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DEVELOPMENT PLANS FOR

TURIPANA

A Major Research and Training Center  
for the Lowland Hot Tropics



Submitted by

Instituto Colombiano Agropecuario

and

Centro International de Agricultura Tropical

36103

May 10, 1968

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## FOREWORD

Three years ago, the Colombian Agricultural Institute outlined in its "Project for the Development of ICA" its plans to develop the agricultural research facilities at Turipana into "one of the most important agricultural research centers of the world". That document, identified as "ICA - Plan General de Desarrollo", March 1965, is a comprehensive analysis of the projected financial needs for a 5-year program to integrate agricultural research, education, and extension on a national basis.

Although significant progress has been made toward the goal for Turipana, present circumstances dictate that this development be accelerated. Population pressures on food supplies continue to mount in the tropical world, and it is becoming increasingly evident that increased food production depends upon the incentives associated with total economic development as well as upon technology, capital resources, inputs, and education.

Turipana is ideally located to provide research data and experience on which to build sound agricultural development programs in the hot, lowland tropics. It is also appropriately situated to stimulate and advise national and regional leadership, to help train the wide range of personnel necessary in the economic advancement of the area, and to work with national and international agencies in community development projects which may be replicated, with certain adaptations, in other countries.

The pending establishing of the International Center for Tropical Agriculture (CIAT) in the Cauca Valley generates additional reasons for accelerating the Turipana development. The programs and staffs of these two institutions will be mutually complementary, with the Turipana site providing opportunities for CIAT to extend in cooperation with ICA its research and training activities into the hot, lowland tropics.

Planning is a continuous process and takes into account new developments, priority changes, and the availability and allocation of resources. Previous projections and plans for Turipana have been revised to incorporate changes in programs and facilities associated with the expected collaboration with CIAT. The plans presented herein were prepared by the senior scientists of ICA and consolidated by the planning staff of that organization. This staff had the additional counsel of Mr. Gordon Echols, architect-planner from the Virginia Polytechnic Institute, Mr. Rafael Obregon, of Obregon and Venezuela, experienced tropical architects of Bogota, Colombia, and the various members of The Rockefeller Foundation staff in Colombia who are concerned with the agricultural programs of ICA and CIAT.

These plans and proposals are respectfully submitted for consideration by such organizations as may be interested in helping to provide the technical and financial assistance necessary for the prompt implementation of this accelerated development program.

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Director Designate  
Centro Interpacional de  
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Agropecuario

May 10, 1968

## FINANCIAL SUMMARY AND INDEX

(Amounts expressed approximately in U. S. Dollars)

	Page
Total investments in Turipana from 1957 to 1967:	
By Colombia	\$ 1,500,000
By The Rockefeller Foundation	127,000
Current investments in Turipana by Colombia:	
In livestock	200,000
In annual operations budget	300,000
Construction and equipment investments in Turipana by Colombia in relation to projected plans:	
Currently committed	179,000
Planned for next 5 years	2,320,000
Total investment in Turipana by Colombia from 1957, exclusive of operational costs, to completion of projected plans:	3,999,000
Funds requested for purchase in United States of equipment for laboratories, farm operations and storage, communication and training, food preparation and dormitory, and utilities:	580,000

SECTION I

BACKGROUND AND GENERAL INFORMATION

## OBJECTIVES OF DEVELOPMENT

Three primary objectives guide the efforts to develop Turipana as a major tropical agricultural research and training center.

The first goal is to accelerate the economic development of the north coastal area of Colombia. This area is potentially productive. The population of the region is essentially uneducated and undernourished. With accelerated development, based on sound research and effective training, it is anticipated that the northern coast of Colombia can adequately support its population demands and produce food for export, either to other parts of Colombia or abroad.

As the conditions prevalent in the north coast area are representative of much of the total lowland tropical world, a more ambitious aspect of this first goal is to help facilitate the development of similar regions in Latin America and other parts of the world.

Some of the major questions to be asked in the search for information and procedures to achieve these ends include these: What is the optimal agricultural land used in the lowland tropics? How can the greatest productivity be extracted from the land without destruction of the natural amenities? What is the optimal use of water in such areas? How can the results best be distributed to the tropical areas where they can be applied?

The second major objective of this effort is to cooperate with the Centro Internacional de Agriculture Tropical (CIAT) in the study of animal and plant production problems indigenous to such areas. Because of its truly tropical character, the Turipana site provides problems and research opportunities not possible at the CIAT headquarters near Peñalva,

at an altitude of 1,000 meters.

The additional facilities are being designed so that the Instituto Colombiano Agropecuario (ICA) and CIAT may pursue their research and training interests as an integrated activity. The physical facilities will possess a flexibility capability to allow optimal use by the two agencies as they continue to develop and expand their joint and individual programs.

Both agencies are dedicated to working together to close the informational and material gaps in agricultural methods and germ plasm that exist in this tropical environment. Similarly, recognizing the difficulties in recruiting research and other professional personnel to live in the area, these agencies are giving considerable attention to the need to provide the best environmental, social, and recreational facilities which can be accomplished within practical restraints. These steps are considered necessary to provide a living environment acceptable to the personnel necessary for the development and maintenance of the Turipana program.

The third major objective of the Turipana development is to provide a major training center for the wide range of leadership, professional, and sub-professional personnel who will work in the north coastal region of Colombia and other similar tropical regions. While the research program with its staff provides a significant base for training, extension, and informational programs, additional facilities are necessary to provide classrooms and other facilities as well as suitable housing and food accommodations.

Other developments, such as the planned extension or communications center, and the closely related community programs associated with the land

tenure program, will keep the research and training operations closely synchronized with farm and commodity interests of the region. Thus Turipana will serve as the center of a vast field laboratory concerned with agricultural and economic development.

Turipana, with adequate leadership and facilities in research, teaching, and extension, can influence positively the world's progress toward increased agricultural productivity in the lowland tropics. This document is based on current planning efforts to provide the basic information for the development of a physical master plan for the description, location, scheduling, budgeting, and implementation of the facilities necessary to achieve the stated objectives.

## DESCRIPTION OF THE PRIMARY AREA TO BE SERVED

Location: The Centro Nacional de Investigaciones Agropecuarias

"Turipana" is located in the municipality of Cerete, Department of Cordoba, in northern Colombia, South America, at 8° N and 76° W. The area consists of 1,472 hectares of clayey soils; the average annual rainfall is 740 mm.

General Aspects of Region: The Center's potential sphere of influence includes the Departments of Cordoba, Bolivar, Sucre, Atlantico, Cesar, Magdalena and Goajira. These Departments, for the most part, consist of low plains and rich valleys, such as Cesar, Sinu and San Jorge. This area of 132,067 kms.<sup>2</sup> for 3,238,956 people has an average of 24.5 people/km.<sup>2</sup>, or 4 hectares per person. The Magdalena, Sinu, San Jorge and Cesar rivers cross this coastal plain area of northern Colombia between 7 and 10° N and 71 and 77° W.

This coastal plain region has the seaports of Barranquilla, Cartagena and Santa Marta. It includes 10 percent of the total land area and 7 percent of the population of Colombia. The climate and topography are typically savanna with definite wet and dry seasons and problems of both drainage and irrigation. The region has a great potential for the development of more intensive agriculture, including mechanized crop production, improved grazing and forage crops for beef and dairy cattle.

Important Agricultural Factors: The soils in the major part of the region are considered good for a variety of crops. Some soils of the area such as those of Goajira, are poor and desert-like, though natural grasses abound.

The temperature ranges between 28 and 35° C, and the climate fluctuates between warm and hot. Rainfall is more or less evenly distributed from

April to November; lack of water becomes critical between December and March. In some parts of the region, precipitation reaches 1,500 mm. annually, in others it is as low as 400 mm.

The most important crop and livestock areas are:

Magdalena: Banana and cotton. Because of its fertile lands and wide expanses of "artificial" and natural grasses, this Department is considered second in livestock in the country. The great livestock area is located along the banks of the Magdalena, and development is widespread.

Guajira: Most of the Department is seeded with natural grasses, and the most important industry is goat-tending.

Cesar: Cotton, rice, corn, sesame and sugar cane. Here the principal industry is cattle raising and finishing. An average of 80,000 animals are slaughtered and exported annually. A Cieolac plant in Valledupar buys most of the milk produced in this Department.

Atlantico: Corn, rice, coconut trees, sorghum and sesame. Sabanalarga is the main cattle center. In other regions cattle is used for milk, an important staple; there are fine examples of the Holstein and Pardo Suizo breeds, with production up to 15 kilos of milk per cow, per day, from two milkings.

Bolivar: Sugar cane (Sincerín), rice, tobacco (Carmen de Bolívar). This is also an important livestock region, with approximately 500,000 head of various breeds.

Cordoba: Corn, rice and cotton. A big cattle raising region, especially in its central and northern areas, this Department supplies meat to several other Departments. Its operations are extensive, especially in fattening cattle. It is considered the first cattle raising Department of the country, with 1,300,000 head.

The livestock regions in general display a great diversity of grasses, the most important being Pasto Para (Panicum purpureum) for the low humidity areas; Guinea (Panicum maximum); Puntero (Hypharrhenia rufa); Pangola (Digitaria decumbens) for the high and/or dry regions, involved mainly in rearing and raising livestock.

For the most part, the people are not proprietors, but work in the companies or factories located in the cities, or on the extensive farms, or haciendas. Few farmers have their own plots of land.

Transportation and Communications: Land routes (highways) of the area are in more or less good condition and join the producer centers (agriculture and livestock) with the large consumer centers.

Waterways: The Sinu river, in the Department of Cordoba; the Magdalena river, between the Departments of Atlantico and Magdalena, Bolivar, and Cesar.

Railways: In the Departments of Cesar and Magdalena.

Airways with Barranquilla, Santa Marta, Riohacha, Cartagena, Sincelejo and Monteria.

Telegraph, telephone, and radio for long distance communications to the interior and exterior of the country.

Important Cities and Markets: The important cities are:

Barranquilla, 403,300 inhabitants, river and sea port.

Cartagena, 242,000 inhabitants, sea port.

Santa Marta, 104,470 inhabitants, sea port.

Sincelejo, 60,000 inhabitants.

Monteria, 145,000 inhabitants.

Riohacha, 31,900 inhabitants, sea port.

The principal cities of this large area receive agricultural and livestock products from diverse regions of production; trade is carried on between regions in livestock and processed foods, such as oil, cakes, honey, etc.

Development in the Area: In order to be acquainted with the specific development projects which other agencies are conducting, meetings have been held with the agricultural section which is composed of approximately 23 agencies.

There are certain cases involving the Agrarian Reform Institute (INCORA), the Agricultural Zone, the Cattlemen's Federation, and the Cotton Growers' Federation, in which Turipana has closely collaborated to effect better development of the program or projects of these agencies. In general, the projects of all other entities can be more efficiently aligned through close collaboration and consultation with the Centro Turipana - ICA.

One specific area of development is the hydrographic river basin of the Sinu River, occupying some 13,000 square kilometers. In this area, there are nearly 300,000 hectares for agricultural development.

The Corporacion Autonoma Regional de los Valles del Magdalena y del Sinu (C.V.M.) has studied the physical characteristics of the river basin. INCOFA undertook the planning, construction and operation of the projects named Cordoba 1 and Cordoba 2. Cordoba 1 is concentrated in the central zone of the valley on the right of the Sinu River. Cordoba No. 2 includes 75,000 hectares which are subjected to periodic inundations because of deficient natural drainage.

Scope of Influence: Turipana has extended its activities outside its particular locality, making known its specific projects in other agricultural and livestock sectors such as Sucre, Bolivar, Atlantico, Magdalena, Cesar, Goajira and Cordoba itself. With adequate communications, cooperation and international understanding between the countries involved, Turipana could influence similar tropical areas around the world.

AMERICA DELOS

SPRING OF CAPRICORN

SPRING OF CAPRICORN

SPRING OF CAPRICORN



EQUADOR

AMÉRICA MÉTROPOLITANA

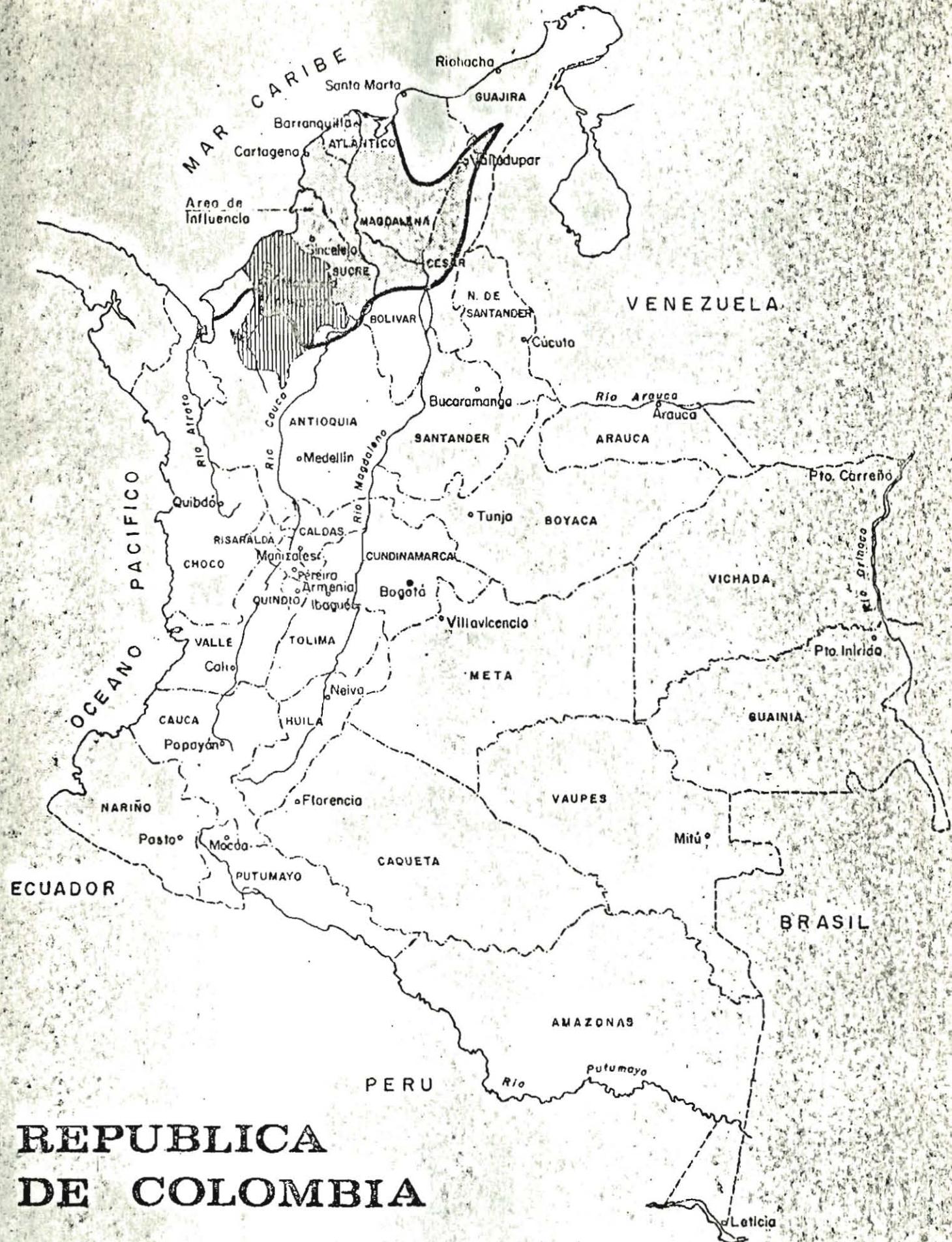
COLONIA

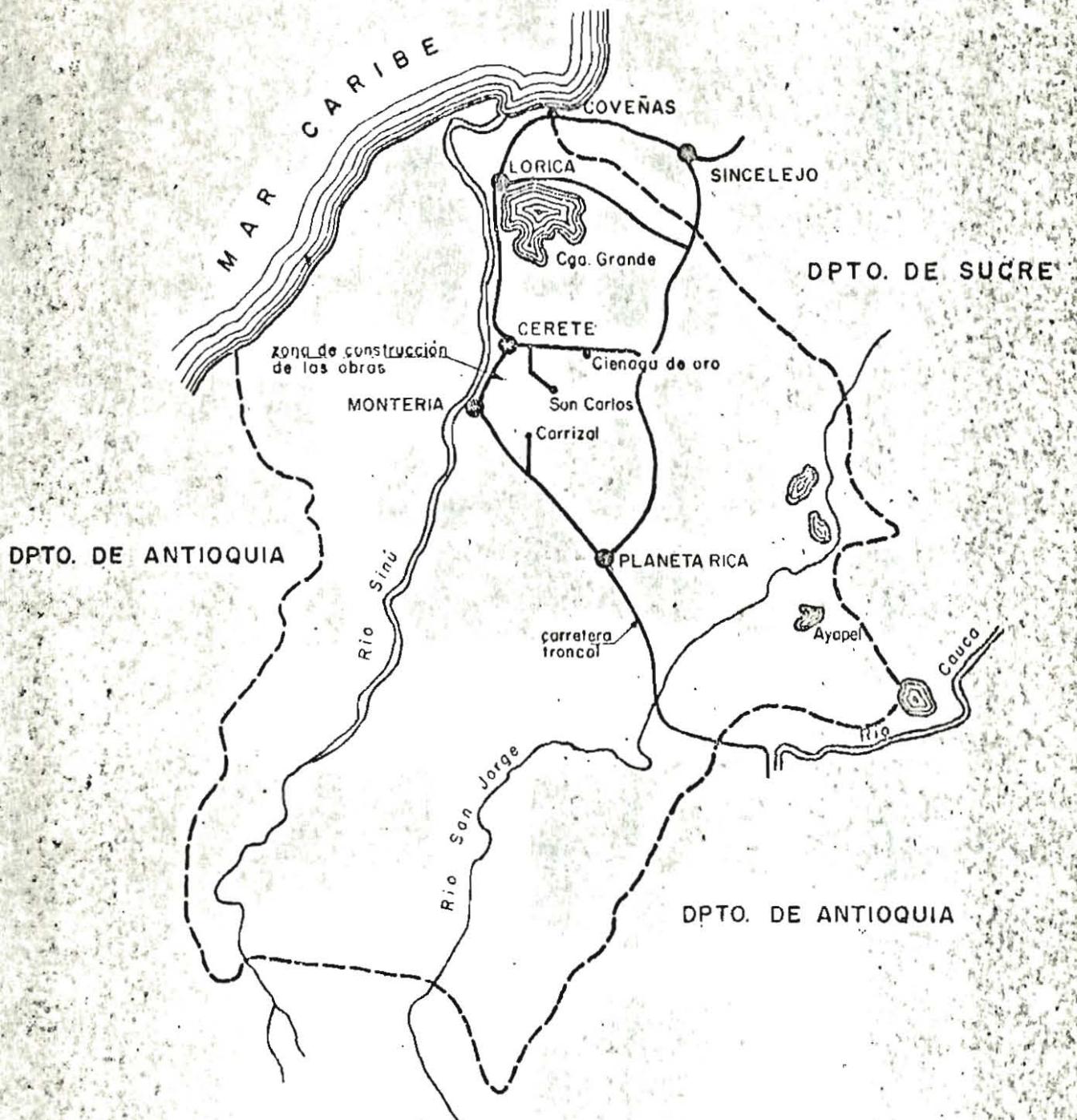
SAN JUAN

P.R.

