	14.23	8.07
Oats	-	-	-	-3.03 1/
Barley	-3.21	-0.67	-3.33	-2.47
Maize	0.11	0.11	9.14	0.12
Sorghum	45.40	12.66	23.85	26.42
Wheat	-4.97	-13.36	-2.79	-6.89
Sub-Total	2.81	0.31	8.44	4.08
2. Starchy Crops:				
Potato	3.13	3.68	8.81	5.40
Plaintain	1.97	4.07	1.13	2.30
Cassava	6.64	8.44	8.20	7.78
Yam	2.60	3.97 2/	6.16 1/	-1.97
Sub-Total	3.40	4.31	5.80	4.58
3. Sugars:				
Sugar Cane	7.56	4.83	5.50 3/	5.99 4/
"Panela" (Sugar Cane)	-0.35	6.21	-2.82 5/	0.94 6/
Sugar	8.09	6.73	5.85	6.82
"Panela"	-0.31	5.64	16.48	7.61
Sub-Total	2.47	5.70	-25.93	-8.38
4. Oils Seeds:				
Soyabean	21.35	21.42	-8.99	8.96
Peanut	-	-	-	25.73 1/
African Palm	-	-	-	1.86 1/
Sesame	21.05	-11.64	-5.21	0.09
Seed Cotton	-0.22	15.87	1.39	5.18
Sub-Total	4.99	13.70	0.30	5.81
5. Stimulants:				
Cocoa	3.95	1.14	4.91	3.42
Tobacco	9.85	0.98	4.27	4.93
Coffee	0.83	2.99	2.45 5/	2.09 6/
Sub-Total	1.44	2.80	-29.40	-11.08
6. Others:				
Beans	0.10	1.92	7.41	3.36
Bananas	3.23	-2.24	9.18	3.64
Cotton Fiber	-0.60	12.66	3.13	4.80
Fruit	2.74	2.93 2/	7.16 1/	-0.46
Vegetables	2.74	3.11 2/	27.35 1/	15.64
Sub-Total	2.71	-12.48	13.91	1.56
TOTAL	2.66	4.12	-9.57	-1.67

1/ Refers to period 1971-76

2/ Refers to period 1965-67

Chart No. VI-26

Colombia. Value of the Agricultural Crop Production 1960-1976

(In thousands of current pesos)

Year / ct	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
	397.350.0	452.196.0	537.615.0	627.600.0	808.200.0	1.144.410.0	1.281.120.0	1.267.060.0	1.655.310.0	1.311.460.0	1.298.700.0	1.645.210.0	1.880.230.0	3.808.710.0	5.688.660.0	6.315.580.0	6.405.360.0
	-	-	-	-	-	-	-	-	-	-	-	-	-	1.760.0	2.160.0	3.900.0	3.700.0
	66.144.0	64.337.0	69.336.0	97.704.0	98.780.0	89.910.0	121.980.0	121.030.0	126.650.0	120.000.0	138.504.0	201.695.0	201.586.0	247.476.0	354.147.0	660.386.0	444.886.0
	410.484.0	476.782.0	396.604.0	620.908.0	1.027.520.0	786.513.0	938.400.0	1.022.550.0	1.035.200.0	1.239.860.0	1.305.240.0	1.388.170.0	1.749.450.0	2.460.130.0	2.662.600.0	2.964.820.0	4.288.590.0
m	-	-	16.800.0	26.400.0	45.155.0	55.705.0	53.760.0	81.000.0	136.300.0	124.300.0	157.648.0	330.720.0	432.390.0	778.400.0	1.069.970.0	1.205.660.0	1.750.000.0
	124.960.0	138.450.0	155.034.0	94.680.0	118.490.0	167.750.0	219.375.0	140.480.0	244.500.0	164.720.0	130.802.0	102.835.0	173.968.0	202.358.0	264.364.0	251.527.0	290.554.0
-Total Cereals	998.938.0	1.131.760.0	1.175.380.0	1.467.290.0	2.098.140.0	2.244.280.0	2.614.630.0	2.632.120.0	3.197.960.0	2.960.340.0	3.003.880.0	3.668.620.0	4.437.610.0	7.498.820.0	10.041.800.0	11.401.800.0	13.183.000.0
e																	
in	228.550.0	277.704.0	253.752.0	417.560.0	913.818.0	466.344.0	747.080.0	700.800.0	780.900.0	1.069.300.0	992.431.0	950.498.0	1.190.880.0	5.703.490.0	2.241.580.0	5.335.440.0	4.478.260.0
a	281.120.0	388.875.0	475.456.0	600.831.0	904.512.0	966.032.0	1.139.820.0	1.187.730.0	1.195.200.0	1.098.800.0	1.287.780.0	1.567.060.0	1.918.130.0	2.251.380.0	3.178.340.0	5.101.820.0	6.082.110.0
	175.740.0	245.700.0	263.640.0	318.400.0	528.500.0	526.400.0	580.440.0	526.400.0	859.520.0	891.000.0	1.069.200.0	2.708.930.0	2.945.730.0	2.635.360.0	4.579.320.0	6.572.290.0	6.045.710.0
	-	-	-	-	-	-	-	-	-	-	-	-	-	182.597.0	178.448.0	243.975.0	281.766.0
-Total Starchy Crops	685.410.0	912.279.0	992.848.0	1.336.790.0	2.346.830.0	1.958.770.0	2.467.340.0	2.564.280.0	2.835.620.0	3.059.100.0	3.349.410.0	5.181.480.0	6.054.740.0	10.772.700.0	10.177.600.0	17.253.300.0	16.887.700.0
a" Sugar	98.940.0	121.605.0	148.592.0	167.642.0	287.755.0	299.045.0	326.542.0	362.000.0	476.500.0	578.172.0	610.479.0	769.596.0	920.112.0	-	-	-	-
	223.440.0	291.421.0	378.159.0	645.450.0	657.140.0	495.600.0	649.944.0	672.952.0	910.616.0	1.428.690.0	1.095.910.0	1.086.440.0	1.987.290.0	2.814.240.0	2.524.120.0	2.710.040.0	7.562.820.0
-Total Sugars	322.380.0	413.026.0	526.751.0	813.092.0	944.895.0	794.645.0	976.486.0	1.034.950.0	1.387.110.0	2.006.860.0	1.706.380.0	1.856.030.0	2.907.400.0	2.814.240.0	2.524.120.0	2.710.040.0	7.562.820.0
on	15.200.0	17.000.0	19.800.0	36.000.0	64.000.0	85.000.0	96.200.0	154.400.0	188.529.0	239.700.0	388.740.0	308.050.0	336.210.0	421.562.0	691.638.0	1.172.180.0	603.900.0
s	-	-	-	-	-	-	-	-	-	-	-	-	-	3.213.0	5.313.0	14.250.0	18.260.0
n Palm	-	-	-	-	-	-	-	-	-	-	-	-	-	427.328.0	740.765.0	612.304.0	683.038.0
e	30.380.0	42.042.0	63.000.0	85.750.0	125.400.0	170.716.0	217.238.0	157.360.0	14.540.0	170.547.0	134.372.0	153.860.0	147.698.0	110.555.0	177.315.0	239.685.0	271.411.0
	314.132.0	366.377.0	413.056.0	444.964.0	462.060.0	637.080.0	756.150.0	783.414.0	1.057.080.0	1.252.580.0	1.473.920.0	1.511.080.0	2.107.470.0	2.948.910.0	3.937.790.0	4.120.030.0	6.894.300.0
-Total Oil Seeds	359.712.0	425.419.0	495.856.0	566.714.0	651.460.0	886.796.0	1.069.580.0	1.095.170.0	1.360.140.0	1.662.820.0	1.997.030.0	1.972.990.0	2.591.370.0	3.911.560.0	5.552.810.0	6.150.440.0	8.470.900.0
co	80.528.0	82.200.0	78.050.0	92.246.0	112.848.0	122.043.0	134.946.0	148.932.0	171.072.0	193.920.0	263.016.0	264.556.0	288.180.0	423.589.0	565.915.0	616.812.0	889.104.0
	49.725.0	56.252.0	102.828.0	126.000.0	166.747.0	194.320.0	266.640.0	230.496.0	243.642.0	252.208.0	247.632.0	233.413.0	298.800.0	609.800.0	673.056.0	1.154.200.0	1.088.800.0
	1.465.560.0	1.515.820.0	1.444.050.0	1.951.270.0	2.275.440.0	2.461.960.0	2.675.350.0	2.918.400.0	3.200.920.0	3.794.580.0	5.637.410.0	5.484.570.0	6.701.590.0	8.540.240.0	10.446.400.0	13.707.100.0	-
-Total Stimulants	1.595.810.0	1.654.270.0	1.624.920.0	2.169.510.0	2.555.030.0	2.778.320.0	3.076.930.0	3.297.820.0	3.615.630.0	4.240.700.0	6.148.050.0	6.032.530.0	7.288.570.0	9.573.620.0	11.685.300.0	15.478.100.0	1.977.900.0
	79.600.0	122.465.0	95.485.0	106.194.0	174.342.0	139.080.0	128.170.0	170.772.0	209.200.0	209.748.0	210.056.0	400.513.0	504.136.0	523.935.0	913.097.0	1.667.100.0	1.388.570.0
s	170.442.0	185.900.0	188.916.0	246.925.0	323.680.0	426.409.0	491.722.0	572.236.0	544.390.0	513.166.0	527.615.0	571.652.0	600.000.00	1.051.180.0	1.473.360.0	1.857.670.0	2.963.010.0
-Total Other Crops	250.042.0	308.365.0	284.401.0	353.119.0	498.022.0	565.489.0	619.892.0	743.008.0	753.590.0	722.914.0	737.671.0	972.165.0	1.104.130.0	1.575.110.0	2.386.450.0	3.524.770.0	4.351.580.0

rce: Calculations based on Chart No. VI-20 on the current prices for the producer supplied by DANE and Chart VI-20.

