DIAGNOSIS OF PARAGUAYAN AGRICULTURE AND FORESTRY

(AN UNOFFICIAL TRANSLATION)
BY
Dr. ADLAI ARNOLD
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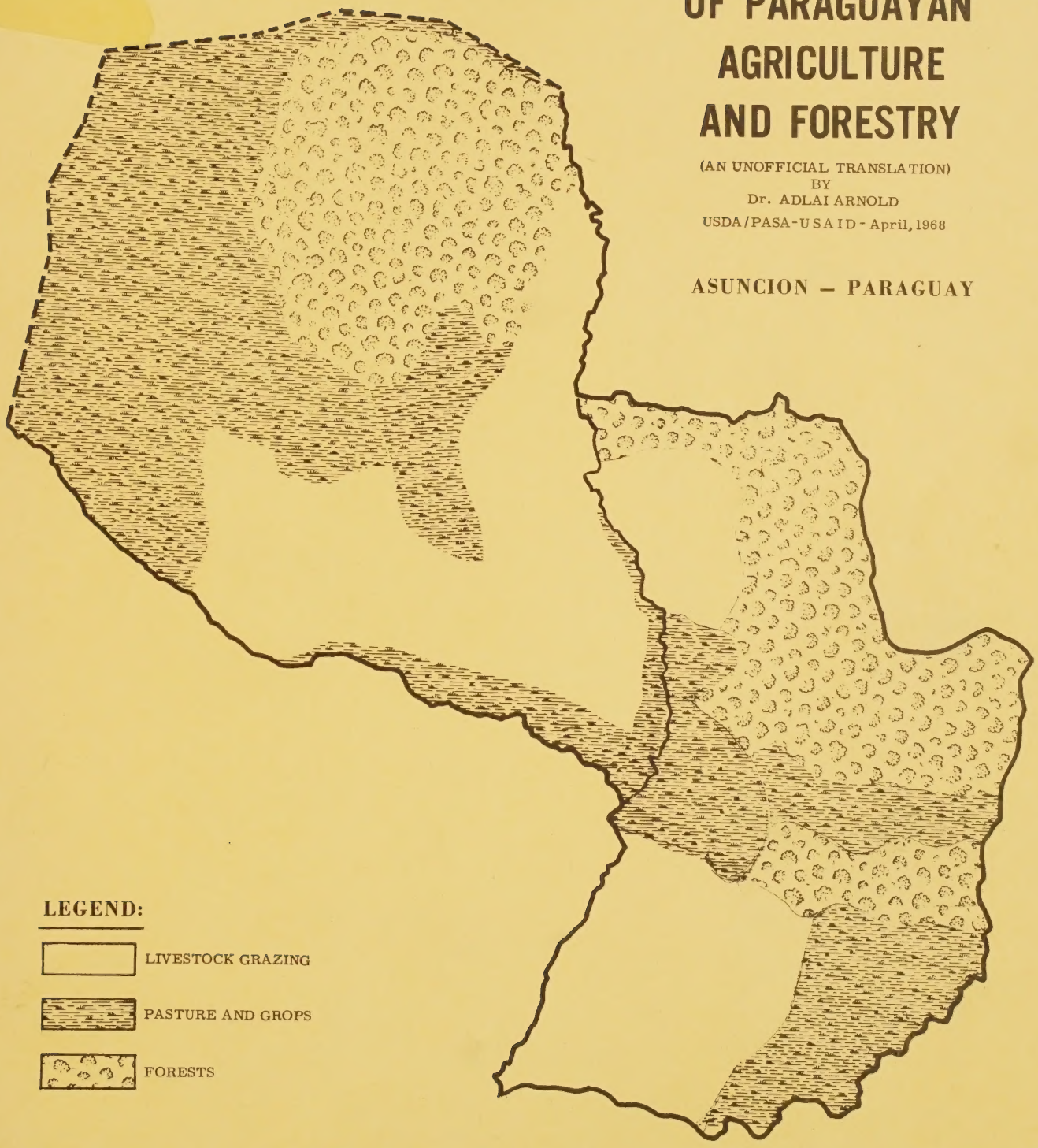
ASUNCION – PARAGUAY



D I A G N O S I S

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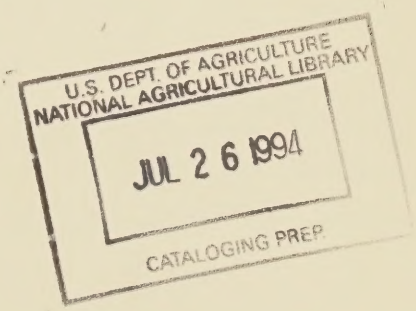
P A R A G U A Y A N A G R I C U L T U R E A N D F O R E S T R Y

BY

The National Secretariat of Planning
In the Presidency of the Republic

(La Secretaría Técnica de Planificación
del Desarrollo Ecónomico y Social
Dependiente de la Presidencia de la Republica)

A Condensed Unofficial Translation



BY

DR. ADLAI F. ARNOLD

FOREWORD

This is an English translation of the latest published diagnosis of Paraguayan Agriculture. The translation is rather free and somewhat condensed. The author of this English version had the double purpose of carefully studying what Paraguayan Professionals have prepared in order to better work with them in the preparation of a new National Plan to cover the period 1969-1973, and at the same time to make available an English version for the use of Specialists studying Paraguay.

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Asunción, Paraguay
April 4, 1968

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II NATIONAL PLAN OF ECONOMIC AND SOCIAL DEVELOPMENT BIENNIUM 1967-1968

D I A G N O S T I C O

OF THE AGRICULTURAL LIVESTOCK AND FORESTRY SITUATION

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I. PRODUCTION FACTORS

A. NATURAL RESOURCES

1. Soils

a. Introduction - History demonstrates a high correlation between the standard of living and the level of management and conservation of soils; this is especially true in an essentially agricultural country such as Paraguay.

The loss of fertility and soil deterioration in the Central Zone could be repeated in other places if the soils are used without considering their nature and potential use capacity. The time required for soil deterioration depends on fertility and natural productivity; soils of high fertility and productivity deteriorate more rapidly than soils having less favorable characteristics.

The fact that farmers tend to use the forested lands because of their high fertility helps explain their willingness to move to new colonization areas, and the rapidity of settlement along new roads in the interior. To the extent that farmers are established on lands of high fertility, less technical assistance and financing will be required to incorporate them into the economic development of the country.

b. Earlier Soils Studies

1) Dr. Moises S. Bertoni - The first technical study of soils in Paraguay was by Dr. Moises S. Bertoni, who published the Agrological, Physiographical, and Climatological Map of Paraguay in 1912. This map, although of an exploratory nature, can be considered the best of its kind. In this work, which includes the Eastern and part of the Western Regions (to the 59th meridian and to parallel 21° 30'), the thirteen soil units mapped are based on a physiographical division employing differentiating factors of geology, surface texture and water permeability. (1)

Bertoni's map is accompanied by a book entitled "Condiciones Generales de la Vida Organica" which describes the climate, physical and geological nature of the terrain, and botanical geography, as well as crops adapted to areas and soil characteristics. Although not in itself a description of the soils, the book contains references of great value for evaluating factors of soil formation and interrelation.

2) Terrado Sulsona et al (2) - Another exploratory study by Terrado Sulsona et al, entitled "Clasificación Preliminar de los Suelos y las Tierras del Paraguay", appeared in 1954. In this work the classification of soils is based

on parent material; residual soils are those formed and maintained "in situ" and the soil is related to the mother rock found below; transported soils are those whose parent materials originated in other places, but have been carried and deposited in their present site by gravity, water and wind. The author divides the soils into 17 units called "series" (table 1). (The nomenclature does not agree with international acceptance in soil science). The following description is from Sulsona et al:

a) Soils of the Eastern Region (II Series) - Residual soils cover 74 percent and transported soils 26 percent of the area, or 11,840,000 and 4,200,000 hectares respectively.

The residual soils include seven series in decreasing order of importance as follows:

(1) Asuncion Series, occupying 38 percent of the area and 6,100,000 hectares is subdivided into three subseries according to variations in geological material as follows;

(a) Derived from loose sand, having a very rapid drainage throughout the profile with sandy texture and low water retention capacity, they are not recommended for agriculture.

(b) Derived from hard, compact sand with adequate drainage and water retention capacity, these are good agricultural soils, but require good management and conservation practices for a sustained yield.

(c) Derived from sand rock in combination with basalt on a rolling to broken topography, having a sandy texture and good water retention capacity, these are good agricultural soils.

(2) Alto Parana Series, covering 19 percent of the area and 3,000,000 hectares, derived from basalt; topography broken to mountainous, having adequate drainage and good water retention capacity throughout the profile, these are soils good for agriculture.

(3) Independencia Series, covering ten percent of the area and 1,600,000 hectares, these soils are derived from sandy-stone high in silica; the topography is broken, with excessive drainage through the profile; with a sandy texture and low water retention, these soils are of limited agricultural use.

(4) Caacupe Series, covering three percent of the area, or 480,000 hectares, these soils are derived from sand stone with a high content of mica and feldpars; the topography is lightly broken to mountainous with drainage free to excessive and an adequate internal drainage. The sandy texture with adequate water retention in the subsoil recommends these soils for traditional agricultural crops.

TABLE I
SOILS OF PARAGUAY

SERIES	ORIGEN	AREA (1,000 Ha.)	LOCATION	TOPOGRAPHY	DRAINAGE External	DRAINAGE Internal	SUITABILITY Crops	SUITABILITY Livestock	SUITABILITY Forests
ASUNCION		6,100	Eastern Region						
a_1	Residual	1,500		Slightly Rolling	Adequate	Free	-	X	X
a_2	"	2,000		Rolling	Good	Moderate	X	X	X
a_3	"	2,600		Rolling	Good	Moderate	X	X	X
Alto Paraná	"	3,000	Eastern Region	Broken	Adequate	Slow	X	X	X
Independencia	"	1,600	" "	Broken	Excessive	Excessive	-	X	X
Caacupé	"	480	" "	Slightly Broken	Free	Adequate	X	X	X
Fonciere	"	480	" "	Level	-	Slow	-	X	X
Ihaty	"	160	" "	Rolling	Free	Slow	-	X	-
Caapucú	"	64	" "	Rolling	Free	Very poor	X	X	X
Napegua	Transported	320	" "	Level	Slow	Impeded	-	X	-
Carmen	"	320	" "	Level	Slow	Impeded	X	X	-
Pilar	"	320	" "	Level	Moderate	Slow	X	X	X
Valles y Llanos	"	3,200	" "	Level	Poor	Impeded	-	X	-
Marisoal	Transported	6,670	Western Region	Level	Adequate	Slow	-	X	X
Bajo Chaco	"	6,670	" "	Level	Poor	Poor	-	X	X
Corro León	"	3,700	" "	Level	-	Very poor	-	X	-
Campamento	"	3,460	" "	Level	Adequate	Slow	-	X	X
Puerto Sastre	"	2,200	" "	Level	Slow	Poor	-	X	X
Jesuitas	"	1,970	" "	Level	-	Impeded	-	X	-

SOURCE: Prepared from Tirado Sulsona, etal. on Soils and Lands of Paraguay. Preliminary Classification - STICA Bulletin Nº 119.

(5) Fonciere Series. Principally suited for grazing, these soils cover about three percent or about 480,000 hectares. Theyare derived from limestone and lime slate, have a level or very lightly rolling topography, drainage low to moderate throughout the profile, and the texture is clayey with good water retention capacity.

(6) Hiaty Series, are soils derived from old glacier material covering about one percent of the Eastern Region, or about 160,000 hectares. The topography is rolling with free external drainage and slow to deficient internal drainage. The texture of the top soil is fine sandy to sandy loam, resting on a gray compact subsoil. Highly susceptible to erosion, these soils are poor for agriculture, but can be used for grazing and pastures.

(7) Caapucú Series, are derived from granite and cover about 64,000 hectares. The topography is rolling to broken, external drainage is free and internal drainage is very poor. If needed, these soils can be developed for agriculture and subsistance crops for ranches or bordering towns.

The four series of transported soils are given in the following order of importance:

(8) Valles y Llanos (Valleys and Plains). This series occupies 20 percent of the area or 3,200,000 hectares. Derived from alluvial mixed materials they are divided into two parts:

(a) Valle de Suroeste: These Soils have a level topography or almost no slope. The external drainage is poor and the internal drainage is impeded. This area is periodically flooded by the numerous small creeks and streams which come down from the high lands of the Northeast and is well suited for pastures.

(b) Valle Central. With a level topography to some slopes, the external drainage is slow with a moderate internal drainage. These soils are derived from sand stone and basalt rocks; andconsitute the lands more suitable for the rice cultivation. These areas are intermixed with some good agricultural lands and other small, very productive sites.

(9) Napegue Soils, derived from alluvial limestone covering approximately two percent of the area, or about 320,000 hectares, these soils have a level to lightly rolling topography; the drainage is slow to impeded, and the texture of the top soil is sandy loam or clay loam. Due to poor drainage these soils should preferably be used for pastures; if they could be adequately drained, they would be of great agricultural value.

(10) Carmen Soils, derived from basalt of alluvial nature and covering about two percent of the Eastern Region or 320,000 hectares; the topography is level with slow to impeded drainage throughout the profile. The texture of the top soil is sandy loam to loam. These soils are presently covered by natural grasses and could be adapted to general agriculture crops if adequately drained.

(11) Pilar Soils, are formed by mixed alluvial materials. They cover two percent of the Eastern Region, or about 320,000 hectares. The topography is level with some slopes toward the river; external drainage is moderate and the internal drainage is slow. With the top soil sandy loam to loamy sand, these soils could produce high yields of subsistence crops.

b) Soils of the Western Region, or the Chaco - The soils of the Chaco are divided into two principal geographical units: The upper and the lower Chaco, comprising about 60 percent of the total area of the country equivalent to some 247,000 Km2.

The soils of these regions are alluvial, gradually varying in characteristics as they move further away from their origin in the Andes mountains.

(1) Soils of the Upper Chaco. This group includes the soils formed by the stratification of the alluvial sediment deposited over the old cap soils of the area by the Pilcomayo and the Parapití rivers. This area, extensively exploited for the production of tannic acid, comprises over 73 percent of the Chaco or about 18,000,000 hectares.

(a) Puerto Sastre Soils. Including the Chernozen clay loams or clay soils of dark gray or black color, these are very susceptible to erosion. The possibility of subterranean slides with the formation of great ditches make the terrain of these soils unsuitable for agricultural development. The soils of the higher parts are mixed with other soils subject to flooding for brief periods, by deteriorated Chernozen covered by pastures, and by podzolized soils covered by forests. The area covered by these soils constitutes about nine percent of the Chaco, or some 2,200,000 hectares.

(b) Mariscal Soils. Derived from fine alluvial materials with slow to adequate drainage throughout the profile, strong signs of deterioration by erosion are evidenced by the frequency of sandy ditches. The topography is level with a light slope toward the Paraguay river. The area covers 27 percent of the Chaco or about 6,670,000 hectares.

(c) Campamento Soils. These soils are similar to the foregoing series, except for the existence of ditches. They cover about 14 percent of the Chaco, or approximately 3,460,000 hectares.

(d) Cerro Leon Soils. These are low wet soils, subject to flooding, having very poor to impeded drainage characteristics throughout the profile. They cover 15 percent of the Chaco, or some 3,700,000 hectares.

(e) Jesuitas Soils. With impeded drainage throughout the profile, they are located in a depression in the Northeast of the Chaco and cover about eight percent of the area, or some 2,000,000 hectares.

(2) Soils of the Lower Chaco. This is a region of very low terrain, in the process of becoming stabilized. The soils are derived from the same materials as those of the upper Chaco, but being of more recent formation they are not so washed. Frequently affected by intensive flooding from the Pilcomayo river and its tributaries, they occupy some 27 percent of the region, or about 6,670,000 hectares. They are suitable for livestock, and most of them could also produce cotton, corn and other products if they had adequate protection against flooding, together with a system of drainage and efficient irrigation.

3) Soils work by FAO Missions (1963 and 1964) -

a) In 1963 a FAO Mission prepared an outline soils map and description to evaluate soils information in Paraguay. (3)

In discussing the classification and location of the various soils of the country this work suggests some new criteria which should be taken into account in order to subdivide the new units proposed by the author to carry out soil studies. Such criteria refers to the following: 1 - Dynamics of soils formation; 2 - The process of zonal definition; 3 - The soil zones of Paraguay; 4 - The process of soils not located in zones of Paraguay; 5 - The relationships between the processes of the soils and fertility. The following discussion is from the 1963 FAO Mission:

(1) Recent Alluvial Soils. Generally located in the lower areas, these soils are subject to frequent flooding. The most important areas are near the Paraguay river, especially along the lower part near its confluence with the Parana river. Also some areas are along the lower course of the Pilcomayo river.

These soils are subdivided into the Pilar complex 1/ and the Pilcomayo association. 1/

(2) Hydromorphic Soils. The hydromorphic soils of Paraguay are of two principal classes: 1 - those which have wet soils throughout the year and 2 - those which are wet only during the rainy season, but which retain some of

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1/ Soil Complex: A minimum nixture of small soils areas differents which are very small but which appear separated in a general map of soils.
Soils Associations: A group of soils definite and known, associated together in a characteristic geographic manner.

their hydromorphic characteristics during the dry season, (pseudogley soils). These latter soils have a dense horizon, a generally compact subsoil (solid clay hard pan), which impedes the entrance and percolation of rain water.