TROPIC OF CANCER

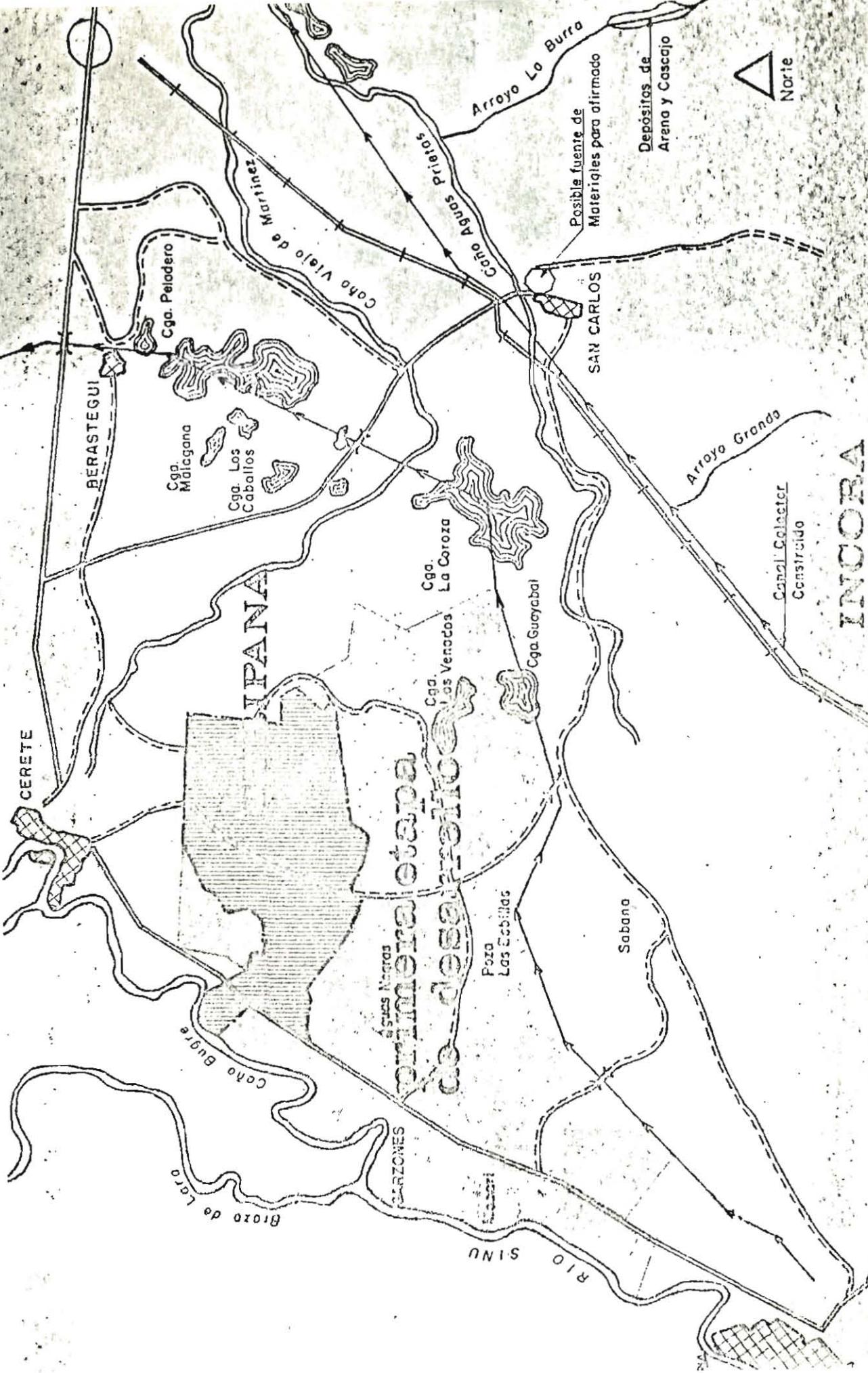
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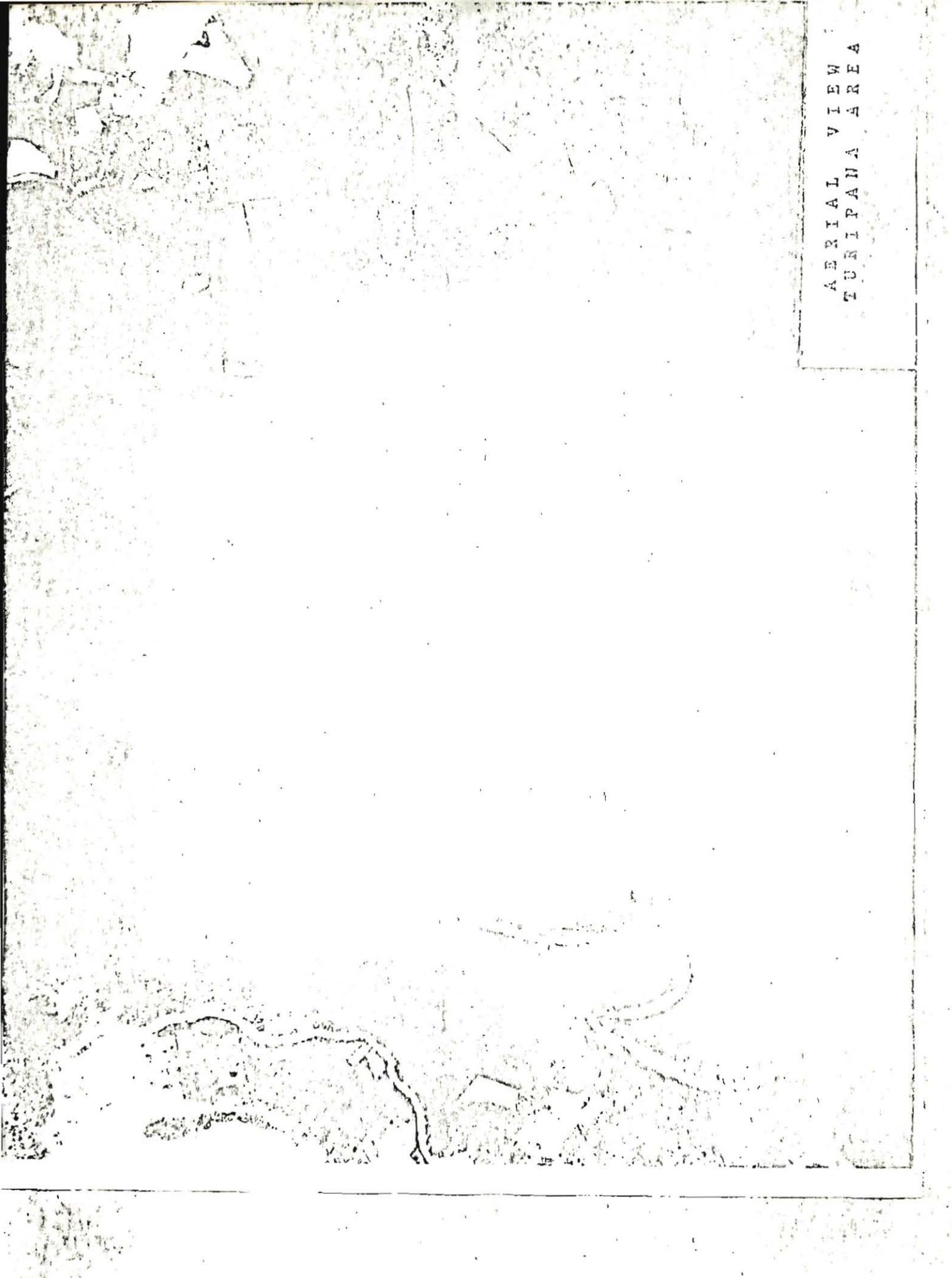


## DEPARTAMENTO DE CORDOBA

INCORA  
PROYECTO  
INVESTIGACIONES - CERETE



AERIAL VIEW  
TUNIPANA AREA



## HISTORY OF THE TURIPANA STATION

On December 30, 1935, the municipality of Monteria purchased the "Buenavista" farm from Sr. Fausto Hawasly to establish what was later called "Monteria Farm." In 1938, the Ministry of National Economy (now Agriculture) acquired this farm from the municipality. The purchase fulfilled Law 71 (1927) and Law 130 (1938) which ordered on behalf of the nation the acquisition of an area for use as a farm. In 1949 the purchase of an adjoining farm, "Las Flores," increased the area by 250 hectares to a total of 772 hectares.

In 1955 the farm became part of the experimental units of the Ministry of Agriculture's Division de Investigaciones Agropecuarias (DIA) and continued functioning with its original nucleus of native cattle.

Various adverse factors such as the growth of Monteria and other socio-economic aspects, as well as the conclusions of the 1957 Farm Directors' Conference, indicated the desirability of uniting into a single Center the work in cattle and different crops for the tropics, especially corn and beans. Consequently, the Ministry of Agriculture decided to transfer the efforts of the Monteria farm to a location more suitable for increased research activity.

After studies, an area of 1,505 hectares was selected and purchased in 1957. Located between the villages of Mateo Gómez and Martínez, on the highway from Monteria to Cartagena, the tract is 12 kilometers from Monteria, 5 kilometers from Cereté. The new farm, "Centro Nacional de Investigaciones Agrícolas Turipana," derived its indigenous name from a Venezuelan Indian chief who established a tribe in the flatlands of the Sinú Valley.

Of the 1,505 hectares, 100 were turned over to the Caja de Crédito Agrario for the Corn Improvement Program. Later (1962), 67 adjoining hectares were acquired from the Empresa Colombiana de Aerodromos (ECA), resulting in a total area of 1,472 hectares. Of these, approximately 250 hectares are lowlands, covered with water from 9 to 10 months a year. Two hundred hectares have been designated for agronomic research and 1,300 for the animal programs.

## PRESENT FACILITIES, STAFF, BUDGET, AND INVESTMENTS

The financial commitment of the government of Colombia in Turipana is extensive. Since 1957, the government has spent approximately \$1,500,000. in U.S. dollar equivalents in lands, buildings, land improvements, machinery and livestock, in addition to supporting the operations annually. The current rate of operational support is \$300,000 (U.S.) and the annual budget is expected to increase at the rate of 20 percent a year over the next 5 years.

New buildings and other capital improvements now planned and scheduled for the next 5 years will total at least \$1,560,000 (U.S.).

The government of Colombia purchased the land for the Turipana station in 1957. The cost of this land was 4,200,000 pesos (\$1,000,000 U.S.)<sup>1/</sup>.

Since acquiring the land, the government has invested more than 700,000 pesos (\$87,500 U.S.)<sup>2/</sup> in developing drainage systems, water supplies, and facilities for beef, dairy, swine and veterinary sciences. In addition, 4 houses have been built at a cost of 300,000 pesos (\$30,000 U.S.)<sup>3/</sup>. Since 1961, The Rockefeller Foundation investment has been slightly more than \$127,000 in the purchase of tractors, farm equipment, and vehicles for use in the research programs at Turipana. The Colombian investment for equipment is 2,400,000 pesos (\$240,000 U.S.)<sup>3/</sup>.

The value of the livestock as invested by the Colombian government is 3,200,000 pesos (\$200,000 U.S.)<sup>4/</sup>.

1/ Conversion rate: 4 to 1

2/ Conversion rate: 8 to 1

3/ Conversion rate: 10 to 1

4/ Conversion rate: 16 to 1

Colombian investments in construction underway or scheduled total 2,845,000 pesos (\$179,000 U.S.)<sup>4/</sup> are as follows: Dairy, 1,000,000; poultry, 300,000; pipe line, 200,000 spent, 500,000 additional needed; pipe for irrigation, 70,000; bodega, 125,000; silos, 200,000, and veterinary laboratory, 950,000 pesos.

At present, the annual operating budget of Turipana, totally financed by the government of Colombia, is 5,000,000 pesos (\$300,000 U.S.), and a 20 percent annual increase is anticipated for the next five years commensurate with the expansion of existing and launching of new programs.

Construction plans reflected in the Appendix (Cuadros 9-23) would require an estimated total investment by Colombia, at present building costs, of at least 25,000,000 pesos (\$1,560,000 U.S.). Expenditure of such funds will be contingent upon appropriations from the national government. The development of Turipana has highest priority in the plans of ICA and there is full confidence that an adequate capital budget will be appropriated annually to permit an orderly but accelerated development of the facilities as necessary to meet the objectives outlined above.

Physical facilities at Turipana include a land area of 65.60 acres (26.24 Has.) for buildings and housing; with 40,847 sq. ft. (4,084.70 M<sup>2</sup>) floor area of buildings. There are 122,400 sq. ft. (12,240 M<sup>2</sup>) of roads.

The present housing facilities include space for 33 single professional employees and 14 workmen.

The total staff of Turipana today numbers 176 persons with 88 employed in administrative activities, 47 in agronomy and 41 in animal sciences.

**SECTION II**

**MAJOR PRESENT AND PROJECTED PROGRAMS**

## PRESENT AND PROJECTED PROGRAMS

Of the four technical and academic departments of ICA, two departments currently conduct research and development activities at Turipana, as follows:

Department of Agronomy, with work in corn, sorghum, grasses and forages, soils, rice, grain legumes, entomology, and seed certification.

Department of Animal Sciences, with work in beef cattle, dairy cattle, and animal health (veterinary medicine).

The nature of this work, the principal problems being attacked, highlights of results, descriptions of present and needed facilities and equipment, and related details are discussed in this section. In addition, information is supplied about the new programs of immediate, joint ICA-CIAT interest to be implemented. These include swine and the communications center.

Plans for Turipana development also include the eventual establishing of programs and providing facilities for several related activities, including a library, as well as these agricultural fields: Cacao, vegetables and fruits, poultry, plant protection (pathology, weed control), yuca, agricultural engineering, and socio-economic development.

## CORN

The major corn production problems in the north coastal region of Colombia are pests and diseases, weeds, cultural practices, and irrigation and drainage. These factors depress the yields of both indigenous and improved corn.

The research underway is directed to achieving the following objectives:

- a. Varieties and hybrids resistant to pests and diseases, as well as economic use of suitable insecticides and fungicides.
- b. Herbicides to control weeds which not only compete with corn for nutrition but complicate harvesting and frequently prevent mechanical harvest.
- c. Improved cultivation techniques and cropping patterns appropriate to the pattern of rain; appropriate drainage is necessary during the first season and practical irrigation during the second.
- d. Varieties resistant to drought.
- e. Increase in the content of high quality proteins in adapted varieties.

At present, there are four main projects:

Improvement (collections, inbred lines, varieties and hybrids, basic material of special characteristics, evaluation of different methods of improvement); Regional Testing, Cultural Practices, and Special Studies (resistance to insects and diseases, corn with high nutritive and industrial value, etc.).

The work includes studies necessary to increase production in all areas of the country between 0 and 600 meters above sea level.

The program has produced five varieties and four hybrids; of these the following are presently being distributed: varieties Diacol V. 153, Diacol V. 103 and ICA V. 105; and hybrids Diacol H. 104 and ICA H. 154. In general, these latter corns demonstrate 50% higher yield than the indigenous

varieties. If this improved material were more generally planted, the impact on national production would be tremendous.

The future program will project the investigations at Turipena to all appropriate areas of the country. The problems to receive major emphasis are those associated with raising yields of commercial materials and with appropriate techniques for the greater production of these materials.

Present Staff and Facilities. Three agronomists are assigned to this program, plus an office clerk, three technicians, and 18 workers.

Although there is sufficient land for a more extensive program, irrigation facilities are lacking. The present buildings are not adequate, and most of the machinery is out-dated for specific jobs. The 8-year-old cold room is in poor condition, a late model dryer has not been installed adequately, and the one vehicle assigned to the program is in poor condition.

Proposed Staff and Facilities. To carry out the proposed program and to promote it among the farmers, one additional agronomist will be needed to conduct regional trials and demonstrations.

In addition to the specific items of equipment (listed in Section V), the other needed facilities (to be provided in the development program) include appropriate buildings, storerooms, laboratories, and irrigation.

## RICE

One of the most important problems in rice production in the north coastal area of Colombia is the rice blast disease caused by the fungus Piricularia oryzae Cav. It results in complete loss in susceptible varieties when the relative humidity is over 90%. In order to select resistant material, some genetic materials are being tested under special conditions so as to develop the fungus. Studies also are being conducted on chemical controls with fungicides, the main purpose of which is to develop a means of protection until the program produces resistant varieties.

Because of lack of irrigation water, the rice program has lost several experimental crops, and this water deficiency has limited past work to:

- a. Collection of varieties.
- b. Selection and observations of genetic material, or material brought from the Palmira Center.
- c. Development of yield trials.
- d. Blast resistant trials;
- e. Regional trials.

Three promising lines have been selected, and these will be studied in the rice zones of the Atlantic Coast. Under field conditions, these lines have shown resistance to blast. They yield well, are long grain, have been resistant to "hoja blanca," and have a short vegetative period.

The rice program includes the following activities:

- a. Extension of improvement projects, resistant disease trials and

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The rice program includes the following activities:

- a. Extension of improvement projects, resistant disease trials and

multiplication of seed of promising varieties.

- b. Initiation of cultural practice projects on irrigation and fertilization; distances, methods, and densities of crops under dry land and irrigation conditions, and weed and pest control.
- c. Production of two crops annually in the different trials.
- d. Organization of a regional trial fertilization program.

Present Staff and Facilities. One agronomist is assisted by a field helper and five laborers. A storeroom is being used as an office, and there is one thresher.

Proposed Staff and Facilities. Two additional agronomists are needed, plus two field helpers, 15 laborers and a secretary.

In addition to the specific items of equipment (listed in Section V), the other needed facilities (to be provided in the development program) include irrigation, about 20 hectares of level land, a large air-conditioned storeroom and offices, and experimental plots for blast resistance trials.

## GRASSES AND FORAGES

The major causes of limited production of grasses in the north coastal area of Colombia are (1) poor management of the existing grass and legume species, and (2) poor utilization of green feeding crops, ensilages, and supplementary forages.

Para grasses, pangola, and the recently introduced angleton are all well adapted to the alluvial soils. Puntoro and guinea predominate in the latasols which compose the soils of almost all of the area. Although the grasses are well adapted and of excellent forage quality, they are poorly utilized because of weeds and poor grazing management (over-grazing and continuous grazing). The dry period limits forage production. On the other hand, periodic inundations in low alluvial soils, and lack of drainage, make access to available forage difficult.

Nitrogen is the most limiting soil nutrient; however, spontaneous legumes of the genera Phaseolus, Pueraria, Centronema and Desmodium abound in the alluvial soils.

The primary objective of the program is to offer the stock farmer the best alternatives for meat or milk production in accord with the existing farm conditions, available resources, and possibilities for progressive improvement of productivity.

Promising results have been obtained on the following aspects of grass management:

- a. Production of seed of tropical grasses.
- b. Methods and dates of seeding.
- c. Mixes of grasses and legumes, frequency of grazing and cutting.

- d. Weed control.
- e. Quantity, sources and frequency of application of nitrogen in green feeding and grazing crops.
- f. Chemical analyses of grasses and legumes under different states of management and growth.
- g. Adaptation and management of new species and varieties.

Present experiments emphasize the evaluation of grasses and management practices with regard to grazing animals, legume seeding in existing pastures, quantity and frequency of phosphorus and potassium, regional trials and demonstration with grazing animals, costs of production, and dissemination of the results on a national scale. This work is being carried out in cooperation with the beef cattle, nutrition, economics and extension programs.

In cooperation with CIAT, it will be possible to evaluate management systems for grasses and animals, and to conduct such studies as chemical analyses and digestibility, types of reserves necessary for growth, place of storage, effect of fertilizers and grazing systems on index of Foliage Area, types or reserves of tropical grasses, production and commercialization of seed of tropical grasses and legumes, genetic improvement of spontaneous legumes, cytogenetics of tropical forages, silages, and efficient use of irrigation.

Present Staff and Facilities. One agronomist with a field helper and four workmen carry on the present program. The facilities consist of one office and ten hectares of research area. The equipment includes a jeep (in poor condition), a mower, a mill, an imprecise scale, and minor agricultural tools.