Chart No. VI-27

Colombia. Indexes of the Value of Agricultural Production, 1960-1976

(Based on current values)

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
1. Cereals:																	
Rice	100.0	113.8	135.3	157.9	203.4	288.0	322.4	318.8	416.5	330.0	326.8	414.0	473.1	958.5	1.431.6	1.589.4	1.612.0
Oats	-	-	-	-	-	-	-	-	-	-	-	-	-	100.0	122.7	221.6	210.2
Barley	100.0	97.2	104.8	147.7	149.3	135.9	184.4	182.9	191.4	181.4	209.4	304.9	304.7	374.1	535.4	998.4	672.6
Maize	100.0	116.1	96.6	151.2	250.3	191.6	228.6	249.1	252.1	302.0	317.9	338.1	426.1	599.3	648.6	722.2	1.044.7
Sorghum	-	-	100.0	157.1	268.7	331.5	320.0	482.1	811.3	739.9	938.3	1.968.5	2.573.7	4.633.3	6.368.8	7.176.5	10.416.6
Wheat	100.0	110.8	124.0	75.7	94.8	134.2	175.5	112.4	195.6	131.8	83.0	82.2	139.2	161.9	211.5	201.2	232.5
Sub-Total	100.0	113.3	117.6	146.8	210.0	224.6	261.7	263.4	320.1	296.3	300.7	367.2	444.2	750.6	1.005.2	1.141.3	1.319.7
2. Starchy Crops:																	
Potatoe	100.0	121.5	111.0	182.7	399.8	204.0	326.8	306.6	341.6	467.8	434.2	396.1	521.0	2.495.5	980.7	2.334.4	1.959.4
Plantains	100.0	138.3	169.1	213.7	321.7	343.6	405.4	422.5	425.1	390.8	458.0	557.4	682.3	800.8	1.130.5	1.814.8	2.163.5
Cassava	100.0	139.8	150.0	181.1	300.7	299.5	330.2	384.5	489.0	507.0	608.4	1.541.4	1.676.1	1.499.5	2.605.7	3.739.7	3.440.1
Yam	-	-	-	-	-	-	-	-	-	-	-	-	-	100.0	97.7	133.6	154.3
Sub-Total	100.0	133.1	144.8	195.0	342.4	285.7	359.9	374.1	413.7	446.3	488.6	755.9	883.3	1.571.7	1.484.8	2.517.2	2.463.8
3. Sugars:																	
Sugar	100.0	122.9	150.1	169.4	290.8	302.2	330.0	365.8	481.6	584.3	617.0	777.8	929.9	-	-	-	-
"Panela" sugar	100.0	130.4	169.2	288.8	294.1	221.8	290.8	301.1	407.5	639.4	490.4	486.2	889.4	1.259.5	1.129.6	1.212.8	3.384.7
Sub-Total	100.0	133.1	144.8	195.0	342.4	285.7	359.9	374.1	413.7	446.3	488.6	755.9	883.3	1.571.7	1.484.8	2.517.2	2.463.8
4. Oil Seeds:																	
Soybeans	100.0	111.8	130.2	236.8	421.0	559.2	632.8	1.015.7	1.240.3	1.576.9	2.557.5	2.026.6	2.211.9	2.773.4	4.550.2	7.711.7	3.973.0
Peanuts	-	-	-	-	-	-	-	-	-	-	-	-	-	100.0	165.3	443.5	568.3
African Palm	-	-	-	-	-	-	-	-	-	-	-	-	-	100.0	173.3	143.2	159.8
Sesame	100.0	138.3	207.3	282.2	412.7	561.9	715.0	517.9	377.0	561.3	442.3	486.1	486.1	363.9	583.6	788.9	893.3
Cotton	100.0	116.6	131.4	141.6	147.0	200.9	240.7	249.3	336.5	398.7	469.2	670.8	670.8	938.7	1.253.5	1.309.0	2.194.7
Sub-Total	100.0	118.2	137.8	157.5	181.1	146.5	297.3	304.4	378.1	462.2	555.1	548.4	720.4	1.087.4	1.543.6	1.709.8	2.354.9
5. Beverages and Stimulants:																	
Cacao	100.0	102.0	96.9	114.5	140.1	151.5	167.5	184.9	212.4	240.8	326.6	328.5	357.8	526.0	702.7	765.9	1.104.0
Tobacco	100.0	113.1	206.7	253.3	335.3	390.7	536.2	463.5	489.9	507.2	498.0	569.9	600.9	1.226.3	1.353.5	2.321.1	2.189.6
Coffee	100.0	103.4	98.5	133.1	155.2	167.9	182.5	199.1	218.4	258.9	384.2	374.2	457.2	582.7	712.7	935.2	-
Sub-Total	100.0	103.6	101.8	135.9	160.1	174.1	192.8	206.6	226.5	265.7	385.2	378.0	456.7	599.9	732.2	969.9	123.9
6. Others:																	
Beans	100.0	53.8	119.9	133.4	219.0	174.7	161.0	214.5	262.8	263.5	263.8	503.1	633.3	658.2	1.147.1	2.094.3	1.744.4
Bananas	100.0	109.0	110.8	144.8	189.9	250.1	288.5	335.7	319.4	301.0	309.5	335.3	352.0	616.7	864.4	1.089.9	1.738.4
Sub-Total	100.0	123.3	113.7	141.2	199.1	226.1	247.9	297.1	301.3	289.1	295.0	388.8	441.5	629.9	954.4	1.409.6	1.740.3
Total Agricultural Products	100.0	115.0	121.0	159.2	215.9	219.0	256.9	269.8	312.1	347.8	402.2	467.2	578.8	858.1	1.005.8	1.341.7	1.244.7

Source: Calculations based on the data in Chart No. VI-26.

Colombia. Value of the Production of Agricultural Products 1960-1976

(In thousands of constant pesos)

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
1. Cereals:																	
Rice	1158.4	1222.1	1361.0	1286.0	1430.4	1839.8	1799.3	1641.2	1965.9	1439.5	1298.7	1490.2	1501.7	2492.6	2917.1	2680.6	2199.6
Oats	-	-	-	-	-	-	-	-	-	-	-	-	-	1.1	1.1	1.6	1.2
Barley	192.8	173.8	175.5	200.2	174.8	144.5	171.3	156.7	150.4	131.7	138.5	182.6	161.0	161.9	181.6	280.2	152.7
Maize	1196.7	1288.6	1004.0	1272.3	1818.6	1264.4	1317.9	1324.5	1229.4	1360.9	1305.2	1257.4	1397.3	1610.0	1365.3	1258.4	1472.7
Sorghum	-	-	42.5	54.0	79.9	89.5	75.5	104.9	161.8	136.4	157.6	299.5	345.3	509.4	548.6	511.7	600.9
Wheat	364.3	374.1	392.4	194.0	209.7	269.6	308.1	181.9	290.3	180.8	103.8	93.1	138.9	132.4	135.5	106.7	99.7
Total	2912.3	3058.8	2975.6	3006.7	3713.5	3608.1	3672.2	3409.4	3798.0	3249.5	3003.8	3323.0	3544.4	4907.6	5149.3	4839.4	4527.1
2. Starchy Crops:																	
Potatoe	666.3	750.5	642.4	855.6	1617.3	749.7	1049.2	907.7	927.4	1173.7	992.4	820.1	951.1	3732.6	1149.4	2264.6	1537.8
Plantains	819.5	1051.0	1203.6	1231.2	1600.9	1553.1	1600.8	1538.5	1419.4	1206.1	1287.7	1419.4	1532.0	1473.4	1629.8	2165.4	2088.6
Cassava	512.3	664.0	667.4	652.4	935.3	846.3	815.2	875.3	1020.8	978.0	1069.2	2453.7	2352.8	1724.7	2348.2	2789.5	2076.1
Yam														119.5	91.5	103.5	96.7
Total	1998.2	2465.6	2513.5	2739.3	4153.6	3149.1	3465.3	3321.6	3667.7	3357.9	3349.4	4693.3	4836.0	7050.1	5219.0	7323.1	5799.3
3. Sugars:																	
Sugar	288.4	328.6	376.1	343.5	509.3	480.7	458.6	468.9	565.9	634.6	610.4	697.0	734.9	-	-	-	-
"Panela" sugar	651.4	787.6	957.3	1322.6	1163.0	796.7	912.8	871.6	1081.4	1568.2	1095.9	984.0	1587.2	1841.7	1294.3	1150.2	2597.1
Total	939.8	1116.2	1333.5	1666.1	1672.3	1277.5	1371.4	1340.6	1647.3	2202.9	1706.3	1681.1	2322.2	1841.7	1294.3	1150.2	2597.1
4. Oil Seeds:																	
Soybeans	44.3	45.9	50.1	73.7	113.2	136.6	135.1	200.0	223.9	263.1	388.7	279.0	268.5	275.8	354.6	497.5	207.3
Peanuts	-	-	-	-	-	-	-	-	-	-	-	-	-	2.1	2.7	6.0	6.2
African Palm	-	-	-	-	-	-	-	-	-	-	-	-	-	279.6	379.8	259.8	234.5
Sesame	88.5	113.6	159.4	175.7	221.9	274.4	305.1	203.8	136.0	187.2	134.3	139.3	117.9	72.3	90.9	101.7	93.2
Seed Cotton	915.8	990.2	1045.7	911.8	817.8	1014.5	1062.0	1014.7	1255.4	1374.9	1473.9	1368.7	1683.2	1929.9	2019.2	1745.3	2367.5
Total	1048.7	1149.7	1255.3	1161.2	1153.0	1425.7	1502.2	1418.6	1615.3	1825.2	1997.0	1787.1	2069.7	2559.9	2847.4	2610.5	2908.9
5. Beverages and Stimulants:																	
Cacao	234.7	222.1	1975.9	1890.2	1997.3	1962.1	1895.3	1929.1	2031.7	2128.6	2630.1	2396.3	230.1	277.2	290.1	261.8	305.3
Tobacco	144.9	152.0	260.3	258.1	295.1	312.4	374.4	298.5	289.3	276.8	247.6	256.7	238.6	399.0	345.1	489.8	373.9
Coffee	4272.7	4096.8	3655.8	3998.5	4027.3	3958.1	3757.5	3780.3	3801.5	4165.2	5637.4	4967.9	5352.7	5589.1	5356.8	5817.9	-
Total	4652.5	4471.0	4113.7	4445.7	4522.1	4466.7	4321.5	4271.7	4294.0	4654.9	6148.0	5464.2	5821.5	6265.4	5992.1	6569.6	679.2
6. Others:																	
Beans	232.0	330.9	241.7	217.6	308.5	223.6	180.0	221.2	248.4	230.2	210.0	362.7	402.6	342.8	468.2	707.5	476.8
Bananas	496.9	502.4	478.2	505.9	572.8	685.5	690.6	741.2	646.5	563.2	527.6	517.8	479.2	687.9	755.5	788.4	1017.5
Total	728.9	833.4	720.0	723.6	881.4	909.1	870.6	962.4	895.0	793.5	737.6	880.5	881.8	1030.8	1223.7	1496.0	1494.3
Total Production Value	12280.6	13094.8	12911.7	13742.8	16096.2	14836.4	15203.2	14724.4	15617.4	16084.1	16942.3	17829.3	19475.7	23655.6	21726.0	23989.0	18006.1

Source: Calculations based on data in Chart No. VI-26.