These soils are subdivided in:

(a) Tebicuary complex
(b) Ypané complex
(c) Itacurubí complex

(3) Hydromorphic Saline Soils and relationships of the Chaco Plain

The East and Southeast part of the Chaco is occupied by saline gleys and pseudogleys; saline alkaline gleys and pseudogleys; associated with red chestnut soils and reddish brown solonitzoides in the higher parts of the plain. The majority of these soils have very slow drainage but some of the chestnut solonitzoides and brown soils are slightly better drained and show superficial signs of leaching.

These soils are composed of the following complexes:

(a) Zamucas complex
(b) Boqueron complex, and
(c) Orihuela complex

(4) Semi-arid Brown Soils and Saline-alcaline Soils. In the Northeast sector of the Chaco, where the environment is decidedly subtropical and semi-arid, are found red-brown solonetzoides in association with solonets, solonj-chak; soils regosolicos of areca; soils of recent alluvial sand enriched with salts and degraded solonets with salt pockets.

(5) Chestnut Soils and Associated Alcaline-salines Soils. A great part of the Central and Southwest area of the Paraguayan Chaco is occupied by reddish chestnuts soils with a very strongly developed clay horizon; this includes the Estigarribia association.

(6) Dark Colored Grumusoles and Clay Soils and relationships. These soils occur principally in the North of the Eastern Region of Paraguay. Smaller areas of similar soils, but associated in a complex manner with hydromorphic soils relationships, occur in the South near Encarnación.

They include:

(a) Association Fonciere
(b) Napegue complex, and
(c) Carmen complex

(7) Yellowish-red Podzolics Soils. These podzolic soils are extremely common in Eastern Paraguay, occupying the greater part of the rolling

area to the East of Asuncion to the edge of the basalt rock, extending to the South past San Ignacio, and to the North a little further than Pedro Juan Caballero.

(8) Redish-brown Laterite Soils. These soils, similar to those known in Brasil under the name of "Terra Roxa Estructurada", are widely distributed in the region of the basalt rock in Eastern Paraguay. They include the Puerto Bertoni Association with two facies:

(a) Adela, and

(b) Encarnación

b) The FAO Mission of 1963 prepared an analysis of all the soils data and other related factors, returning to Paraguay in January 1964 in order to establish the places to be visited later by the groups of soils especialists which arrived in August of the same year. As result of this work a report revised from the former work of Wright was published. This report include a summary of the geology of the country according to Putzer, H., 1962 and much material from the former report, the eight basic divisions of Wright et al, are maintained but not the subdivisions (with the exception of the groups of Grumosoles that were tentatively left the same because of not having visited the areas where they occur).

This work divides the soils as follows:

(1) Soils of recent alluvium. This division is identical to the foregoing but eliminates the group of Pilcomayo complex.

(2) Hydromorphic Soils composed of Planosoles without concretion of Calcium Carbonate. These soils are associated with hydromorphic laterites, red podzol soils and grumusoles.

(3) Saline Hydromorphic Soils and related Soils of the Chaco Plain. Are divided in the following subgroups:

(a) Hydromorphic Soils, Grumusoles and some Reddish Chestnut minimum Soils - represented by the Complex Zamucas.

(b) Planosoles. Gley Planosolic Soils, solonets, solodi and brown-gray podzolic soils. Represented by the Orihuela Complex.

(c) Gley Soils, Grumusole, Solonetzicos Soils and some Planosoles. (This subdivision is tentative because the area was not visited).

(4) Semi-arid Brown Soils and Saline-alkaline relationed Soils. Composed of red-brown soils, regozolicos and regosoles.

(5) Chestnut Soils and Associated alkaline-saline Soils. Composed of the following units.

(a) Reddish Chestnut Soils, minimum and maximum, with hydromorphic soils relationships and some hydromorphic soils and

(b) Minimum reddish chestnut Soils, with related soils and very few hydromorphic soils.

(6) Grumusoles and Clays of dark color relationships. This group is tentatively maintained without any changes.

(7) Yellowish-red Podzolics. Are composed of the following units.

(a) Yellowish-red Podzolics with low saturation base, derived from Misiones sandstone associated with humid gley soils.

(b) Yellowish-red Podzolics soils of low saturation base, derived from the sandstone Passo Dois and Fubarao and slate sandstones of alluvial materials, associated with Planosole without concretions of calcium carbonate and with soils of hydromorphic laterites.

(c) Yellowish-red Podzolics soils of low base saturation derived from certain sand stones associated with planosole without concretions of calcium carbonate.

(d) Yellowish-red Podzolic soils of low base saturation derived from the sandstone of Misiones associated with sandy latosoles.

(e) Yellowish-red Podzolics soils of medium to high base saturation derived from Passo Dois and Tubarao sandstones and slates, associated with planosoles without concretions of calcium carbonate.

(8) Reddish-brown Laterite Soils. Composed of the map unit called reddish-brown laterite soils derived from basic igneous rocks.

(9) Latosoles. Are divided into:

(a) Terra Roxa Legitima, derived from igneous basic rocks and

(b) Sandy latosoles, derived from sandstone from the Misiones area.

4) Soils Studies of Plan Triangulo - Among the recent works on soils is that of the Plan Triangulo which was being completed in the period 1965-1966. This publication on soils is of a detailed reconnoisance which includes a triangle of approximately 48,000 Km2 between parallel 25° 15' North and the Parana river to the East and South, and Route 1 Asunci n-Encarnación on the West, having as vertices the cities of Asunción, Encarnación and Pto. Presidente Stroessner. This is the first time that Paraguay used aerial photographs to aid in a work of this nature, and it is of interest that the precision and speed obtained in the publication on soils by the Plan Triangulo was principally due to the availability of aerial photographs.

This work was based on photographs in a scale of 1/50,000 and 1/25,000 and semicontrolled mosaics in a scale of 1/100,000 to 1/50,000.

The mapping of the area first required field visits, and later the selection and interpretation. There are 70 map units each with an association of two or more groups or series of soils. These units have been grouped in accordance with the following physiographic division of terrain.

Physiographic Zones	No. of Units	Area Has.	Covered Percent
1. Alluvial Planes subject to flooding	11	1,300,800	27.9
2. Small Valleys	4	397,200	8.0
3. Terraces and Alluvial fans	6	38,000	4.0
4. Up Lands	49	2,938,000	61.0
		4,824,000	100,0

After preparing the soils maps, the units were studied and interpreted on the basis of their use capacity. The following describes the eight classes of use capacity developed in the study:

a) Use Capacity Class I - The approximately 600 hectares of class I soils include those lands which have little limitations to restrict use; they are very good to excellent soils, suitable for sustained production with high to relatively high yields for a majority of the crops, forestry species, or climatically adapted pastures.

b) Use Capacity Class II - Comprising approximately 1,880,800 hectares, or about 40 percent of the total area, these soils have some limitations which reduce the selection of crops and/or require moderate conservation practices.

They can be considered as good soils with some limitations or continuous risks, but can produce good yields for almost all classes of climatically adapted crops, pastures or forestry species, provided that they are well managed and that the plants are protected against insects and diseases.

c) Use Capacity III - Class III soils occupy approximately 352,600 hectares or about 7.7 percent of the total area. The soils in this class have severe limitations which reduce the selection of crops and or require special conservation practices.

They are medium good lands, with more restrictions or exposed to more risks, than the soils of class II. They can produce medium to good yields for duly aclimated crops, pastures or forestry species. They have a limited adaptability for some agricultural crops, due to external deficiency in the soils, topography or characteristics of drainage described for class II.

d) Use Capacity Class IV - The soils of class four comprise about 401,300 has. or about 8.5 percent of the total area and have very severe limitations which restrict the selection of crops and/or require very careful management. They are less suited than Class III soils for the majority of agricultural crops. These soils are often marginal lands for many agriculturally acclimated crops, but they can be good to very good for special crops.

e) Use Capacity Class V - Occupying 1,698,000 hectares or some 36.3 percent of the area, this class is exceeded only by class II. Under present conditions these soils are not adequate for agricultural crops, whether from a high water table or from suffering frequent flooding, or by both causes at the same time. Nevertheless, they can be used satisfactorily for range grazing and artificial pastures. They are level soils, or almost level, but low and frequently flooded. If economically feasible, the improvement of drainage could convert some of these into the best soils of the area.

f) Use Capacity Class VI - Soils belonging to this class cover an area of approximately 79,000 hectares of the Plan Triangulo study area, equivalent to 1.7 percent of the total. They have severe limitations which make them generally unsuitable for agricultural crops; their present use is limited to native pastures.

g) Use Capacity Class VII - Covering about 230,000 hectares or about 5 percent of the total area of the Plan Triangulo, these soils have very severe limitations which make them unsuitable for agricultural crops, restricting the use almost exclusively to forests.

The limitations are difficult to control and consist of one or various of the following (1) very steep slopes (2) very superficial soils (3) stoniness, and (4) very low water retention capacity.

h) Use Capacity Class VIII - Covering about 38,601 hectares in the Plan Triangulo area, this class has such retrictions of soils and topography that they are limited to use for recreation, hunting and fishing or water. The principal limitations can be (1) erosion or danger of erosion (2) extremely steep slopes (3) very shallow or stony soils, (4) extremely low water retention capacity and (5) rigorous climate.

c. Work to be Done - Because of its predominantly agricultural and livestock enterprises, Paraguay depends on a knowledge of its natural resources to effectively plan agricultural development programs based on true data. Soil maps are essential to show the requirements of soils with respect to conservation, technology,

management and fertility. The lack of a general idea of the soils which cover the country can result in a failure to use areas of great agriculture potential.

A knowledge of the classes and/or groups of soils permits comparison and understanding of the relationships to similar soils in other geographical areas. Because soils are determined by the interaction of five principal factors: 1) Topography 2) Climate 3) Vegetation and other living organisms 4) Parent rock materials and 5) The time that these factors have influenced the product obtained, it is logical to assume that similar soils exist in places having similar conditions and thus by benefitting from the experiences of other countries, guaranies and time for studies can be saved in Paraguay.

For accurate mapping it is essential to have an adequate base map. In Paraguay these are provided by the area photographs and mosaics.

To date approximately one third of the country is covered by aerial photos of 1/50,000 and semicontroled mosaics of 1/100,000; three-fourths of this area is also covered with photos of 1/25,000.

A photographic cover of the rest of the country could be done by stages covering priority development areas. A team of technicians could be mapping the zones selected at the reconaisance level. Later studies could be made in the areas of greater agriculture potential at the semi-detailed or detailed level according to needs.

In the selected areas studies on the behavior of principal soils groups could follow immediately: Response to fertilizers, to mechanical working, to irrigation, etc. Such knowledge is essential to increase agricultural production.

Classification of soils must be in accordance with the priorities established by the Paraguayan government (The Ministry of Agriculture and Livestock, the National Secretariat of Planning and the College of Agriculture and Veterinary Science) as follows:

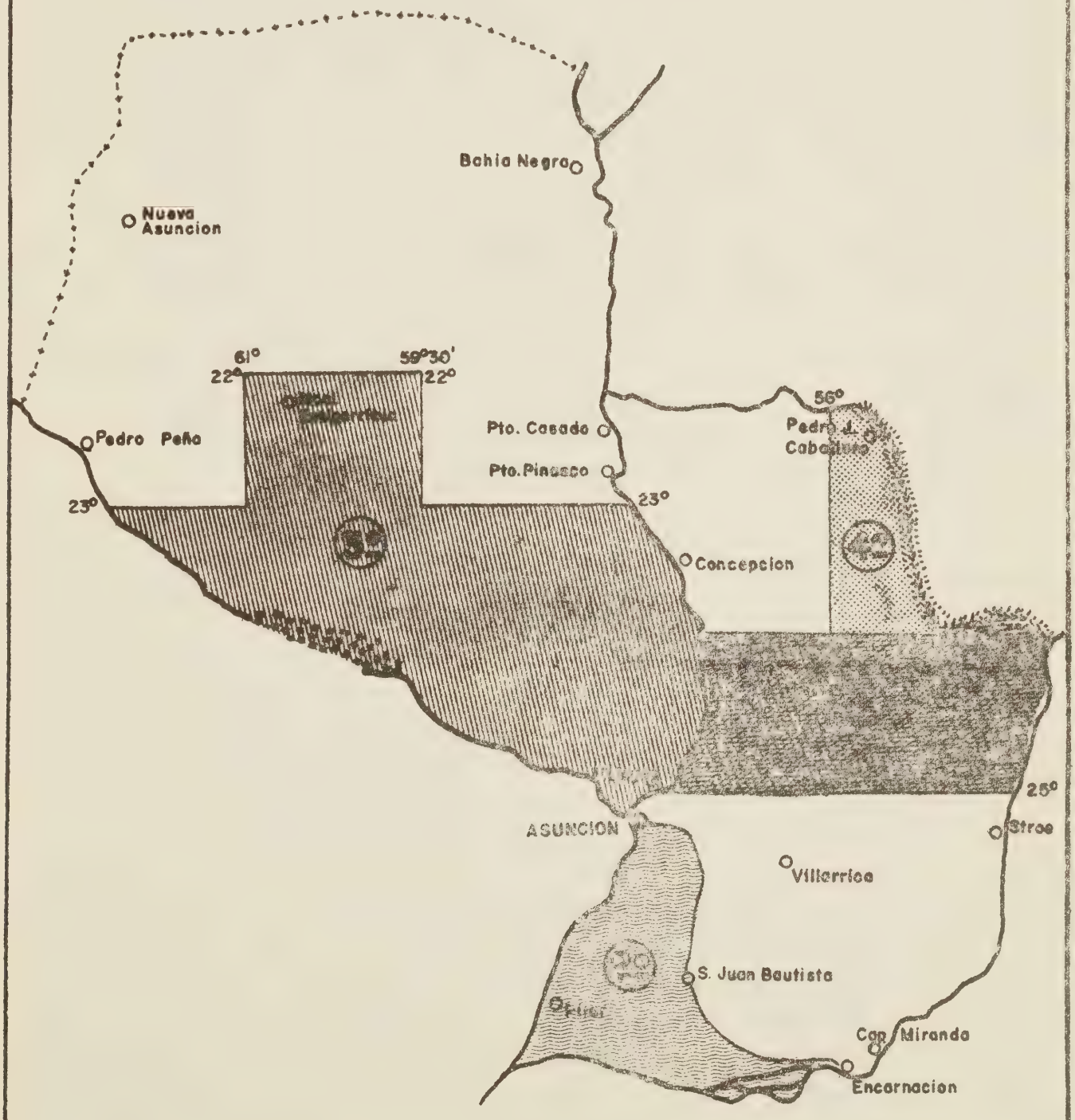
Priority Area No. 1 - A Zone comprised of an area between parallels 24° 00' and 25° 15' of latitude South between the Parana and Paraguay rivers; this zone, known as "Saltos del Guairá Project", is a priority zone by virtue of the trunk routes being constructed accross the territory as well as the possibility of developing the Salto de Guairá as an international source of electricity, plus the necessity of orienting the spontaneous colonization along the communications routes. (See map No. 1)

Priority Area No. 2 - The second priority area between route 1 and the Parana and Paraguay rivers has been selected because of the grazing importance and of the development possibility for an extensive area by means of drainage and use of canals

REPUBLICA del PARAGUAY

MAPA Nº 1

AREAS PRIORITARIAS PARA EL ESTUDIO DE LOS SUELOS



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for the waters of the rivers Tebicuary, Ypoa lake, the Laguna Verá and the rivers and creeks which they drain as well as by the possibility of installing the port of Itapirú in the confluence of the Paraná and Paraguay rivers, and by the possility of developing an international source of electric energy such as the Falls of Apipé (See map No 2 -(2°).

Priority Area No. 3 - The third priority area is a large zone between the rivers Pilcomayo and the Paraguay and a line which extends along the parallel 23° 00' to 59° 30' of longitud West; from this meridian to 22° 00'of latitud South; from this parallel to 61° 00' of longitud West; from this meridian until we again reach 23° 00' latitud South and finally from this parallel over to the river Pilcomayo. This region of the Chaco is crossed by the highway from Villa Hayes to Cnel Eugenio Garay, (a part of the Panamerican highway). This area possibly has the highest potential for livestock development of the country, being limited by soil management problems for which more knowledge is needed. (See map No. 1 - 3°).

Priority Area No. 4 - The fourth priority selected is the area between 24° 00' of latitude South to 56° 10' of longitud West and the Eastern boundary of the country. Presently this zone is the scene of a strong colonization effort, and its importance is increased by being near to the Saltos de Guairá where an electric power plant could shortly be developed. (See map No. 1 - 4°).

Priority Area No. 5 - The rest of the country could be developed as needs arise. These priorities are tentative and can be modified if needed. The principal limitations of the areas 3, 4 and 5 are the lack of aerial photography cover and the difficulties of access.

There is much to do in soil conservation. The Ministry of Agriculture and Livestock (STICA) by means of agricultural extension agents have begun soil conservation planning in many agencies and are carrying out an educational program with farmers receptive to these ideas. Some are planting crops along contour levels and if this could be extended to all farmers it would be a decided improvement.