Proposed Staff and Facilities. In 1968, two agronomists and an additional field helper were added to the staff. Additional building

needs include offices for the staff, a laboratory and rooms for drying, <sup>mold</sup> grinding, weighing, and storing specimens, as well as seeds. Equipment needs are detailed in Section V.

## GRAIN LEGUMES

About 20 species of ~~comestibles~~<sup>legumes</sup> are eaten throughout the world regularly in appreciable quantities. The greatest caloric intake of pulses is in Brazil with a per capita intake of 215 calories, followed by Mexico with 190 and Haiti with 175 calories. Many of the developing countries such as Bolivia, Colombia, El Salvador, Guatemala, Jamaica, Panama, Peru and British Honduras consume relatively small quantities of pulses. This is reflected in the relatively low daily protein intake for these countries. If pulse production could be encouraged, significant increases in protein availability would result. The protein content of the pulses ranges from 17 to 25 percent in the dry grains, and of soybeans, as high as 38 percent.

In this group of grain legumes we consider of first importance for this area black beans, cow peas, and soybeans. The main problems for development are diseases and the unfavorable environment such as excess of rain in some months and drought in others.

The program plans to concentrate on finding the varieties of high adaptability and production, on agricultural methods, varieties of high protein quality and with resistance to the common diseases.

Later studies will concentrate on increasing yields by selecting promising lines from crosses and investigating the possibilities of reducing or eliminating photosensitivity.

Management studies will include methods of insect, disease and weed control, fertility levels, plant and row spacing, varietal adaptability, irrigation, and date of planting.

Close cooperation with CIAT and other stations in Latin America working on various pulses will be extremely important.

The necessary facilities and equipment for this program are outlined in Section V.

## SOILS

The major soil problems in the alluvial valleys of the north coastal region of Colombia are associated with drainage and irrigation. As soils are levelled or formed for irrigation, serious fertility and physical management problems arise, particularly when cuts are as deep as has been necessary on many fields at Turipana. Here, acute P and N deficiencies were encountered along with less severe zinc and sulphur deficiencies in subsoils exposed by cuts of approximately 50 cms.

Soil fertility is seriously limiting productivity on the non-alluvial soils in the region which presently are devoted primarily to forests and grazing lands. These soils are generally acid, low in P, N, K, Ca and Mg. The topography does not favor intensive agricultural use.

The present soil program is concentrated in three projects:

a. Regional trials in the Sinu Valley and surrounding foothills below Monteria. These trials are designed to determine nutrient needs for row crop production on the more important soils of the region, using corn as an indicator crop. They also provide fertilizer response data for calibration of laboratory (soil test) methods.

b. Management studies at Turipana in which there are tests of various ~~tillage~~ <sup>Turipana</sup> tillage and planting systems, row spacing, and planting rates with corn, sorghum, and soybeans.

c. Irrigation and drainage studies at Turipana. In the first 5 months of 1968, under the leadership of a temporary scientific aide from California, 45 hectares of land have been levelled and formed for 4 irrigation systems. Studies of these different systems will begin in the second half of the year.

when irrigation water will be available and needed.

Preliminary results (data from one crop) indicate the need for careful attention to fertility when soils are cut. Few fertility problems have been encountered on uncut alluvial soils. Management studies have provided general guidelines for row and plant spacing for the varieties of corn, sorghum, and soybeans presently grown. Regional trials (2 years' data) confirm the lack of fertilizer response (with the exception of N) on Sluice Valley soils.

Present Staff and Facilities. Two agronomists, one field assistant, and six laborers carry out the present program. Office space is provided <sup>deposito</sup> in a warehouse, along with a combination work-storeroom. Adequate land is available for current research activities.

Proposed Staff and Facilities. Six professionals are needed to staff a laboratory, to expand regional trials, and to execute management, drainage, and irrigation research. Three field assistants and a laboratory technician, along with 15 laborers, are needed to support these professionals. Adequate laboratory, office, work and storage space, along with a greenhouse, are contemplated in the development plans.

See Section V and Appendix.

### BEEF CATTLE

The major problems in beef cattle production in the north coastal region of Colombia are parasitic and infectious diseases, inadequate management of grazing fields and cattle, nutritional problems (especially from weaning to fattening), marketing, transportation, and the scarcity of slaughterhouses.

The principal objective of the research is to develop management practices, both for grazing lands and cattle, applicable to the region. These practices include vaccinations, time for castration and weaning, carrying capacity of different grasses adapted to the region, rotation of grazing lands, periods of use, and fertilization. Other work includes determination of the mineral requirements for cattle according to age and type of production, and selection and breeding of commercial crosses of cattle.

The present beef cattle program is concerned with these three projects:

- a. Management: Identification of animals. Vaccination. Control of parasites. Time of castration and weaning. Breeding periods. Determination of percentages of birth. Mortality and weaning.
- b. Nutrition: Nutrition of suckling calves, grazing cows, and adult cattle for production and reproduction. Fattening in pasture (evaluation of female hormones, mineral supplementation). Production of meat per hectare per year on different grasses. Determination of the carrying capacity of para grass.
- c. Improvement: Breeding. Selection and performance of the Romosinuano and Cebu breeds. Testing of the bulls. Weight control. Commercial crossing (Cebu x Romo, Romo x Cebu, Charolais x Romo).

The most conspicuous results obtained so far include:

- a. Improvement of the growth rate of steers by 15 percent through use of female hormones.
- b. Increase in percentages of birth and weaning (from as low as 35-40 percent to 80-85 percent) and lowering of mortality rate in calves through application of the management practices described above.
- c. Production of cattle for slaughter with higher weights than the common cattle of the area.

The beef cattle program will concentrate on: Evaluation of different management systems; nutrition of suckling calves; semi-intensive fattening (evaluation of different grasses and legumes, rotation and fertilization <sup>peadero</sup> of meadows); value of mineral supplementation in grazing and breeding cattle; selection and breeding; production of animals for slaughter at earlier ages (18-24 months); and studies of yield and quality of meats.

Present Staff and Facilities. Two veterinarians, two clerks, and 14 workers comprise the present staff. In addition to the grazing lands, there are a few corrals in poor condition, a scale, two vehicles, a tractor, plow, <sup>seeds</sup> *pastello quenda*, rake, and scythe. Improvements were completed in 1967 on the grazing fields, fences, and offices.

Proposed Facilities. The facility needs include space for laboratories <sup>enfermerias</sup> and offices, corrals, silos, infirmaries, and more adequate water supplies. The requested equipment includes a feed mixing plant and cattle washing equipment.

DAIRY

The main problems of milk production in the north coastal area of Colombia are as follows:

- a. Scarcity of forages, especially during the summer season, and lack of knowledge regarding proper pasture management, conservation, fertilization, and grazing systems.
- b. Unprofitable use of forages and other crops which could be used for ensilage.
- c. Antiquated and non-technical systems of dairy cattle management and of raising calves and heifers.
- d. Absence of a milk-producing breed.
- e. Deficient systems of reproduction, genetic selection and dairy cattle improvement. The most appropriate breed or cross for the region is not known.
- f. The tropical climate with high temperature and excessive humidity makes adaptation of European breeds difficult.
- g. Prevalence of many tropical diseases and unprofitable use of systems of disease control.
- h. Lack of appropriate buildings to facilitate cattle management and to provide better environment for cattle.
- i. Lack of trained personnel and the attitude of many cattlemen with respect to technical improvements.

The present program is oriented to the study of management, feeding, reproduction, genetics and selection, animal health and physiology, in addition to cooperative work on pastures and forages.

Investigation has been principally directed towards evaluating the native CCC livestock, European Holstein, Pardo Suizo, and their crosses, with regard to the production of milk under the hot and humid tropical conditions of the north coast.

Studies conducted throughout the past several years have provided

some valuable information:

- a. Although the Costeño con Cuernos (CCC) breed adapts excellently to the tropical environment, it does not appear to be an economic producer of milk.
- b. The European breeds studied (Holstein and Pardo Suizo) adapt poorly to the tropical environment. Undoubtedly, improved management conditions for these two breeds and disease control could improve production and reproduction, but the costs would make the effort uneconomical.
- c. If carried out at young age, acclimatization of the European breeds presents few problems. However the environmental effects are severe for the first gestation and the following lactation.
- d. The CCC is fertile and when crossed with stock of low reproductive performance the 1/2 bloods also retain this characteristic.
- e. When the CCC are mated with Holsteins, the milk production of the 1/2 bloods is essentially similar to that of the Holstein in this environment.
- f. The milk let down problem of the CCC does not occur in the 1/2 bloods.

The future program will focus on the following areas:

- a. Continued studies of indigenous and European breeds and their crosses; for example: 1/2 Holstein x 1/2 CCC; or comparisons of 3/4 Holstein with 1/2 CCC, regarding milk production and fertility.
- b. Studies to improve environmental conditions, which would perhaps require different types of buildings and facilities.
- c. Advanced studies to improve feed systems, including evaluation of consumption and nutritive value of the available forages -fresh and ensiled; studies of systems of management and use of pastures for intensive or extensive rotation; and studies on the possibility of using grain supplements and by-products in the most economic manner.
- d. Advanced studies to improve management systems of livestock especially regarding the use of shaded areas for cows in total or semi-confinement, with the purpose of obtaining a better environment for improving milk production and fertility.
- e. Continued studies on the ensiling of such forages as corn and sorghum.

In cooperation with the programs of physiology and veterinary medicine, it is necessary to continue these studies:

- a. Control of tropical disease, especially hemoparasites (*Anaplasma*) and internal and external parasites.
- b. Physiological aspects of reproduction. Determination of the factors involved in the sexual cycle, ovulation and fertility in regard to the neurohormone balance.
- c. Physiological aspects of lactation, including determination of the causes of poor let down of milk, and the short duration of lactation in CCC cows, especially when milked in the absence of the calf.
- d. Adaptability of CCC cattle and European breeds in order to establish some constant physiological norms. Study of the behavior and habits of these animals and of their mechanisms of thermoregulation based on the signs which reveal the degree of adaptation of the animals.

Present Staff and Facilities. Two animal husbandry technicians, a manager, a secretary, a sub-professional worker, and several laborers make up the current staff.

Present facilities include two provisional milking stables, some shaded sheds, some rooms adapted to serve as a temporary laboratory and storeroom, and three bunker silos. The following facilities currently are being added: milking room, *sambaias*, launding sheds, facilities for calves, maternity section, feed plant, storerooms, infirmary, dairy laboratory, offices, water and electrical power. The equipment includes some machinery for engiling, mixing, and grinding; a scale; sprayer, and some agricultural tools.

Proposed Facilities and Equipment. The development plans propose rooms for studies of nutrition and physiological environment; feeding and drinking troughs. The additional equipment needed includes agricultural machinery, irrigation equipment, milking equipment, and that necessary for nutrition and physiology laboratories.

## ANIMAL HEALTH

Losses to the animal industry in the north coastal area of Colombia amount to as much as 40 percent of the total production annually. The principal factors affecting the cattle population are hemoparasites, anaplasmosis, babesiosis, trypanosomiasis, gastro-intestinal problems, pulmonary parasites, and fertility difficulties.

As a consequence, the research program has been directed to the development of management systems to control hemoparasites, along with studies of vaccination procedures and of the general epidemiology of hemoparasites. Other activities include development of an adequate and timely diagnostic service, studies of gastro-intestinal parasites, and use of rotation of grazing lands to achieve control. Field trials to evaluate anaplasmosis immunization methods are underway.

The projected program envisions a complete diagnostic service, including microbiology and pathology by 1969-70 and extensive investigation of hemoparasites in 1969. New research laboratories are to be constructed by 1969, inasmuch as the present laboratory work is carried out in the remodeled area of the kitchen of one of the provisional dwellings.

The present equipment and facilities include a vehicle, minimal surgery facilities, clinical equipment, microscopes, centrifuge, incubator and related accessories. Two veterinary clinicians are employed in the field service program.

The new laboratory building will include six isolation units for research, as well as an autopsy facility.

Additional personnel to be added in 1969 will include a microbiologist and a parasitologist, as well as several sub-professionals. Two of these currently are in training.

## SWINE

The swine industry of the north coastal area of Colombia is perhaps one of the least advanced pork production systems in the Western Hemisphere. The major problems are in nutrition and management. There is a lack of knowledge of the best way to feed pigs, especially using the feeds indigenous to the area. Some of these possible feed ingredients have not been studied.

Most pigs in the area are produced under poor management conditions, and the time to reach market weight is twice that of the most advanced swine producing areas. Parasites are important sources of economic losses to the swine industry and hazards to the human population.

Turipaná will be the only tropical swine research station in Colombia. Facilities, to be constructed as soon as funds are available, will handle the production of 800-1,000 pigs per year.

Initial plans are being studied and the site has been prepared.

The personnel projected for the swine program will include two men on research and one on extension, with appropriate supporting staff and equipment.

## COMMUNICATIONS CENTER

Full realization of the impact of the Turipana program on the agricultural development of the north coastal region of Colombia will depend on effective operation of an extension and communications center. This center will establish training and informational activities designed to help identify, mobilize, qualify and stimulate the wide spectrum of personnel and institutions essential to the development process.

These activities will include information dissemination through periodicals, bulletins, radio, field days, exhibits, and demonstrations; organization and conduct of short courses, workshops, and similar training programs for farmers, farm managers, extension workers, field representatives of public and private agencies, and regional and national leaders; and facilities for letting visitors see first-hand the research and developmental projects.

Development plans for Turipana include the necessary physical facilities, equipment, and personnel. These facilities will include a small auditorium which also will be used for meetings of the Turipana staff and by trainees in residence at the station (see next section).

## TRAINING

The professional research staff of Turipana will cooperate with the Communications Center in presenting informational and educational programs, including short courses, for extension workers, farmers, and other vocational groups. In addition, this staff will engage in other educational-training activities more directly tied to the research programs and, in certain cases, in cooperation with CIAT. It is anticipated that from 40 to 60 trainees may be involved in such training activities at any one time.

These trainees may be identified in the following general categories:

1. Professional research and production training personnel from agricultural agencies of Colombia and other countries who will spend from several months to a year or more at Turipana in research and/or production oriented training. They may be sponsored by CIAT, ICA, or any of several other organizations or institutions. Included in this category would be graduate students who come to Turipana to pursue a particular line of investigation or to work on a thesis or dissertation study. Professional workers might also be engaged in studies leading to or associated with advanced academic work. Some of these persons might also serve as research assistants.
2. Undergraduate students in agriculture and veterinary medicine invited to spend several months at Turipana as (a) summer students needing field experience as a degree requirement, (b) vocational school curricles of acceptable technical schools, such as Lorica, who wish to continue their training as apprentices, and (c) selected students from nearby institutions, such as the Universidad de Cordoba, to gain field and laboratory experience.

**SECTION III**

**TRAINING**

3. Employees of the Turipana station who would receive on-the-job training supplemented by regular seminars and technical discussions.

Planning for new facilities at Turipana recognizes these training objectives and opportunities and appropriate lecture rooms and teaching laboratory facilities are incorporated in the design of buildings and physical <sup>distribución</sup> layout of the grounds. While certain instructional objectives can best be achieved in the field, the bodega, or farm shop, other objectives necessitate some classroom and laboratory space. These rooms are to be incorporated in the offices and laboratory facilities for the plant and animal sciences programs.

A basic requirement of the teaching space is to provide a flexibility which would permit later expansion or reduction of these areas, or the diversion of the space to other uses, without major alterations of the structures or associated equipment. Also, these areas need to be so arranged as to permit close and frequent interaction of the trainees and professional staff without interference with the research functions of the station. Some of the classroom areas are to be equipped with movable partitions to permit arranging of rooms to accommodate groups of various sizes.

It is anticipated that the training conducted in cooperation with the Communications Center would regularly include short courses for sub-professionals (*tecnicos* and *practicos*), local extension workers and field representatives of various government and private agencies, agricultural teachers, farm foremen, herdsmen, and local agricultural tradesmen. These short courses, depending upon subject, objective, and audience, will range from a few days to two or three weeks, with several hundred persons being enrolled during a calendar year.

## **SECTION IV**

### **THE PHYSICAL PLANT**

OBREGON VALENZUELA & CIA. LTDA.  
ARQUITECTOS - INGENIEROS

OFICINAS:  
LE 64 No. 13-30 - OF. 402 - 403  
S.C.A. S.C.I. S.C.E. C.C.C.

BOGOTA-COLOMBIA  
TELS. Nos. 48 83 29 Y 48 83 30  
CABLES: "OBREVAL"

Bogotá, D. E. May 13, 1.968.-

To : Drs. Jorge Ortiz Méndez  
Ulisses J. Grant.-

From: Arq. Rafael Obregón G.-  
Bogotá - Colombia.

The plans developed by the planning staff of I.C.A. Tibaitata have been revised in my office for soundness of planning and Architectual conceptual development.-

The general layout seems Topologically correct, well planned and efficient.-

The elevations, cross sections and architectural concept show that the region, its climatological conditions and available building materials have been thoroughly studied and understood.-

The architecture itself though still in a very initial stage appears to be both interesting, well conceived and easy to construct.-

Sincerely yours,

  
RAFAEL OBREGÓN G.-

## PLANNING AND ARCHITECTURAL CONSIDERATIONS

This functional master plan for Turipana considers the total scope of its immediate and future requirements. Optimal locations of activities, facilities, movement patterns and utilities are as important among these requirements as are integration of the existing physical plant, use of the natural characteristics, social and recreational activities, and treatment of the landscape. The total master plan also must provide for schedules of area requirements, equipment, budgets and increments of implementation.

Because Turipana's lowland, hot tropical location is not conducive to human comfort, its built environment must provide the most favorable conditions for occupants.

Design development should be appropriate to the north coastal area -regionally aesthetic, adapted to the climate, and consistent with the characteristics of a total architecture. A modest expression in building design is not incompatible with the incorporation of necessary controls to overcome environmental disadvantages.

With proper architectural control over solar heat gain, and adequate natural ventilation systems, the building design should combine maximum human comfort and minimal air conditioning loads. Mechanical air conditioning may be necessary in some areas, but the possibility of mechanical failure dictates the need for a tropical architecture oriented to environmental control.

Turipana's remote location offers few social, cultural or recreational advantages. Consequently, a social and recreational center is considered in the master plan, this possibly to consist of outdoor facilities for games and swimming.

## PLAN DEVELOPMENT CRITERIA

### Geography, Environs and Services

Consideration of the general environmental conditions, described in Section I, is vital to the developing of the master plan for Turipana. Particular emphasis is placed on building orientation in relation to the direction of sunlight and to the prevailing breeze and wind vectors throughout the year. Graphic representations of the primary environmental variables which most influenced the development of this plan are included in the Appendix. Although the topography of the site is essentially flat, some alterations have been made for adequate drainage. Structural soil conditions do not favor buildings more than two stories in height without additional footing stabilization.

The environs are similar to the immediately surrounding area. A branch of the Sinu River borders a small frontage of the property on the northwest, across the highway from the major land area. Two communities, Monteria and Cerete, are within vehicular commuting distance.

A domestic water system, being constructed on the site, will connect with a proposed line from Cerete and deliver 8 liters per second. Electricity and telephone services are currently provided. Wells are being constructed to provide water for animals, and an irrigation system is being implemented.

### Design Considerations

The climatic conditions necessitate major design considerations to achieve temperature controls. Building facades with maximum ventilation and minimum sun exposure permit natural cooling by air movement through buildings, and also control solar heat gain. Generous roof overhangs contribute to

shading of walls, thus controlling heat gain and light glare. Insect control within built spaces is important. The creation of the necessary environmental controls, through architectural design, will minimize the needs for mechanical air conditioning. If engineering feasibility studies determine the necessity of air conditioning, the development of the architectural design will considerably reduce the load requirements of the mechanical system.