Note: In order to obtain the data in constant prices, it was deflacted by the price index implicit in the G.N.P. See Chart No. VI-1.

Chart No. VI-28

Colombia. Indexes of the Value of Agricultural Production

(Based on constant 1970 pesos)

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
1. Cereals:																	
Rice	100.0	105.5	117.4	111.0	123.4	158.8	155.3	141.6	169.7	142.2	112.1	128.6	129.6	215.1	251.8	231.4	189.8
Oats	-	-	-	-	-	-	-	-	-	-	-	-	-	100.0	96.2	143.7	110.3
Barley	100.0	90.1	91.0	103.8	90.6	74.9	88.8	81.3	78.0	68.3	71.8	94.7	83.5	83.9	94.1	145.3	79.2
Maize	100.0	107.6	83.9	106.3	151.9	105.6	110.1	110.6	102.7	113.7	109.0	105.0	116.7	134.5	114.0	105.1	123.0
Sorghum	-	-	100.0	127.2	187.9	210.6	177.5	246.7	380.6	320.8	370.7	704.3	812.0	1.197.8	1.290.0	1.203.2	1.413.0
Wheat	100.0	102.7	107.7	53.2	57.5	74.0	84.5	49.9	79.7	49.6	28.4	25.5	38.1	36.3	37.2	29.3	27.3
Sub-Total	100.0	105.0	102.1	103.2	127.5	123.8	126.0	117.0	130.4	111.5	103.1	114.1	121.7	168.5	176.8	166.1	155.4
2. Starchy Crops:																	
Potatoe	100.0	112.6	96.4	128.4	242.7	112.5	157.4	136.2	139.1	176.1	148.9	123.0	142.7	560.1	172.5	339.8	230.8
Plantain	100.0	128.2	146.8	150.2	195.3	189.5	195.3	187.7	173.1	147.1	157.1	173.1	186.9	179.7	198.8	264.2	254.8
Cassava	100.0	129.6	130.2	127.3	182.5	165.1	159.1	170.8	199.2	190.8	208.6	478.9	459.2	336.6	458.3	544.4	405.2
Yam	-	-	-	-	-	-	-	-	-	-	-	-	-	100.0	76.6	86.7	81.0
Sub-Total	100.0	123.3	125.7	137.0	207.8	157.5	173.4	166.2	168.5	168.0	167.6	234.8	242.0	352.8	261.1	366.4	290.2
3. Sugar:																	
Sugar	100.0	113.9	130.4	119.0	176.5	166.6	158.9	162.5	196.1	220.0	211.6	241.6	254.7	-	-	-	-
"Panela" sugar	100.0	120.9	146.9	203.0	178.5	122.3	140.1	133.8	166.0	240.7	168.2	151.0	243.6	282.7	198.6	176.5	398.6
Sub-Total	100.0	118.7	141.8	177.2	177.9	135.9	145.9	142.6	175.2	234.3	181.5	178.8	247.0	195.9	137.7	122.3	276.3
4. Oil Seeds:																	
Soybeans	100.0	103.6	113.1	166.4	255.6	308.3	304.8	451.3	505.2	593.7	877.2	629.6	605.9	622.5	800.3	1122.3	467.9
Peanuts	-	-	-	-	-	-	-	-	-	-	-	-	-	100.0	129.6	287.6	298.2
African Palm	-	-	-	-	-	-	-	-	-	-	-	-	-	100.0	135.8	92.9	83.9
Sesame	100.0	128.2	180.0	198.3	250.5	309.8	344.4	230.1	153.5	211.3	151.7	157.3	133.1	81.6	102.6	114.8	105.2
Seed Cotton	100.0	108.1	114.1	99.5	89.3	110.7	115.9	110.8	137.0	150.1	160.9	149.4	183.8	210.7	220.4	190.5	258.5
Sub-Total	100.0	109.6	119.7	110.7	109.9	135.9	143.2	135.2	154.0	174.0	190.4	170.4	197.3	244.1	271.5	248.9	277.3
5. Beverages & Stimulants																	
Cacao	100.0	94.6	84.1	80.5	85.0	83.5	80.7	82.1	86.5	90.6	112.0	102.0	98.0	118.0	123.6	111.5	130.0
Tobacco	100.0	104.8	179.5	178.1	203.5	215.5	258.3	205.9	199.6	190.9	170.8	177.0	164.6	275.2	238.0	337.9	257.9
Coffee	100.0	95.8	85.5	93.5	94.2	92.6	87.9	88.4	88.9	97.4	131.9	116.2	125.2	130.8	125.3	136.1	-
Sub-Total	100.0	96.1	88.4	95.5	97.2	96.0	92.8	91.8	92.3	100.0	132.1	117.4	125.1	134.6	128.7	141.2	14.6
6. Others:																	
Beans	100.0	142.6	104.1	93.7	132.9	96.3	77.5	95.3	107.0	99.2	90.5	156.3	173.5	147.7	201.7	304.9	205.4
Bananas	100.0	101.1	96.2	101.8	115.2	137.9	138.9	149.1	130.1	113.3	106.1	104.2	96.4	138.4	152.0	158.6	204.7
Sub-Total	100.0	114.3	98.7	99.2	120.9	124.7	119.4	132.0	122.7	108.8	101.1	120.8	120.9	141.4	167.8	205.2	204.9
Total Production Value	100.0	106.6	105.1	111.9	131.0	120.8	123.8	119.9	127.1	130.9	137.9	145.1	158.5	192.6	176.9	195.3	146.6

Source: Calculations based on the data in Chart No. VI-28.

Chart No. VI-30

Colombia. Annual Percentage Variation in the Value of Agricultural Production, 1960-1976

(Based on constant 1970 pesos)

	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
1. Cereals:																
Rice	13.80	18.89	16.74	28.78	41.60	11.95	- 1.10	30.64	-20.77	- 0.97	26.68	14.29	102.57	49.36	11.02	1.42
Oats	-	-	-	-	-	-	-	-	-	-	-	-	-	22.73	80.56	- 5.13
Barley	- 2.73	7.77	40.91	1.10	- 8.98	35.67	- 0.78	4.64	- 5.25	15.42	45.62	- 0.05	22.76	43.10	86.47	-32.63
Maize	16.15	-16.82	56.56	65.49	-23.46	19.31	8.97	1.24	19.77	5.27	6.35	26.03	40.62	8.23	11.35	44.65
Sorghum	-	-	57.14	71.04	23.36	- 3.49	50.67	68.27	- 8.80	26.83	109.78	30.74	80.02	37.46	12.68	45.15
Wheat	10.80	11.98	-38.93	25.15	41.57	30.77	-35.96	74.05	-32.63	-36.98	- 0.93	69.17	16.32	30.64	- 4.86	15.52
Sub-Total	13.30	3.85	24.84	42.99	6.97	16.50	0.67	21.50	- 7.43	1.47	22.13	20.96	68.98	33.91	13.54	15.62
2. Starchy Crops:																
Potatae	21.51	- 8.63	64.55	118.85	-48.97	60.20	- 6.19	11.43	36.93	- 7.19	- 8.76	31.52	378.93	-60.70	138.02	-16.07
Plantains	38.33	22.26	26.37	50.54	6.80	17.99	4.20	0.63	- 8.07	17.20	21.69	22.40	17.37	41.17	60.52	19.21
Cassava	39.81	7.30	20.77	65.99	- 0.40	10.27	16.42	27.19	3.66	20.00	153.36	8.74	-10.54	73.76	43.52	- 8.01
Yam	-	-	-	-	-	-	-	-	-	-	-	-	-	- 2.27	36.72	15.49
Sub-Total	33.10	8.83	34.64	75.56	-16.54	25.96	3.93	10.58	7.88	9.49	54.70	16.85	77.92	- 5.52	69.52	- 2.12
3. Sugars:																
Sugar	22.91	22.19	12.82	71.65	3.92	9.19	10.86	31.63	21.34	5.59	26.06	19.56	-	-	-	-
"Panela" sugar	30.42	29.76	70.68	1.81	-24.58	31.14	3.54	35.32	56.89	-23.29	- 0.86	82.92	41.61	-10.31	7.37	179.07
Sub-Total	28.12	27.53	54.36	16.21	-15.90	22.88	5.99	34.03	44.68	-14.97	8.77	56.65	- 3.20	-10.31	7.37	179.07
4. Oil Seeds:																
Soybeans	11.84	16.47	81.82	77.78	32.81	13.18	60.50	22.10	27.14	62.18	-20.76	9.14	25.39	64.07	69.48	-48.48
Peanuts	-	-	-	-	-	-	-	-	-	-	-	-	-	65.36	168.21	28.14
African Palm	-	-	-	-	-	-	-	-	-	-	-	-	-	73.35	-17.34	11.55
Sesame	38.39	49.85	36.11	46.24	36.14	27.25	-27.56	-27.21	48.90	-21.21	14.50	- 4.00	-25.15	60.39	35.17	13.24
Cotton	16.63	12.74	7.72	3.84	36.58	19.82	3.61	34.93	18.49	17.67	2.52	39.47	39.93	33.53	4.42	67.66
Sub-Total	18.27	16.56	14.29	14.95	36.12	20.61	2.39	24.19	22.25	20.10	- 1.20	31.34	50.95	41.96	10.76	37.76
5. Stimulants:																
Cocoa	2.08	- 5.05	18.19	22.33	8.15	10.57	10.36	14.87	13.36	35.63	0.59	8.93	46.99	33.60	8.99	44.15
Tobacco	13.13	82.80	22.53	32.34	16.54	37.22	-13.56	5.70	3.52	- 1.81	14.45	5.43	104.08	10.37	71.49	- 5.67
Coffee	3.43	- 4.73	35.12	16.61	8.20	8.67	9.08	9.68	18.55	48.56	- 2.71	22.19	27.44	22.32	31.21	-
Sub-Total	3.66	- 1.77	33.51	17.77	8.74	10.75	7.18	9.64	17.29	44.98	- 1.88	20.82	31.35	22.06	32.46	-87.22
6. Others:																
Beans	53.85	-22.03	11.21	64.17	-20.23	- 7.84	33.24	22.50	0.26	0.15	90.67	25.87	3.93	74.28	82.58	-16.71
Bananas	9.07	1.62	30.71	31.08	31.74	15.32	16.37	- 4.87	- 5.74	2.82	8.35	4.96	75.20	40.16	26.08	59.50
Sub-Total	23.33	- 7.77	24.16	41.04	13.55	9.62	19.86	1.42	- 4.07	2.04	31.79	13.57	42.66	51.51	47.70	23.46
TOTAL	15.02	5.26	31.50	35.61	1.47	17.30	5.01	15.68	11.43	15.63	16.18	23.88	48.24	17.21	33.40	- 7.23

Source: Calculations based on data in Chart No. VI-28.