Recently, the USAID sponsored a short term soil conservation specialist in Paraguay who, in cooperation with the Institute of Rural Welfare (IBR) and the College of Agronomy and Veterinary Science held a short course in soil conservation for the agricultural extension workers of IBR and STICA. Furthermore, by taking as a base the Plan Triangulo study and other maps a soil conservation guide for field workers was prepared 2/, and also farms were selected for setting up demonstrations.

2/Kimberlin, Leon, de Barros Barreto, N.Y. Velazquez "Guia Practica en Conservacion de Suelos" (en prensa).

B I B L I O G R A P H Y

Soils Section

1. Bertoni M.S., 1918 - Condiciones generales de la vida orgánica y división territorial. 171 p. acompañado Mapa Agrológico, fisiográfico y Climatológico, 1912. Imprenta y Editorial "Ex Sylvis", Pto. Bertoni, Alto Paraná.

2. Tirado Sulsona P., Hammon J.B., Ramírez J.R., 1954. Clasificación Preliminar de los suelos y las tierras del Paraguay. Boletín No. 119 STICA, Asunción. 165 p.

3. Wright A.C.S. León L. de, Pacheco R., 1964. Notes on the Soils of Paraguay. Food and Agriculture. Organization of the United Nations. World Soil Resources Reports No. 11. Rome 41 p.

Little has been done in soil chemistry. In soil fertility, the College of Agriculture and Veterinary Science in cooperation with the International soil analysis project of the University of North Carolina State is carrying out an active program which has the goal of analyzing 10,000 soil samples annually by the beginning of the crop year 1967-1968. The most efficient way to determine soil fertility is to correlate laboratory analysis with plant growth in the field.

The project consists of the following parts: 1) Soil sampling - cooperating in this are extension agents and the National Development Bank. 2) Development of analysis methods - Methods presently used have been proved adequate, but studies are being initiated which might discover even better methods for local conditions. 3) Interpretation and recommendation - The analysis results are interpreted with respect to probable fertilizer response.

a) Low - when a significant response to fertilizer is obtained in 85 percent or more cases.

b) Medium - fifty percent or more cases respond significantly to fertilizer.

c) High - when 15 to 20 percent of the cases receive a significant response to fertilizer.

After response categories are determined, recommended fertilizer amounts are based on field trials for different crops in the different regions of the country. 4) Evaluation - An annual evaluation must be made of the scope of the recommendations and percent of adoption in order to ascertain concrete facts, such as fertilizer application but no soil amendments (lime and others), or vice versa. A wrong interpretation could be a detriment to agricultural development.
5) Preparation of Summaries - Finally, as data are accumulated, a fertility map and outline of element deficiencies can be prepared by geographical areas. This would help to determine fertilizers and soil amendments needed, as well as whether adequate supplies are available by seasons.

2. Climate

Climate is of great importance to agricultural production because agriculture is the most exposed and subject to weather of all productive effects. An adequate knowledge of climatic factors would permit programming with greater security, however, despite the eminently agricultural nature of the country, studies of climate and its relation to agriculture, as well as meteorology specialists are quite limited in Paraguay.

The following is a description of the various elements which condition climate in certain zones:

a. Temperature: The mean annual temperature in Paraguay is 22.5 C. (72.5F) but there are variations by zones, diminishing gradually from North to South as follows:

	Annual Mean Temperature	
	Centigrade	Fahrenheit
Bahía Negra	25.9	77.6
Puerto Casado	25.1	77.2
Horqueta	24.9	76.8
Asunción	24.2	75.6
Pilar	22.6	72.7
Encarnación	21.8	71.2

In all zones of the country there are possibilities of temperatures higher than 40° C (104° F), and lower than 3.0 C (37.4° F). (Table No. 2). There are insufficient hours of cold temperatures, even in the South, to supply the needs of such temperate zone crops as apples, pears, etc.

On the average, frosts occur from May to September, varying in frequency and intensity by topographic characteristics and from North to South. Zones most susceptible are: Central, Alto Parana, and the Southern part of the Eastern Region. Occasionally frosts seriously affects perennials and winter crops.

Throughout the country the summers are long and hot; abundant to excessive heat prevails in the North and Central parts of the Eastern Region with annual mean temperatures superior to 24° C (75.2° F).

The considerable thermal variation between summer and winter, despite limitations from frosts, limited hours of cold, and small variation in sunlight hours, permits a wide range of possibilities from tropical, subtropical and even some temperate zone plants.

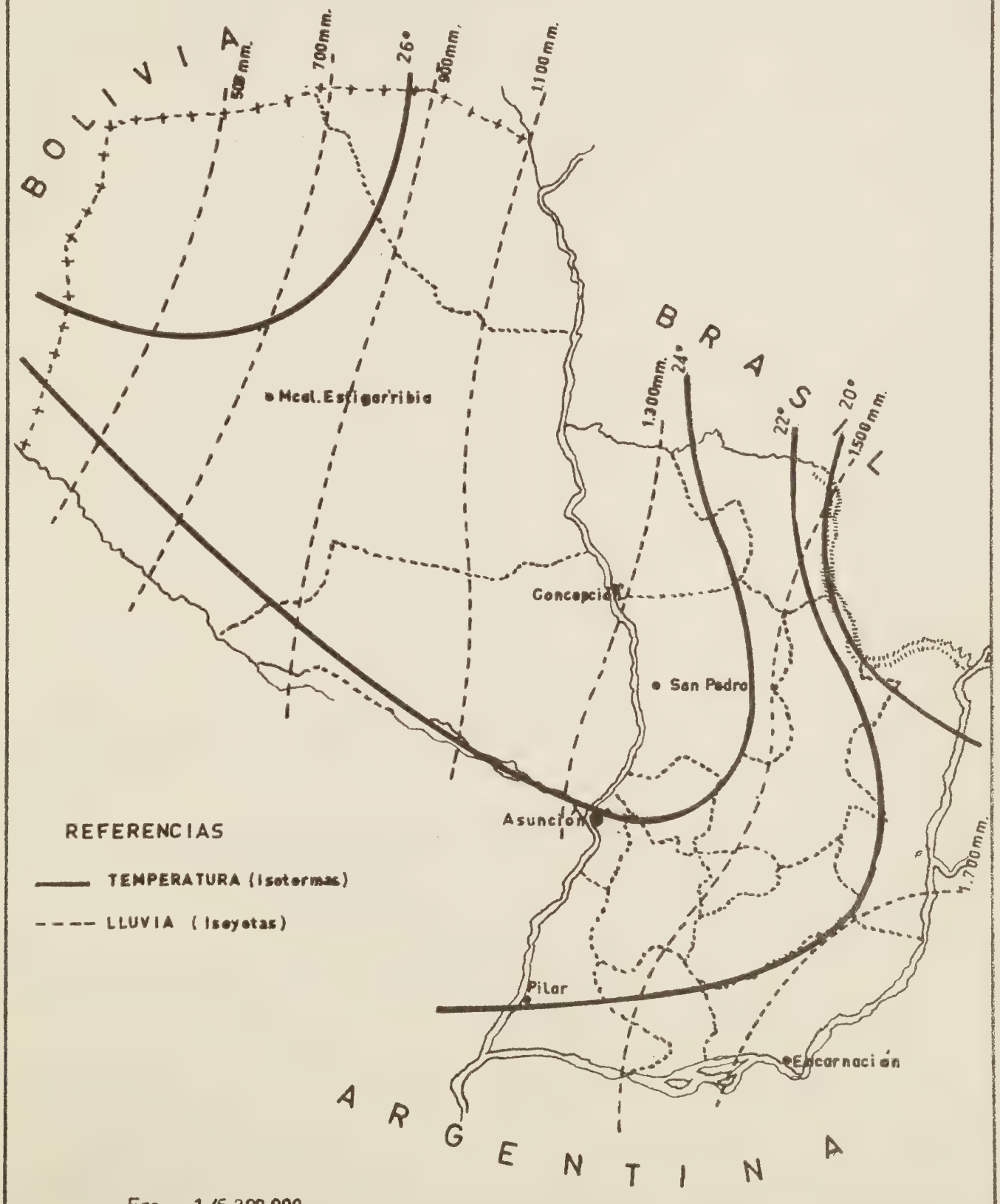
The intelligent selection of sites by considering such factors as topography, altitude, and appropriate cultivation methods (including selection of varieties and seeding dates), makes it possible, within limits, to include such temporal zone crops as wheat, and tropical crops including coffee and various vegetables and forages. The climate is favorable for citrus, cotton, sugar cane, tung, yerba mate, tobacco, castor beans, pinneaple, banana, sweet potatoes, rice, mandioca, vegetables in general, peanuts, strawberries, sunflower, kenaff, etc.

b. Precipitation: Annual precipitation ranges from a minimum of less than 500 m.m. (20 inches) in the Northwest Chaco to a maximum of 1700 to 1800 m.m. (68 to 72 inches) in the extreme Southeast of the Eastern Region (See map No. 2).

REPUBLICA del PARAGUAY

MAPA Nº 2

C L I M A



REFERENCIAS

——— TEMPERATURA (Isotermas)

– – – – LLUVIA (Isoyetas)

Esc. 1/5.200.000

TABLE 2

AVERAGE TEMPERATURES

Period: 1941-1960

	Absolute Maximum (Centigrade)	Average Maximum (Centigrade)	Average (Centigrade)	Average Minimum (Centigrade)	Absolute Minimum (Centigrade)
Bahia Negra	41.2	30.8	25.9	19.9	1.7
Mcal. Estigarribia	43.6	30.7	25.4	18.0	5.1
Puerto Casado	41.7	31.0	25.1	19.1	0.9
Horqueta	44.0	30.6	24.9	17.6	2.5
San Lorenzo	40.0	27.9	23.0	15.5	1.6
Asunción	41.8	28.4	24.2	18.9	2.3
Villarrica	41.6	27.5	22.6	16.4	3.0
Pte. Franco	40.0	27.5	22.1	15.2	3.0
Pilar	42.5	27.2	22.6	16.4	2.2
San Juan Bta. M.	40.8	26.8	22.1	15.8	1.0
Encarnación	41.0	26.8	21.8	14.7	6.0

SOURCE: Ministry of National Defense - Department of Meteorology.-

The Eastern Region, principal zone of agricultural production, has an annual rain fall from 1,300 to 1,500 m.m. (52 to 60 inches). Although this is sufficient for most crops, the seasonal distribution is generally inadequate. Rains occur in all months of the year, but drouths may come in periods of great water need, or heavy rains may fall in very short periods of time. Also, excessive rain generally hinders harvesting.

Estimations of the hydrobalance have been initiated in certain zones. This is indispensable for determining the actual amount of water available in the soil, as well as annual distribution.

In the Chaco (Mariscal Estigarribia) the months of least rainfall are June and July with 16.7 m.m. (.6 inches) and August with 4.1 m.m. (.2 inches); (See table No. 3). The months of greatest rainfall are January and February with 111.8 and 108.9 m.m. (4.4 and 4.3 inches) respectively. This can not be taken in an absolute sense, because the months with greater rainfall are January, February and November, with 146.4, 150.3 and 141.5 m.m. respectively. The least precipitation comes in June, July, and August with 102.8, 72.5 and 57.0 m.m. respectively (See table No. 3). There is generally a deficit of water in the summer, ranging from small to considerable.

The rainfall pattern in the East is more uniform than in the Chaco. Because of higher temperatures the Chaco has a higher evapotranspiration. Although the demand for water coincides with greater rainfall (September to February), the greater evapotranspiration of this season generally results in a water deficiency beginning in December.

c. Humidity: Like temperature and rainfall, humidity also varies by zones with an annual average of 59 percent in Mariscal Estigarribia; Bahía Negra 68 percent and Puerto Casado 69 percent (See table No. 4). The variation in the Eastern Region is from 73 to 77 percent.

Humidity affects plant growth, and may condense in the form of dew and fog without producing rain. Its frequency and distribution deserves special consideration as a climatic factor in any particular place, and although it forms a small part of total moisture, losing a large proportion to evaporation, it exercises an appreciable effect on vegetation in certain climatic conditions. Humidity also has an important influence on human confort.

In summary, climatic data are not sufficient, and should be developed as soon as possible to supply a more exact appraisal of the country's climate. (See table No. 4).

TABLE 3

AVERAGE MONTHLY AND ANNUAL RAINFALL

Period: 1941-1960

LOCATION	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Bahia Negra	138.0	133.4	125.2	74.8	59.1	41.3	35.7	15.0	57.1	107.3	133.4	109.2	1.030.5
Mcal. Estigarribia	111.8	108.9	80.5	59.6	41.5	16.7	16.7	4.1	25.9	94.3	84.1	98.0	575.2
Puerto Casado	143.0	127.5	145.3	105.8	79.3	57.3	46.6	27.9	70.8	125.3	143.2	126.0	1.203.0
Horqueta	173.9	118.7	139.5	128.9	130.3	80.2	48.5	33.5	76.6	166.3	130.6	121.6	1.348.6
San Lorenzo	142.9	229.3	51.4	222.2	85.4	94.0	72.9	59.9	151.4	160.2	179.2	201.6	1.650.3
Asunción	167.4	142.1	159.5	138.0	131.2	86.7	54.0	30.3	87.0	145.5	128.5	121.8	1.392.0
Villarrica	150.4	123.2	153.5	152.4	136.7	111.1	82.1	60.2	110.1	199.9	132.3	127.8	1.533.3
Pte. Franco	146.8	120.3	162.0	138.4	148.2	124.5	99.7	72.3	156.2	161.3	142.6	138.5	1.610.6
Pilar	118.5	128.5	163.5	151.0	105.2	86.5	44.7	43.5	79.3	145.4	139.9	115.3	1.321.3
San Juan Bta. M.	152.5	155.9	123.7	217.5	77.1	84.2	89.9	79.8	137.5	157.5	143.1	129.2	1.547.9
Encarnación	143.4	184.9	156.4	169.8	163.0	155.3	112.0	76.3	141.9	206.2	136.1	123.2	1.760.1
Total Eastern Region	148.4	150.3	138.7	164.8	122.1	102.8	75.5	57.0	117.5	167.8	141.5	135.0	1.520.5

SOURCE: Ministry of National Defense - Department of Meteorology.-

TABLE 4

AVERAGE HUMIDITY

Period: 1941-1960

Location	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Bahia Negra	68	72	71	71	70	72	68	63	63	65	66	65	68
Mcal. Estigarribia	58	63	64	66	67	67	58	49	50	54	55	56	59
Puerto Casado	67	73	74	74	75	69	62	62	62	66	67	65	69
Horqueta	73	75	70	75	78	79	72	64	67	72	71	69	72
San Lorenzo	70	73	74	78	78	79	76	73	73	72	69	69	71
Asunción	63	66	69	69	73	73	71	64	65	64	61	58	66
Villarrica	68	70	73	75	77	78	72	68	71	71	68	62	71
Pte. Franco	76	68	75	68	79	81	75	70	70	70	66	65	73
Pilar	63	67	70	73	76	78	73	67	68	67	63	60	69
San Juan Bta. M.	70	70	70	75	76	78	77	71	72	72	66	66	72
Encarnación	67	71	73	76	79	81	75	69	71	71	65	62	72
Eastern Region	68	70	72	75	77	79	73	68	70	70	66	64	71

SOURCE: Ministry of National Defense - Department of Meteorology

3. Water

a. An exhaustive knowledge of the water resource is indispensable not only for agriculture, but also for construction of roads and bridges, the utilization of hydroelectric power and running water, navigation, etc. Thus it is necessary to carry out coordinated water research to avoid duplication as well as waste of time and money.

Although it is known that the country is well supplied with water, especially the Eastern Region, with its numerous rivers, creeks and springs; knowledge of the water potential is still limited. Water studies have been partial and without continuity, devoted to special projects such as Acaray and Apipé hydroelectric development etc; to date there is no complete study of this important resource.

State Institutions having divisions responsible for water studies are the Ministries of Agriculture, Public Work and Communications, National Defense, Public Health and Social Welfare; as well as Corposana, the Institute of Military Geography, the Division of Hydrography and Navigation, etc.

Agrometeorological studies show that, in addition to occasional great drouths, there are annual water deficiencies in the Eastern Region where most of the agriculture exists, thus demonstrating the need for irrigation, which can only be applied through a knowledge of the water resource. Because agriculture can not continue depending entirely on climatic conditions, it is recommended that a pilot irrigation project be initiated. Except for vegetables and rice there are no irrigated crops; the total area irrigated is estimated to be 16,000 hectares, about two percent of the total area cultivated.

b. Hydrography 3/: The hydrography in Paraguay is based on the Paraguay and Paraná rivers (See map No. 3). The Eastern Region with a well distributed system, is better supplied with water than the Chaco. The two main rivers, together with their tributaries and various creeks and lakes, provide the basis of an economic agriculture, livestock and forestry structure.

However, no concrete studies are available to show the principal characteristics of the watersheds (fundamentally related to the rainfall), the grade of the terrain and the slope of the streams. There scarcely exists even a superficial knowledge of that part of the Eastern Region drained by the Paraguay river where the topography has little slope and slow drainage. There also exist valleys subject to periodic or permanent flooding which extend from the Ypané southward to the

3/ Extracted from files of the Hydrography department of the Division of Hydrography and Navigation.

Paraná comprising wide areas to lake Ypoá and the Tebicuary valley occupying the whole Ñeembucú department. The distinction between these zones is very important from a hydrological point of view as such knowledge would permit a better definition of the country's potential of water for irrigation and other purposes.