Analysis of the existing plan for Turipana reveals that considerable development has taken place. This development includes drainage of large portions of land, construction of canals for continuous drainage, provision of a system of roads for easy access to all parts of the site, the precise delineation of areas into 20 and 80 hectare fields, electricity, telephone and limited water-services, and development of agricultural activities in many parts of the site.

The building program has resulted in warehouses, maintenance and service shops, silos, certain poultry, swine, beef and dairy farm structures, four family houses, and an office structure.

Presently, there are two major entrances to the site. It is recommended that only one entrance be maintained for greater control over vehicular movement into and out of the farm. This also insures a more precise and controlled circulation pattern, discouraging intrusion of vehicular movement into the living and general administrative areas. It is also recommended that pedestrian entrances be limited to controlled points on the periphery of the site.

In determining optimal land use of the major areas of construction, the following criteria were developed and incorporated into the plan:

1. To conserve as much land as practical for agricultural use.
2. To locate major structures so that expansion may take place as growth demands.

3. To maintain maximum flexibility in land allocation and building development to allow for changes in program requirements.
4. To condense the major-building complex to a pedestrian scale (i.e. to place the aggregate of buildings within reasonable walking distance of each other); at the same time to provide adequate space between structures for proper light, ventilation and expansion.
5. To provide a functional relationship between building groups and farm land to insure optimal travel patterns.

The incorporation and implementation of these criteria should assure the fulfillment of Turipana's land use objectives.

For the physical development of the central building complex, the following criteria were developed and incorporated into the plan:

1. To develop statistical information regarding personnel and building areas, and projected expenses for the anticipated growth of Turipana. (See Planeacion Fisica, Cuadro No. 11B, 13, 14, 15, 24, 25, 26, and 27).
2. To devise an index of construction (building area to land area ratio) which would allow a desirable relation in initial and future construction.

$$\frac{\text{Floor Area}}{\text{Land Area}} = \text{Index of Construction}$$

(See Planeacion Fisica Cuadro 28, 29, 30 y 31)

3. To maintain controlled entrance and egress of vehicular and pedestrian movement--thus the decision to provide a single entrance to serve the central administrative housing complex, storage and maintenance facilities, and farm lands. It is recommended that the existing road, entering from the public highway and leading directly to the workshops and interior of the farm, be used for this purpose. This road offers adequate control of vehicular movement, proper access and egress, and separation of vehicular and pedestrian circulation. It does not intrude into areas of future expansion nor does it obstruct traffic patterns.
4. To develop the central complex with a maximum of two floors in the major structures. This is a necessary consideration, first, because of the unstable structural soil conditions as indicated in soil tests. A copy of the soils report is included as part of this program. Second, because of the desirability of maintaining a simple linear relationship among functions, there has been no demand to increase structures over two floors. Finally, land values are not high enough, comparatively, to create demands for building heights of more than two floors.
5. To locate buildings and parking areas in reasonable proximity, especially

those which should be most accessible to visitors, such as administration, communications, etc.

6. To provide a functional covered pedestrian circulation system. Roof overhangs on buildings will shelter walkways and building walls.
7. To create a controlled open space, delineated by the primary buildings, on the order of a "civic plaza," to serve as a focal entrance for pedestrian movement.
8. To provide secondary controlled open spaces, between other structures within the major complex, for pedestrian circulation, light and ventilation.
9. To develop an appropriate landscape plan which will complement architectural development and modify adverse environmental conditions. Shade trees are desirable for air movement, to screen parking lots, and to eliminate glare or reflections from the intense sunlight.
10. To analyze and recommend appropriate construction materials appropriate to the north coast area.
11. To provide adequate parking spaces at primary locations for easy building access and direct connection to service routes.

With these criteria established and incorporated in the plan, certain design decisions evolve in the plan development. They are as follows:

1. To locate a service road with connection to the principal road, encircling the major building complex and providing access and parking for the primary installations.
2. To delineate pedestrian travel patterns within the service periphery.
3. To avoid conflict of vehicular and pedestrian circulation.
4. To introduce one controlled pedestrian entrance to the site adjacent to the workmen's cafeteria (obreros casino).
5. To assemble structures of similar function in adjacent or adjoining patterns within the central complex. This functional series of relations is described on the graphic functional diagram.
6. In addition to being appropriate to the regional character, certain available building materials in the area are most suited to the needs of local construction, and lend to the architectural concepts of a valid tropical architecture. The materials suggested from some limited investigations are:
  - a. Block masonry produced on the site for wall construction.

- b. Open block masonry to be used for ventilation openings.
- c. Hardwood beams for spanning roof areas and certain floor areas.
- d. Poured in place reinforced concrete for slabs.
- e. Plaster and concrete stucco for wall coverings.

#### Conclusions

This master plan has evolved from a careful and complete appraisal of all relevant criteria and design considerations. Its purpose is to describe an orderly and constant growth pattern for the physical development of Turipana. It is intended as a continuing basis for planning to which projected program stages should be added as present stages are implemented. While it allows the flexibility vital to a projected and developing program, the plan's usefulness lies essentially in its implementation. Adoption of the plan, with its built-in provision for growth within the overall structure, eliminates the danger of random and unprofitable expansion in the future.

## AIR CONDITIONING APPROACHES

The environment of Turipana presents certain major considerations regarding air conditioning. Solar heat gain, humidity, and solar light are somewhat adverse to human comfort. Although these environmental conditions are not acute, they inhibit scientific and professional performance. A controlled environment contributes to efficiency and productivity.

There are three basic approaches to a controlled environment.

The first is a physical plant without air conditioning. The major constraints to mechanical air conditioning are:

1. High cost of initial installation.
2. Necessary maintenance efforts to assure optimal operation and to prevent deterioration.
3. The possibility of mechanical break down because of electrical or mechanical failure.
4. The necessity for a sophisticated system of balance to provide optimal operation.
5. Human physiological reaction to closed, mechanically controlled environments; and the possibility of body shock when entering or leaving this surrounding.

Mechanical air conditioning should be evaluated.

Architectural design constitutes an important aspect of environmental control. Throughout the tropical world, architectural efforts have concentrated on the search for such environmental controls. An excellent description of the parameters involved in climate modification appears in the book, Tropical Architecture 1/. Humidity, temperature, radiation, and air movement are the primary considerations for determining an architecture sympathetic to human

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1/ Maxwell Fry and Jane Drew.

Tropical Architecture in the Dry and Humid Zones, B. T. Batsford Limited, A. Fitzharding Street, Portman Square, London W 1, 1964. (See pages 11 through 85).

comfort 2/. "By our efforts we can to some extent control this environment. We can modify and adapt it by the skill and intelligence with which we build, and in doing so produce an architecture and a landscape suited both to it and us". 3/

With this effort to control the climate by non-mechanical means it is possible to create an architecture sympathetic to the human needs at Turipana and to create a regional expression sympathetic to the north coast.

A second approach is a physical plant with mechanical air conditioning of offices, laboratories and teaching spaces for the professional staff, and in storage areas for perishable materials. These spaces are described in the master plan as offices and laboratories for agronomy and animal sciences. Certain additional professional spaces for administration, library, classrooms and the operational portions of the communications center might also be included, but not any housing or food service areas.

The third approach is mechanical air conditioning of the total complex which houses any activity of the professional staff. This would include agronomy, animal sciences and agricultural engineering offices and laboratories, the communications center, the total residential unit (casino and houses), administration, cafeteria and social center, classrooms and teaching laboratories. Warehouses and farm structures would not be air conditioned unless a professional office were located in the building.

Architectural climatic controls would provide for human comfort in spaces which are not air conditioned, as well as provide mechanical load

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2/ IBID, see sketch Page 27.

3/ IBID, Page 29.

reductions in air conditioned areas. Another major consideration is the control of insect penetration into the structure. Spaces which are not sealed must be equipped with screens.

Efforts should be directed towards selecting the most desirable mechanical control system and the determinants for phasing the implementation. Two types of air conditioning equipment may be considered: a central unit serving the total complex, or individual units for specific areas. Air conditioning engineers generally consider central units more economical, easier to maintain, and more comfortable. Individual units (window units) are designed essentially for structures requiring minimal air conditioning. Generally, these units are satisfactory only for short terms which do not correspond to the total life of a building.

Either system may be included in a building or building complex during or after construction, if adequate provisions are made in the plans. Before a final decision is made, feasibility studies should be conducted by professional air conditioning engineers to insure the consideration of all relevant factors.

## EXPLANATION OF ILLUSTRATED PLANS

Three plans have been developed from the criteria and design decisions for the central administrative complex at Turipana. These plans - a Functional Plan (Plano de Funcionamiento), a Transportation and Circulation Plan (Vino y Estacionamientos), and a Master Plan (Plan General), are described below.

The Functional Plan (Plano de Funcionamiento) describes the outline configuration of the site, the existing and proposed facilities, and the basic circulation patterns. Details of this plan follow:

1. A buffer land area, between the administrative complex and the public highway, will be used to exhibit animals, and for sale of products produced on the farm.
2. A single major vehicular entrance will permit maximum control of access and egress. The main road penetrates the interior of the farm allowing availability to all areas and activities; however restricts movement only to those authorized vehicles. One pedestrian entrance, adjacent to the workers' cafeteria (obrero's caisne) will assure control of individual access to Turipana. This is necessary in order to prevent unauthorized personnel from entering the grounds and to discourage pilfering of equipment, materials and produce.
3. To maintain minimum solar heat gain, all new buildings are directly north-south oriented. Location of the minimum wall areas so as to face the east-west sun rays will minimize heat gain. For maximum sunlight, greenhouses are oriented at right angles to the east-west sun rays. (See compass rose on the plan margin).
4. To maximize the benefit from the prevailing winds and breezes, minimum walls are oriented toward this air movement, as shown in the wind roses on the plan margin.
5. The relations between buildings are demonstrated in the functional diagram included in this section (See Functional Diagram).

The dominant activities of the complex are the operational programs of agronomy and animal sciences, their laboratories and offices. Supporting activities include the Communications Center, Housing Units (casino and casas) Social Center and Cafeteria, Administration, and Library. The

greenhouses are adjacent to the agronomy offices and laboratories. The placement of these structures will define a central "civic plaza" as a main entrance area.

The plaza constitutes an architectural order by physically separating these structures while maintaining a central related complex. The space is 40 meters across, on a scale proportionate to the building masses and in accordance with the human scale. Spaces between other buildings, such as between agronomy and animal science offices and laboratories, are subsidiary to the central major space; however, they are scaled to the pedestrian, and offer a proper proportional space relation among buildings. A notable effect of these spaces is that they allow air movement between and through buildings.

Because warehouses, shops and machinery sheds are related to the fields and to agronomy and animal science operations, they are located between this central complex and the farm. Some of these peripheral service buildings have already been completed and must necessarily be integrated with future buildings.

The housing unit for some members of the professional staff and trainees is located across the service road, to the northeast of the central complex, thus providing privacy and separation from operational activities. Some outdoor recreational facilities are provided in this vicinity. Family houses and the workmen's cafeteria (obrero's casino) are also located to the northeast, separated from the central grouping and isolated within their own environs.

The Veterinary Medicine Laboratory is located across the public highway on a parcel of land next to the river. Because of the necessity for complete isolation from other animal production, the most remote site available was selected.

The prevailing winds from the northwest will remove odors arising from the swine and poultry activities southeast of the central complex (See plan of total farm site). Bodegas, shops, and proper landscaping will provide visual barriers. (See Master Plan).

The accompanying schedule of priorities determines the phases of implementation of the total building program. The Functional Plan shows the buildings and their dates of completion. Portions of agronomy and animal science laboratories and office buildings are shown as future additions to be completed by 1980.

The total complex is developed with the intention of growth flexibility. The central complex may expand to the north or northwest to fill the land area within the service road. Even further expansion of the complex can be accommodated across the service road or the central artery. Housing growth may continue to the northwest.

Heavy rainfalls occur in this area from May to November. Storm drainage with undisturbed ground absorption is important. Additional runoff from roofs and ground surfaces intensify the drainage problem. Canals constructed to drain agricultural land are accessible to the building complex opposite the primary road. Development of this area must include adequate storm drainage from this complex to remove water before it accumulates. It is advisable to construct the building complex on a low podium so that water will drain away from all structures.

An adequate sewage discharge system must be developed based on an engineered plan. The plan should include the criteria requirements and resulting decisions for volume discharge, proper fall for adequate drainage, regard for the sanitation of natural drainage systems, measures to avoid

contamination and health hazards, and a feasibility study for sewage treatment plant.

Electric power is available at Turipana. It is necessary to devise and construct the distribution system to coincide with the master plan.

Transportation and Circulation Plan (Vias y Estacionamientos). The second central area plan illustrates transportation and circulation patterns for the complex. Three elements are involved. The primary artery from the public highway extends into the interior of the farm and will carry most of the vehicular traffic. A secondary peripheral service loop will direct personnel and service vehicles to desired locations within the administrative unit. The third level of movement is pedestrian circulation within the complex.

The primary artery is described in the Functional Plan. The service loop provides access to housing facilities, cafeterias, bodegas, and parking areas. To limit the number of internal roads, service vehicles to and from greenhouses and laboratories will use the service walks.

Parking areas are located for most convenient access to the Administration Building, the Communication Center, warehouses, shops, laboratories and housing units. An auxiliary parking area for overflow volumes, such as during field days, is provided in the area adjacent to the Administration Building.

Service access is necessary to the cafeteria and housing areas for food and beverage deliveries and garbage removal. Paramount among design considerations has been pedestrian circulation within the building complex and total separation from vehicular traffic. This has been accomplished

by pedestrian walks along building facades and beneath overhangs to provide protection from sun and rain.

A pedestrian walk from the housing unit to the Veterinary Medicine Laboratory provides direct access from the major complex.

Master Plan (Plan General). The final plan is a delineation of the total design development plus landscaping. This may be called the Master Plan.

The three principal criteria considered in landscape development are:

- a. To fulfill requirements for shading from the sun and to screen parking areas and such elements as the swine and poultry structures.
- b. To satisfy aesthetic demands through attractive and pleasant surroundings.
- c. To use landscape materials which can be maintained with a minimum effort. Some suggested plant materials include the rubber (caucho) plant, ceiba, and cardonha.

Certain outdoor recreational facilities should be included in the landscape program. These may include outdoor games and possibly a swimming pool.

A LA CIUDAD

CENTRO DE  
COMUNICACIONES

ENTRADA

CASINO  
ENDEPERA  
CENTRO SOCIAL  
BIBLIOTECAS

ADMINISTRACION

CALIDAD

CERTIFICAC.

FITOMOL

FITOPATOLOGIA

SUELOS

INVESTIGACIONES

AGRICOLA

AGRICULTURA

AREAS DEL PROGRAMA:

OPICINAS  
LAU. SEMILLAS  
DEPOSITOS  
HEAD-HOUSE  
QUINTOS FINCA

COMERCIO

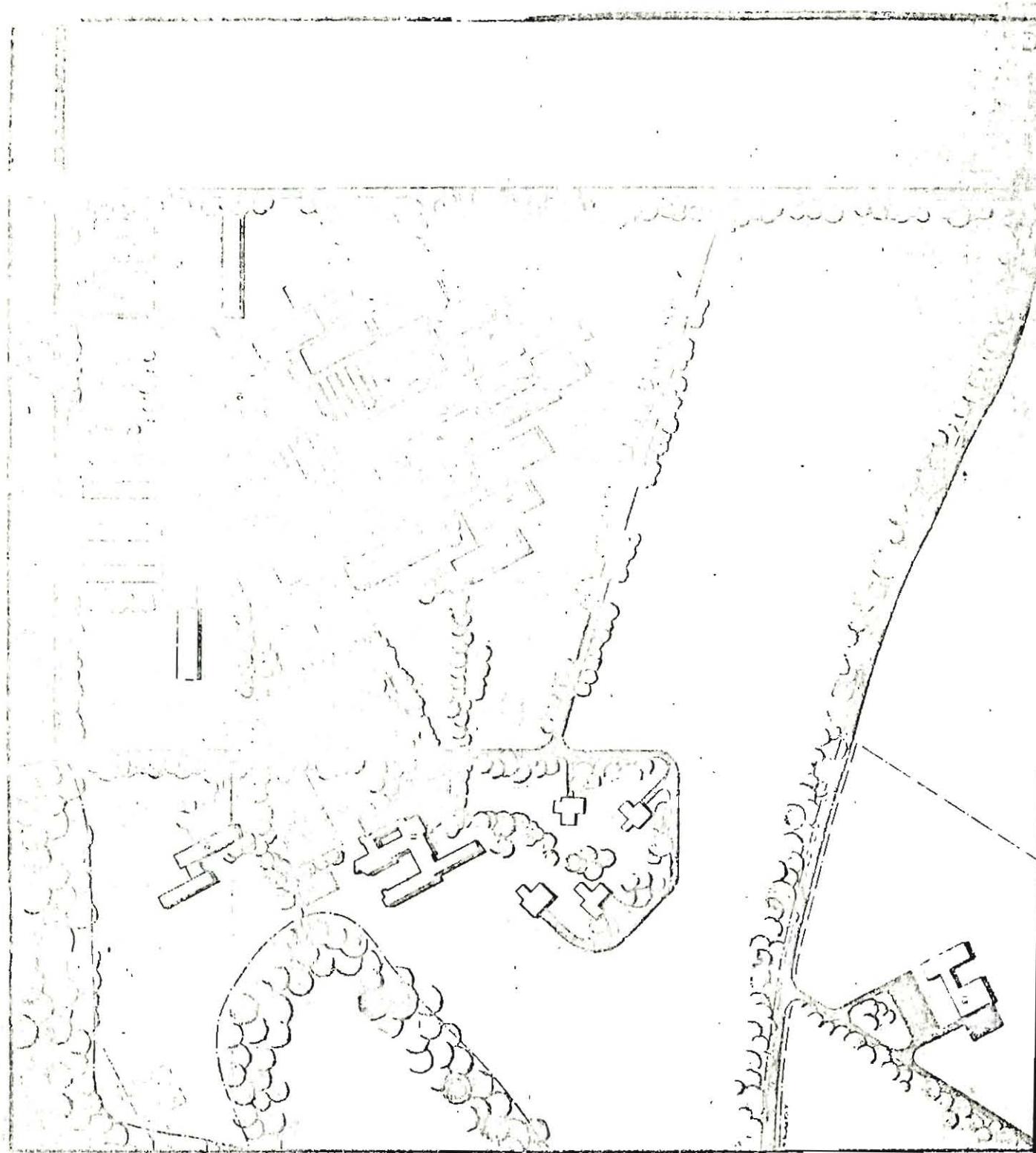
INVERSIÓN

DODRIGAS

ZONA TRABAJO

MERRACHINIAS

C A M P O



PROJETO DO ESTABELECIMENTO  
INDUSTRIAL

PROJETO DO ESTABELECIMENTO  
INDUSTRIAL

1952-53-54-55-56-57-58-59-60-61-62-63

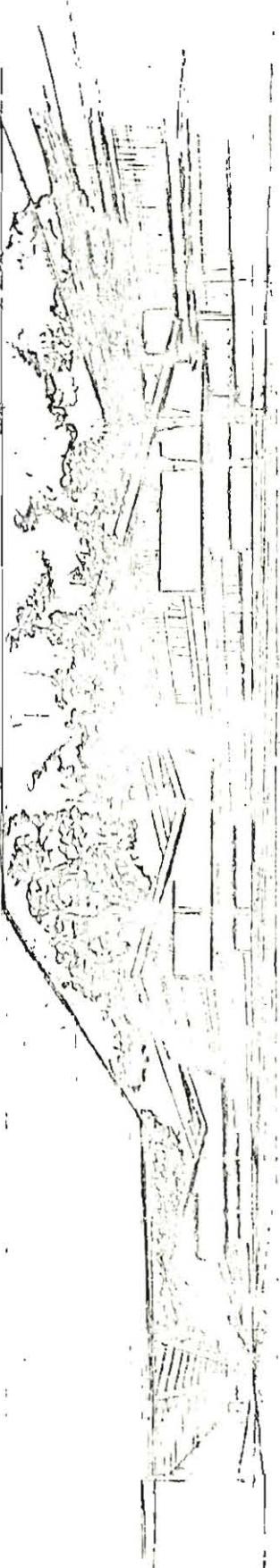
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57