Chart No. VI-31

Colombia. Percentage Participation of Each Product or Group of Products in the Total Value of Agricultural Production

(1960-1976)

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
1. Cereals:																	
Rice	9.43	9.33	10.54	9.36	8.89	12.40	11.84	11.15	12.59	8.95	7.67	8.36	7.71	10.54	13.43	11.17	12.22
Oats	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.01	0.01	0.01
Barley	1.57	1.33	1.36	1.46	1.09	0.97	1.13	1.06	0.96	0.82	0.82	1.02	0.83	0.68	0.84	1.17	0.85
Maize	9.74	9.84	7.78	9.26	11.30	8.52	8.67	9.00	7.87	8.46	7.70	7.05	7.17	6.81	6.28	5.25	8.18
Sorghum	-	-	0.33	0.39	0.50	0.60	0.50	0.71	1.04	0.85	0.93	1.68	1.77	2.15	2.53	2.13	3.34
Wheat	2.97	2.86	3.04	1.41	1.30	1.82	2.03	1.24	1.86	1.12	0.61	0.52	0.71	0.56	0.62	0.45	0.55
Sub-Total	23.71	23.36	23.05	21.88	23.07	24.32	34.15	23.16	24.32	20.20	17.73	18.64	18.20	20.75	23.70	20.17	25.14
2. Starchy Crops:																	
Potatoe	5.43	5.73	4.98	6.23	10.05	5.05	6.90	6.17	5.94	7.30	5.86	4.60	4.88	15.78	5.29	9.44	8.54
Plantains	6.67	8.03	9.32	8.96	9.95	10.47	10.53	10.45	9.09	7.50	7.60	7.96	7.87	6.23	7.50	9.03	11.60
Cassava	4.17	5.07	5.17	4.75	5.81	5.70	5.36	5.94	6.54	6.08	6.31	13.76	12.08	7.29	10.81	11.63	11.53
Yam	-	-	-	-	-	-	-	-	-	-	-	-	-	0.51	0.42	0.43	0.54
Sub-Total	16.27	18.83	19.47	19.93	25.81	21.23	22.79	22.56	21.56	20.88	19.77	26.32	24.83	29.80	24.02	30.53	32.21
3. Sugars:																	
Sugar	2.35	2.51	2.91	2.50	3.16	3.24	3.02	3.18	3.62	3.95	3.60	3.91	3.77	-	-	-	-
"Panela" sugar	5.30	6.01	7.41	9.62	7.23	5.37	6.00	5.92	6.92	9.75	6.47	5.52	8.15	7.79	5.96	4.79	14.42
Sub-Total	7.65	8.52	10.33	12.12	10.39	8.61	9.02	9.10	10.55	13.70	10.07	9.43	11.92	7.79	5.96	4.79	14.42
4. Oil Seeds:																	
Soybeans	0.36	0.35	0.39	0.54	0.70	0.92	0.89	1.36	1.43	1.64	2.29	1.57	1.38	1.17	1.63	2.07	1.15
Peanuts	-	-	-	-	-	-	-	-	-	-	-	-	-	0.01	0.01	0.03	0.03
African Palm	-	-	-	-	-	-	-	-	-	-	-	-	-	1.18	1.75	1.08	1.30
Sesame	0.72	0.87	1.24	1.28	1.38	1.85	2.01	1.38	0.87	1.16	0.79	0.78	0.61	0.31	0.42	0.42	0.52
Seed Cotton	7.46	7.56	8.10	6.63	5.08	6.84	6.99	6.89	8.04	8.55	8.70	7.68	8.64	8.16	9.29	7.28	13.15
Sub-Total	8.54	8.78	9.72	8.45	7.16	9.61	9.88	9.63	10.34	11.35	11.79	10.02	10.63	10.82	13.11	10.88	16.16
5. Beverages and Stimulants:																	
Cacao	1.91	1.70	1.53	1.38	1.24	1.32	1.25	1.31	1.30	1.32	1.55	1.34	1.18	1.17	1.34	1.09	1.70
Tobacco	1.18	1.16	2.02	1.88	1.83	2.11	2.46	2.03	1.85	1.72	1.46	1.44	1.23	1.69	1.59	2.04	2.08
Coffee	34.79	31.29	28.31	29.10	25.02	26.68	24.72	25.67	24.34	25.90	33.27	27.86	27.48	23.63	24.66	24.25	-
Sub-Total	37.88	34.14	31.86	32.35	28.09	30.11	28.43	29.01	27.50	28.94	36.29	36.65	29.89	26.49	27.58	27.39	3.77
6. Others:																	
Beans	1.89	2.53	1.87	1.58	1.92	1.51	1.18	1.50	1.59	1.43	1.24	2.03	2.07	1.45	2.16	2.95	2.65
Bananas	4.05	3.84	3.70	3.68	3.56	4.62	4.54	5.03	4.14	3.50	3.11	2.90	2.46	2.91	3.48	3.29	5.65
Sub-Total	5.94	6.36	5.58	5.27	5.48	6.13	5.73	6.54	5.73	4.93	4.35	4.94	4.53	4.36	5.63	6.24	8.30
TOTAL AGRICULTURAL PRODUCTS	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: Calculations based on data in Chart No. VI-28.

Chart No. VI-32

Colombia. Percentage Participation of Each Product in the Value of the Total Production and of the Group Products

(1960-1976)

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
1. Cereals:																	
Rice	39.78	39.96	45.74	42.77	38.52	50.99	49.00	48.14	51.76	44.30	43.23	44.85	42.37	50.79	56.65	55.39	48.59
Oats	-	-	-	-	-	-	-	-	-	-	-	-	-	0.02	0.02	0.03	0.03
Barley	6.62	5.68	5.90	6.66	4.71	4.01	4.67	4.60	3.96	4.05	4.61	5.50	4.54	3.30	3.53	5.70	3.37
Maize	41.09	42.13	33.74	42.32	48.97	35.05	35.89	38.85	32.37	41.88	43.45	37.84	39.42	32.81	26.52	26.00	32.53
Sorghum	-	-	1.43	1.80	2.15	2.48	2.06	3.08	4.26	4.20	5.25	9.01	9.74	10.38	10.66	10.57	13.27
Wheat	12.51	12.23	13.19	6.45	5.65	7.47	8.39	5.34	7.65	5.56	3.46	2.80	3.92	2.70	2.63	2.21	2.20
Sub-Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
2. Starchy Crops:																	
Potatoe	33.35	30.44	25.56	31.24	38.94	23.81	30.28	27.33	27.54	34.95	29.63	17.48	19.67	52.94	22.02	30.92	26.52
Plantain	41.01	42.63	47.89	44.95	38.54	49.32	46.20	46.32	42.15	35.92	38.45	30.24	31.68	20.90	31.23	29.57	36.02
Cassava	25.64	26.93	26.55	23.82	22.52	26.87	23.52	26.35	30.31	29.13	31.92	52.28	48.65	24.46	44.99	38.09	35.80
Yam	-	-	-	-	-	-	-	-	-	-	-	-	-	1.69	1.75	1.41	1.67
Sub-Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
3. Sugars:																	
Sugar	30.69	29.44	28.21	20.62	30.45	37.63	33.44	34.98	34.35	28.81	35.78	41.46	31.65	-	-	-	-
"Panela" Sugar	69.31	70.56	71.79	79.38	69.55	62.37	66.56	65.02	65.65	71.19	64.22	58.54	68.35	100.00	100.00	100.00	100.00
Sub-Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
4. Oil Seeds:																	
Soybean	4.23	4.00	3.99	6.35	9.82	9.59	8.99	14.10	13.86	14.42	19.47	15.61	12.97	10.78	12.46	19.06	7.13
Peanuts	-	-	-	-	-	-	-	-	-	-	-	-	-	0.08	0.10	0.23	0.22
African Palm	-	-	-	-	-	-	-	-	-	-	-	-	-	10.92	13.34	9.96	8.06
Sesame	8.45	9.88	12.71	15.13	19.25	19.25	20.31	14.37	8.42	10.26	6.73	7.80	5.70	2.83	3.19	3.90	3.20
Cotton	87.33	86.12	83.30	78.52	70.93	71.16	70.70	71.53	77.72	75.33	73.81	76.59	81.33	75.39	70.92	66.86	81.39
Sub-Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
5. Beverages and Stimulants:																	
Cocao	5.05	4.97	4.80	4.25	4.42	4.39	4.39	4.52	4.73	4.57	4.28	4.39	3.95	4.42	4.48	3.90	44.95
Tobacco	3.12	3.40	6.33	5.81	6.53	6.99	8.67	6.90	6.74	5.95	4.03	4.70	4.10	6.37	5.76	7.46	55.05
Coffee	91.84	91.63	88.87	89.94	89.06	88.61	86.95	88.49	88.53	89.48	91.69	90.92	91.95	89.21	89.40	88.56	-
Sub-Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
6. Other Crops:																	
Beans	31.83	39.71	33.57	30.07	35.01	24.59	20.68	22.98	27.76	29.01	28.48	41.20	45.66	33.26	38.26	47.30	31.91
Banana	68.17	60.29	66.43	69.93	64.99	75.41	79.32	77.02	72.24	70.99	71.52	58.80	54.34	66.74	61.74	52.70	68.09
Sub-Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: Calculations based on data in Chart No. VI-28.