The watersheds of the Paraná river are very different from the Paraguay with respect to slope, drainage and potential for hydroelectric power.

1) Paraná River

a) Rising in the Sierras of Santos in Brasil the Paraná has a total length of approximately 4,700 kms. For about 850 kms. it serves as a boundary between Brasil and Paraguay; from the Mbaracayú Cordillera to the Yguazú river it separates Paraguay from Brasil; and beginning at this point it forms a boundary between Argentina and Brasil until reaching its confluence with the Paraguay river.

The Paraná river is navigable for about 2,058 kms., from Puerto Adela to its mouth. The width varies between 400 and 900 meters; near its confluence with the Paraguay it widens to about 3,000 meters, forming various channels and islands. Its channel is very deep, varying between 40 and 50 meters. The velocity of the stream is relatively high and the currents form many rapids and whirlpools which makes navigation difficult and dangerous even for larger ships; during periods of low water there are many dangerous rocks.

b) Afluents of the Paraná river: The Paraná has eleven principal tributaries flowing from Paraguayan territory on the West, of which the most important are the Acaray, Monday, Ñacunday, and the Carapá. Other streams include the Itambey, Tambey, Pirapó, Yabebyry, Lemoy and the Paragiti-y.

2) For lack of adequate studies showing the relation of hydrography to present development problems, the following is a description of the principal rivers and streams of the country:

a) Paraguay River: Beginning in the state of Matto Grosso, Brasil at an altitude of about 600 meters (1,950 feet) above sea level, the Paraguay flows 2,550 Km. (1,530 miles) from Cuyabá (Brasil) to its confluence with the Paraná river, (at Corrientes). To the North the Paraguay river separates Paraguay and Brasil from the Negro river to the Apa; from the Apa to the Pilcomayo it traverses Paraguayan area; from the Pilcomayo to the Paraná it is the boundary between Paraguay and Argentina.

The Paraguay is one of the principal trade arteries of the country; it supplies the primary means of transportation to great areas of Brasil and Argentina, as well serving the greater part of Paraguay. Internal and external trade depend largely on its navigability, and the irregular flow of its waters causes great losses to the transport economy.

REPUBLICA del PARAGUAY
SISTEMA OROGRAFICO
SISTEMA HIDROGRAFICO

MAPA Nº 3

Esc. 1/5.200.000

For the greater part of the year the Paraguay is navigable for boats of 10 feet draft from the Parana to Asunción. Nevertheless, studies reveal that between Corrientes and Asunción there are occasions when some depths measure less than 2.43 meters (8.0 feet) during five months on the average; 2.74 meters during 1.4 months; and 3.04 meters during an average 2.4 months. During periods of extreme drouth, such as occurred in 1948 and 1963, some depths measure less than 1.15 meters (3.8 feet).

The mean volume flow is 3.064 cubic meters per second measured at a point 1.1 km. below the bay of Asunción. The minimum flow measured is 1.03 cubic meters and the maximum 11.0 cubic meters per second. These data were taken in the period between 1931 and 1940. The velocity of the current is as follows:

SECTION	Km/Hour
North of Apa river	2.5 to 3.5
Between Apa river and Asunción	3.5 to 4.5
South of Asunción	4.5 to 5.5

The velocity of the current varies between 2 and 8 km. per hour.

b) Afluentes of the Paraguay River: Of the 30 important tribiutaries of the Paraguay River, 14 are in paraguayan territory. Flowing into the Paraguay from the East the principal streams are as follows:

(1) Apa River: This river serves as a natural boundary with Brasil to the North of the Eastern Region. It is about 380 Km. long and the watershed covers 16,180 Km2. This river it is not navigable because of its shallow depth, the velocity of the current is up to 7.8 Kms. per hour, for periods of short duration.

(2) Aquidabán River: With 275 kms. of length and a watershed area of approximately 380 Km2, this river is navigable for small boats for a distance of 3 Kms.

(3) The Ypané River is 282 Kms. long with a watershed of 11,300 Km2; approximately 50 Kms. are navigable during the period of heavy flow, but it is somewhat difficult to navigate because of various rock formation.

(4) The Jejuí River is 52 Kms. long with a watershed of some 19.160 Km2. Formed by the Western branch and the Aguaray-Guazú branch (which has 21 Km. of length), this river is navigable for boats having one foot of draft for a distance of 200 Kms.

(5) Manduvirá River: With a length of 212 Kms. and a watershed of 10,280 Kms2, it is navigable for approximately 60 to 80 Kms. (for small boats); although there are stony passes, reefs and thick vegetation which make navigation difficult, it is considered navigable for very small boats for some 20 Kms.

(6) Salado River: With only 65 Kms. of length and a watershed of 1.020 Kms, this stream is not navigable.

(7) Tebicuary River: This river has a length of 500 Kms. and a watershed of 31,450 Km2; its width varies from 80 to 150 meters, and it is navigable for about 232 Kms. In periods of low water the depth is about 0.8 meters.

b) Streams Flowing to the Paraguay River from the West

(1) Verde River: Having a length of 280 Kms. and a watershed of 6,900 Km2, it is only navigable during periods of high water for boats of draft less than 0.7 mts.

(2) Monte Lindo River: This river is 440 Kms. long with a watershed of 9,000 Kms2; the width varies from 19 to 40 meters; navigation is limited to rafts and small boats during seasons of high water.

(3) Negro River: Having a length of 275 Kms., the watershed of this river is approximately 7,550 Kms2. It is navigable by small boats for 130 Kms. during the high water periods on the Paraguay river.

(4) Confuso River: Having a length of 550 Kms. and a watershed of 9,600 Kms2, is practically not navigable.

(5) Pilcomayo River: This tributary serves as a boundary between the Paraguayan Chaco and Argentina. Rising in the uplands of Bolivia, it has a length of approximately 2,000 Kms. and is navigable for about 200 Kms. by boats having a draft of one meter.

3) Lakes: There are two large lakes in Paraguay: Ypacaraí and Ypoá

a) Ypacaraí Lake: A tourist center located approximately 50 Kms. to the East of Asunción, this lake has an area of 5 to 6 Kms2 between the districts of Ypacaraí, San Bernardino and Areguá. It has its drainage to the Paraguay river by means of the Salado river.

b) Ypoá Lake: About 100 Kms. to the South of Asunción, drainage is into the Paraguay river by the Paray creek and into the Tebicuary river by the Negro river.

In addition to the rivers and the lakes mentioned above, there exist numerous less important rivers, creeks and springs which make the Eastern Region a very good area for the development of agriculture and livestock even though there are frequent periods of droughts which cause great losses.

B. RURAL POPULATION

The Population density in 1965 of 5 persons per square kilometer (13 per sq. mile) reveals the high ratio of land to man in Paraguay. In the Eastern Region, where most of the population is concentrated, (including the rural) the population is more dense, reaching 67 per Km2 (174 per square mile, meanwhile the average density in the Chaco is .4 per Km2 (1.0per sq. mile).

Population of Paraguay

(1000 persons)

Year	Total	Rural	Percent
1961	1,801.4	1,158.8	64.3
1962	1,845.4	1,190.9	64.2
1965	2,030.0	1,296.7	63.9
1967	2,161.2	1,375.2	63.6
1968	2,230.9	1,416.8	63.5
1970	2,379.0	1,504.8	63.3

SOURCE: Demographic study No. 2 - Secretaría Tecnica de Planificación

The rural population has grown slower than the urban having dropped from 64.3 percent in 1961 to an estimated 63.9 percent and 63.3 percent in 1965 and 1970 respectively.

The highly youthful age structure results in an economically active population of only 567,900 persons (30.6 percent) with 75.6 percent men (435,400) and 24.4 percent women (132.500). (Table 5)

About 59.3 percent of the total active population (337,300 persons) are working in the rural zones, the rest are in the Capital and other Urban cities.

Of the total rural population in 1961, 62 percent (604,599) were principally occupied in agriculture and livestock as compared to 377,244 persons in non-agricultural work. (Table 5)

Studies by demographers predict that the economically active population in the interior of the country will grow at the rate of 3.6 percent for the period of 1965/1970; with rural active rising to 31.5 percent by 1970, as compared to 30.4 percent in 1960

The 357,000 persons work force of the Agricultural and Forestry sectors in 1965 was distributed as follows:

Agriculture	289,080	80%
Livestock	32,990	9%
Forestry	35,330	11%

TABLE 5

PROJECTION OF POPULATION EMPLOYED IN AGRICULTURE LIVESTOCK AND FORESTRY

Years	Population	Agriculture (Crops) Population Economically Active		
		Males	Females	Total
1956 (1)	816.553	193.202	21.324 (4)	214.526
	-	-	-	-
1961 (2)	908.983	230.116 (3)	25.399	255.515
1962 (5)	934.160	237.360	26.160	263.520
1963	960.000	244.830	26.940	271.770
1964	986.600	252.540	27.750	280.290
1965	1.013.900	260.500	28.580	289.080
1966 (6)	1.044.000	269.250	29.540	298.790
1967	1.075.000	278.300	30.530	308.830
1968	1.106.900	287.650	31.560	319.210
1969	1.139.800	297.315	32.620	329.935
1970	1.173.600	307.300	33.720	341.020

(1) Agricultural Census 1956

(2) Agricultural Census by Sample, 1961

(3) Calculated by difference between total and livestock

(4) The demographic study No. 3 stated that 9.4 percent of PEA in Agriculture and Forestry were females.

(5) Beginning in 1962 the Total Population was projected at an annual rate of 2.77 percent and the PEA at 3.15 and 3.10 percent respectively for men and women. (Demographic Study No. 3)

(6) Since 1966 the rates were: Total Population: 2.97 percent; PEA: Males: 3.36 percent and Females: 3.35 percent (Demographic Study No. 3)

SOURCE: Prepared by the Secretaría Técnica de Planificación - Agriculture and Forestry Sector

TABLE 5

(Cont.)

Year	Livestock		Agriculture	
	Total Population	Population Econ. Active	Total Population	Population Econ. Active
1956 (1)	64.303	25.721	880.856	240.247
	-	-	-	-
1961 (2)	72.860	29.144	981.843	284.659
1962 (5)	74.880	30.060	1.009.040	293.580
1963	76.960	31.000	1.036.960	302.770
1964	79.090	31.980	1.065.690	312.270
1965	81.280	32.990	1.095.180	322.070
1966 (6)	83.690	34.090	1.127.690	332.880
1967	86.170	35.235	1.161.170	344.065
1968	88.730	36.420	1.195.630	355.630
1969	91.360	37.640	1.231.160	367.575
1970	94.070	38.900	1.267.670	379.920

TABLE 5
(Cont.)

Years	Forestry		General Total	
	Total Population	Population Econ. Active	Total Population	Population Econ. Active
1956 (1)	64.434	27.773	945.290	258.020
	-	-	-	-
1961 (2)	78.020	31.208	-	315.867
1962 (5)	80.180	32.190	1.089.220	325.770
1963	82.400	33.200	1.119.360	335.970
1964	84.680	34.250	1.150.370	346.520
1965	87.025	35.330	1.182.205	357.400
1966 (6)	89.610	36.520	1.217.300	369.400
1967	92.270	37.750	1.253.440	381.815
1968	95.000	39.000	1.290.630	394.630
1969	97.820	40.310	1.328.980	407.885
1970	100.720	41.660	1.368.390	421.580

Thus Agriculture (crop farming) has great significance as a source of occupation for the national population and as a generator of income for the great majority of the rural producers.

The 1961 Agricultural sample Census shows that of the total population occupied in the agricultural, livestock and forestry sector, 77 percent are independent producers (including family members and additional persons) and the remaining 23 percent are salaried (day workers employees, or contracted workers). This demonstrates the family characteristics of agriculture, significant for the formulation of the sector's development strategy.

Underemployment in Agriculture in 1965 was estimated to be about 32 percent of the work force. The calculation was made on the number of male persons economically active assuming that cultivation is carried out in the greater part by men on the base of 250 work days annually, and in accordance with the requirements of man-days per hectarea and by crop. Diverse types of work, such as taking care of animals, birds, constructions, and reparing of building, etc., were not taken into account; neither was taken into account the number of female persons economically active because, generally, the labor of women is limited to housework and small scale marketing of products. However, the women do carry out certain work, such as the classification of seeds, harvesting of some products, etc.

The under-employment of labor is partly permanent, but principally seasonal due to the few winter crops to absorb labor. The season of greater labor utilization is from July to March; April, May and June are months of less labor use. Considering that seasonal crops absorbed about 82 percent of man-days utilized from July to March in 1965, the utilization varies from 60 to 75 percent of the total work force available. On the other hand, in months of April, May and June this utilization was 18, 28, and 47 percent respectively.

Crops absorbing a greater amount of labor in 1965 are mandioca and corn, which respectively represents 25.8 and 20.3 percent of the total labor utilized; followed by cotton, beans, sugar cane, and tobacco with 7, 6, 5, and 9 percent respectively. Peanuts, soybeans and rice represent about two percent and permanent crops absorb between one and two percent of tohal labor.

1. Labor Productivity

a. Product per capita - The agricultural, livestock and forestry sector constitutes one of the principal components of the gross national product contributing 36.3 percent in 1965. The components of the sector vary considerably in product per capita:

PRODUCTIVITY PER CAPITA

(in 1962 dollars)

SECTORS	1961	1962	1963	1964	1965
Livestock	545.2	568.9	539.3	555.3	570.0
Forestry	163.9	164.6	155.3	156.1	168.5
Agriculture 4/	80.4	83.2	86.5	83.2	85.0

SOURCE: Prepared by the National Secretariat of Planning, Agricultural and Forestry Sector.

For lack of detailed studies these indicators only approximately reflect the relative productivity of each component.

The development of product per-capita has varied among the components. For example, agriculture presents a relatively more favorable growth tendency, having grown at a rate of 1.27 percent annually in the last five year period, which is double the .65 percent of the preceding period. Product per-capita grew from 76 dollars in 1956 to 85 dollars in 1965.

The development of the other sectors manifested an extremely slow growth in that the of scarcely 0.66 percent annually for livestock meanwhile the situation is practically stationary in the forestry sector.

b. Product per person occupied - In terms of productivity per person economically active there are also substantial differences between agriculture, livestock and forestry:

PRODUCTIVITY PER PERSON OCCUPIED

SECTORS	1961	1962	1963	1964	1965
Livestock	1.368	1.416	1.339	1.372	1.404
Forestry	410	410	385	386	415
Agriculture	286	295	306	293	295

SOURCE: Secretaría Tecnica de Planificación - Agricultural and Forestry Sector.

The level of income is much smaller in agriculture than in livestock and forestry. Agriculture grew 0.51 percent annually compared to .20 percent in livestock while forestry growth was practically stagnated.

4/ Product per capita in agriculture does not consider the amount consumed by the rural families which could be an important factor.

The lower income in agriculture as compared with the other branches of the sector, stems in great measure from the small consuming market. Eighty percent of the rural population in agriculture constitutes a strangulation factor for expansion of the national market, especially for goods originating outside of agriculture and livestock.

C. AGRICULTURE LIVESTOCK AND FORESTRY CAPITAL

Capital include installations and improvements of permanent character, implements, machinery, vehicles, log wagons, permanent crops, the existing number of livestock, etc.

Agricultural Assests - The 1956 agricultural and livestock census is the base for estimating the value of agricultural assets. This census gives the number of implements machinery and permanent crops classified as to productive and non-productive ages. Livestock numbers were estimated jointly by the Central Bank and the National Secretariat of Planning.

The capital of the sector had an increase of 2.201 million Gs. of 1962 value for the period 1961/65 which represents an annual growth of 2.1 percent as compared to scarcely one percent in the preceding period(Table below). The more dynamic growth of agriculture is due to greater investment during the last five years as a result of greater attention given to this sector by means of credit institutions, principally the National Development Bank.

It must be pointed out that 62 percent of the capital is represented by livestock. This reveals that capital consisting of permanent investments, such as instalations, improved equipment, tools, vehicles, permanent crops, etc., is at a very low level and demonstrates the small proportion of durable goods investment in the agricultural sector.

The next item in order of importance is installations and improvements which rose 12 percent in 1961/65, the greatest rise of five percent in the last year reflecting the investments in the livestock sector financed by the NDB (BNF).

AGRICULTURAL AND FORESTRY CAPITAL
(in millions of 1962 Gs.)

1.	Machinery and implements	590.8	606	606.2	630.4	700.7
2.	Permanent Crops	3,141.9	3,289.1	3,450.9	3,625.7	3,813.7
3.	Livestock	15,660	15,900	16,059	16,219	16,382
4.	Installations and improvements	5,187.5	5,282.3	5,381	5,546.4	5,828.9
5.	Vehicles, ox wagons, etc.	193.9	210.9	226.8	238.1	250
		24,774.1	25,288.2	25,723.9	26,259.6	26,975.3

More than five percent of the item "Installations and Improvements" is in the livestock sector. The livestock values plus the installations and improvements of this sector account for two-thirds of all capital in the agricultural, livestock and forestry sector.

The item "machinery and implements" did not rise significantly during the period but did reverse the trend of falling values (or decapitalization) experienced in 1956/60, rising by 12.2 percent reflecting the promotion program of the NDB. A sustained long and medium run credit policy by the financing institutions makes it possible to predict an accelarated rate of capitalization in the agricultural and livestock sector. With better work equipment it can be expected that the presently low productivity of agricultural units due to scarcity of machinery will rise along with a greater participation of land and labor in the generation of goods in the sector.