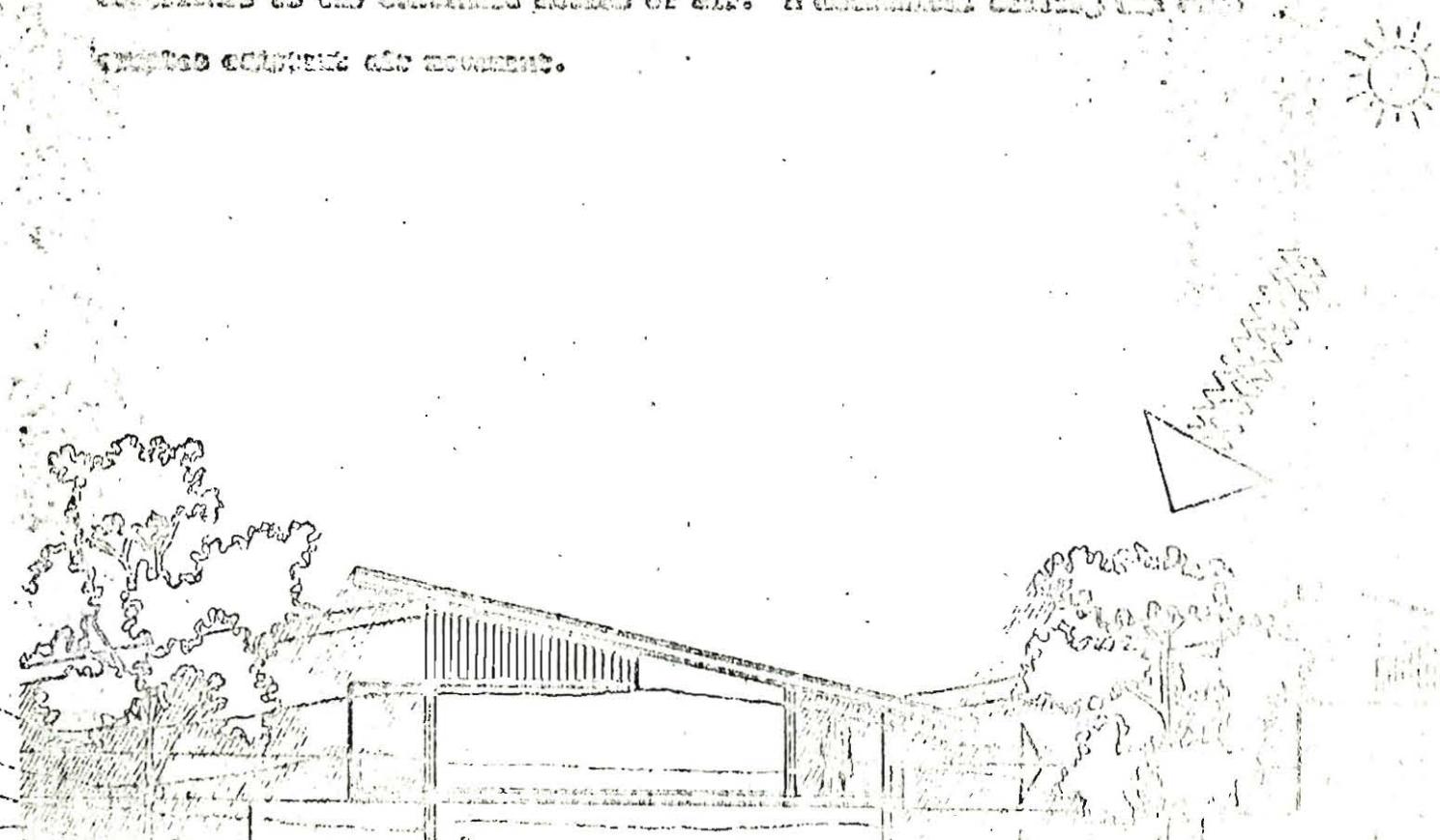
ENVIRONMENTAL WELDERIZATION

Building designs will permit air movement within the building spaces. Low velocity air movement cools the human body effectively if it flows to body height. Air is cooled as it circulates over or through evaporators and the shaded side of a building.

Appropriate air cooling may be accomplished by providing crosswind air exchanges and with properly located plant materials to shade the building walls.

Maximum air current is gained by providing the widest openings on the shade side and the larger openings on the sun side (see illustration). The gentle prevailing northeast breeze, entering through shade leaves, increases in velocity as it passes through the building and is controlled by the shade walls.

The optimum orientation combines winds and evaporated clothing effects. (See wind rose on page.) With clothing effects, combine to the combined action of air. A combined cooling factor computes effective air movement.



## FINANCIAL ESTIMATES AND SUPPORT REQUEST

When the government of Colombia completes the plans outlined herein for the development of Turipana as a major research and training center for the lowland, hot tropics, it will have invested approximately \$4,000,000 (U.S.) since acquiring the site in 1957. This amount does not include the annual operations budget which it expects to increase by 20 percent a year, starting with the current annual base of \$300,000.

Information presented in the preceding sections details the nature of past, present, and projected investments, and, in addition, describes the substance and principal thrusts of the major agronomic and animal science research and training programs underway or to be expanded or initiated at Turipana.

The tabular material on page 61 indicates the schedules and priorities currently valid for the development and construction of the physical plant necessary to accomplish the objectives set forth for Turipana, i.e., research, training, and the agricultural and economic development of the north coastal area of Colombia.

This section also describes the categories of equipment for which funds are being requested to permit purchase in the United States. Much of this equipment is not available locally and when it is, the costs are usually considerably greater and/or the quality inferior to that obtainable in the United States. All of the equipment listed is necessary to operate the laboratory and farm programs, the communications center and training program, the cafeteria and dormitory, and such utilities as electricity, telephone, and radio.

This list was prepared by first requesting the responsible scientists in

each program area to assess their requirements for facilities and equipment. This was accomplished in late 1967, and the scientists reviewed these lists in March-April, 1968. The earlier requirements were revised in line with changes in priorities and new developments, particularly those relating to future cooperative activities between ICA and CIAT.

Then, the total requirements, as determined by combining the departmental requests, were consolidated and reduced by the ICA planning staff, taking into account such criteria as (a) joint use of equipment by two or more departments, (b) construction and program priorities and schedules, and (c) local availability of some items.

Finally, this list was integrated into the categories shown and the amounts of money calculated for each category. The resulting figures are considered realistic but conservative. The summary which follows, while based on a detailed list originating with the scientists, does not relate individual pieces of equipment to specific programs. When purchases are initiated against these requested funds, these purchases will be identified with specific programs, where possible, and will be justified in relation to the specific program or programs where the equipment will be used.

**SECTION V**

**FINANCIAL ESTIMATES AND SUPPORT REQUEST**

CATEGORIES OF EQUIPMENT PURCHASES FOR WHICH  
FINANCIAL ASSISTANCE IS REQUESTED

Laboratory Equipment . . .	\$ 180,000
. . . for Veterinary Medicine, Soils, Animal Sciences, Plant Protection, and Agronomy programs, and including such items as microscopes, centrifuges, flame photometer, gas analyzer, colorimeters, absorption spectrophotometer, ovens, balances, micronut, cold rooms, inoculation chamber, calculators, adding machines, typewriters, and miscellaneous equipment for laboratory use such as glassware and other supplies.	
Farm and Storage Equipment . . .	240,000
. . . including facilities for seed processing and storage, and consisting of such items as tractors, (farm and small) with associated equipment, combine harvesters, ensilage cutter, mowers, driers, animal feeders, feed mixers, feed mill, sprayers, pickup trucks, scales and other farm tools.	
Communication and Training Equipment . . .	35,000
. . . including instructional aids (projectors, sound amplifiers, illustrative materials and specimens), printing and reproduction machinery (offset press and associated items, mimeograph, folder, binder, etc.), and photographic items.	
Food Preparation and Dormitory Equipment . . .	50,000
Utilities . . .	75,000
. . . including emergency electrical plant, transformers, automatic telephone plant, and radio-telephone equipment	
TOTAL	\$ 580,000

SUMMARY: FUTURE EQUIPMENT AND CONSTRUCTION COSTS  
(in U.S. dollars)

EQUIPMENT

	Assistance Requested	Investment by Colombia
Laboratory	\$ 180,000	-
Farm and Storage	240,000	-
Communication and Training	35,000	\$ 15,000
Food Preparation and Dormitory	50,000	50,000
Utilities	75,000	20,000
Office	-	75,000

CONSTRUCTION

Roads, water supply, grading	-	600,000
Buildings, 35,000 sq. m.	-	1,560,000

TOTAL	\$ 580,000	\$ 2,320,000
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CONSTRUCTION AND DEVELOPMENT SCHEDULES AND PRIORITIES

Priority	Completion of Plans	Budget Request	Construction begins	Construction Completed
<u>Under Construction</u>				
Domestic Water Supply				Dec. 1968
Dairy Barns and Bodegas				Sept. 1968
Poultry				Dec. 1968
<u>Planned and Construction Funds Committed</u>				
Sewage System and Electrical Services			(construction concurrent with development)	
Dormitory (Casino) and Cafeteria			Oct. 1968	June 1969
Veterinary Medicine Laboratory			Oct. 1968	June 1969
<u>New Facilities Scheduled *</u>				
<u>Priority 1</u>				
Beef and Swine Barns	Aug. 1968	June 1968	Sept. 1968	March 1969
Soils Laboratory	Jan. 1969	Jan. 1969	March 1969	June 1969
Seed Certification	Jan. 1969	Jan. 1969	March 1969	June 1969
Workers' Cafeteria	Oct. 1969	Jan. 1970	March 1970	Feb. 1971
Agricultural Engineering	Oct. 1969	Jan. 1970	March 1970	Feb. 1971
<u>Priority 2</u>				
Communications Center	Oct. 1969	Jan. 1970	March 1970	Feb. 1971
Agronomy Buildings			Plans and budgeting to be accomplished	
Pastures and Forages			after 1970 to allow construction to be	
Grain Legumes			completed before December 1973.	
Plant Protection				
Corn				
Rice				
Yuca				
Vegetables, Fruits				
Cacao				
Oil Crops				
Animal Science Buildings				
Dairy Offices, Laboratories				
<u>Priority 3</u>				
Library			Plans and budgeting to be accomplished	
Administration			after 1970 to allow construction to be	
Social Center			completed before December 1980.	

\* Existing bodega space is being used and will continue to be used for certain training activities and to house temporary offices and laboratories pending completion of the scheduled new facilities.

I C A  
CENTRO NACIONAL  
DE INVESTIGACIONES AGROPECUARIAS.

PROYECTO DE DESARROLLO FISICO  
ELABORADO POR LA OFICINA DE  
PLANEACION FISICA DEL ICA

mayo 15 de 1968

## SOIL STUDIES FOR FOUNDATION CONDITIONS

The following extracts from the report of Roberto Maldonado Y., Civil Engineer, Bogota, Colombia, May 8, 1968 (Ref. #39/68), are included to suggest the general characteristics concerning bearing capacity for buildings.

### Turipana Casino, Foundation Estimates

#### Bearing Capacity

The soils are principally loams of medium compressibility with resistance to penetration of  $\pi/12''$  on the average, and unconfined resistance on the order of  $1.3 \text{ kg/cm}^2$ . Because the natural humidity is below the plastic limit, unconfined resistance is less than  $1.3$  and probably would not exceed  $1.0 \text{ kg/cm}^2$ .

Since the topsoil is organic, it is recommended that it be excavated and replaced with compacted and selected fill.

According to laboratory tests, the most appropriate depth for a foundation is  $0.7 \text{ m}$  because of the minimal variation of humidity.

Maximum permissible bearing capacity is estimated at  $1.2 \text{ kg/cm}^2$  per square foot.

There is a notable difference between the resistances to penetration and field resistances to unconfined compression, which should correspond. This difference is due to the dry soils, with natural humidities below the plastic limit and near the limit of contraction. It is also due to the fact that some cementant clay must exist among profile loams, which makes unconfined resistance to the penetrations greater. Therefore, the maximum bearing capacity was taken to a fatigue corresponding to the maximum limit for penetrations of five 12 inch impacts assuming relatively low compressibilities and notable angles of friction.

An estimate was made of the settling of an individual footing of  $2.0 \times 2.0$  meters cemented to a depth of  $0.7 \text{ m}$  with a  $0.78 \text{ kg/cm}^2$  fatigue. To estimate the Index of Compression, Relation of Voids, etc., data were used and a Test of Consolidation made in the area of the first Test on similar soils, compensating for the differences of Compressibility and Humidity. According to this estimate, total settling without using fill, is on the order of  $7 \text{ cms.}$  for several years, which is permissible.

If fills are used, the difference of pressure will extend to substantially greater depths and cause total settling greater than  $7 \text{ cms.}$ , and could easily double that in a few years, depending on the quantity of fill. It is considered that  $50 \text{ cms.}$  of fill are permissible, if they do not produce notable increases of settling.

It is considered necessary to use grade beams for the entire perimeter of construction, between columns and located in such a manner that they function

as a base. The perimeter grade beam should be secured by means of similar tying beams, perpendicular to the perimeter, to prevent lateral movement of walls and columns. As a precautionary measure to prevent changes of humidity in the foundation area, it is recommended that a perimeter sidewalk be constructed with adequate width to prevent free passage of superficial water. This sidewalk would also prevent extreme drying during the dry seasons.