Chart No. VI-33

Colombia. Total and Five Yearly Growth Rates in the Value of the Production of Agricultural Products

(Based on current values)

Period / Product	1960-65	1965-70	1970-76	1960-76
1. Cereals:				
Rice	23.56	2.56	30.46	18.97 1/
Oats	-	-	-	28.10 1/
Barley	6.33	9.02	21.46	12.65
Maize	13.88	10.66	21.92	15.79 3/
Sorghum	49.11	23.12	49.35 2/	35.35 3/
Wheat	6.06	- 9.15	18.71	5.41
Sub-Total	17.57	6.00	27.95	17.49
2. Starchy Crops:				
Potatoe	15.33	16.30	28.54	20.43
Plantains	28.00	5.91	29.52	21.18
Cassava	24.53	15.22	33.47	24.74
Yam	-	-	-	15.55 1/
Sub-Total	23.36	11.32	30.94	22.17
3. Sugars:				
Sugar	24.75	15.34	22.76 4/	20.42 5/
"Panela" sugar	17.27	17.20	37.98	24.62
Sub-Total	19.77	16.51	28.16	21.79
4. Oil Seeds:				
Soybean	41.09	35.53	7.61	25.87
Peanuts	-	-	-	78.45 1/
African Palm	-	-	-	16.92 1/
Sesame	41.23	- 4.67	12.43	14.66
Cotton	14.97	18.48	29.32	21.29
Sub-Total	19.77	17.62	27.23	21.82
5. Stimulants:				
Cacao	8.67	16.59	22.50	16.19
Tobacco	31.33	4.96	27.99	21.27
Coffee	10.93	18.02	19.44	16.07
Sub-Total	11.72	17.21	-17.22	1.35
6. Others:				
Beans	11.80	8.59	36.99	19.56
Bananas	20.12	4.35	33.32	19.53
Sub-Total	17.72	5.45	34.42	19.54
TOTAL	16.98	12.91	20.71	17.06

1/ Refers to the period 1973-1976
2/ Refers to the period 1962-1965
3/ Refers to the period 1962-1976
4/ Refers to the period 1970-1972
5/ Refers to the period 1960-1972

Chart No. VI-34

Colombia. Total and Five Yearly Growth Rates in the Value of the Production of Agricultural Products

(Based on constant 1970 values)

PERIOD / PRODUCTS	1960-65	1965-70	1970-76	1960-1976
1. Cereals:				
Rice	9.69	-6.72	9.17	4.08
Oats	-	-	-	3.32 1/
Barley	-5.60	-0.85	1.64	-1.44
Maize	1.10	0.63	2.03	1.30
Sorghum	28.17 2/	11.97	24.98	20.82 3/
Wheat	-5.83	-17.38	-0.65	-7.77
Sub-Total	4.37	-3.59	7.07	2.79
2. Starchy Crops:				
Potatoe	2.38	5.76	7.57	5.36
Plantains	13.63	-3.67	8.39	6.02
Cassava	10.55	4.78	11.69	9.13
Yam	-	-	-	-6.79 1/
Sub-Total	9.52	1.24	9.58	6.88
3. Sugars:				
Sugar	10.75	4.89	9.71 4/	8.10 5/
"Panela" Sugar	4.11	6.58	15.46	9.02
Sub-Total	6.33	5.95	7.25	6.55
4. Oil Seeds:				
Soybeans	25.26	23.25	-9.94	10.12
Peanuts	-	-	-	43.93 1/
African Palm	-	-	-	-5.69 1/
Sesame	25.38	-13.31	-5.91	0.31
Seed Cotton	2.06	7.75	8.21	6.11
Sub-Total	6.33	6.97	6.46	6.58
5. Beverages and Stimulan:				
Cacao	-3.52	6.03	2.51	1.65
Tobacco	16.59	-4.54	7.10	6.10
Coffee	-1.51	7.32	0.63	2.07
Sub-Total	-0.81	6.59	-30.72	-11.33
6. Others:				
Beans	-0.74	-1.24	14.64	4.60
Bananas	6.64	-5.10	11.56	4.58
Sub-Total	4.51	-4.09	12.48	4.58
7. Total Production Value	3.85	2.69	1.02	2.42

Chart No. VI-35

Colombia. Cattle Production Indicators, 1960-1976

a of Pasture 1/ ousands Has.)	Total Stocks 2/	Stocking Rate Head/Has. 1/ 2/	Total Production		Value of the Production		Commercial Consumption (Thousands of Heads) 2/
			Milk (Thousands Tons)	Beef (Thousands Tons) 4/	Milk (Thousands of $) 1/	Beef (Thousands of $) 4/	
17.388.9	15.000.000	0.86	1.416.6 1/	322	861.292.8	1.329.860.0	1.879.0
17.647.6	15.500.000	0.88	1.520.6 1/	356	989.910.6	1.459.600.0	1.965.0
17.951.7	16.000.000	0.89	1.594.4 1/	380	1.073.031.2	1.565.600.0	2.145.0
18.090.4	16.400.000	0.91	1.657.8 1/	381	1.483.731.0	1.645.920.0	2.305.0
18.211.6	16.700.000	0.92	1.688.0 1/	395	1.777.464.0	2.275.200.0	2.418.0
18.471.6	17.000.000	0.92	1.712.0 1/	386	2.234.160.0	2.624.800.0	2.469.0
18.597.0	17.300.000	0.93	1.743.0 1/	365	2.377.452.0	3.504.000.0	2.228.0
18.989.3	17.900.000	0.94	1.843.9 1/	371	3.089.454.4	3.561.600.0	2.205.0
19.565.2	18.700.000	0.96	1.929.9 1/	397	3.439.081.8	-	2.360.0
20.336.9	19.500.000	0.96	2.015.6 1/	412	3.675.446.6	-	2.624.0
20.901.0	20.200.000	0.97	2.164.1 1/	558 5/	4.013.323.4	4.829.144.0 7/	2.870.0
21.409.7	20.800.000	0.97	2.266.8 1/	623 5/	4.626.538.8	6.019.470.0 7/	3.050.0
22.019.0	21.400.000	0.97	2.332.1 1/	587 5/	6.049.467.4	7.156.307.0 7/	2.798.0
-	22.100.000	-	2.430.0 6/	590 5/	4.748.367 7/	9.794.919.0 7/	2.576.0
-	23.032.000	-	2.027.4 3/	598 5/	6.480.100 7/	11.849.312.0 7/	2.630.0
-	23.888.000	-	2.096.4 3/	637 5/	6.030.000.0	14.327.746.0 7/	2.948.0
-	24.676.000	-	2.229.0 3/	542	-	18.366.396.0 7/	3.556.0

/ Dane
/ Banco Ganadero
/ Minagricultura
/ U.S.D.A. Atkinson

5/ D.N.P.
6/ FAO
7/ Banco de la República

Chart No. VI-36

Colombia. Indexes of Cattle Production Indicators, 1960-1976

Year	Area of Pastures	Total Stocks	Stocking Rate	Total Production		Value of the Production		Commercial Consumption
				Milk	Beef	Milk	Beef	
1960	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1961	101.4	103.3	102.3	105.9	110.5	114.9	109.7	104.5
1962	103.2	106.6	103.4	112.5	118.0	124.5	117.7	114.1
1963	104.0	109.3	105.8	117.0	118.3	172.2	123.7	122.6
1964	104.7	111.3	106.9	119.1	122.6	206.3	171.0	128.6
1965	106.2	113.3	106.9	120.8	119.8	259.4	197.3	131.4
1966	106.9	115.3	108.1	123.0	113.3	276.0	263.4	118.5
1967	109.2	119.3	109.3	130.1	115.2	358.7	267.8	117.3
1968	112.5	124.6	111.6	136.2	123.2	399.2	-	125.6
1969	116.9	130.0	111.6	142.2	127.9	426.7	-	139.6
1970	120.2	134.6	112.7	152.7	173.2	465.9	363.1	152.7
1971	123.1	138.6	112.7	160.0	193.4	537.1	452.6	126.3
1972	126.6	142.6	112.7	164.6	182.3	702.3	538.1	148.9
1973	-	147.3	-	172.9	183.2	551.3	736.5	137.0
1974	-	153.5	-	143.1	185.7	752.3	891.0	139.9
1975	-	159.2	-	147.9	197.8	700.1	1077.3	156.8
1976	-	164.5	-	157.3	168.3	-	1381.0	189.2

Source: Calculations based on the data in Chart No. VI-35.

Chart No. VI-37

Colombia. Annual Percentage Variation in the Cattle Production Indicators, 1961-1976

Year	Area of Pastures	Total Stocks	Stocking Rate	Total Production		Value of the Produc.		Commercial Consumption
				Milk	Beef	Milk	Beef	
1961	1.49	3.33	2.33	5.93	10.56	14.93	9.76	4.58
1962	1.72	3.23	1.14	6.25	6.74	8.40	7.26	9.16
1963	0.77	2.50	2.25	3.98	0.26	38.27	5.13	7.46
1964	0.67	1.83	1.10	1.82	3.67	19.80	38.23	4.90
1965	1.43	1.80	0.00	1.42	-2.28	25.69	15.37	2.11
1966	0.68	1.76	1.09	1.81	-5.44	6.41	33.50	-9.76
1967	2.11	3.47	1.08	5.79	1.64	29.95	1.64	-1.03
1968	3.03	4.47	2.13	4.66	7.01	11.32	10.68	7.03
1969	3.94	4.28	0.00	4.44	3.78	6.87	10.68	11.19
1970	2.77	3.59	1.04	7.37	35.44	9.19	10.68	9.38
1971	2.43	2.97	0.00	4.75	11.65	15.28	24.65	6.27
1972	2.85	2.88	0.00	2.88	-5.78	30.76	18.89	-8.26
1973	-	3.27	-	5.06	0.51	-21.51	36.87	-7.93
1974	-	4.22	-	-17.25	1.36	36.47	20.97	2.10
1975	-	3.72	-	3.40	6.52	-6.95	20.92	12.09
1976	-	3.30	-	6.33	-14.91	-	28.19	20.62

Source: Calculations based on the data in Chart No. VI-35

Chart No. VI-38

Colombia. Total and Five Yearly Growth Rates of the Cattle Production Indicators

Period	Area in Pastures	Total Stock	Stocking Rate	Total Production		Production Value		Commercial Extraction
				Milk	Meat	Milk	Meat	
1960-65	1.21	2.53	1.35	3.86	3.69	21.00	14.56	5.61
1965-70	2.50	3.50	1.06	4.79	7.64	12.42	12.96	3.05
1970-76	2.63 1/	3.39	0.00 1/	0.49	-0.48	8.48 3/	24.93	3.63
1960-1976	1.98 2/	3.16	1.00 2/	2.87	3.30	13.85 4/	17.83	4.06

1/ Refers to period 1970-72
2/ Refers to period 1960-72
3/ Refers to period 1970-75
4/ Refers to period 1960-75

Source: The calculations are based on the data in Chart No. VI-35.