II. PRODUCTION CHARACTERISTICS

A. AGRICULTURE

1. The Areas Cultivated

Agricultural crops are distributed throughout the country with the greater proportion in the Eastern Region; only four percent of the total cultivated land is in the Chaco.

The growth and development of area cultivated has been nearly constant with light variations. In 1956/60 the area cultivated increased 4.5 percent as compared with 4.1 percent in 1961/65. Nevertheless, in the last three year period, the annual increase in terms of hectares has been greater.

The total area cultivated increased from 645,548 hectares in 1961 to 774.063 in 1965 (the total area in 1956 was 527.448) (Table 6).

Agricultural crops include some 37 species: comprised of 23 annual and 14 permanent crops. (Table 7). The relative areas planted to annual and permanent crops have not varied greatly in the last five years, approximately 80 and 20 percent of the total respectively:

DISTRIBUTION OF CULTIVATED AREA

CLASS OF CROPS	1961		1965	
	Ha.	%	Ha.	%
Annual	517,161	80.18	624,026	80.67
Permanent	127,974	19.82	149.460	19.33
TOTAL	645,035	100.0	773,486	100.0

TABLE 6

AGRICULTURE: AREA CULTIVATED - 1950-1965

Years	Hectares	Years	Hectares
1950	499.943	1958	608.687
1951	473.768	1959	631.133
1952	503.343	1960	620.982
1953	492.812	1961	645.548
1954	511.345	1962	702.515
1955	533.316	1963	736.262
1956	527.448	1964	739.890
1957	561.097	1965	774.063

SOURCE: Prepared by the Secretaría Técnica de Planificación - Agriculture and Forestry Sector

Because of the high dependency on annual crops as compared to the permanent crops, the farmer is more exposed to variations of climate and prices.

By another analysis, the area cultivated in 1961 was distributed among some 160,000 farms with a high predominance of small and medium farms as compared to the almost complete non-existence of traditional agricultural haciendas.

Farms cultivating between one and five hectares, represents 63 percent of total units and 30 percent of the area cultivated, followed by those cultivating five to ten hectares representing 25.4 percent of the total units and 33.1 percent of the total area cultivated. Farmers cultivating from one to 20 hectares represent 7.32 percent of the total number and 19 percent of the total area cultivated; those having greater than 20 hectares only represent 1.8 percent of the total number of farmers but 20 percent of the total area cultivated (Table 8).

This distribution clearly demonstrates the emminently family nature of the agricultural structure in Paraguay with an almost total lack of "PLANTATIONS", which characterize the rural areas of other countries. These facts give this sector a high priority for investment and development efforts because the benefits will be spread over a high percentage of the families and producers of the country.

2. Growth Value of the Agricultural Production

The behavior of the Agricultural Sector in the period 1961/65 is very encouraging in comparison with foregoing periods. The gross value of agricultural production has grown in this period at a rate of 4.7 percent compared to 3.5 percent in 1956/61.

Growth has not been uniform for either annual or permanent crops. The years 1962 and 1963 show a growth of 10 and seven percent respectively as compared to a drop of one percent in 1964 and another increase of 3.8 percent in 1965.

Annual crops increased in value at a slightly slower rate than permanent crops, except in 1965, when annual crops grew at the rate of 9.3 percent value as compared with 1.4 percent for permanents. This is true because annual crops represent 80 percent of the gross production value and the principal components (mandioca, corn, sweet potatoes, etc.) have a moderate growth. The increase of 9.3 percent in 1965 was largely due to cotton and tobacco, meanwhile the fall in price of tung was a factor accounting for the low rate of growth in permanent crops. (Table 9)

3. Structure of Agricultural Production

Of great importance in understanding the behavior of agriculture is the production structure. For example, in countries depending on only one crop, the development stability of the agricultural sector depends on the behavior of

TABLE 8

PARAGUAY: DISTRIBUTION OF FARMS BY SIZES

1961

Size of Units Hectares	Number of Units		Total Area	
	Number	Percent	Hectares	Percent
Without arable land	2.807	1.75	-	-
Less than 1	13.367	8.32	7.740	0.83
1 to 4.9	89.030	55.37	256.066	27.47
5 to 9.9	40.843	25.40	306.322	32.86
10 to 19.9	11.766	7.32	176.640	18.95
20 to 49.9	2.489	1.55	87.115	9.34
50 to 99.9	328	0.20	24.600	2.63
100 and more	147	0.09	73.500	7.88
TOTAL	160.777	100.00	931.983	100.00

SOURCE: Prepared by the Secretaría Técnica de Planificación - Agriculture and Forestry Sector

TABLE 9

GROSS VALUE OF AGRICULTURAL PRODUCTION

(Producer's Price)

(In 1962 ₲.)

(000)

PRODUCTS	1961	1962	1963	1964	1965
A. PERMANENT CROPS					
1. Avocado	14.513	14.896	15.342	15.802	16.346
2. Banana	313.200	371.304	348.720	390.240	409.716
3. Coffee	122.605	276.475	320.183	253.997	266.619
4. Prune	9.107	11.152	11.493	11.834	12.175
5. Coco.	145.731	102.117	175.000	182.000	196.000
6. Peach	7.212	8.935	9.198	9.460	9.724
7. Guava	13.923	14.290	14.667	14.814	15.035
8. Lime	5.645	5.701	5.758	5.810	5.917
9. Lemons	7.634	8.816	9.128	11.159	10.298
10. Mango	12.305	25.242	25.896	26.169	26.520
11. Papaya	2.628	3.679	3.854	4.088	4.322
12. Apples	10.185	11.676	12.454	13.232	14.011
13. Grafted Orange	28.260	32.270	33.120	34.440	36.000
14. Native Orange	421.667	442.000	455.000	468.500	482.500
15. Tangerine	94.071	98.400	101.200	104.000	107.200
16. Sour Orange (leaves)	61.370	61.370	73.106	83.863	61.370
17. Pear	1.946	2.724	2.876	3.036	3.203
18. Pineapple	166.750	156.554	169.176	181.550	178.468
19. Grapefruit	43.104	58.274	61.438	61.682	66.652
20. Castor Beans	88.600	10.325	85.800	97.500	117.000
21. Tung	207.767	235.960	256.360	213.520	170.000
22. Grape	82.000	74.000	60.000	65.000	62.000
23. Yerba Mate	150.350	157.625	172.660	196.910	212.430
S U B - T O T A L	2.010.573	2.282.585	2.452.585	2.448.606	2.483.506

TABLE 9

GROSS VALUE OF AGRICULTURAL PRODUCTION

(Producer's Price)

(In 1962 ₲.)

(000)

PRODUCTS	1961	1962	1963	1964	1965
B. ANNUAL CROPS					
1. Garlic	23.472	24.124	24.776	25.428	26.080
2. Alfalfa	74.000	80.000	86.400	88.800	91.600
3. Cotton	379.750	503.750	615.350	559.550	651.000
4. Rice	295.740	350.610	331.080	334.800	344.100
5. English Peas	13.065	19.980	27.750	25.530	28.860
6. Sweet Potatoes	334.800	370.500	378.000	390.000	396.000
7. Pumpkin & Squash	118.320	121.440	125.076	128.820	132.000
8. Sugar Cane	437.237	523.320	538.020	564.480	586.824
9. Onions	126.360	144.180	178.200	220.320	228.420
10. Strawberries	5.976	6.138	6.300	6.480	6.660
11. Beans & Peas	384.160	445.760	469.280	449.120	464.800
12. Corn	1.030.500	1.055,250	1.080.000	1,134.000	1.164.150
13. Peanuts	235.646	241.900	212.400	231,280	226.560
14. Potatoes	80.938	75.933	77.220	91.520	120.120
15. Watermelon	376.640	377.300	388.640	400.640	406.000
16. Cantaloupe	170.810	175.379	180.310	185.440	190.000
17. Tobacco	255.850	481.600	752.500	451.500	541.800
18. Wheat	64.800	51.840	50.400	43.200	39.600
19. Vegetables	345.000	355.000	355.631	364.582	374.050
20. Mandioca	1.773.680	1,776.970	1.821.430	1.859.130	1.900.340
21. Mandioca for Forage	886.840	888.485	910.715	929.565	950.170
22. Grain Sorghum	11.385	11.700	12.051	12.411	12.780
23. Broon Corn	9.383	9.630	9.900	10.125	10.350
24. Flowers	20.800	19.000	18.987	18.423	17.931
25. Soybeans	13.060	57.600	105.600	153.600	172.800
26. OTHERS	7.423	13.590	14.340	14.257	14.947
SUB - TOTAL	7.455.635	8.180.970	8.770.356	8.693.001	9.097.942
GENERAL - TOTAL	9.466.200	10.463.555	11.222.911	11.141.607	11.581.448

SOURCE: Prepared by the Secretaría Técnica de Planificación

only a few products which expose them to adverse exogenous factors, such as the instability of the external market, and to endogenous factors, such as bad weather conditions.

The highly diversified structure in Paraguay makes it less dependent on a few lines of production, and consequently less sensible to the adverse action of the above variables.

Agricultural production includes some 50 species, representing both annual and permanent crops. In 1965 annual crops represented 78.3 percent of the total as compared to 77.6 percent in 1961 (Table 10). Certain crops, such as tobacco, cotton, rice, sugar cane, potatoes, beans, soybeans and onions accounted for this slight rise.

On the other hand, the agriculture structure is solidly based on traditional crops for internal consumption, with subsistence crops accounting for a strong percentage. The growth of subsistence crops can not be greater than the vegetative demand of the country, and in some cases, even less, due to the fact that the per capita consumption of some items has reached the biological limit (for example, mandioca, corn, beans, sweet potatoes, melons, etc.)

Item consumed in 1965 amounted to 63.5 percent as compared with the principal exports of 23.4 percent (Table 11). Nevertheless, in 1961 the export group had increased to 19.3 percent of the total product in 1961, revealing the dynamic growth of export goods as compared to the vegetative development of internal consumption. For external demand to cause significant responses in total agricultural production it will be necessary for export items to constitute at least 50 percent, but this will not be possible in the short run because changes of the traditional structure of production is a slow and gradual process, made even more difficult by the fact that Paraguayan agriculture consists of 180,000 family type productive units with an almost total absence of large enterprises.

4. Behavior of Agricultural Yields

The efficiency of agriculture is reflected in the yield obtained by each productive process. The censuses of 1942 and 1956 and the sample census of 1961, plus estimations for 1965, provide indications of productivity changes for various crops over more than 20 years. Among the items which have demonstrated strong improvement in yields are sugar cane, rice, onions, potatoes and tung which had almost doubled their yields in 1965 as compared with 1943 (Table 12). The improvement was greater in the period 1956/65 due to intensified research and agricultural experimentation. These research results have been disseminated though the Technical

TABLE 10

AGRICULTURAL PRODUCTION STRUCTURE (1961, 1965)

(Percent)

ITEMS	1961	1965
I. Annual		
1. Garlic	0,25	0,23
2. Alfalfa	0,77	0,80
3. Cotton	3,96	5,70
4. Rice	2,80	3,01
5. English Peas	0,15	0,25
6. Sweet Potatoes	3,49	3,47
7. Pumpkin & Squash	1,34	5,15
8. Sugar Cane	4,56	5,14
9. Onions	1,32	2,00
10. Strawberries	0,06	0,08
11. Beans & Peas	4,01	4,07
12. Corn	10,76	10,19
13. Peanuts	2,46	1,98
14. Potatoes	0,84	1,05
15. Watermelon	3,84	3,55
16. Candaloupe	1,78	1,66
17. Tobacco	3,27	4,74
18. Wheat	0,68	0,35
19. Vegetables	3,60	3,27
20. Mandioca	27,15	24,94
21. Grain Sorghum	0,22	0,22
22. Broom Corn	-	-
23. Soybeans	0,01	0,15
24. Flowers	0,19	0,16
25. Others	0,08	0,13
	77.59	78.25
II. Permanent		
1. Bananas	3,26	3,59
2. Coffee	1,28	2,33
3. Coco	1,52	1,72
4. Orange	6,13	5,09
5. Sour Orange	0,59	0,54
6. Pineapple	1,74	1,56
7. Grapefruit	0,45	0,58
8. Castor Beans	0,92	1,02
9. Tung	2,17	1,49
10. Grape	0,86	0,54
11. Yerba Mate	1,62	1,86
12. Other Fruits (1)	1,87	1,40
TOTAL	22,41	21,75

(1) Includes: Avocado, prune, peaches, guava, lime, lemons, mango, papaya, apples, tangarines, and pears.

SOURCE: Prepared by the Secretaría Técnica de Planificación - Agriculture and Forestry Sector.

Assistance efforts of the Ministry of Agriculture and Livestock. Cotton, corn, tobacco and castor beans had only slight improvements while the remainder of the crops showed no significant yield variations. (Table 13)

The improvement in yields is the result of better varieties and seeds, more implements, better cultural practices, fertilizers, insect and disease control and seeding in more favorable seasons. It will be possible to incorporate these improvements throughout agriculture by a solid teaching and technical assistance program accompained by necessary research.

Although the present technical assistance is not able to reach the great mass of the farmers, important improvements were achieved in agricultural efficiency, and such results will be even more satisfactory as technical assistance services are increased.

5. Agricultural Technology

Agricultural and livestock production is each day growing more dependent on technical improvements developed through research and related experiments. The following is an analysis of the incorporation of such improvements and machinery in the country.

a. Agricultural Mechanization

1) Tractors: In 1956, there was one tractor for each 312 farm units, this ratio improved to one tractor for each 132 units in 1961 and to 89 for each farm unit in 1965. Nevertheless, when such figures are compared with those of Argentina which had one tractor for each seven or eight farm units in 1965, we can see that our country is still far behind this level of capitalization. Nevertheless, the 8.5 percent rate of adding new tractors at the end of the period 1961/65 is evidence that in the medium run we can reach a more satisfactory capitalization.

The tractor is generally employed for the preparation of land for seeding and harvesting rice. It is also used for artificial pastures and on a smaller scale in the cultivation of wheat and other cereals.

The limited use of the tractor in the agriculture of the country is due in great measure to the small family type units and to high tractor prices as well as to the high cost of maintenance, repairs and agricultural fuels. Tractor use is also limited due to the economy of using animal power. In 1965, there were approximately 206,400 animals supplying the greater part of power on farms.

Hindrances to the use of tractors also exists in the new colonization areas. In 1961 there were 155,000 farms units of less than 20 hectares representing 93 percent of the total units and 87 percent of the total area cultivated. On such

TABLE 13

PHYSICAL PRODUCTION OF AGRICULTURE 1961 - 1965

PRODUCTS	UNIT	1961	1962	1963	1964	1965
A. PERMANENT CROPS						
1. Avocado	1000 fruits	7,458	7,655	7,884	8,120	8,400
2. Banana	1000 stalks	8,700	10,314	10,520	10,840	11,381
3. Coffee	Tons	2,749	6,199	7,179	5,695	5,978
4. Plum-	1000 fruits	18,700	22,900	23,500	24,300	25.000
5. Coco	Tons	104,094	72,941	125,000	130,000	140,000
6. Peaches	1000 fruits	24,700	50,600	31,500	32,400	33,300
7. Guava	" "	143,532	147,321	151,210	152,722	155,000
8. Limes	" "	58,195	58,777	59,365	59,900	61,000
9. Lemons	" "	16,119	28,975	30,000	36,725	33,725
10. Mango	" "	63,100	129,450	132,800	134,200	136,000
11. Papaya	" "	4,500	6,300	6,600	7,000	7,400
12. Apples	" "	2,617	3,000	3,200	3,400	3,600
13. Grafted Oranges	" "	47,100	53,783	55,200	57,400	60,000
14. Native Oranges	" "	843,335	884,000	910,000	937,000	965,000
15. Tangerines	" "	235,178	246,000	253,000	260,000	268,000
16. Sour oranges (leaves)	Tons	62,750	62,750	74,750	85,750	62,750
17. Pears	1000 fruits	500	700	739	780	823
18. Pineapples	" "	14,500	13,596	14,711	15,787	15,518
19. Grape fruit	" "	44,900	60,702	63,998	64,252	69,429
20. Castor beans	Tons	11,359	10,016	11,000	12,500	15,000
22. Tung (whole nuts)	"	30,554	34,700	37,700	31,400	25,000
23. Grapes	"	8,200	7,400	6,000	6,500	6,200
24. Yerba Mate	"	15,500	16,250	17,800	20,300	21,900

NOTE: Tons are 1000 kilograms or longtons (2240 lbs.)