# TEMPERATURAS MEDIAS

DATOS DE LA ESTACION METEOROLÓGICA  
AÑO 1.966

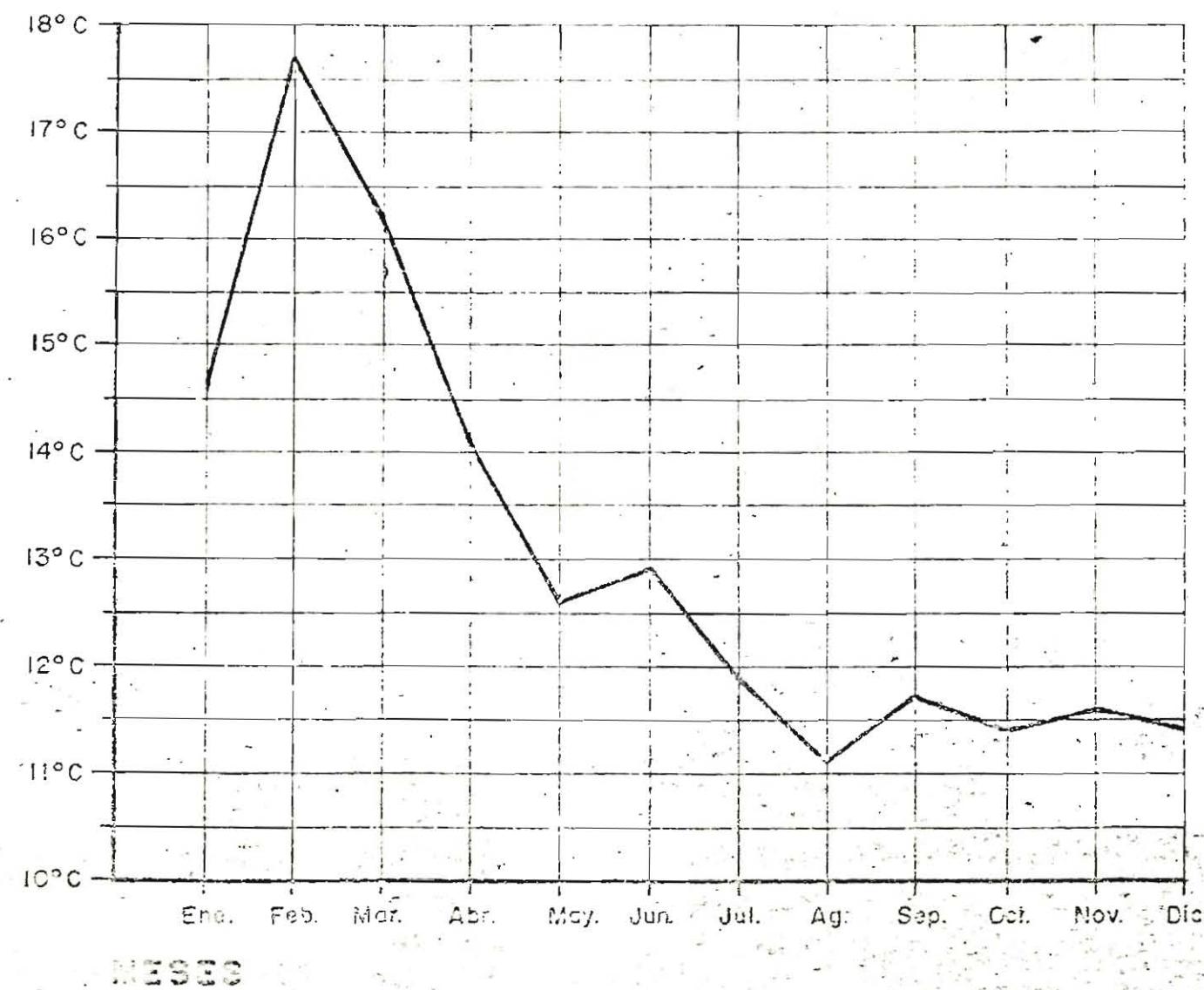
TURIPANA



**OSCILACION MEDIA**  
DATOS DE LA ESTACION METEOROLOGICA  
AÑO 1966

**TURIPANA**

**GRADOS  
CENTIGRADOS**

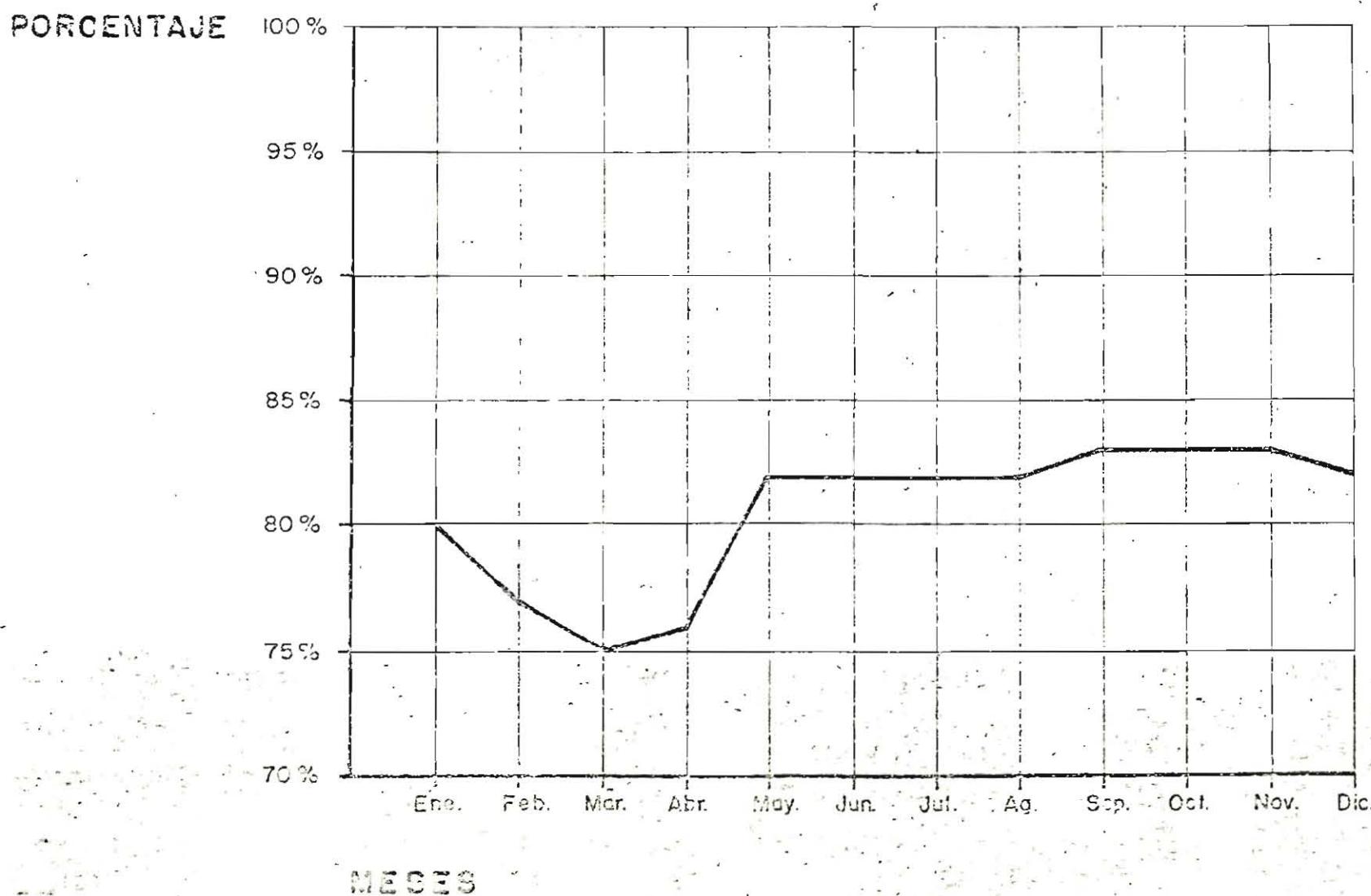


# HUMEDAD RELATIVA MEDIA

DATOS DE LA ESTACION METEOROLOGICA

AÑO 1966

TURIPANA

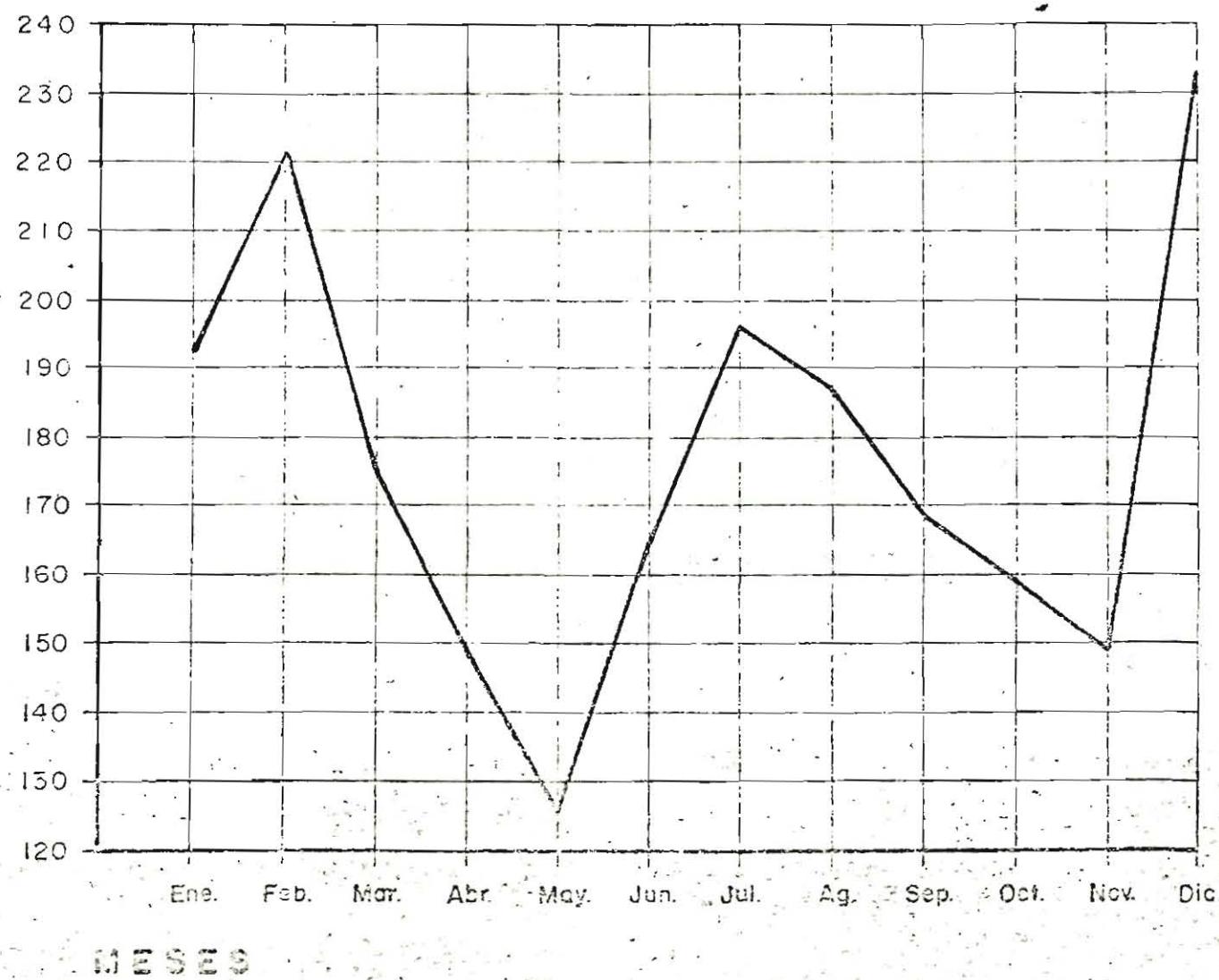


# BRILLO SOLAR EFECTIVO TOTAL

DATOS DE LA ESTACIÓN METEOROLÓGICA  
AÑO 1966

TURIPANA

HORAS Y  
DECIMAS



MESES

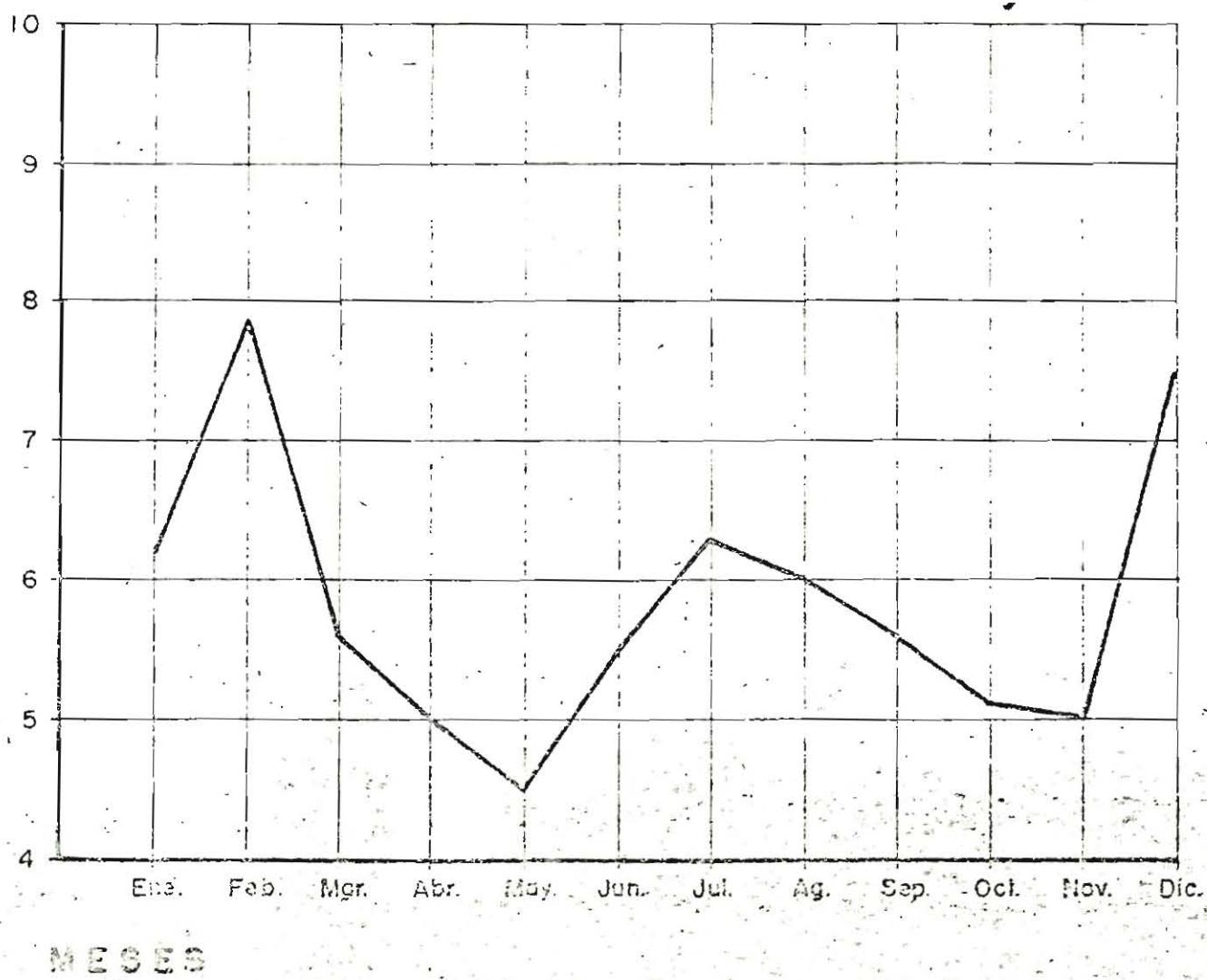
# BRILLO SOLAR EFECTIVO MEDIO

DATOS DE LA ESTACION METEOROLOGICA

AÑO 1966

TURIPANA

HORAS Y  
DECIMAS



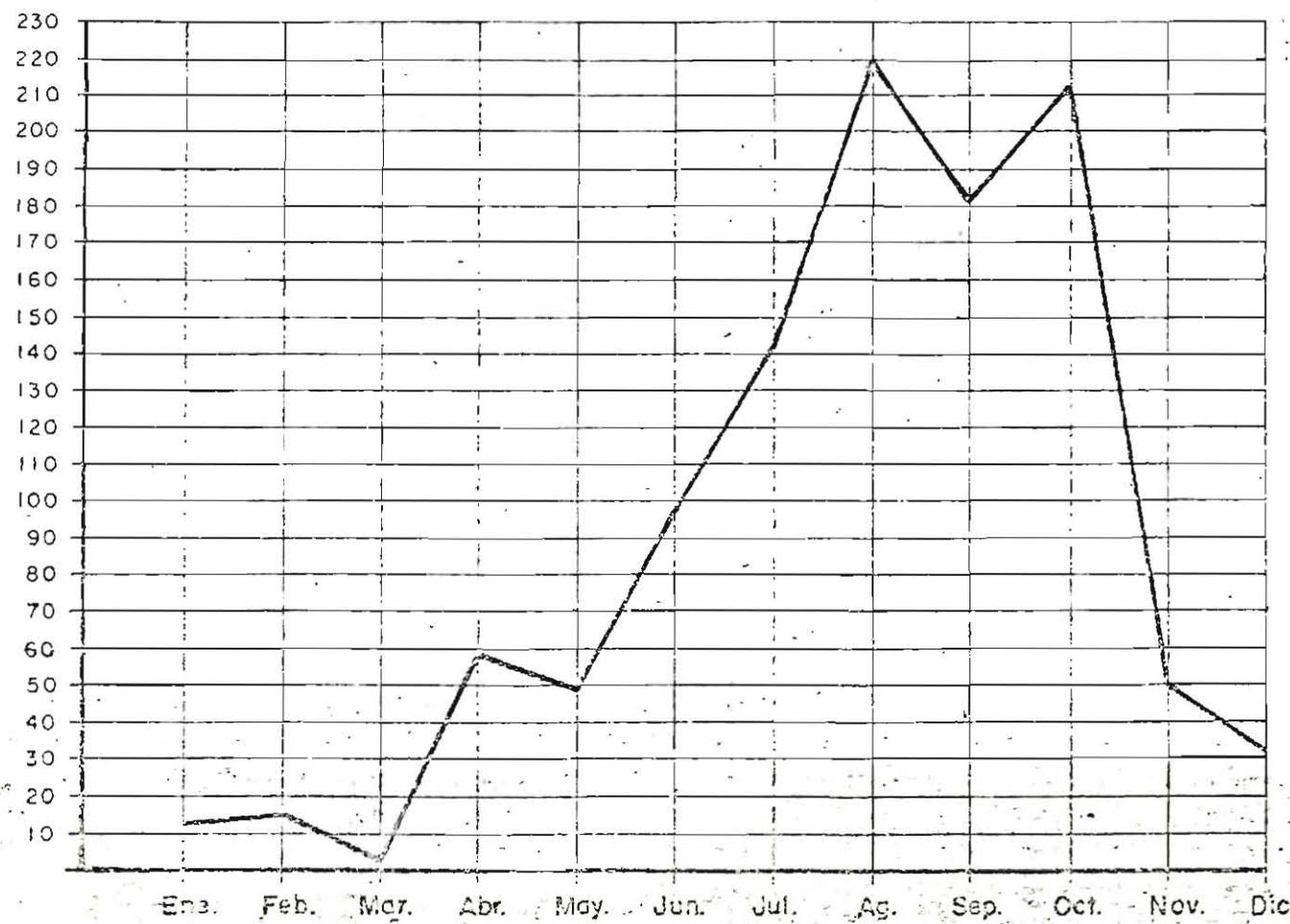
MESES

# PRECIPITACION TOTAL

DATOS DE LA ESTACION METEOROLOGICA  
AÑO 1966

TURIPANA

MILIMETROS

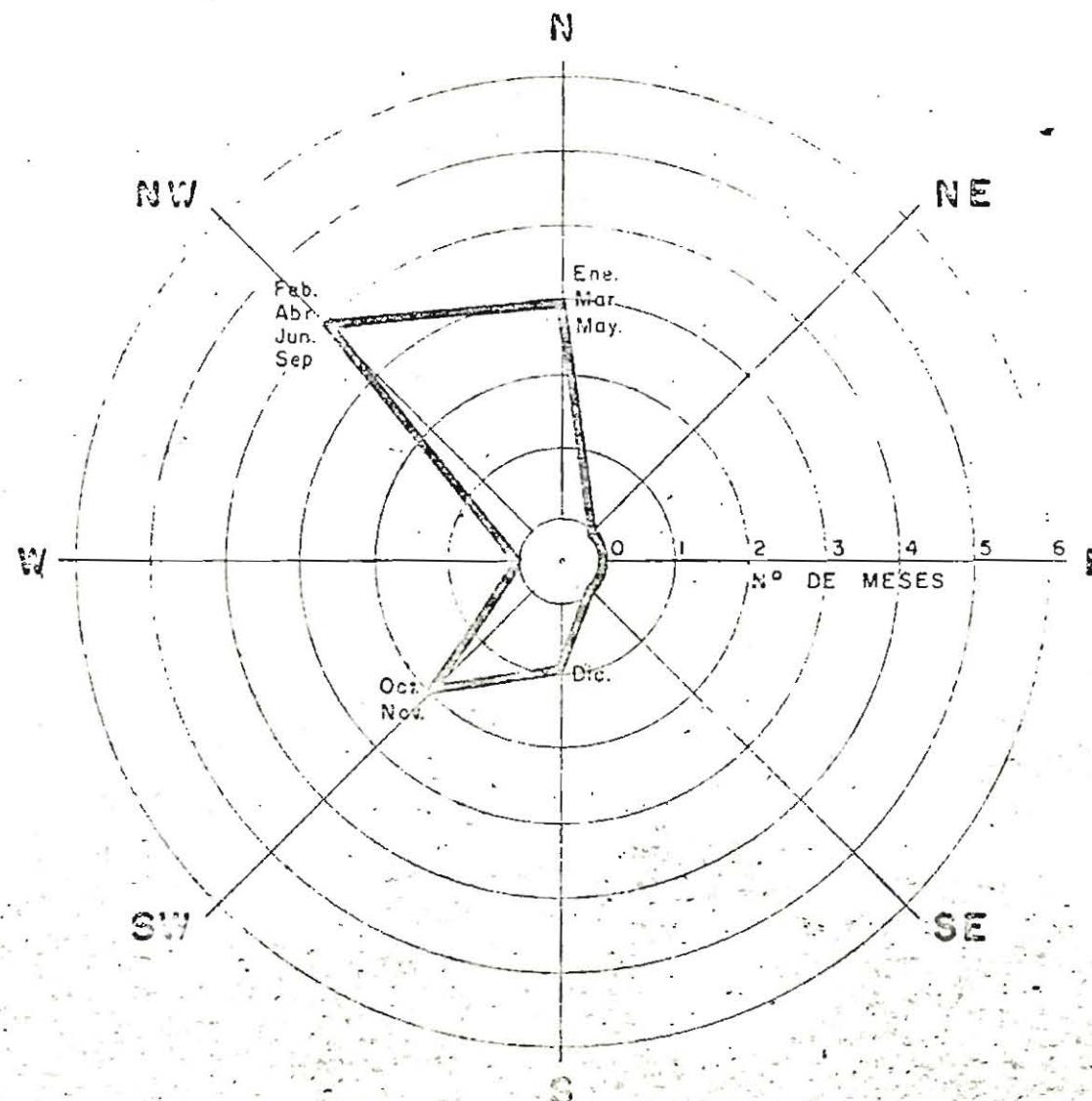


MESES

# VIENTO DOMINANTE

DATOS DE LA ESTACIÓN METEOROLÓGICA  
AÑO 1966

TURIPANA

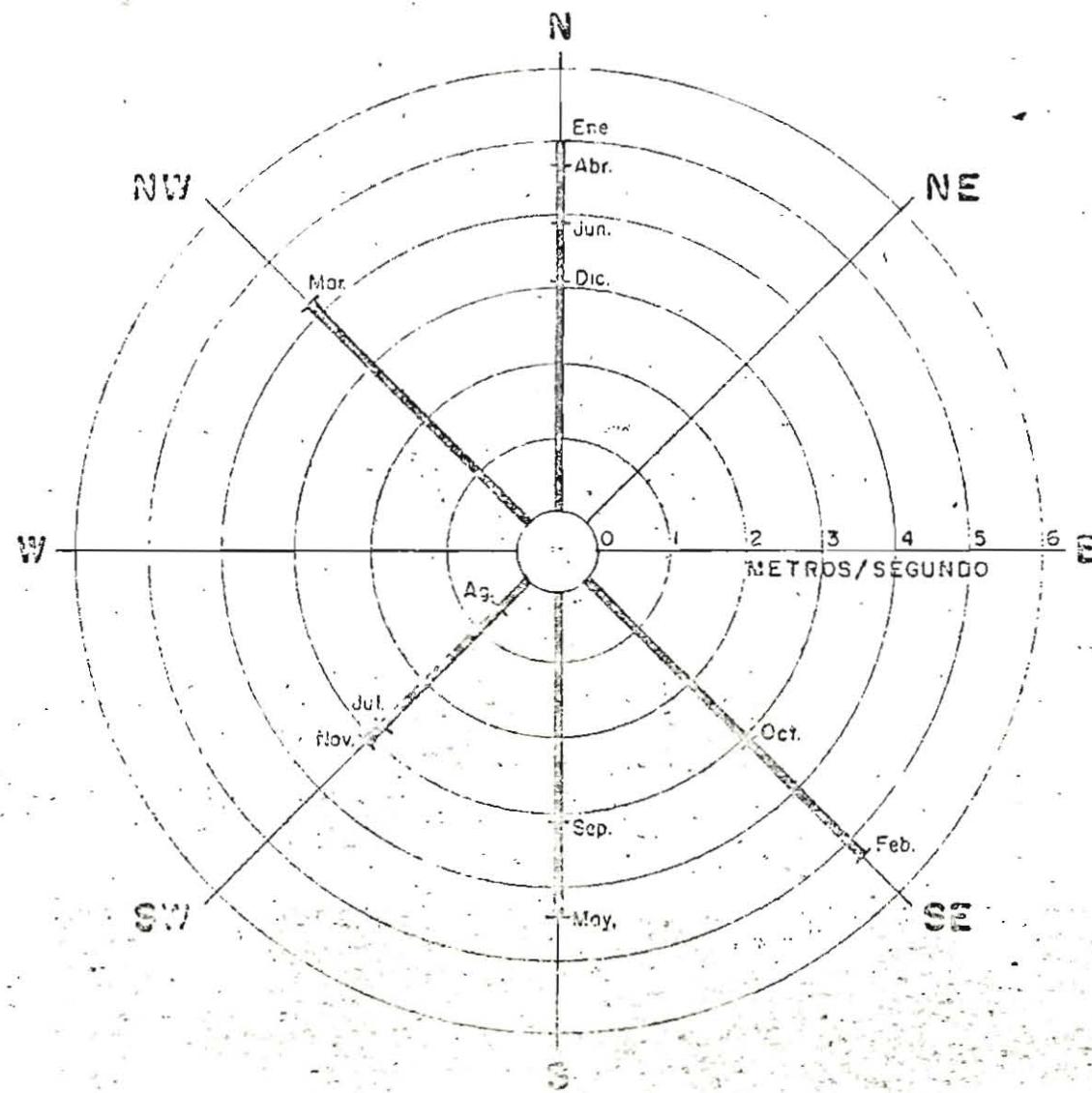


CALMA - JULIO  
AGOSTO

# VELOCIDAD MAXIMA DE VIENTOS

DATOS DE LA ESTACION METEOROLOGICA  
ANO 1966

TURIPANA



# ADMINISTRACION

# TURIPANA

	AREAS		
	CLASE	M² 1968	M² 1973
DIRECCION	OFICINA DIRECTOR	30.00	30.00
	SALA JUNTAS		30.00
	SECRETARIA		15.00
	OFICINA SECRETARIAS		15.00
TOTAL		30.00	90.00
PERSONAL	OFICINA JEFE		20.00
	OFICINA 5 EMPLEADOS		40.00
	TOTAL		60.00
PRESUPUESTO	OF. ANALISTA PRESUP.		20.00
	OF 2 AUX. CONTABILID.		20.00
	TOTAL		40.00
CONTABILIDAD	OFICINA CONTADOR		20.00
	OFICINA 6 EMPLEADOS		48.00
	TOTAL		68.00
TESORERIA	OFICINA TESORERO	20.00	20.00
	OFICINA 4 EMPLEADOS	16.00	32.00
	TOTAL	36.00	52.00
ALMACEN	OFICINA ALMACENISTA	22.00	22.00
	OFICINA 6 EMPLEADOS	45.00	48.00
	DEPOSITO ALMACEN	22.00	22.00
	BODEGA	400.00	400.00
TOTAL		489.00	492.00
AUDITORIA	OFICINA AUDITOR	20.00	20.00
	OFICINA SECRETARIA		15.00
	OFICINA REVISORES		32.00
TOTAL		20.00	67.00
BANCO	OFICINA GERENCIA		20.00
	OFICINA CAJA		20.00
	CELADOR		5.00
	HALL PUBLICO		20.00
TOTAL			65.00
CENTROS Y ESTACIONES	OFICINA INGENIERO	20.00	20.00
	OFICINA TOPOGRAFOS		15.00
	TOTAL	20.00	35.00
TALLERES.	OFICINA JEFE	50.00	50.00
	BODEGA CARPINTERIA	24.00	24.00
	LATONERIA	100.00	100.00
	MECANICA	150.00	150.00
	HECHIMENTAS	29.00	25.00
	PINTURA	45.00	45.00
	TALLER CARPINTERIA	160.00	160.00
	OFICINA CARPINTERIA	16.00	16.00
	HERRERIA	72.00	72.00
	ESTACION SERVICIO	225.00	225.00
TOTAL		2.447.00	2.447.00
TOTAL CON 20% CINC Y SERVICIOS		3.042.00	3.650.40

	PERSONAL		
	CATEGORIAS	1968	1973
ADMINISTRATIVOS	1	1	
TECNICOS	2	2	
OFICINISTAS	1	3	
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TOTAL		2	
ADMINISTRATIVOS		1	
TECNICOS			1
OFICINISTAS			
OBREROS			
TOTAL		2	
ADMINISTRATIVOS		1	
TECNICOS			1
OFICINISTAS			
OBREROS			
TOTAL		2	
ADMINISTRATIVOS		1	
TECNICOS			1
OFICINISTAS			
OBREROS			
TOTAL		2	
ADMINISTRATIVOS		1	
TECNICOS			1
OFICINISTAS			
OBREROS			
TOTAL		2	
ADMINISTRATIVOS		1	
TECNICOS			1
OFICINISTAS			
OBREROS			
TOTAL		2	
ADMINISTRATIVOS		1	
TECNICOS			1
OFICINISTAS			
OBREROS			
TOTAL		2	
ADMINISTRATIVOS		1	
TECNICOS			1
OFICINISTAS			
OBREROS			
TOTAL		2	
ADMINISTRATIVOS		1	
TECNICOS			1
OFICINISTAS			
OBREROS			
TOTAL		2	
ADMINISTRATIVOS		1	
TECNICOS			1
OFICINISTAS			
OBREROS			
TOTAL		2	
ADMINISTRATIVOS		1	
TECNICOS			1
OFICINISTAS			
OBREROS			
TOTAL		2	
ADMINISTRATIVOS		1	
TECNICOS			1
OFICINISTAS			
OBREROS			
TOTAL		2	
ADMINISTRATIVOS		1	
TECNICOS			1
OFICINISTAS			
OBREROS			
TOTAL		2	
ADMINISTRATIVOS		1	
TECNICOS			1
OFICINISTAS			
OBREROS			
TOTAL		2	
ADMINISTRATIVOS		1	
TECNICOS			1
OFICINISTAS			
OBREROS			
TOTAL		2	
ADMINISTRATIVOS		1	
TECNICOS			1
OFICINISTAS			
OBREROS			
TOTAL		2	
ADMINISTRATIVOS		1	
TECNICOS			1
OFICINISTAS			
OBREROS			
TOTAL		2	
ADMINISTRATIVOS		1	
TECNICOS			1
OFICINISTAS			
OBREROS			
TOTAL		2	
ADMINISTRATIVOS		1	
TECNICOS			1
OFICINISTAS			
OBREROS			
TOTAL		2	
ADMINISTRATIVOS		1	

TURIPANA

PERSONAL

AGRONOMIA

AREAS DE TRABAJO

PROGRAMA

CATEGORIA

AREA M<sup>2</sup> 1972

	CLASE	AREA M <sup>2</sup> 1972
CACAO	OFICINA	96.60
	HEAD HOUSE	32.00
	DEP. TIERRA ESTERILL.	10.00
	BODEGA EXPERIMENTAL	46.00
	BODEGA COMERCIAL	184.00
	DEP. HERRAMIENTAS	30.00
	<b>TOTAL</b>	<b>404.50</b>

	CLASE	AREA M <sup>2</sup> 1972
LEGUMINOSAS	OFICINA	115.00
	TIERRADERO	50.00
	DEP. DE TIERRA	300.00
	LABORATORIO SEMILLA	40.00
	CHARTOS SERVICIOS (4)	84.00
	OFICINA ESPECIAL	147.00
	BODEGA COMERCIAL	63.00
	DEP. HERRAMIENTAS	30.00
	DEPÓSITO EMPAQUES	100.00
	LABORATORIO CALID.	30.00
	DEP. LIMPIOS Y FERT.	30.00
	<b>TOTAL</b>	<b>658.50</b>

	CLASE	AREA M <sup>2</sup> 1972
PASTOS Y FORRAJES	OFICINA	61.00
	LABORATORIO TIERRAD.	100.00
	DEPÓSITO MEDICAMENTOS	36.00
	DEPÓSITO DE AGUAS	30.00
	SOLERA	30.00
	<b>TOTAL</b>	<b>291.00</b>

	CLASE	AREA M <sup>2</sup> 1972
YUGA	OFICINA	64.50
	LAB. SEMILLAS	30.00
	DEP. CALIDAD	30.00
	DEP. SEMILLAS	30.00
	GRANJA INCUBACION	76.00
	DEP. DE TIERRA	10.00
	BODEGA EXPERIMENTAL	30.00
	BODEGA COMERCIAL	30.00
	DEP. LIMPIOS Y FERT.	30.00
	<b>TOTAL</b>	<b>365.50</b>

	CLASE	AREA M <sup>2</sup> 1972
MICROBIOLOGIA	OFICINA	77.00
	LAB. SEMILLAS	20.00
	DEP. CALIDAD	30.00
	DEP. SEMILLAS	30.00
	GRANJA INCUBACION	30.00
	DEP. DE TIERRA	10.00
	BODEGA EXPERIMENTAL	30.00
	BODEGA COMERCIAL	30.00
	DEP. LIMPIOS Y FERT.	30.00
	<b>TOTAL</b>	<b>303.00</b>

	CLASE	AREA M <sup>2</sup> 1972
ESTADISTICA	OFICINA	15.00
	LAB. SEMILLAS	20.00
	DEP. CALIDAD	30.00
	DEP. SEMILLAS	30.00
	GRANJA INCUBACION	30.00
	DEP. DE TIERRA	10.00
	BODEGA EXPERIMENTAL	30.00
	BODEGA COMERCIAL	30.00
	DEP. LIMPIOS Y FERT.	30.00
	<b>TOTAL</b>	<b>135.00</b>

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196

196

## AREAS DE TRABAJO

## PERSONAL

TURIPANA

## PROGRAMA

## CLASE

## AREA M- 1973

ARROZ

OFICINA	69.50
CER. SEMILLAS	10.00
CAMARA INOCULACION	20.00
DEP. SEMILLAS	30.00
BODEGA EXPERIMENTAL	127.50
BODEGA COMERCIAL	255.00
POD. SEMILLA AÑOS ANT.	127.50
DEPOSITO HERRAMIENTA	30.00
<b>TOTAL</b>	<b>639.50</b>

MAIZ Y SORGO

OFICINA	89.00
BODEGA EXPERIMENTAL	166.00
BODEGA COMERCIAL	664.80
LABORATORIO	40.00
DEP. SEMILLAS	60.00
<b>TOTAL</b>	<b>1.019.80</b>

CANA

OFICINA	54.50
DEPOSITO TIERRA EST.	1.00
LABORATORIO	130.00
DEPOSITO HERRAMIENTA	30.00
TRAPICHE	350.00
BODEGA	150.00