Chart No. VI-39

Colombia. Pig Production Indicators, 1960-1976

Year	Total Stocks	Slaughter (Number of Heads)	Meat Production (Thousands of Tons)	Value of the Production (Thousands of $) 1/
1960	1.870.000 1/	1.154.000 1/	54 1/	260.820.0
1961	1.950.000 1/	1.284.000 1/	56 1/	310.000.0
1962	2.150.000 1/	1.235.000 1/	55 1/	327.345.0
1963	2.300.000 1/	1.226.000 1/	50 1/	459.111.0
1964	2.400.000 1/	1.124.000 1/	51 1/	118.633.0
1965	2.400.000 1/	1.100.000 1/	48 1/	821.733.0
1966	2.300.000 1/	1.112.000 1/	50 1/	870.000.0
1967	2.200.000 1/	1.245.000 1/	51 1/	850.000.0
1968	2.100.000 1/	1.161.000 1/	53 1/	938.100.0
1969	2.200.000 1/	1.191.000 1/	54 1/	1020.600.0
1970	2.244.000 1/	1.232.000 1/	56 1/	1291.920.0
1971	2.300.000 1/	1.463.000 1/	59 1/	1604.800.0
1972	1.540.000 3/	1.400.000 3/	70 3/	2219.000.0
1973	1.735.400 2/	1.128.000 2/	83 2/	3510.900.0
1974	1.804.400 2/	1.191.168 2/	68 2/	3318.400.0
1975	1.897.400 2/	1,677.216 2/	98 2/	5517.400.0
1976	1.868.500 2/	-	-	-

Sources: 1/ U.S.D.A. Atkinson
2/ Ministry of Agriculture - Agricultural Figures, 1977.
3/ FAO

Chart No. VI-40

Colombia. Indexes of Pig Production Indicators, 1960-1976

Year	Total Stocks	Slaughter	Meat Production	Value of the Production
1960	100.0	100.0	100.0	100.0
1961	104.2	111.2	103.7	118.8
1962	114.9	107.0	101.8	125.5
1963	122.9	106.2	92.5	174.4
1964	128.3	97.4	94.4	275.5
1965	128.3	95.3	88.8	315.0
1966	122.9	96.3	92.5	333.5
1967	117.6	107.8	94.4	325.9
1968	112.3	100.6	98.1	359.6
1969	117.6	103.2	100.0	391.3
1970	120.0	106.7	103.7	495.3
1971	122.9	126.7	109.2	615.2
1972	82.3	121.3	129.6	850.7
1973	92.8	97.7	153.7	1346.1
1974	96.4	103.2	125.9	1272.2
1975	101.4	145.3	181.4	2115.4
1976	99.9	-	-	-

Source: The calculations are based on the data in Chart VI-39.

Chart No. VI-41

Colombia. Annual Percentage Variation in Pig Production Indicators

1961-1976

Year	Total Stocks	Slaughter	Meat Production	Value of the Production
1961	4.28	11.27	3.70	18.86
1962	10.26	-3.82	-1.79	5.60
1963	6.98	-0.73	-9.09	39.03
1964	4.35	-8.32	2.00	57.90
1965	0.00	-2.14	-5.88	14.35
1966	-4.17	1.09	4.17	5.87
1967	-4.35	11.96	2.00	-2.30
1968	-4.55	-6.75	3.92	10.36
1969	4.76	2.58	1.89	8.79
1970	2.00	3.44	3.70	26.58
1971	2.50	18.75	5.36	24.22
1972	-33.04	-4.31	18.64	38.27
1973	12.69	-19.43	18.57	58.22
1974	3.98	5.60	-18.07	-5.48
1975	5.15	40.80	44.12	66.27
1976	-1.52	-	-	-

Source: Calculations based on the data in Chart No. VI-39.

Chart No. VI-42

Colombia. Growth Rates of the Pig Production Indicators for the Period 1960-1976 and for Each Five Years

Period	Total Stocks	Slaughter	Meat Production	Value of the Production
1960-65	5.11	-0.95	-2.32	25.79
1965-70	-1.33	2.29	3.13	9.47
1970-75	-3.00 1/	6.36	11.84	33.69
1960-1975	-5.01 2/	2.52	4.05	22.56

Source: Calculations based on the data in Chart No. VI-39.

1/ Refers to period 1970-1976

2/ Refers to period 1960-1976

Chart No. VI-43

Colombia. Sheep Production Indicators, 1960-1976

YEAR	Total Stocks 1/	Production 1/		Value of the Production
		Meat (Thousands Tons)	Wool (Tons)	Wool
1960	1.305.000	2.	600	4.830 3/
1961	1.400.000	2.	645	5.335 3/
1962	1.450.000	2.	686	6.096 3/
1963	1.500.000	2.	761	8.109 3/
1964	1.600.000	2.	855	11.100 3/
1965	1.800.000	2.	906	12.222 3/
1966	1.840.000	2.	951	15.210 3/
1967	1.845.000	2.	996	17.710 3/
1968	1.814.000	2.	1.000	-
1969	1.870.000	2.	1.000	-
1970	1.960.000	2.	1.000	27.429 3/
1971	2.018.000	2.	1.100	32.151 3/
1972	2.036.000 4/	2. 3/	1.220 4/	30.768 5/
1973	1.812.000 2/	1.8 3/	1.250 4/	40.418 5/
1974	1.888.100 2/	1.9 3/	1.030 3/	54.781 5/
1975	1.920.800 2/	1.9 3/	1.100 3/	84.227 5/
1976	2.026.400 2/	2.0 3/	1.170 3/	92.343 5/

Sources:
1/ U.S.D.A. Atkinson
2/ Ministry of Agriculture. Agricultural figures 1977.
3/ USDA Atkinson
4/ FAO-Prod. Year Book
5/ Banco de la República

Chart No. VI-44

Colombia. Indexes of Sheep Production Indicators, 1960-1976

YEAR	Total Stocks	Production		Value of the Production
		Meat	Wool	Wool
1960	100.0	100.0	100.0	100.0
1961	107.2	100.0	107.5	110.4
1962	111.1	100.0	114.3	126.2
1963	114.9	100.0	126.8	167.8
1964	122.6	100.0	142.5	229.8
1965	137.9	100.0	151.0	253.0
1966	141.0	100.0	158.5	314.9
1967	141.3	100.0	166.0	366.6
1968	139.0	100.0	166.6	-
1969	143.3	100.0	166.6	-
1970	150.1	100.0	166.6	567.8
1971	154.6	100.0	183.3	665.6
1972	156.0	100.0	203.3	637.0
1973	138.8	90.0	208.3	836.8
1974	144.6	95.0	171.6	1.134.1
1975	147.1	95.0	183.3	1.743.8
1976	155.2	100.0	195.0	1.911.8

Source: Calculations based on the data in Chart No. VI-43.

Chart No. VI-45

Colombia. Annual Percentage Variation in Sheep Production Indicators, 1960-1976

YEAR	Total Stocks	Production		Value of the Production
		Meat	Wool	Wool
1961	7.28	0.00	7.50	10.46
1962	3.57	0.00	6.36	14.26
1963	3.45	0.00	10.93	33.02
1964	6.67	0.00	12.35	36.88
1965	12.50	0.00	5.96	10.11
1966	2.22	0.00	4.97	24.45
1967	0.27	0.00	4.73	16.44
1968	- 1.68	0.00	0.40	-
1969	3.09	0.00	0.00	-
1970	4.81	0.00	0.00	15.70
1971	2.96	0.00	10.00	17.22
1972	0.89	0.00	10.91	- 4.30
1973	-11.00	-10.00	2.46	31.36
1974	4.20	5.56	-17.60	35.34
1975	1.73	0.00	6.80	53.75
1976	5.50	5.26	6.36	9.64

Source: Calculations based on the data in Chart No. VI-43.

Chart No. VI-46

Colombia. Total Growth Rates for the Period and for Each Five Years, 1960-1976, of the Sheep Production Indicators

Period	Total Stocks	Production	Value of the Production
		Wool	Wool
1960-65	6.64	8.59	20.40
1965-70	1.71	1.99	17.54
1970-76	0.55	2.65	22.42
1960-1976	2.78	4.26	20.25

Source: The calculations are based on the data in Chart No. VI-43.

Chart No. VI-47

Colombia. Indicators of Poultry Production, 1960-1976

Year	Total Stocks (Million of Heads)	Total Production		Value of the Production	
		Meat (Thousands of Tons)	Eggs (Million of Units)	Meat ($) 1/	Eggs ($) 1/
1960	26.2 1/	30 1/	1.048 1/	-	443.304.000
1961	27.4 1/	32 1/	1.096 1/	-	491.008.000
1962	30.0 1/	34 1/	1.178 1/	-	560.728.000
1963	35.0 1/	34 1/	1.400 1/	437.920.000	802.200.000
1964	36.5 1/	35 1/	1.460 1/	450.100.000	1.043.900.000
1965	38.0 1/	35 1/	1.521 1/	479.500.000	1.064.700.000
1966	39.5 1/	36 1/	1.580 1/	540.000.000	1.185.000.000
1967	41.0 1/	37 1/	1.643 1/	572.020.000	1.297.970.000
1968	-	-	-	-	-
1969	-	-	-	-	-
1970	-	23.5	1.065.0	1.241.786.000 3/	1.538.539.000 3/
1971	-	36.0	1.495.9	1.556.142.000 3/	1.455.729.000 3/
1972	-	39.9	1.646.0	1.738.704.000 3/	1.844.098.000 3/
1973	17.4 2/	48.5 2/	2.024.0 2/	2.402.038.000 3/	2.612.976.000 3/
1974	20.6 2/	62.5 2/	1.865.4 2/	3.534.769.000 3/	3.285.890.000 3/
1975	21.6 2/	63.0 2/	2.321.6 2/	4.904.433.000 3/	3.672.776.000 3/
1976					4.501.012.000 3/

Source: 1/ U.S.D.A. Atkinson
2/ Ministry of Agriculture - Agricultural Figures, 1977.
3/ Banco de la República

Chart No. VI-48

Colombia. Indexes of Poultry Production Indicators, 1960-1976

Year	Total Stocks	Total Production		Value of the Production	
		Meat	Eggs	Meat	Eggs
1960	100.0	100.0	100.0	-	100.0
1961	104.5	106.6	104.5	-	110.7
1962	114.5	113.3	112.4	-	126.4
1963	133.5	113.3	133.5	100.0	180.9
1964	139.3	116.6	139.3	102.8	235.4
1965	145.0	116.6	145.1	109.5	240.1
1966	150.7	120.0	150.7	123.3	267.3
1967	156.4	123.3	156.7	130.6	292.7
1968	-	-	-	-	-
1969	-	-	-	-	-
1970	-	78.3	101.6	283.2	347.0
1971	-	120.0	142.7	356.2	328.3
1972	-	133.0	157.0	397.3	415.9
1973	66.41	161.6	193.1	548.1	589.4
1974	78.63	208.3	178.0	806.1	741.2
1975	82.44	210.0	221.5	1.132.6	828.3
1976	-	-	-	-	1015.3

Source: Calculations based on the data in Chart No. VI-47.