TABLE 13

PHYSICAL PRODUCTION OF AGRICULTURE (CONTINUED)

PRODUCTS	UNIT	1961	1962	1963	1964	1965
B. ANNUAL CROPS						
1. Garlic	1000 bunches	144	148	152	156	160
2. Alfalfa	Tons	18,500	20,000	21,600	22,000	22,900
3. Cotton	"	24,500	32,500	39,700	36,100	42,000
4. Rice	"	31,800	37,700	35,600	36,000	37,000
5. English peas	"	1,177	1,800	2,500	2,300	3,600
6. Sweet potatoes	"	111	123,500	126,000	130,000	132,000
7. Pumpkin and Squash	1000 fruits	9,860	10,120	10,423	10,735	11,000
8. Sugar cane	Tons	743,600	890,000	915,000	960,000	998,000
9. Onions	"	7,800	8,900	11,000	13,600	14,100
10. Strawberries	"	332	341	350	360	370
11. Corn	"	229,600	234,500	240,000	252,000	258,700
12. Peanuts	"	19,970	20,500	18,000	18,600	19,200
13. Potatoes	"	5,660	5,310	5,400	6,400	8,400
14. Beans and Peas	"	34,300	39,800	42,300	40,100	41,500
15. Watermelon	1000 fruits	26,260	26,950	27,760	28,600	29,000
16. Cantaloupe	"	8,990	9,230	9,490	9,760	10,000
17. Tobacco	Tons	8,500	16,000	25,000	15,000	18,000
18. Wheat	"	9,000	7,200	7,000	7,200	5,500
19. Mandioca total	"	1,333,600	1,366,900	1,401,100	1,430,100	1,461,000
20. Grain Sorghum	"	2,530	2,600	2,678	2,758	2,870
21. Broom corn	"	4,170	4,280	4,400	4,500	4,600
22. Soybeans	"	136	6,000	11,000	16,000	18,000

SOURCE: Prepared by the "Secretaría Técnica de Planificación.
Agriculture and Forestry Section.

small units it would be feasible to use tractors by means of cooperatives, which are already performing satisfactorily in some foreign colonies. Cooperatives make the use of machinery more feasible; otherwise tractor repairs and purchases of agricultural fuel and oil are outside the economic possibilities of small producers.

2) Other Machinery: In 1956 there were 77,865 plows (excluding wooden plows) which means that there was one unit for each two farms and for each six hectares, by 1965 there were 89,356 plows representing an increase of 1.6 percent annually.

Considering normal utilization, the country is well supplied with these implements, but soil preparation is deficient in 80 percent of the cultivated area due to a lack of technological knowledge on the part of the farmers as well as to antiquated machinery. In 1961 there still existed 32.189 wooden plows representing 27 percent of all plows. These plows carry out an important precentage of the labor of soil preparation. Nevertheless, such antiquated material is now being replaced and the supply of machinery and implements for the preparation and conservation of soils is growing by means of credit (for plows, rakes, cultivators, seeders, etc.) by the Banco Nacional de Fomento within its program of agriculture and livestock promotion. The country does not have sufficient machinery for land clearing, nor for the construction of soil drainage, nor for the conservation or rebuilding of land affected by erosion.

Equipment for the control of insects and diseases is insufficient.

b. Use of Fertilizers, Insecticides and Fungicides

Even though recent years have brought an increase in fertilizer use, it is still relatively small in relation to crop needs, and to improve soil quality for raising yields.

Soils of the Central Zone are exhausted from many years of using a one crop system and inadequate management.

Soils need certain special treatment to produce satisfactory yields; they are deficient in the three principal elements: Nitrogeno (N), Phosphate (P), and Potasium (K), as well as in organic material. Most of the soils in the Eastern Region respond favorably to lime, althought there is no deficiency of calcium as a nutrient; it is needed for correcting soil PH, which in turn influences the availability of other soil elements (N, P, K, etc.). The most notorious deficiency in new areas is phosphorous, which shows the necessity of correction even in the new soils considered fertile.

The crops which have received fertilizer treatment are generally comercial crops of citrus with an average of one annual application; vegetables with one annual application, and to a smaller degree fertilizers have been used on sugar cane, potatoes, etc.

According to the 1961 sample census, of the 160,777 agricultural units, 3,025 said they had used chemical fertilizers, representing two percent of the total; and 17,600 were using organic fertilizers or manure, representing 11 percent of the total.

FERTILIZER IMPORTS

Fertilizer use in the country increased on an average of about 30.7 percent between 1961 and 1965, as can be seen in the following table:

1961	331,342 Kg.
1962	834,993 Kg.
1963	1,024,128 Kg.
1964	1,391,343 Kg.
1965	1,233,159 Kg.

Nevertheless, this represents only 80,000 hectares fertilized, about one percent of the total cultivated area.

With respect to the use of insecticides, phytosanitary control has been increased slowly according to the following figures:

1961	1,843 Kg.
1962	9,933 Kg.
1963	11,458 Kg.
1964	25,917 Kg.
1965	49,349 Kg.

The principal crops which receive insecticide treatments are cotton, comercial cultivation of citrus, potatoes, tomatoes, grapes, and on a smaller scale tobacco and pineapple.

c. Insects and Diseases

The 1,500 million guaranies damage from insects and diseases demonstrates the negative impact and amounts to about 15 percent of the Gross National Product generated by agriculture (Table 14).

Other crops have also occasionally been treated for insects and diseases.

The high cost of fertilizers, insecticides and fungicides is a hindrance to increased use, despite the liberation by law 881 which exonerates the taxes of importation.

TABLE 14

LOSSES FROM INSECTS AND DISEASES

CROPS	Losses Percent	1961 Guaranies (1000) 1965
Cotton	30	279.000
Sugar Cane	10	65.000
Citrus	30	300.000
Tobacco	15	95.000
Mandioca	15	500.000
Corn	10	130.000
Potatoes	20	30.000
Coffee	15	30.000
Peanuts	10	25.000
Peas and Beans	15	70.000
Tomatoes	20	45.000
TOTAL		1.569.000

The Department of Vegetative Defense in the Ministry of Agriculture charged with the phytosanitary program needs a larger budget to comply with the needs of agriculture.

There exist other legal dispositions which try to prevent and control the seeds and other agricultural imputs imported into the country, but in practice the effect of this effort is very limited.

Research and experimentation on the application and results from insecticides and fungicides use have been carried out by the Instituto Agronomico Nacional de Caacupé with satisfactory results for a variety of crops, but generally such information has not yet been disemminated to producers because of the scarcity of technical and financial resources.

In those cases where the producers have come to understand the advantages of using modern practices, these can not be applied due to the limitations imposed from the unfavorable benefit-costs of production which yet exist. Other aspects in the economic and institutional order, such as marketing, prices, etc. do not permit the use of greater productive investments for the utilization of more exact technology.

Under these conditions it is necessary to supply adequate means for research as to the damage costs from insects and diseases, as well as to create an organization adequate for their control.

B. LIVESTOCK

1. Livestock Numbers

Cattle, hogs, horses, sheep and poultry have had persistent increases, while goats have tended to decrease (Table 15).

a. Cattle, constituting the principal component of the livestock capital had a favorable growth in the last decade, increasing at a rate of 0.95 percent annually. The rate of growth was greater in 1961/65 than in the preceding five years.

The capital growth of livestock is a result of productivity on the one hand and of demand pressure from annual slaughter on the other. Cattle productivity is not satisfactory. Annual production is only about 13 or 14 percent of total cattle, meanwhile demand, influenced by the dynamic nature of a growing external demand, is always greater than the possibilities of supply. If not controlled, these two variables would produce a decapitalization of cattle, but the government has preserved and safeguarded the cattle riches by establishing maximum annual limits of livestock slaughter for processing.

TABLE 15

LIVESTOCK AND POULTRY

(1000 head)

Year	Cattle	Horses	Sheep	Hogs	Goats	Poultry
1956	5.040	522	362	442	59	5.051
1957	5.078	538	371	473	57	5.176
1958	5.110	553	380	507	55	5.304
1959	5.165	569	390	543	53	5.436
1960	5.095	586	400	582	52	5.571
1961	5.222	606	408	622	50	5.709
1962	5.300	622	437	667	47	5.851
1963	5.353	639	447	714	50	5.996
1964	5.407	655	442	765	49	6.144
1965	5.461	673	438	819	48	6.296

SOURCE: Prepared by the Secretaría Técnica de Planificación - Agriculture and Forestry Sector - Data from the Ministry of Agriculture and Livestock and the Central Bank of Paraguay.

Nevertheless, we can expect a more rapid capitalization over the coming years, as a result of the prefered attention now being given to livestock, by providing measures designed to effect productivity improvements.

b. Hogs, principal source of red meat after cattle had a very dynamic increase of 7.1 percent annually in the ten year period 1956/65.

This increase is due to more interest in pork production, principally in the zone of Itapuá, where pork production is a means of taking advantage of certain products such as corn, mandioca, sweet potatoes, etc. Pork provides a more economical source of protein food to offset the constant increase of cattle prices.

c. Horses and Sheep, habitually produced along with cattle, have had a very slow growth, with indications of a tendency to diminish in the future. This is due to a diminishing need for horses in the production of cattle, and to the reduction of carrying capacity of pastures. With pastures limited, cattle are preferred because they produce a higher income as compared to horses and sheep.

d. Poultry, grew at an annual rate of only 2.5 percent, even though commercial production increased rapidly near the capital. It is possible that the censuses have not been able to adequately cover this zone, as observation would tend to indicate a higher rate of growth.

2. Total Production

a. Total livestock production experienced a favorable growth in 1961/65 of 3.3 percent annually as compared to 1.4 percent in 1956/60. This would indicate an even greater growth in the next five years (Table 16).

b. In the same period (1961/65) cattle production increased 2.2 percent annually as compared with .9 percent in 1956/60.

c. Although milk production undoubtedly has experienced technological progress in the area of Asunción, this is not so in the rest of the country, where production is insufficient to satisfy growing internal demand. Total production in 1961/65 increased at an annual rate of 2.2 percent as compared to 1.28 percent in 1958/60. High production costs plus complex and difficult marketing channels impede a more accelerated expansion. In view of favorable natural conditions there is need for a definite public policy to resolve the existing strangulation and to provide stimulation to rapidly increase productions.

d. Hog production increased dynamically, reaching an annual growth rate of eight percent and revealing a high flexibility in adjusting to the growing internal demand caused by the substitution of pork for beef.

e. The gross production of poultry increased 3.1 percent as compared to a 2.2 percent increase on eggs.

TABLE 16

PRODUCTION AND VALUE OF LIVESTOCK AND LIVESTOCK PRODUCTS 1961-1965

(Millions of 1962 Guaranies)

ITEM	UNIT	1961		1962		1963		1964		1965	
		Volume	Value	Volume	Value	Volume	Value	Volume	Value	Volume	Value
CATTLE	Head	687,500	3,643,8	675,900	3.582,3	620,100.	3,287.-	673,400	3,604,5	761,600	4.036,5
SHEEP	Head	93,000	43,9	96,000	45,3	98,300	46,4	101,700	48,0	96,380	45,5
GOATS	1000 Head	17,000	8,1	17,900	8,4	18,800	8,9	18,600	8,8	18,100	8,5
HOGS	1000 Head	401,9	1,104,0	436.9	1,200,0	476,5	1,308,3	514,7	1,413,4	543.-	1,490,5
HORSES	Head	-	-	2,500.-	0,8	2,200	0,7	25,900	7,8	11,000	3,3
POULTRY	1000 Birds	1,676,7	108,6	1,718,7	114,3	761,3	117,1	1,805	120,0	1,849,7	123,0
MILK	1000 liters	74,597	821,0	77,956	858,0	79,561	875,2	90,616	886,8	81,701	898,7
EGGS	1000 Un.	138,600	629,6	203,500	645,1	208,000	659,4	212,100	672,4	217,000	687,9
WOOL	Tons	281	22,5	281	22,5	281	22,5	280	22,4	280	22,4
HOG BRISTLES	Tons	160	11,0	237	16,3	217	14,9	413	28,3	510	35,0
HONEY	1000 liters	329	16,8	332	16,9	335	17,1	338	17,2	341	17,4
		-	6,409,3	-	6,509,9	-	6,357,5	-	6,827,6	-	7,368,7

SOURCE: Prepared by the "Secretaría Técnica de Planificación". Agricultural and Forestry Section, from data of the "Banco Central del Paraguay".

f. The slaughter of horses for export had an accelerated increase of 70 percent annually in response to the growing demand of industry processing for export.

3. Efficiency and Productivity of Livestock

a. The indexes of productivity of livestock are not as satisfactory as could be expected in view of the favorable natural conditions of the country.

b. The annual rate of cattle slaughter oscillates around 12 to 13 percent of the total number, and the production per head only amounted to an average 19-20Kgs. in recent years, revealing lc productivity as compared with other countries. (Table 17)

c. The reproductive efficiency rate of 40 percent reflects deficiencies of management and sanitation. This low rate is the combined effect of a low birth rate and high calf mortality.

d. The average weight of slaughtered animals decreased until 1960 reaching a low of 331 kilograms, then it rose to 372 pounds by 1965 (Table 18).

This improvement of livestock weight is the result of better finishing of market animals plus a decrease in weight losses due to overland transportation. Water transportation and hauling by truck have increased substantially.

e. The dressing percentage of slaughtered animals has followed the same changes as observed in the living animals, dropping from 49.5 percent in 1956 to 47.0 percent in 1961, then rising again to 49.4 in 1965.

f. Among the negative factors in livestock production has been a proliferation of middlemen in the marketing of livestock and meat which considerably raises consumer prices with unfavorable repercussions on the great majority of the population.

4. Concluding observations

a. The hygienic and sanitary conditions of meat sold to the consumers in the capital do not provide the guarantees necessary for quality and thus represent health dangers for the population.

b. There exists a freezing plant with capacity to store meat for consumption in Asunción, which if utilized for this purpose, would considerably reduce the cost of middlemen and offer better quality meat.

c. Transportation from slaughterhouses to places of sale is carried out by inappropriate vehicles without any hygienic care and completely exposed to atmospheric contamination.

d. Cattle feeding is not satisfactory. The existence of great range areas without adequate divisions hinders efficient pasture utilization. In addition, the

TABLE 17

COMPARATIVE PRODUCTION FROM CATTLE IN SELECTED COUNTRIES

COUNTRIES	Million	Slaughter Percent	Live Weight p/head	Dressed Weight p/head Kg.	Production p/head Kg.
United Kingdom	11.7	30.3	482	262	80.7
West Germany	13.4	31.0	491	258	88.4
United States	103.7	27.0	463	266	76.0
Australia	18.5	23.0	-	211	53.3
New Zealand	6.7	19.0	389	214	41.0
Argentina	40.9	25.8	380	202	60.0
Brasil	79.0	8.9	-	155	14.0
Paraguay	5.3	12	348	170	19.0

SOURCE: FAO - Annual Production Report, 1964.

TABLE 18

CHANGES IN CATTLE PRODUCTION

YEAR	Live Weight p/head Kg.	Dressed Weight p/head Kg.	Percent
1956	348	172	49.5
1957	345	169	49.0
1958	343	168	49.0
1959	334	164	49.0
1960	331	159	48.0
1961	336	158	47.0
1962	345	167	48.5
1963	352	174	49.3
1964	365	180	49.3
1965	372	184	49.4

SOURCE: Prepared by the Secretaría Técnica de Planificación - Agriculture and Forestry Sector - Data from the Livestock Department, COPACAR, and Meat Industries.

seasonal distribution of water and grass result in a seasonal supply of steers. Pastures represent about 70 to 80 percent of the livestock area and consist almost totally of native grasses.

e. The carrying capacity of the pastures is diminishing by the growing proportion of weeds.

f. Livestock management is deficient: a lack of trained personnel, an insufficiency of equipment, absentee landlords, etc., constitute dificiencies which must be overcome to improve technology on livestock ranches.

g. Diseases and insects are the causes of immense livestock losses each year. It has been estimated that four diseases (Aftosa Fever, Tuberculosis, Parasitosis, and Brucellosis) cause an annual loss of 42 percent of the gross value of cattle production. The incidence of disease is high and constantly increasing, aggravated by the lack of eradication campaigns and adequate prophylactic measures on the part of the state as well as among the producers themselves.

h. In marketing, the lack of standardization of products, and the deficiency of mobilization and transportation constitute unfavorable factors for the development of livestock production.

i. There exist faults in the whole process of marketing livestock products. In cattle production the deficiencies of mobility and transport cause great losses of meat annually, also the lack of modern slaughter houses causes high losses in the slaughtering process.

C. FORESTRY

1. Introduction

Forestry is suffering from a prolonged period of stagnation which has prevented it from playing an important role in the economic and social development of the country.

Undoubtedly, the lack of adequate legislation plus the lack of application of laws now existing has greatly impeded the forestry industry from doing its part in developing the forested regions of the country. This legal deficiency has contributed to the stagnation observed in the forest economy.

The majority of the producers have not succeeded in reaching the higher level of production necessary to overcome the unforseen and changing situations which arise from the country; there is almost total dependence on exporting timber in the form of logs, the most primitive expression of trade between countries.

The logical, and negative result, has been the destruction of dense forest riches and a decrease in value of wood exports, which always occur in cases where

primary products are exported, justly defined as the deterioration of the terms of exchange, which increasingly damages developing countries.

The pressure of these facts urgently obliges the government to adopt the necessary measures to assure that the country not delay in taking necessary action to overcome the present insufficiency and to determine the role which should be assigned to the Forestry Sector of the Social and Economic Development Plan.

In order to achieve this goal, the first step is to determine precisely what are the fundamental aspects of the forestry problem which require immediate attention and then continue with the study and analysis of other aspects, such as utilization, technology, etc., which must be considered in the light of research. In accord with this criterion the first task is to determine the relationship which exists between forestry resources and forestry policy, because it is only by a full and effective compliance with the terms of such policy that it will be possible to carry out a Development plan for this important sector.