<b>TOTAL</b>	<b>715.50</b>

FRUTALES

OFICINA	90.00
LABORATORIO	50.00
MVERNADERO	170.00
VIVERO	70.00
SELECCIONADORA	100.00
CUARTO FRIO	6.00
BODEGA	200.00
DEPOSITO CAJAS	5.00
DEPOS. FERTILIZANTES	30.00
<b>TOTAL</b>	<b>771.00</b>

HORTICULTURA

OFICINA	81.50
LABORATORIO CAL.	
MVERNADERO	170.00
VIVERO	50.00
SELECCIONADORA	200.00
DEPOS. FERTILIZANTES	60.00
<b>TOTAL</b>	<b>591.50</b>

SALARIO TOTAL \$ 1.704.000

## CATEGORIA

## 1.968

## 1.973

PROFESIONAL	1	3
TECNICOS		1
OFICINA		1
CALIFICADOS	1	3
OBREROS	5	20

## TOTAL

7

26

PROFESIONAL	2	4
TECNICOS		1
OFICINA	1	3
CALIFICADOS	3	5
OBREROS	19	20

## TOTAL

24

32

PROFESIONALES		2
TECNICOS		1
OFICINA	1	1
CALIFICADOS		1
OBREROS		8

## TOTAL

13

PROFESIONALES	1	4
TECNICOS		2
OFICINA		2
CALIFICADOS		3
OBREROS		12

## TOTAL

1

23

PROFESIONALES		2
TECNICOS		1
OFICINA	1	3
CALIFICADOS		6
OBREROS		15

## TOTAL

5

25

SALARIO TOTAL

47

317

## AREAS DE TRABAJO

## PERSONAL CIENCIAS ANIMALES

PROGRAMA	CLASE	AREA M <sup>2</sup> 1973
AVICULTURA	OFICINA	62.00
	DORMITORIO	12.00
	LABORATORIO	48.00
	DEPOSITO	2.20
	CIRCULACION	32.60
	SERVICIOS	32.90
	TOTAL	187.70
MEDICINA VETERINARIA	OFICINA	171.50
	LABORATORIO	235.50
	DEPOSITO	32.40
	BIBLIOTECA	33.00
	SERVICIOS	52.60
	CIRCULACION	332.70
	TOTAL	857.70
GANADO DE CARNE.	OFICINA	92.00
	LABORATORIO	14.00
	DEPOSITO	33.90
	DORMITORIO	10.85
	CIRCULACION	60.00
	SERVICIOS	20.00
	TOTAL	230.75
LECHERIA	OFICINA	96.00
	LABORATORIOS	15.30
	MAQUINAS	20.30
	CIRCULACION	382.00
	SERVICIOS	19.45
	TOTAL	533.05
PORGINOS	OFICINA	77.00
	LABORATORIO	12.00
	CIRCULACION	175.00
	SERVICIOS	12.00
	TOTAL	276.00
PLANTA DE MEZCLAS	OFICINA	13.75
	TOLVAS	74.25
	ZONA TRABAJO	179.05
	CIRCULACION	62.00
	SERVICIOS	6.25
	TOTAL	341.25
AREA TOTAL OCUPADA POR CIENCIAS ANIMALES		2.426.50

CATEGORIA	1.968	1.973
PROFESIONALES		2
TECNICOS	2	2
OFICINA	1	1
CALIFICADOS		8
OBREROS		
TOTAL		13
PROFESIONALES		7
TECNICOS	2	7
OFICINA		3
CALIFICADOS		
CEREROS		4
TOTAL	4	21
PROFESIONALES		4
TECNICOS	2	2
CALIFICADOS		2
OFICINA		1
OBREROS	8	15
TOTAL	10	24
PROFESIONALES		4
TECNICOS		2
OFICINA	1	2
CALIFICADOS		3
OBREROS	19	9
TOTAL	24	20
PROFESIONALES		3
TECNICOS		2
OFICINA		1
CALIFICADOS		2
OBREROS		2
TOTAL		16
PROFESIONALES		1
TECNICOS		1
OFICINA		1
CALIFICADOS		
CEREROS		2
TOTAL	1	4
	41	98

## AREAS DE TRABAJO

PROGRAMA	CLASE	AREA M <sup>2</sup> 1973
MATAMALEZAS	OFICINA	47.00
	LABORATORIO	60.00
	INVERNADERO	75.00
	COLECCION	100.00
	BODEGA	50.00
	DEPOSITO MATAMALEZAS	30.00
	TOTAL	362.00
	OFICINA	86.50
	LABORATORIO QUIMICA	100.00
	LABORATORIO FISICA	50.00
SUELOS	LABORATORIO MUESTRAS	73.25
	INVERNADERO	86.70
	MUESTRAS Y SECADORA	50.00
	BALANZAS	26.55
	BODEGA	61.90
	DEPOSITO REACTIVOS	30.00
	DEPOSITO TIERRA	12.00
	DEPOSITO SEMILLAS	50.00
	TOTAL	528.90
	OFICINA	47.00
CERTIFICACION SEMILLAS	LABORATORIO	50.00
	INVERNADERO	55.00
	DEPOSITO SEMILLAS	30.00
	DEPOSITO HERRAMIENTAS	30.00
	TOTAL	212.00
	OFICINA	104.50
	LABORATORIO	60.00
	INVERNADERO	75.00
	INSECTORIO	25.20
	COLECCION	100.00
ENTOMOLOGIA	DEPOSITO INSECTOS	50.00
	BODEGA	74.35
	TOTAL	489.05
	OFICINA	47.00
	INVERNADERO	30.00
	DEPOSITO TIERRA	12.00
	DEPOSITO SEMILLAS	75.00
	DEPOSITO SEMILLAS	50.00
	DEPOSITO INSECTICIDAS	15.00
	TOTAL	210.00
CANTIDAD DE PERSONAL Y SERVICIOS		616.20
TOTAL AREAS AGROLOGIA		9.313.95

## PERSONAL

CATEGORIA	1.968	1.973
PROFESIONALES		2
TECNICOS		
OFICINA		1
CALIFICADOS		3
OBREROS		3
TOTAL		9
PROFESIONALES		4
TECNICOS		1
OFICINA		2
CALIFICADOS		11
OBREROS		13
TOTAL		31
PROFESIONALES		2
TECNICOS		
OFICINA		1
CALIFICADOS		6
OBREROS		
TOTAL		9
PROFESIONALES		4
TECNICOS		1
OFICINA		1
CALIFICADOS		3
OBREROS		3
TOTAL		12
PROFESIONALES		2
TECNICOS		
OFICINA		1
CALIFICADOS		5
OBREROS		6
TOTAL		10
TOTAL		380

**AREAS  
ESTABLOS - ALMACENAMIENTO**

**TURIPANA**

<b>PROGRAMA</b>	<b>CLASE</b>	<b>AREA M<sup>2</sup> 1.973</b>
<b>AVICULTURA</b>	ESTABLOS	1.410 . 00
	BODEGA	364 . 00
	CIRCULACION	240 . 00
	<b>TOTAL</b>	<b>2.014 . 00</b>
<b>MEDICINA VETERINARIA</b>	OPERACION	168 . 35
	UNIDADES AISLAMIENTO	160 . 00
	COLONIAS	23 . 30
	SALA NECROPSIA	67 . 00
	BODEGA	55 . 90
	TAMO	75 . 60
	BRETE	37 . 20
	<b>TOTAL</b>	<b>587 . 35</b>
<b>GANADO DE CARNE</b>	ESTABLOS	170 . 00
	PESEBRERAS	50 . 05
	BASCULA	35 . 00
	CORRALES AL AIRE LIBRE	2.820 . 00
	BODEGA - SILOS - ALIMENTO	977 . 00
	<b>TOTAL</b>	<b>4.052 . 05</b>
<b>LECHERIA</b>	ESTABLOS	2.250 . 00
	CORRALES DE TRABAJO	50 . 00
	SALA ORDEÑO	71 . 65
	PLANTA LECHE	42 . 95
	CORRALES AL AIRE LIBRE	430 . 00
	SALA ESPERA	58 . 00
	<b>TOTAL</b>	<b>2.952 . 60</b>
<b>PORCINOS</b>	ESTADLOS	000 . 00
	BODEGA	260 . 00
	CORRALES AL AIRE LIDRE	1.640 . 00
	<b>TOTAL</b>	<b>2.720 . 00</b>
<b>PLANTA DE MEZCLAS</b>	BODEGA	360 . 00
	SILOS	112 . 00
	<b>TOTAL</b>	<b>472 . 00</b>
<b>TOTAL OCUPADO POR CIENCIAS ANIMALES</b>		<b>12.790 . 00</b>

## **DEPARTAMENTOS**

### **REFERENCES**

	ÁREAS			PERSONAL			
	CLASE	N°	1968		CATEGORIAS	1968	1973
INGENIERIA AGRICOLA	OFICINA JEFE			30.00	PROFESSIONALES		
	SALA DE JUNTAS			30.00	TECNICOS		
	DIBUJO			30.00	OFICINA		
	SECRETARIA			15.00	OBREROS		
	LABORATORIO			30.00	TOTAL		
	DEPOSITO			15.00	JEFES/BRIGADILLAS		
	TOTAL CON CIRC. Y SERV.			100.00	TECNICOS		
EDUCACION	OFICINA LEGANZO			70.00	OFICINA		
	OFICINA SECRETARIO			15.00	OTROS		
	OFICINA REGISTRO			20.00	TOTAL		
	OFICINA 4 SECRET.			40.00	SUB-TOTAL		
	SALAS DE JUNTAS			90.00	PROFESSIONALES		
	3 AULAS - 25 E/c/u			209.25	TECNICOS		
	SUB-TOTAL			409.25	OFICINA		
BIBLIOTECA 200 LECTORES	SALA LECTURA			300.00	OBREROS		
	CUBICULOS			56.00	TOTAL		
	MICRO-FILM			17.00	SUB-TOTAL		
	COLECCION			52.00	PROFESSIONALES		
	DEPOSITO DE LIBROS			80.00	TECNICOS		
	SUB-TOTAL			705.00	OFICINA		
	TOTAL CON CIRC. Y SERV.			1334.10	OBREROS		
EXTENSION CENTRO DE COMUNICACION	AUDITORIO			200.00	TOTAL		
	SALA CLASES - 3			167.00	SUB-TOTAL		
	OFICINAS EXTENSION			251.00	PROFESSIONALES		
	OFICINAS COMUNICAC.			64.00	TECNICOS		
	DIBUJO			50.00	OFICINA		
	AYUDAS AUDIO-VISUAL			20.00	OBREROS		
	FOTOGRAFIA			40.00	TOTAL		
	IMPRESION-PUBLICAC			100.00	SUB-TOTAL		
	ALOJAMIENTO			1530.00	PROFESSIONALES		
	TOTAL CON CIRC. Y SERV.			2186.40	TECNICOS		
	TOTAL			4.374.50	OFICINA		
					OBREROS		

## ZONA SOCIAL

18. 19. 20. 21. 22. 23. 24.