Chart No. VI-49

Colombia. Annual Percentage Variation in the Poultry Production Indicators
1960-1976

Year	Total Stocks	Total Production		Value of the Production	
		Meat	Eggs	Meat	Eggs
1961	4.58	6.67	4.58	-	10.76
1962	9.49	6.25	7.48	-	14.20
1963	16.67	0.00	18.85	-	43.06
1964	4.29	2.94	4.29	2.78	30.13
1965	4.11	0.00	4.18	6.53	1.99
1966	3.95	2.86	3.80	12.62	11.30
1967	3.80	2.78	3.99	5.93	9.53
1968	-	-	-	-	-
1969	-	-	-	-	-
1970	-	-14.04 2/	-13.46 2/	29.48 2/	5.83 2/
1971	-	53.19	40.46	25.32	- 5.38
1972	-	10.83	10.03	11.73	26.68
1973	-13.31 1/	21.55	22.96	38.15	41.69
1974	18.39	28.87	- 7.84	47.16	25.75
1975	4.85	0.80	24.46	40.45	11.76
1976	-	-	-	-	22.57

1/ Corresponds to period 1968-1972
2/ Corresponds to period 1968-1970

Source: Calculations based on the data in Chart No. VI-47.

Chart No. VI-50

Colombia. Growth Rates of the Poultry Production Indicators for the Period 1960-1976 and for Five Year Periods

Period	Total Stocks	Total Production		Value of the Production	
		Meat	Eggs	Meat	Eggs
1960-65	7.72	3.13	7.73	4.63 3/	19.15
1965-70	3.87 1/	-7.65	-6.87	20.96	7.64
1970-75	11.41 2/	21.80	16.86	31.93	19.59 4/
1960-1975	-1.27	5.07	5.44	22.42	15.58 5/

Source: The calculations are based on the data in Chart No. VI-47.

1/ It refers to period 1965-67.
2/ It refers to period 1973-75.
3/ It refers to period 1963-65.
4/ It refers to period 1970-76.
5/ It refers to period 1960-76.

VII. GENERAL CONCLUSIONS

In the brief study made in the preceding Chapters, three principal indicators were used to gather information, and they can be used to identify the priorities in agricultural research in the country. These indicators are:

- the funds six institutions and sixteen universities allocated to their research programmes at different times between 1960-1976;

- the number of people involved in research and

- the behaviour of agricultural production. For this point certain indicators were considered: a) the area sown, b) the physical production and c) the value of the production, d) the yields per product and e) the imports and exports of the products.

After carefully revising these indicators we could obtain the following conclusions.

The first point that must be emphasized is that the agricultural sector is declining in importance within the country's economy as a whole, or at least as far as its participation in the Gross National Product (GNP) is concerned. In 1960 the agricultural sector represented 30.4% of the GNP while by 1975 this percentage had dropped to 24.1%. Now, although this phenomenon can be considered as a natural result of the general development process in the country, it is also related to a phenomenon that has been already pointed out; that greater emphasis is given to increasing production by using more technology, technical assistance and credit for producers than by doing research, as a result the resources allocated to research have declined in relative terms. However, it should be emphasized that the most recent four-year development plan (1974-1978) gave greater importance to developing the rural sector and to increasing agricultural production. One of the methods chosen to achieve this was to support research, although the emphasis was different to the past as it underlined the need to work on a series of basic products that belong to so called traditional agriculture.

1. Agricultural Products

Nevertheless, the agricultural sector has continued to grow, although at a slower rate than the economy in general. For example, between 1960-1976 the area under cultivation increased 1.7% annually, and this growth was fastest during the sub-period 1970-1976, mainly due to the increased area down to cereals such as sorghum, African oil palm and cotton.

Have these crops, whose importance this study has already mentioned, been given priority in research? Let us see. Of all the products examined in this study,

cereals represent the biggest sub-group, a third of all agricultural production are cereals, although they are the group that has grown most slowly during the period. This proves that cereals have been very important products, but that their level of participation within the whole is declining continually.

Now, cereals also play a very important role within research because they are the sub-group of products receiving the largest share of ICA's research funds, and, of the entities studied, ICA is the only one that researches these products. 1/ Moreover, it should be underlined that "maize and sorghum", which is one research programme, received the largest part of the research budget all during the period studied, while, at the same time, the area under cultivation, the yields and production, both physical and in monetary terms of sorghum have increased more than any other of the crops examined. This was not the case with maize, this crop has been loosing its relative importance within the whole as far as area sown and the real value of the yields are concerned. If we compare it with other products in its group, this seems to have occurred because it is being replaced by other crops, principally sorghum whose production is greater and its market price is better. In addition, in recent years maize imports have been growing.

Now, ICA has emphasized the maize and sorghum research programme, and as a result it is the most important of all the programmes, including basic agricultural and livestock research programmes. The only exception to this was the period 1975-1976 when the Perennial Oilseeds programme had the largest share of the budget, 5%, in constant terms.

Sorghum deserves special note. It is a typical cash crop, it is grown basically for industrial use, especially for cattle, swine and poultry feed. And, more than any other crop, it has replaced maize that, in turn, is the small farmers principal crop and one of the basics in their diet, it is grown all over the country and in all the climatic zones. We do not have exact information as to which of the two receives the larger half of the ICA budget for their joint programme, but if we bare in mind such factors as the number of varieties obtained, the international programmes ICA has with CIMMYT in Mexico and the number of experts working on improving maize in ICA, we can suppose that ICA has given priority to maize over sorghum. In fact, it should not be forgotten that in 1970, 75% of the research personnel was working with cereals, and 66.7% of them were working with maize and sorghum. During the last few years the Government has stressed production plans that favour those basic crops that belong to traditional

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1/ Excepting rice that is included in the ICA-CIAT agreement and which the Federación de Arroceros studies, but this will be discussed later on.

farming, and it would seem that as maize is typical of these crops, that is why ICA has chosen to give it priority in research. Finally, it should be pointed out that an important part of the increases in maize production have resulted from improved yields, as the area down to maize did not expand during the pe- (- 0.7% annually), while for sorghum the area expanded considerably, (17.1% annually) and production grew 21% annually as opposed to maize production that only rose 1.3% annually.

After maize and sorghum, wheat and rice are the next most important crops within the cereals sub-group. Indeed, they are third and fourth, respectively, in area under cultivation, but their production growth rates differed as the growth rate for rice during the period 1960-1976 was 3.0% annually, and wheat had a negative growth rate. Now, the relative economic importance of these two crops, although much less than the first two within the cereals sub-group is, to a certain extent, echoed in the funds allocated for research on them. For example, wheat has 2% to 7% of the total of ICA's research funds, and relatively, its share increased during the period (1.5% annually), while, for example, oats and barley had high negative growth rates as far as research funds are concerned. The case of rice was a little different, as it had the highest positive growth rate of all the agricultural products in the ICA budget, and was second only two the maize and sorghum programme in its total share of the budget. In addition, as rice is economically such an important crop for the country, the Federación de Arroceros (the Rice Growers Federation) gave rice research an important boost in the ICA-CIAT Agreement.

One fact can be concluded from what has been said so far. According to the indicators studied, the cereals, and of them principally sorghum, maize and wheat, are the most important agricultural products in economic terms 1/ and in research they have been given almost the same levels and order of priority as they have in the economy. In other words, there is a correlation between the economic importance and the importance given to research on each crop.

After cereals, the group of Oil Seeds and the Starchy Crops have contributed most to increasing physical agricultural production, although they have not received a correspondingly important share of the research funds. In fact, despite the fact that between 1969-1971 Perennial Oil Seeds grew considerably within the ICA research budget, their growth rate was negative between 1971-1976 and for the period as a whole. In the case of cotton, the other crop in this group, it started the period with a relatively high share of the research budget, (3.36% of the total) but by the end it only had 2.0% and its annual growth rate was 5.59%. Relati-

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1/ Obviously, given its importance in the country's development and its special position in the agricultural economy, they all come second to coffee.

vely, both products occupy a medium level position in economic terms, although the indicators for cotton (area, production and value) grew during the period. That means that both economically and in the research funds they have been allocated, these products are in a middle position.

Finally, we should mention such crops as cassava, plantain, bananas and oats. The rises in Cassava yields were due almost exclusively to improved yields, this can be partly explained as a result of the interest that has been given to research on cassava, especially improving varieties and cultivation practices. CIAT has been particularly active in this field because after beef cattle, it has been the most important research programme in that institution, in terms of funds. ICA has also given considerable importance to this crop, it is included in a joint programme with Potatoes and it had the second largest share of the ICA research budget in the crops group.

Plantain, bananas and oats all have low priority in the ICA research programmes. The first began to appear in the budget in 1962 and its participation remained static during the first five years, it had a high growth rate between 1966-1967 and despite the fact that it later declined, it ended the period with one of the highest growth rates (31.39% annually). The increased economic importance of bananas was mainly due to better yields, while on the contrary, althouth the area planted with plantain increased, the yields dropped. In order to explain this it must be remembered that bananas are a plantation cash crop, 40% of its market is foreign and the crop has extensively benefitted from new technology developed both in the country and abroad, while plantains are a typically subsistence crop. Therefore, it is not unreasonable to suppose that ICA's principal research efforts are dedicated to improving the former.

It is enough to say that oats has a very limited importance both in economic terms (it occupies only 0.01% of the total area down to crops) and in terms of the research funds it receives (less than 1.0%) in ICA. In this entity it only began to appear in the budget in 1969.

In conclusion two more agricultural products deserve mention, soya beans and beans. The first is an oil seed whose behaviour has been more dynamic as all the economic indicators for this crop rose during the whole period. Moreover, although it did not appear as a separate item in the ICA budget, the institutions reports show that it is an important crop within the Grain Legumes and Annual Oil Seeds, this programme also includes Beans. Despite the fact that this programme did not begin to appear in the ICA budget until 1969, it received relatively large amounts of funds, between 2.5% and 5.0% of the total research budget. Furthermore, the Bean programme is the third most important in the CIAT budget and in terms of the number of researchers working on it, this is indicative of the priority the programme has been given.