2. Forestry Resources and their Exploitation

A summary of the area occupied by forests from a recent study follows:

Total Area of the Country	40,675,000 Has.	100.0 percent
Area in Forests	24,000,000 "	55.0 "
Total Area of Eastern Region	16,000,000 "	100.0 "
Area in Forests	8,000,000 "	50.0 "
Total Area of Western Region	24,000,000 "	100.0 "
Area in Forests	16,000,000 "	66.0 "

SOURCE: "Sintesis de la Situación Forestal de Paraguay" by Lucas Tortorelli, 1965.

An area covered by forests of 55 percent of the whole country, amounting to 13 hectares per-capita, provides Paraguay with great possibilities to improve forestry production if decisive action is taken to replace the present selective and exhaustive exploitation with a system of rational and orderly forest management.

The Eastern Region which contains the greater area of the productive forests also has most of the most important species and accounts for about 90 percent of forest production. The Western Region (Chaco), although greater in area and with more forest cover, has timber of generally low commercial value. The Quebraco Colorado is one of the forest species of greater value in the Chaco.

It is estimated that presently the Productive forests occupy about 6,000,000 hectares with about 85 percent located in the Eastern Region, principally in Virgin jungles and forests. It is further estimated that private property accounts for about 90 percent of the productive forests. However, exploitation on private properties is generally not carried out by the owners but by renters or other classes

of contracts which in turn are often sub-rented or sub-contracted. Often three or four persons are exploiting the same tract and thus they have no incentive to practice conservation or sustained forestry - it is to their interest to get the maximum benefit in the minimum time. These factors unite to produce an irrational exploitation of the forestry resources in the country.

Productive forests occupy 15 percent of the country amounting to about 3.3 hectares per-capita. It is estimated that merchantable timber per hectare amounts to about 100 m3, which based on a cutting cycle of 30 years yields about 3.3 annually. This means that on the six million hectares about 600 million m3 of merchantable timber is producing about 20 million m3 annually. With respect to accessibility, this 20 million hectares is estimated to be located as follows:

10 million m3	presently inaccessible
6 million m3	difficult accessibility
4 million m3	accessible, constituting the present real yield of the timber products.

These figures provide the basis for the projection of forest production in the short run, which, if based on rational and orderly exploitation, complemented by an adequate forestry policy, would permit the forest sector to reach the highest levels of growth.

Studies reveal that there are more than 70 species of commercial value with only seven to ten presently utilized. This is explained by the general lack of knowledge of the qualities of many species and the relative abundance of the species traditionally exploited.

3. Forestry and its Relationship to the Agricultural and Livestock Activities

From colonial times forests have supplied the lands devoted to agricultural and livestock activities. In Paraguay, as well as in other Latinamerican countries, agriculture has not taken into account the existence of forests.

The non-existence of a forest policy coordinated with the agricultural and livestock policy is evidenced by observing the devastation of the forests in the colonization zones. Clearing is done without any consideration of the fertility and stability of the soils. The forest cover is completely removed from the soils without providing any protection in hilly area. This manner of preparing lands for agriculture and pasture constitutes an immense damage to the forest resource, equal to that which has happened in all Latinamerica. At times it is worse than that produced by irrational exploitation of the forests.

The rate of forest destruction is growing worse - it has been estimated that from 30,000 to 50,000 hectares are cleared annually, which containing 100 m3 per hectare, amount to 5,000,000 m3 lost annually which could be used to increase forest production both quantitavely and qualitatively.

Therefore it is necessary to coordinate and harmonize forest policy with that of agriculture and livestock as a meansof utilizing a great resource which is being destroyed. This will add value to forest production and strongly contribute to the economic and social development of the country.

4. Forests and Necessity of Forest Policy

The forest policy of the country constitutes a factor of extraordinary importance in the promotion of social and economic development, as well as assuring the maintenance of an equilibrium in the soil and climatic relationships in the rural zones and areas surrounding the forests. The lack of a forest policy results in the treating of the forest resource as if it were a mineral deposit, without any consideration of it as a natural renewable resource. This results in the destruction of forests and the deterioration of agriculture in the zones of forest influence.

The incessant destruction of forests which the country has suffered, without obtaining the maximum benefits expected, can be appreciated by noting that it has been estimated that a third part of the forest resource has been devastated, and that such areas have been in great part underutilized, or after promising beginnings, have greatly decreased in their gross production until they have reached a stagnated situation without any possibility of reaching a satisfactory socio-economic level despite the efforts of the producer. Now is the time to change this tendency, which more than anything else is due to a lack of legislation and a scarcity of specialized technical services to serve the forestry sector.

The negative results observed in this country, and generally found in all latinamerica, has originated from the belief that forests are an obstacle to agriculture, on the one hand, and that on the other hand, the rational treatment and conservation of forests constitute a barrier to the timberman whose only motive is to irrationally cut the forests to increase his economic wealth.

These considerations show the importance of forestry policy, its decisive influence on the reational management of forests and the development of agriculture, which once achieved, can contribute to a forestry policy adequate to the necessities of the country, backed by modern and organic legislation, and applied by an efficient technical forest service.

5. Reforestation

Paraguay has excellent ecological conditions for the production of forest species of rapid growth, such as conifers and eucalyptus. This is a good time to introduce these species, however, to date there are no programs of reforestation, and because the existence of such species is scarce and dispersed, they can not be considered as a source of prime materials for industry. Of course, the purpose of most existing plantations has not been for the purpose of prime materials but more for the conservation of soils, windbreaks, livestock fencing, etc.

The area reforested in 1956 was 465 hectares; in 1961 600 hectares, of which eucalyptus and Ybyrapyta represented 36 and 30 percent of the total respectively. By 1966 it is estimated that reforested areas amounted to 2,000 hectares (including those carried out in that year) and were constituted principally of pines for which a nursery has been established in the Pto. Presidente Stroessner Colony.

Although the impact of a reforestation program can only reach its maximum benefit over a relatively long period, forest plantations could be a short run solution for those regions of the country faced with economic and social problems, provided they possess facilities for implementation.

From an economic viewpoint, a program of reforestation could constitute a fundamental stimulus for the gradual and harmonious development of paper and cellulose, as well as other wood industries, by supplying the industrial investor with a clear and precise picture of the actual availability of prime material.

This situation has been perfectly understood by the public sector, and a program of reforestation has been initiated. This activity must be increased in the shortest time possible in order to obtain prime materials for the industries.

Although the economic aspect constitutes the principal reason for a reforestation program, there are also social reasons for it execution. Colonists labor, presently idle for much of the winter season, can be employed in reforestation projects to improve the social and economic conditions of the respective communities.

Because the colonists are already familiar with the techniques used in planting trees, plus the very low wages prevailing in the colonies, the plantations can be established at very low costs. This explains and justifies the inclusion of reforestation in the program of economic and social development. This activity acquires the character of a work of infrastructure; because in addition to the diversification which it makes possible, it requires the building

of roads, establishment of services, and creation of permanent employment, which in turn gives rise to a flow of local industrial and marketing activities, thus contributing to the establishment of the rural population.

6. Marketing of Forest Products

Even though the consequences of an irrational exploitation of forests and the devastation of areas cleared for agriculture has severely decreased forest production, this has not prevented forest products from constituting one of the most important items of the national economy.

Because the internal market for timber is small, exportation has been the greater economic incentive for marketing forest products. Such exports have been in the most primitive form possible (prime material in the form of logs) and this has damaged the country by foregoing added value, and by the elevated cost of transportation, as well as by the small relative value of exported materials in relation to finished products.

The structure of the forest market caused the low level of internal forestry industry development, because foreign purchasers wanted logs to process in their own industrial plants.

The increase in forestry exports has not contributed in any manner to the economic development of the nation. This is a consequence of not having promoted the development of internal wood industries. Such an increase in exports in correlation with an increase in the destruction of forests exploited more intensively to offset the continual decrease in values of the primary materials exported, which in turn was due to the international economic factors which favored manufactured products.

Although the development equation requires that countries increase exports, in Paraguay, this must be done on the basis of an effective industrialization policy which makes possible a growing substitution of manufactured products (sawed lumber, plywoods, pressed woods and furniture) for logs in the short run, and in the medium run, the substitution of cellulose and paper. This is fundamental to developing a solid and stable forest economy and to achieving the goals established for the forest sector.

It is of no value to establish norms and regulations to govern forest management if at the same time there are no steps taken to modernize and equip the forest industries in order to attract potential investors.

In summary, over the next several years a policy of industrialization could reverse the present tendency, and vigorously increase manufactured products

in substitution for the logs now exported, thus bringing an effective benefit to the country, as well as better management of the forests.

7. Possibilities in the Forest Industry

The lack of industries to utilize the prime materials of the forest has perhaps been one of the greatest contributing factors to the irrational exploitation and devastation referred to above. The pattern of export marketing which has required some 75 to 80 percent of output in order to supply the traditional markets of the River Plate has contributed greatly to the backward development of wood industries. In addition, the lack of legislation, and until a few years ago, the lack of an effective promotion policy for the sector industry (especially with respect to financing for promoting the installation of industrial plants, the promotion of manufactured products, etc.) have contributed to the situation.

a. Sawed Lumber

Of the estimated 110 sawmills employing more than five persons, less than 20 can be considered to have equipment in good condition. Of these 20, less than half are considered modern, and the rest are producing at low levels of efficiency, significantly adding to production costs.

Because in the short run lumber processing could effectively provide a substitution for exporting logs, it would be very profitable to improve the existing equipment so that within five years the country could have a modern sawmill industry.

The government could immediately establish credit lines designed for supplying all the needs for an efficient production of high quality lumber. In addition, there is a need for artificial dry kilns which would greatly contribute to the yields and quality of final products.

b. Plywood

Despite the great demand for plywood in furniture, car, truck and bus bodies, cabinets, packing crates, carpentry, etc., this industry is still very weak.

Plywood is another item which could in a short time contribute greatly to the development of the country, and for this reason it should be carefully considered in all financing plans, as well as be favored by fiscal planning and tariff duties designed to promote industrialization of the forest sector.

The sure growth of internal consumption, together with the future possibilities of new markets in the United Sates and the other country members of LAFTA (ALALC), plus the traditional markets of the River Plate, all combine to give plywwod a prominent place in industrial development plans.

c. Veneer

Veneer is another wood industry with a growing world market. At present this industry in Paraguay is only beginning, with production going entirely for internal consumption. This product is cheap to process and freight costs which have obliged the country to sell other wood products to the River Plate market, are not significant. Recognizing that this item will have to find markets in the United States and in Europe, it will be necessary to allocate an important sum for investment in machinery and equipment so that in the near future the veneer industry can be in condition to satisfactorily produce the quality and volume required by whatever purchaser.

d. Parquet, Doors, Windows, Carpenter works, and Furniture

These items presently have a very small production, but a secure and broad market within the LAFTA (ALALC) where some concessions have been secured (important in the case of furniture).

The possibilities of exporting out of the zone and to the United States can be achieved with all security as soon as these industries are developed and in production enough to assure buyers of quality, volume and prices, as well as a constant and permanent supply.

Therefore it is necessary to establish goals for these products and to provide adequate financing, promotion and tariffs arrangements.

e. Pressed Wood

This wood industry has reached the greatest world wide growth in recent years. To date it does not exist in Paraguay, but by the beginning of next year it is feasible to initiate a modern plant which would surely stimulate the establishment of others.

Because this industry utilizes left-overs and waste materials from other processes, and can utilize almost all types of woods, it provides an ideal solution for taking full advantage of the native forests. Preference should be given to requests for financing and tariff exemptions in order to establish such plants for complementing other processes, such as sawed lumber, plywood, etc. The future possibilities of this item are equal to, or superior to the other items discussed above.

8. Conclusions

a. Forests comprise 24,000,000 hectares or 55 percent of the total area of the country. The productive forests cover 6,000,000 hectares of which 85 percent is in the Eastern Region.

b. To date forest exploitation has been emminently extractive and selective, resulting in a rapid deterioration of the forest economic value.

c. The devastation of the forests is growing more intense, estimated at from 30,000 to 50,000 hectares per year.

d. No forest policy backed by adequate legislation exists, and the few norms which now exist, in addition to being inadequate, are not enforced.

e. For lack of an adequate processing industry, approximately 80 percent of the exports are prime materials in the form of logs.

f. Grades and standards do not exist for wood products.

g. With respect to the forest potential there are no conclusive studies; those available are partial, generally isolated studies by diverse organizations. Only in the past two years have coordinated and continous studies been initiated.

h. There does not exist any financially and technically equipped organization to make technical studies, and to regulate and rationalize forestry exploitation.

i. Ninety percent of the Forestred area is private property on which forestry exploitation is by rental contracts or by concessions.

j. In 1966, the estimated reforestation and/or forestation was estimated at 2,000 hectares; presently there is an extensive reforestation program in the Alto Parana Zone, principally of pine species.

III. MACROECONOMIC VARIABLES

A. GROSS PRODUCT

The agriculture, livestock and forestry sector plays a decisive role in the economy of the country, contributing 36.3 percent to the gross national product in 1965 as compared with 38.8 percent in 1956 and 37.00 percent in 1961 (Table 19).

The diminishing relative importance of this sector shows that its historic behavior has not been sufficiently dynamic to grow parallel with the rest of the economy.

Within the sector's gross national product (agriculture, livestock and forestry) agriculture increased from 56.6 percent in 1956 to 58.2 percent in 1965; livestock remained almost stable (arond 31.3 percent) with some fluctuations in intermediate years. (Table 20)

Forestry hunting and fishing contributed 10.4 percent to gross national product in 1965 as compared with 11.9 percent in 1956 and 9.3 percent in 1963, its lowest point. (Table 20)

TABLE 19

PARAGUAY: GROSS NATIONAL PRODUCT

(In 1962 Gs.)

(1000)

SECTORS	1956		1961		1965	
	Guaranies	Percent	Guaranies	Percent	Guaranies	Percent
Agriculture	7.852.200	22.0	9.203.700	21.4	10.743.800	21.1
Livestock	4.365.200	12.2	5.015.110	11.7	5.837.873	11.5
Forestry-Hunting and Fishing	1.646.800	4.6	1.654.080	3.9	1.896.650	3.7
TOTAL	13.864.200	38.8	15.872.890	37.0	18.478.323	36.3
Industry-Mining and Construction	6.722.930	18.8	8.068.890	18.8	9.352.020	18.4
Services	15.159.410	42.4	19.027.444	44.2	23.040.059	45.3
TOTAL	35.746.540	100.0	42.969.224	100.0	50.870.402	100.0
Population (1000)	1.574.9		1.801.4		2.030.0	
Product per-capita US$	180		189		199	

SOURCE: Prepared by the Secretaría Técnica de Planificación - Agriculture and Forestry Section - Data from the Central Bank of Paraguay

TABLE 20

GROSS NATIONAL PRODUCT

AGRICULTURAL AND FORESTRY SECTORS

(in 1962 million Gs.)

	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965
AGRICULTURE	7,852	8,189	8,504	8,735	8,908	9,204	9,790	10,463	10,346	10,900
LIVESTOCK	4,365	4,305	4,709	4,427	4,388	5,015	5,369	5,232	5,532	5,838
FORESTRY	1,614	1,584	1,568	1,552	1,511	1,611	1,664	1,613	1,666	1,931
HUNTING & FISHING	33	28	26	35	37	43	40	40	44	49
	13,864	14,106	14,807	14,747	14,844	15,873	16,863	17,348	17,588	18,718

IN PERCENT

AGRICULTURE	56.6	58.1	57.4	59.2	60.0	58.0	58.1	60.3	58.8	58.2
LIVESTOCK	31.5	30.5	31.8	30.0	29.6	31.6	31.8	30.2	31.5	31.1
FORESTRY	11.6	11.2	10.6	10.5	10.2	10.1	9.9	9.3	9.3	10.4
HUNTING & FISHING	0.3	0.2	0.2	0.3	0.2	0.3	0.2	0.2	0.2	0.3
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

SOURCE: Prepared by the Secretaría Técnica de Planificación. Agricultural and Forestry Sector, with data from the Banco Central del Paraguay.

The gross product of the sector took a favorable turn in the last five years with an annual growth of 3.8 percent. This was substancially higher than the 1.7 percent in 1956/60, a rate which did not even equal the population increase and which amounted to a decrease in real per capita product in the rural sector. The recuperation in 1961/65, plus the 5.1 percent growth in 1965, represent a growing strength with prospects for improvement in the future.

The following is an analysis of the historic behavior of the gross national product for each branch of the sector:

1. Agriculture

Constituting the principal component of production in the country, this sector contributed 21.12 percent to the GNP in 1965, having reached its highest point with 22.5 percent in 1963, then falling in relative importance the last two years due to the greater growth in other sectors, principally in services. The behavior for the 10 year period 1956/65 was a steady growth with the exception of 1964.

The last five year period witnessed a constant growth of 3.67 percent in agriculture as compared with 3.1 percent in the preceding five years. This increase resulted in a per capita increase of .67 percent, which, even though less than satisfactory, did represent an improvement in the general welfare of the rural population.

The fall in 1964 is explained by the decrease in production of tobacco, cotton, tung and coffee, which are weighty items in the agricultural structure. Climatic factors and unfavorable prospects in the world markets contributed to the reduced production.