<b>CAFETERÍA</b> 50 PERSONAS	COMEDOR COCINA TOTAL	700.00 130.00 830.00	ADMINISTRATIVOS SERVICIOS TOTAL	2 5 10
<b>CENTRO SOCIAL</b> 300 PERSONAS	0.75 M <sup>2</sup> /persona  TOTAL	-  225.00	ADMINISTRATIVOS TECNICOS OFICINA OBREROS TOTAL	1 2 2 5
<b>CASINO DE EMPLEADOS</b>	VIVIENDA ZONA SOCIAL ADMINISTRACION SERVICIOS CIRCULACION 30%  TOTAL	840.00 199.00 15.00 261.00 305.00 1.710.00	ADMINISTRATIVOS SERVICIO  TOTAL	8 6 10
<b>CASINO DE OBREROS</b>	VIVIENDA 20% personal plantilla COMEDOR COCINA DESPENSA SALA REUNIONES SALA JUEGOS ADMINISTRACION DEPOSITO  TOTAL	225.00 142.50 57.00 42.75 75.00 300.00 20.00 15.00 877.25	ADMINISTRATIVOS SERVICIO  TOTAL	5 6 10
20 % CIRCULACION Y SERVICIOS		720.45		
TOTAL		4.370.70	TOTAL	1.35

## CONSTRUCCIONES PARA 1973

TURIPANA

## AREAS GENERALES

CLASE	M <sup>2</sup>	\$ 900 M <sup>2</sup>
ADMINISTRACION	1.203.40	1083.060.00
EDUCACION	1.331.10	1197.990.00
INGENIERIA AGRICOLA	180.00	162.000.00
EXTENSION	2.863.40	2'577.060.00
AGRONOMIA	9.319.95	7'063.028.00
CIENCIAS ANIMALES	15.224.50	7'303.490.00
ZONA SOCIAL	3.318.00	2'986.200.00
CASINO DE OBREROS	1.052.70	947.430.00
TOTALES	34.493.05	22'345.558.00

## CONSTRUCCIONES AGRONOMIA PARA 1.973

TURIPANA

PROGRAMAS	OFICINAS-LABORATORIO		INVERNADEROS		BODEGAS-DEPOSITOS		TOTALES	
	S 900/M <sup>2</sup>		S 1.220/M <sup>2</sup>		S 400/M <sup>2</sup>			
	M <sup>2</sup>	\$	M <sup>2</sup>	\$	M <sup>2</sup>	\$	M <sup>2</sup>	\$
CACAO	96.50	86.850.00	48.00	58.560.00	260.00	104.000.00	404.50	249.410.00
LEGUMINOSAS	268.50	241.650.00	50.00	61.000.00	340.00	136.000.00	658.50	438.650.00
PASTOS Y FORRAJES	81.00	72.900.00	100.00	122.000.00	110.00	44.000.00	291.00	238.900.00
YUCA	489.50	440.550.00			70.00	28.000.00	559.50	468.550.00
ARROZ	99.50	89.550.00	20.00	24.400.00	550.00	220.000.00	669.50	333.950.00
FITOPATOLOGIA	297.00	267.300.00	822.00	1.002.840.00			1.119.00	1.270.140.00
MAIZ Y SORGO	189.00	170.100.00			830.80	332.320.00	1.019.80	502.420.00
CAÑA	185.50	166.950.00			530.00	212.000.00	715.50	378.950.00
FRUTALES	140.00	126.000.00	240.00	292.600.00	391.00	156.400.00	771.00	575.200.00
HORTICULTURA	81.50	73.350.00	250.00	305.000.00	260.00	104.000.00	591.50	482.350.00
CERTIFICACION SEMILLAS	117.00	105.300.00	35.00	42.700.00	60.00	24.000.00	212.00	172.000.00
ENTOMOLOGIA	264.50	236.050.00	100.20	122.244.00	124.35	49.740.00	489.05	410.034.00
MATAMALEZAS	207.00	186.300.00	75.00	91.500.00	80.00	32.000.00	362.00	309.800.00
SUELOS	417.40	375.660.00	86.70	105.774.00	124.80	49.920.00	628.90	531.754.00
TRIGO	53.00	47.700.00	42.00	51.240.00	115.00	46.000.00	210.00	144.940.00
CIRCULACION-SERVICIOS	018.20	556.360.00					318.20	556.360.00
TOTALES	1.060.10	1.244.690.00	1.853.80	2.230.053.00	3.845.95	1.538.300.00	9.319.95	7.003.028.00

# CONSTRUCCIONES TURI PAMA PARA 1973

## CIENCIAS ANIMALES

PROGRAMA	ZONA TRABAJO	ESTABLOS Y ALMAC.		TOTALES	
		\$ 900/M2	\$ 400/M2	M2	\$
AVICULTURA	187.70	168.930,00	2.014,00	805,720,00	2.201,70
MEDICINA VETERINARIA	857.70	771.930,00	597,35	234,940,00	1.445,05
GANADO DE CERDO	230,75	207,675,00	4.052,05	1'621,140,00	4.282,60
LIGERADA	533,05	479,745,00	2.952,50	1'181,040,00	3.485,65
PERDIDOS	276,00	243,400,00	2720,00	1'020,000,00	2.096,00
PERDIDAS	541,30	507,170,00	272,00	190,300,00	813,50
					495,970,00
					7'302,690,00

PROVISIONES FISCA

100,000,00 100,000,00 100,000,00

70,000,00

100,000,00 100,000,00 100,000,00

**PERSONAL ACTUAL Y PROYECCIONES TURIPANA**

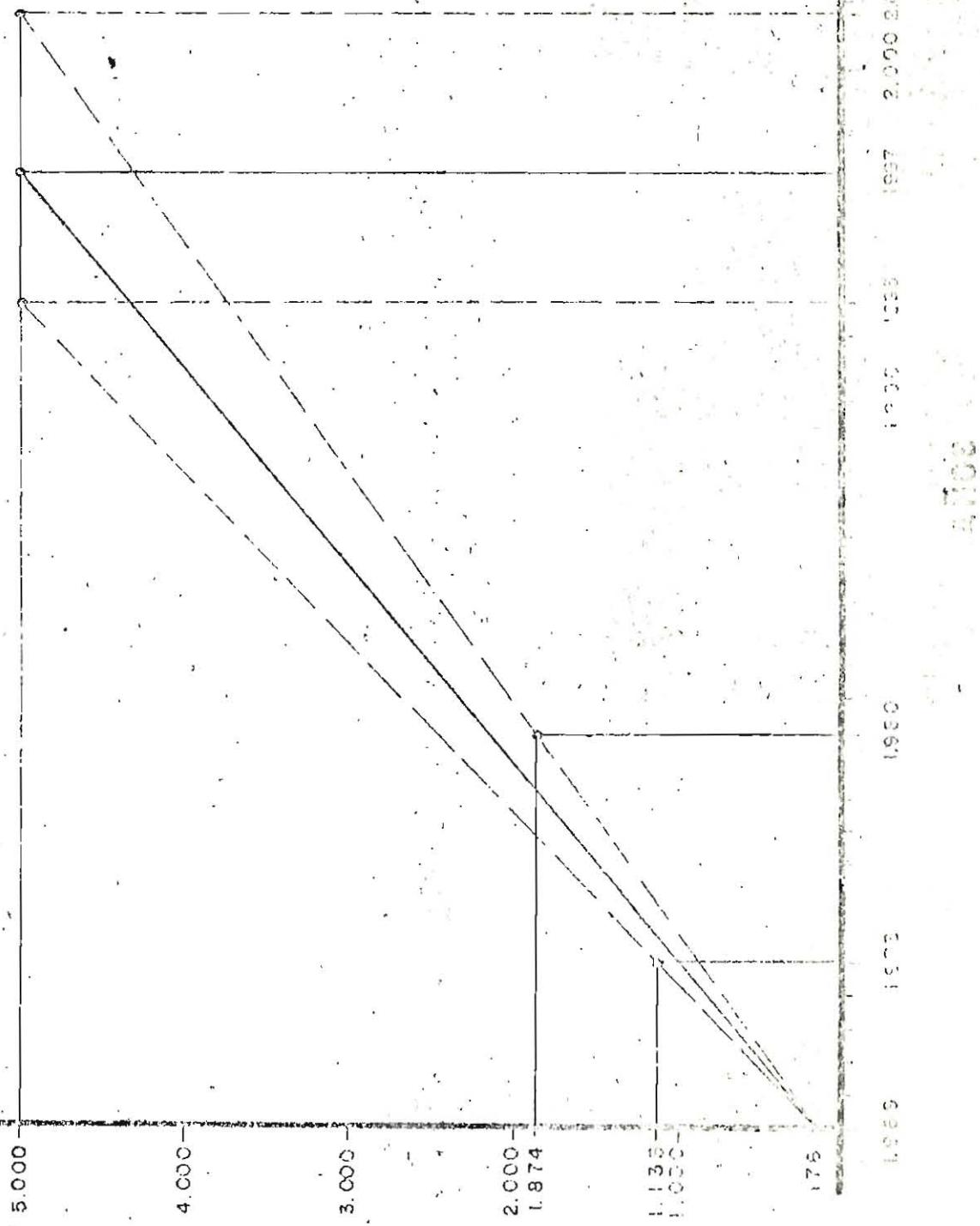
DEPENDENCIAS	1.968			1.973			1.980		
	NOMINA	ESTUD.	PLANILLA	TOTAL	NOMINA	ESTUD.	PLANILLA	TOTAL	
ADMINISTRACION	19	-	69	39	49	-	76	125	
AGRONOMIA	7	-	40	47	89	-	299	388	
CIENCIAS ANIMALS	13	-	23	41	45	-	53	38	
EDUCACION	-	-	-	-	12	60	1	73	
EXTENSION	-	-	-	-	31	375	-	406	
INVESTIGACION AGROSOIL	-	-	-	-	5	-	6	6	
ZONA SOCIAL	-	-	-	15	-	22	-	37	
TOTAL	39	-	187	173	246	635	359	1.181	1.274

NOTA: 1- ESTADISTICAS DE ESTADISTICAS CON EL PERSONAL EN ESTADO DE SERVICIO DE S.G.A.T.E. I.G.A.

2 - ESTADISTICAS DE ESTADISTICAS CON EL PERSONAL EN ESTADO DE SERVICIO DE S.G.A.T.E. I.G.A.

# PROYECCIONES DE PERSONAL EN TURIPANA

PERSONAL



ALOJAMIENTO  
TURIPANA

CLASE	CAPACIDAD			CUPOS NECESARIOS		
	1.968	1.973	1.980	1.968	1.973	1.980
CASAS	53	55	35	14	—	—
CASINO EMPLEADOS	109	109	109	—	109	—
CENTRO COMUNICACIONES	—	—	115	—	—	117
CASINO CERENCO	14	16	14	14	16	14

NOTA: Por el personal económico del Instituto y para los trabajos se calcularon cupos necesarios del 100% y para el personal no docente se calcularon cupos necesarios del 120%.

ALOJAMIENTO PERSONAL DE TURIANA

DEPENDENCIAS	PERSONAS POR ALCOBADA	ALCOBAS	SUB. TOTAL	TOTAL
CASINO	2	36	72	108
CENTRO COMUNICACIONES	1	5	5	15
CASAS	12	5	60	80

2	36	72	108
1	5	5	15
3	8	24	40
1	15	15	40
2	20	40	115

12	5	60	80
1	15	15	40
1	15	15	40
2	20	40	115
12	5	60	80

12	5	60	80
1	15	15	40
1	15	15	40
2	20	40	115
12	5	60	80

TURIPANA = 1.968

AREA 1.472.67 Has.

### ZONA DE EDIFICIOS Y VIVIENDAS

26.24 Has.

1.78 %  
del total

### AREA OCUPADA

### CONSTRUIDO 1er PISO

4.034.70 M<sup>2</sup>

1.50 %

### AREA DE VIAS

12.240.00 M<sup>2</sup>

4.66 %

### AREA CONSTRUIDA

4.034.70 M<sup>2</sup>

0.015

INDICE DE CONSTRUCCION =

CREA CREA DE 2000

4.034.70 4.034.70

= 252.000.00

ESTACIONES = 2.7 ESTACIONES HAB.

PROPIEDAD PARA 1.973

TURPANA

POBLACION PARA 1.973

1.188 PERSONAS

NECESARIOS 133 m<sup>2</sup>/ PERSONA EN EL TERRENO TOTAL ZONA EDIF.

TOTAL AREA ZONA EDIFICIOS

DARA 1.188 PERSONAS =

150.789 m<sup>2</sup>  
15.08 Hect.

AREA CONSTRUIDA (proyecto)

contado 5216 m<sup>2</sup>/ PERSONA

Total dada 1.188 PERSONAS = 62.102.39 m<sup>2</sup>

Area construida = 65%

Area de construccion = 41.430.000 m<sup>2</sup> = 0.5

Area construida = 31.000 m<sup>2</sup>

Area construida = 31.000 m<sup>2</sup>

Area construida = 31.000 m<sup>2</sup>

# CONSTRUCCIONES Y USO DEL TERRENO TURIPANA

AREA TERRENO

250.000

200.000

150.000

100.000

50.000

100.000

100.000

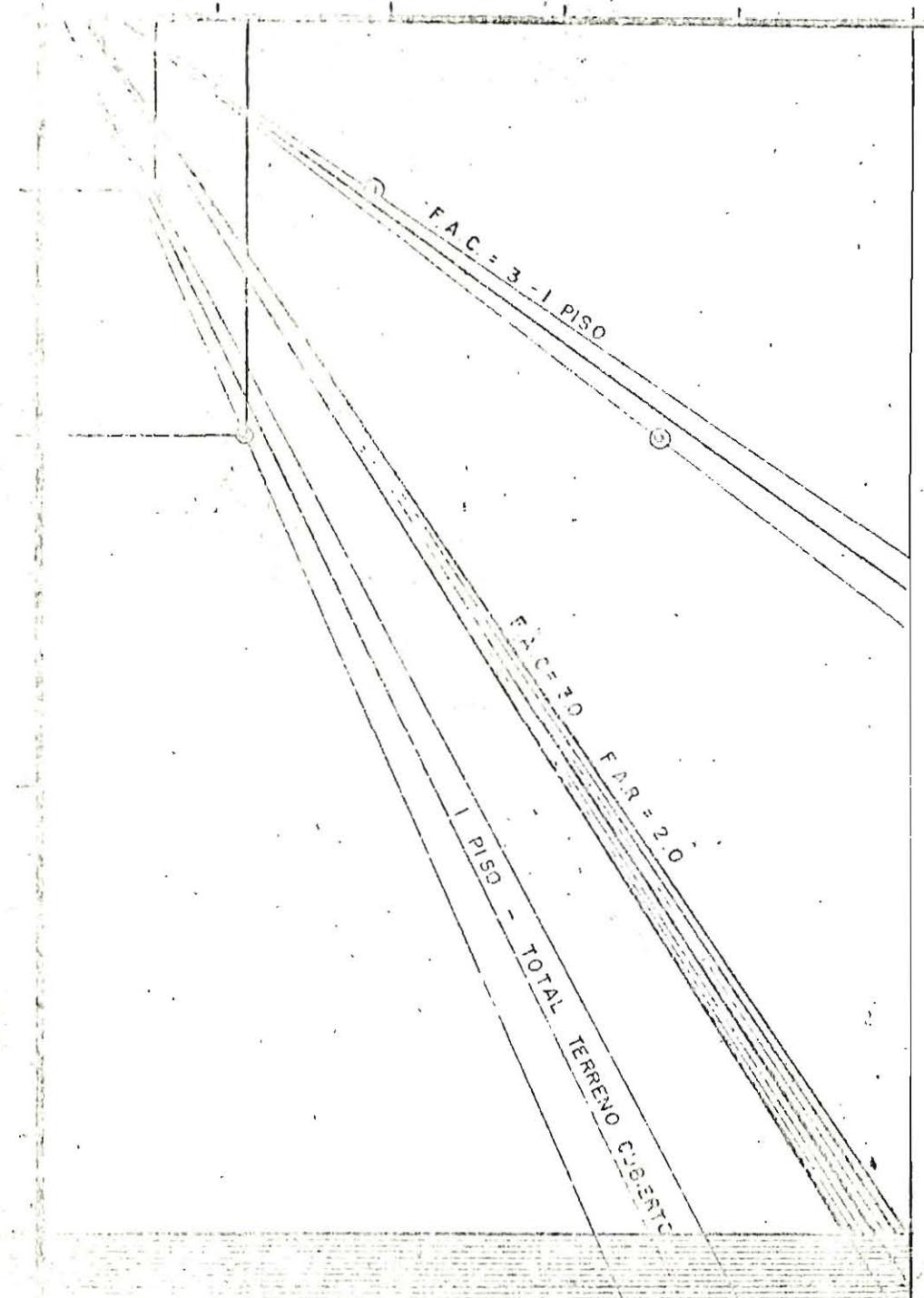
100.000

100.000

FAC = 3 - 1 PISO

FAC = 2.0  
FAC = 2.0

TOTAL  
TERRENO CUBIERTO  
1 PISO



PROUESTA PARA 1.980

TURIPANA

POBLACION PARA 1.980

1.874 PERSONAS

NECESARIOS 153 M<sup>2</sup> / PERSONA EN EL TERRENO TOTAL ZONA EDIF.

TOTAL AREA ZONA EDIFICIOS

para 1.874 personas =  $1.874 \times 153 = 249.242 \text{ M}^2$   
24.92 Hs.

AREA CONSTRUIDA

nescede 57.16 M<sup>2</sup> / persona

TOTAL para 1.874 personas = 63.637.85 M<sup>2</sup>

INDICE OCUPACION = 25%

INDICE DE CONSTRUCCION =

area construida = 69.637.85 M<sup>2</sup> = 0.6  
area terreno = 63.637.85 M<sup>2</sup> = 0.6

63.637.85 M<sup>2</sup> = 139.275.70 = 25.9 Ha.