The remaining agricultural products are sugar cane (both for sugar and "panela", unrefined sugar loaves), cacao, vegetables and fruit and tobacco, these are all secondary products in comparison with those mentioned above, both as regards the relative position of their production indicators and the importance given to research on them. In fact, the sub-group with the smallest share in the ICA research budget was Sugars, although its growth rate increased throughout the period at quite a fast pace with only one short spell between 1966-1971 when the rate slowed. Its growth rate as a group was affected after 1975 when sugar cane for "panela" was included in the group because it is an essentially important subsistence crop in the hot and sub-tropical climatic zones where the area under cultivation has expanded significantly, especially in the hilly areas. Consequently, the Government has given it priority and as a result ICA began to give it special attention too.

In ICA there is a Vegetable and Fruit programme with a sizeable number of people participating in it and in the last five years it has grown markedly, probably because it includes several basic products that are counted as priority popular foodstuffs. Some of them have been chosen as priority for the rural development plans (DRI). This includes a sub-project, the Peasants Vegetable Plots, and the Food and Nutrition Plan (PAN) that also has a sub-project, the School Vegetable Plots Programmes.

Coffee cannot be included in the same analyses and comparisons as the other products being studied. Between 26% and 30% of the total area that is cultivated in the country is planted with coffee 1/ and it accounts for between a quarter and a third of the total value of agricultural production. Moreover, it is the principal agricultural export and the largest foreign exchange earner.

The Federación Nacional de Cafeteros (the Coffee Growers Federation) is responsible for all research on coffee, including improving varieties, cultivation practices and plant diseases. Of course ICA made some contributions but virtually only in certain plant health problems (such as "Rust"). In general this work is carried out in cooperation with the Federación de Cafeteros who also finances it, and the Agronomy Department of the National University in Bogotá has participated as well. Actually, it should be pointed out that the coffee research programme is the most important in the university, it accounts for 11.76% of the total research budget, while hardly any of the other products (except for Vegetables and Fruit with 7.05% and 5.27%, respectively) accounted for more than 1.0%.

Basically, coffee research programmes have concentrated on plant improvement, cultivation practices and soils, these three areas are important for the Federación

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1/ If considered comparatively with the other crops included in this study.

de Cafeteros, in 1977, the year for which data is available, 77.4% of their personnel were involved in agronomic research, especially phytopathology, improvement and agroclimatology.

2. Livestock Products

Livestock farming is especially important in the country, between 85% and 86% of the total land area used for agriculture, some 22 million hectares, is dedicated to livestock raising, besides, the area is being extended at a faster rate than the area for crops.

The livestock products which this study could gather information on are by species and they are included in six research programmes in ICA. In addition to ICA, the Federación de Cafeteros, CIAT and several universities, principally the National University, also have livestock research programmes.

By using such indicators as the total land area, the number of stock or the population and the total value of the production, we can say that the chief products in the national livestock industry are, in order of importance, beef and dairy cattle, pigs, poultry, sheep and minor species. Now, bovine cattle, both beef and dairy had the highest growth rate, between 64.5% between 1960 and 1976, and an annual growth rate of 3.16%, while the pig and poultry populations actually declined during the same period. 1/

ICA, which has research programmes dealing with these species, gave priority to dairy cattle over beef cattle. Second was pigs and lastly sheep, which in proportion had the smallest sums in the budget except in 1975-1976 when minor species appear as a research programme and they had the least funds. However, it must be remembered that of all the livestock species, minor species and pigs had the fastest growth rate within the ICA research budget, which shows that there has been continual interest in and priority given to these products.

This point is important especially since at CIAT the Beef Cattle and the Pig research programmes are rated very highly, the first has priority over the second, and ICA cooperates closely in these programmes. The importance given to these programmes, particularly the Beef Cattle one, of all the programmes at CIAT including crop programmes, this is the largest single item in the research budget throughout the whole period, can be explained in part because CIAT gave very special attention to the joint programmes they had with ICA at the Carimagua Farm, and they made heavy demands in the budget.

1/ No information was obtained on the production of minor species or donkeys or horses.

In summary it can be said that, except for the priority ICA gave to Dairy Cattle, the research priorities seem to correspond to the economic importance of the product. 1/ But, it was different with the allocation of human resources, because Sheep had the largest share of the personnel up to 1975, although after then and up to the present, beef and dairy cattle, in that order of importance absorbed the largest number of researchers into their respective programmes.

3. Other Research

The technical aspects of forestry and fishing research has been the responsibility of two specialized institutions, CONIF in forestry with a little help from CVC and two universities, and INDERENA in Marine Sciences also with some outside help from universities and CVC in Aquaculture. Neither ICA or any of the other institutions considered in this study have had any research programmes in these fields.

Fishing research in general is the most important in the institutions, it receives almost fifty percent of the universities' budgets and they have nine different fish programmes. Ichthyology is the main programme both in the universities and in INDERENA in terms of percentages of the research budgets. INDERENA has a total of five programmes, after Ichthyology the next most important are Fish Biology and Aquaculture with equal research funds. This means that "talasocultura", Pisciculture and Fish Development are the least important programmes in the area.

There have only been specific and continual forestry research programmes very recently, they are being carried out by CONIF with some support from CVC and the Jorge Tadeo Lozano University in Bogotá, although in the university the programme does not figure as forestry. Of the three programmes CVC had forestry experiments was the least important in 1975, it moved up to second place in 1976, these were the two years examined, and had the highest growth rate over the two years. The funds were, in reality, very small, less than half a million pesos in current terms, on average. For CONIF there is no detailed data that has been broken down for each speciality, it can only be said that the total budget in 1975 was three million pesos and that it was reduced 25% the following year.

1/ It should however be clarified that like the crop programmes, it is impossible to determine fully which programmes have priority just from the total research amounts that cannot be broken down into items, because each programme differs. Thus, it is probably that the cost of equipment, installations, laboratories and personnel in a cattle programme will be considerably higher than in a Cassava programme, and if they both receive the same amount for research over a period of time, it does not necessarily mean that they were both given the same priority.

So, despite the fact that the timber industry in Colombia has great potential and that forests are such an important ecological resource, forestry has not been given the priority it deserves in research.

4. Basic Research and Research on Products

The second big sub-division in the research programmes has been called "basic", so as to differentiate it from the products, but so as to indicate that it is also applied. Anyway, it includes support programmes for the products and those programmes covering technical disciplines. For the purpose of this study we have analyzed the ICA programmes, there are four of them dealing with agriculture and eight in Veterinary Medicine or Basic Livestock Research.

Firstly, over the whole period the Basic Agricultural Research was the most important sub-group within ICA in terms of the research funds it received, even more important than the research on products although there were fifteen programmes in this group and only four in the second. The budget for basic agriculture grew more slowly than the budget for products, but they both had negative rates between 1971-1976 and their highest growth rates were in the years 1966-1971.

The opposite occurred with livestock, the research budget for products (six programmes) was always proportionally higher than Basic Livestock and throughout the period they both had lower growth rates than the agricultural sector.

The Federación de Cafeteros' budget also gave priority to basic agriculture, although this difference was less marked than in ICA. CIAT, the only other institution where this distinction could be made, the opposite occurred since all the programmes were for products or they were applied research and it was impossible to obtain data that had been broken down according to disciplines.

Therefore, we only have enough information to identify and analyze this subdivision between product and discipline programmes in ICA. In addition to the comments already made about this institution, we can conclude that basic agriculture and basic livestock were taken as one group and agricultural and livestock products as another, research on products was always more important, almost three times more important, in the research budget than basic research or research on disciplines.

So far in this Chapter we have examined the position of the products research programmes in the budget. What happens in the case of programmes-disciplines or basic programmes?

In the agricultural group, Soils was the discipline with the largest share of the budget and Entomology and Vegetable Physiology received the least funds. Never-

theless, Phytopathology must be mentioned because together with Soils it was the programme with the fastest growth rate during the period.

In the livestock section Pathology and Microbiology were the two basic research programmes with the largest share of the budget from 1969 onwards and Toxicology, Epidemiology and Vesicular Diseases had the smallest sums when they appeared as a separate item in the budget.

As we have already pointed out in the previous Chapter, it is obvious that greater priority was given to research in those disciplines dealing with pests and diseases in plants and animals, as the aim was to increase production yields.

SUMMARY

A general examination of the findings obtained from the information permits the following conclusions:

1. In an analysis of the development of agricultural research in Colombia, ICA must be taken as the basic reference point because this institution specializes in the area, its scope is national and it covers a large number and a wide range of programmes, products and disciplines.

   The other institutions included in this study and a few others in the country from which it was impossible to obtain information, only carry out a very limited amount of research on a few products and for specific sectors, this is the case of CONIF in forestry research, CIAT which has no more than five products from the tropical zone, and the Federación de Cafeteros in the case of coffee.

   Consequently, practically all the results and estimates made in this study are based fundamentally on the information obtained from ICA, although it is fair to say that what is valid for that institution is valid for generalizing about agricultural research in Colombia as a whole.

2. The Universities as a group participate very little in agricultural research, they collaborate in specific aspects of the research done by ICA and above all they are working on fishing programmes which they give priority.

3. The remaining institutions considered here, like FEDECAFE and CVC, only work on subjects they are particularly interested in or supplement, with very limited resources, areas that ICA does not cover, such as forestry by CONIF and CVC.

4. By comparing the economic production indicators for the basic agricultural products and the breakdown of the research budgets of the institutions studied here, a preliminary classification of research priorities can be attempted.

1. Products

a) Agricultural products with the highest priority: sorghum, maize, wheat, rice, cassava, beans and coffee.

b) Agricultural ~~priority~~ products with medium priority: perennial oil seeds, cotton, potatoes, soya beans, sugar cane and sugar cane for "panela" (unrefined sugar), cacao, vegetables and fruit and tobacco.

c) Agricultural products with low priority: barley, plantain, bananas and oats.

d) Livestock products with high priority: beef cattle, dairy cattle and pigs.

e) Livestock products with medium priority: poultry.

f) Livestock products with low priority: sheep and minor species.

2. Disciplines

a) Agricultural discipline given high priority: soils.

b) Agricultural discipline with medium priority: Phytopathology.

c) Agricultural discipline with low priority: Entomology and Vegetable Physiology.

d) Livestock disciplines with high priority: Pathology and Microbiology.

e) Livestock disciplines with medium priority: Physiology, Nutrition and Parasitology.

f) Livestock disciplines with low priority: Toxicology, Epidemiology and Vesicular Diseases.