In the first four years of 1961/65, permanent crops were stronger than the annuals, but annuals increased substantially more than the permanents in 1965. This is explained by the greater emphasis on tung, castorbeans, coffee, petit-grain and fruits in the first four years, and by a relative production rise in cotton, tobacco, soybeans and sugar cane in 1965

CHANGES IN THE CONTRIBUTION OF AGRICULTURE IN GROSS NATIONAL PRODUCT

(In 1962 million Gs.)

Years	G.N.P.	Years	G.N.P.
1956	7,852	1961	9,204
1957	8,189	1962	9,790
1958	8,504	1963	10,463
1959	8,733	1964	10,346
1960	8,908	1965	10,900

Agricultural production, and consequently production generated by it, will have these sharp annual variations as long as annual crops occupy nearly 80 percent of the total

STRUCTURE OF THE AGRICULTURAL CONTRIBUTION TO GROSS NATIONAL PRODUCT

(Percent)

CROPS	1961	1962	1963	1964	1965
Permanents	21.4	21.9	22.0	22.3	21.1
Annual	78.6	78.1	78.0	77.7	78.3
TOTAL	100	100	100	100	100

This allocation causes the sector to be exposed to ecological factors on the one hand, and to frequent oscillation of prices, especially in export items, on the other.

2. Livestock

Livestock contributed 11.5 percent to the gross national product in 1965; a relatively constant proportion for the period 1961/65. The second five years period 1956/65 demonstrated a much more dynamic increase than the first, increasing at an annual rate of 3.4 percent as compared to an almost stationary .4 percent in 1956/60

CHANGES IN THE CONTRIBUTION OF LIVESTOCK IN GROSS NATIONAL PRODUCT

(In 1962 million Gs.)

Years	G.N.P.	Years	G.N.P.
1956	4,365	1961	5,015
1957	4,305	1962	5,369
1958	4,709	1963	5,232
1959	4,427	1964	5,532
1960	4,388	1965	5,838

SOURCE: Prepared by the Secretaría Técnica de Planificación - Agricultural and Forestry Sector.

Several factors explain the improvement during recent years: powerful stimulants were provided by the increasing industrialization and external demand resulting in better prices to the producers. Along with this was the rapid improvement of cattle ranches stemming from a credit program which increased production and decreased losses from poor feeding, sanitation and diseases.

Red meat, (cattle and pork) demonstrated a more dynamic growth than poultry although poultry grew steadily and shows promise of more strength in the next few years. Of the total production in the livestock sector, cattle, pork, milk, eggs and chickens represented 55, 20.5,12 and nine percent respectively. Pork has been increasing its relative importance and has been growing rapidly as compared with other livestock.

3. Forestry

Forestry accounted for 3.63 percent of the gross national product in 1965. Over the ten year period (1956/65) forest products diminished in relative proportion except for the two last years.

CHANGES IN THE CONTRIBUTION OF FORESTRY TO GROSS NATIONAL PRODUCT

(In 1962 million Gs.)

Years	G.N.P.	Years	G.N.P.
1956	1,613.5	1961	1,610.8
1957	1,584.3	1962	1,663.5
1958	1,568.3	1963	1,612.6
1959	1,551.5	1964	1,666.4
1960	1,510.9	1965	1,930.6

SOURCE: Prepared by the Secretaría Técnica de Planificación - Agricultural and Forestry Sector.

The behavior for the period was irregular. The fall during the first five years of the period is explained by the persistent fall in exportations derived from difficulties with the Argentina market. In the same manner, the behavior during the past five years resulted from improvement in the export market coupled with some improvement in internal industrialization. Exports weigh heavily on total production and their fluctuations significantly affect the total gross product.

B. DEMAND

1. Intermediate and Final Demand

The demand for agricultural and livestock products of national origin experienced a significant increase in 1961/65 as compared with the five preceding years: 6.1 percent as compared with 2.18 percent. However there was considerable variation between the component variables of the sector at the farm level. (Table 21)

TABLE 21

SUMMARY OF INTERMEDIATE AND FINAL DEMAND FOR NATIONAL AGRICULTURAL LIVESTOCK AND FORESTRY PRODUCTS

(In 1962 ₲s.)
(1000)

SECTORS	1961	1962	1963	1964	1965
1. AGRICULTURE TOTAL	9.240.1	10.229.3	10.977.7	11.211.6	11.606.6
a) Agricultural Inputs	167.5	127.6	127.0	122.7	133.3
b) Industrial Inputs	1.601.0	1.743.0	1.957.8	1.973.1	1.945.8
c) Livestock Inputs	1.353.4	1.474.8	1.514.3	1.468.0	1.584.6
d) Consumption	5.434.5	5.794.4	5.957.2	6.141.0	6.315.9
e) Export	589.7	956.5	924.0	1.029.6	1.144.4
f) Inventory	94.1	133.0	497.4	477.2	482.6
2. LIVESTOCK TOTAL	6.409.3	6.509.9	6.357.5	6.829.6	7.368.7
a) Industrial Inputs	1.387.1	1.338.3	1.367.7	1.417.9	1.686.1
b) Consumption	4.598.4	4.733.0	4.746.1	5.062.0	5.207.7
c) Investment	412.8	422.3	228.8	321.4	439.9
d) Export	11.0	16.3	14.9	28.3	33.0
3. FORESTRY TOTAL	1.626.6	1.676.0	1.633.2	1.712.8	1.997.1
a) Industrial Inputs	445.2	467.5	421.3	523.8	690.8
b) Consumption	987.6	1.018.6	1.045.5	988.3	1.039.7
c) Export	193.8	189.9	166.4	200.7	266.7
4. HUNTING&FISHING TOTAL	43.2	39.9	40.1	44.3	49.2
a) Consumption (fishing)	22.1	22.7	23.3	23.9	24.5
b) Export (hunting)	21.1	17.2	16.8	20.4	24.7
GRAND TOTAL	17.319.2	18.455.1	19.008.5	19.798.3	21.021.6

SOURCE: Prepared by the Secretaría Técnica de Planificación - Agriculture and Forestry Sector.

a. Agriculture

The demand for agricultural products grew at an annual rate of 4.4 percent in 1961/65, only .22 percent greater than the five preceding years. This shows that demand was practically stabilized by 1956. The direct consumption of annual crops increased 3.5 percent annually as compared with 4.0 percent for the permanent crops.

With respect to direct consumption, demand grew slightly faster than the rate of population increase, despite the inelastic demand characteristic of the greater part of the crops; thus demonstrating the close tie between demand, population increase and per capita income.

The demand for industrial raw material has been relatively strong for annual crops, increasing six percent annually. The demand for inputs for export goods exercised a great influence on this growth; soybeans increased 80 percent and cotton 12 percent annually and were the two most important items. Industrial demand for inputs from permanent crops has been almost tied to the rate of population growth. One of the causes is the falling tung oil price in the international market during the first years of the period 1961/65. Prices rose slightly in the later years of the period only to fall again in 1965.

The relative proportion by destination of agricultural products for 1961 and 1965 follows:

	Annual Crops		Permanent Crops	
Destination	1961	1965	1961	1965
	(percent)		(percent)	
Consumption	58	52	63	60
Industry	37	35	23	21
Exports	5	12	14	19
TOTAL	100	100	100	100

The growing demand for exported goods is reflected in the increased demand for both annual and permanent crops as compared with a relative decrease in demand for industry and local consumption imputs between 1961 and 1965.

b. Livestock

The demand for livestock and products experienced an encouraging growth in the period 1961/65, increasing at an annual rate of 3.3 percent as compared with a relative stagnation in the preceding five years period. Classified by final destination: Input for industry increased at an annual rate of 4.9 percent

maintaining a strong growth from 1956 in response to a stable external demand. Internal consumption grew 3.3 percent annually, a rate higher than the population growth, due principally to the increased consumption of pork. Although very small the exportation of primary livestock products has been very dynamic.

c. Forestry

Demand for forest products improved considerably in 1961/65, increasing at the rate of 4.7 percent annually as compared with a negative tendency in 1956/60. This growth is explained by the elevated demand for industrial inputs, which grew at an annual rate of 11.5 percent, and by exports which experienced an annual growth rate of eight percent. Nevertheless, direct consumption experienced a considerable drop in 1961/65 as compared with the preceding five year period: .74 percent as compared with 2.52 percent.

d. Hunting and Fishing

The demand, calculated only on the basis of value exported, reflected an annual growth of 5.7 percent in the period 1961/65, a rate slightly less than the preceding period. Fishing grew at an annual rate of four percent which was an improvement over the preceding five years period in which the growth was about the same as the population.

2. Total Demand

The total demand of the sector has experienced a significant increase of four percent annually in 1961/65 as compared with 2.78 percent in the preceding period, thus overcoming the infra-vegetative growth experienced in 1956/60. (Table 22).

The national demand component increased at an annual rate of 4.7 percent as compared with a negative rate for imported goods of - 9.5 percent annually. This probably reflects the relatively advanced substitution of national products for imported, as well as the better utilization of the rich natural resources of the country.

Separated by Branches of Activity

Agriculture grew at an annual rate of 4.5 percent as compared with 3.5 percent for 1956/60. One of the causes of this improvement was the greater facility of obtaining credit in recent years. The demand for Livestock Products demonstrated a more moderate growth as compared to agriculture: 3.3 percent annually in the latter period as compared with 1.44 percent in 1956/60.

Substitution for imported livestock products is rapidly taking place evidenced by a negative rate of - 23 percent annually for livestock imports in the latter period (1961/65). If this reduction persists, a few years will suffice to reduce imported livestock products to minimum levels.

TABLE 22

SUMMARY OF TOTAL DEMAND

(In 1962 Øs.)

(000)

SECTORS						
1. AGRICULTURE	TOTAL	10.163.4	11.114.9	11.773.7	11.943.5	12.307.2
National		9.240.1	10.229.3	10.977.7	11.211.6	11.606.6
Imported		923.3	885.6	796.0	731.9	700.6
2. LIVESTOCK	TOTAL	6.548.3	6.685.9	6.583.9	6.876.6	7.414.7
National		6.409.3	6.509.9	6.357.5	6.829.6	7.368.7
Imported		139.0	176.0	226.4	47.0	45.9
3. FORESTRY	TOTAL	1.626.6	1.676.0	1.632.2	1.712.8	1.997.1
4. HUNTING&FISHING	TOTAL	43.2	39.9	40.1	44.3	49.2
GRAND TOTAL		18.381.5	19.516.7	20.030.9	20.577.2	21.768.2
TOTAL NATIONAL		17.319.2	18.455.1	19.008.5	19.798.3	21.021.7
TOTAL IMPORTED		1.062.3	1.061.6	1.022.4	778.9	746.5

SOURCE: Prepared by the Secretaría Técnica de Planificación - Agriculture and Forestry Sector.

Forest products had a relatively dynamic demand, growing at the annual rate of 3.7 percent in recent years. With respect to total demand originated in hunting and fishing the rate of growth was slightly lower for the period 1961/65 as compared to the preceding five year period; four percent as compared with 5.25.

In general, it can be stated that demand for agricultural products, as well as for livestock and forestry, has demonstrated a more dynamic growth in 1961/65 than in the preceding period with strong increments operating throughout the period. This is the basis for expecting a more favorable situation in the coming years. An important factor is the general reduction in imports of agricultural and livestock products which in turn is the reflection of an effective substitution of national production for such imports.

C. AGRICULTURAL LIVESTOCK AND FORESTRY SUPPLY

1. Internal Supply (Table 23)

Internal supply grew at a rate of 3.2 percent in 1961/65 as compared with less than three percent in 1959/60. This reflects greater dynamic conditions in the variables which produce supply, especially production, which grew an annual rate of four percent. This is even more significant when it is considered that the import component of supply has diminished strongly at an annual rate of 7.7 percent.

Exports have grown progressively, reaching an annual rate of 12.8 percent in 1961/65 as compared with 11.5 for the preceding period. This item includes only those raw materials of agriculture, livestock and forestry which have not had any processing whatever, consequently excluding products used for national industrial inputs.

Comparing the development of exports with imports the former has experienced a favorable change by doubling imports in 1965. In 1961/65 national production exceeded population growth, thereby covering growth of national demand and substituting for imports, thus demonstrating a positive advance in the country's development.

Considering the problem sectorially, agriculture's internal supply grew at an annual rate of 3.5 percent as compared to 2.44 percent in the preceding five year period. This rate of growth is less than that of national agricultural production because it is the result of growing exports and decreasing imports. This demonstrates that Paraguayan agriculture, despite the difficulties of technology, financing, and the persistent fall in international prices of some items, has been able to progressively increase its support of the economic system by

TABLE 23

INTERNAL SUPPLY OF THE AGRICULTURAL AND FORESTRY SECTOR

(AT THE PRODUCER LEVEL)

(Millions of 1962 Guaranies)

	1964				1965			
	Production	Imports	Exports	Internal Supply	Production	Imports	Exports	Internal Supply
AGRICULTURE	11,003,4	731,7	1,029,9	10,705,2	11,425,9	700,5	1,145,6	10,980,8
LIVESTOCK	6,829,6	47,1	28,3	6,048,4	7,368,7	48,9	35,0	7,382,6
FORESTRY	1,712,8	-	200,7	1,512,1	1,997,1	-	226,7	1,730,4
HUNTING AND FISHING	44,3	-	20,4	23,9	49,2	-	24,7	24,5
T O T A L	19,590,1	778,8	1,279,3	19,089,6	20,840,9	749,4	1,432,0	20,118,3
I N D E X	112,0	80,0	156,9	108,2	119,1	77,0	175,6	114,0

SOURCE: Prepared by the Secretaría Técnica de Planificación.
Agriculture and Forestry Section.

TABLE 23

INTERNAL SUPPLY OF THE AGRICULTURAL AND FORESTRY SECTOR

(AT THE PRODUCER LEVEL)

(Millions of 1962 Guaranies)

	1961				1962				1963			
	Production	Imports	Exports	Internal supply	Production	Imports	Exports	Internal supply	Production	Imports	Exports	Internal supply
AGRICULTURE	9,414,5	834.-	589,7	9,658,8	10,411,7	885,9	922,3	10,375,3	11,127,7	795,4	924,0	10,999,1
LIVESTOCK	6,409,3	139.-	11,0	6,537,3	6,509,9	176 0	16,3	6,669,6	6,357,5	226,4	14,9	6,569,0
FORESTRY	1,626,6	-	193,8	1,432,8	1,676,0	-	189,9	1,486,1	1,633,2	-	166,4	1,466,8
HUNTING AND FISHING	43,2	-	21,1	22,1	39,9	-	17,2	22,7	40,1	-	16,8	23,3
TOTAL	17,493,6	973.-	815,6	17,651,0	18,637,5	1,061,9	1,145,7	18,553,7	19,158,5	1,021,8	1,122,1	10,058,2
INDEX	100,0	100,0	100,0	100,0	106,5	109,1	140,5	105,1	109,5	105,0	137,6	108,0

means of a constant increases in the area cultivated, and in productivity, and above all, by means of decided changes of the productive structure toward new market orientations. Its diversification, consisting of some 50 products, has enabled it to overcome the negative impact of a persistent fall in prices of some items plus price instability in others.

Livestock supply grew at the rate of 4.2 percent annually which represented a strong up turn from the 1.43 percent of the preceding period 1956-1960.

The proportion imported decreased while the exportation of sub-products was growing in recent years. The figures do not include all the export meat products, because some are included as an internal supply for industry processing.

The forestry sector was almost static during 1961 to 1963 then rapidly improved in 1964 and 1965, as a consequence of greater industrial demand, accompanied by a strong growth in external demand during the last two years.

The internal supply from hunting and fishing behaved uniformly but with a small contribution to total internal supply. Nevertheless, it must be pointed out that the exportation of leather and skins from wild animals substantially increased especially during the last two years after falling in 1962 and 1963.

2. Total Supply (Table 24)

The total supply of agricultural, livestock, forestry, hunting and fishing sector grew at a rate of 3.5 percent annually in the period 1961/65 as compared to 2.78 percent annually in the former period. This is the combined result of a national component which had negative tendency slightly more than seven percent annually. This reveals the beginning of a process of substitution for imported goods in the agricultural and livestock sectors which was operating principally during the last two years, a completely different picture than that of the period 1956/60 in which imports were growing steadily to reach 6.7 percent annually.

Omitting the total supply of the larger sectors, agriculture presented a growth of 3.3 percent composed of 4.4 percent of annual growth of national production and a decrease of seven percent in the imported component.

Total supply in the livestock sector grew at the rate of 2.9 percent annually; the combined result of the national production growth of 3.3 percent annually and of the importations decrease of 23.6 percent annually, revealing the rapid substitution in the first two years, principally of cheese, butter, and live animals.

Total supply in the forestry sector grew about 4.7 percent annually, a totally different behavior from the stagnated situation observed in 1956/60, thus presenting an encouraging picture for this important activity.

TABLE 24

TOTAL SUPPLY OF THE AGRICULTURAL LIVESTOCK AND FORESTRY PRODUCTION

(Prices at the farm level)

(In 1962 Million ₡s.)

	SECTORS		1961	1962	1963	1964	1965
1.	AGRICULTURE	TOTAL	10.248.5	11.297.6	11.923.1	11.735.1	12.126.4
	Production		9.414.5	10.411.7	11.127.7	11.003.4	11.425.9
	Imported		834.0	885.9	795.4	731.7	700.5
2.	LIVESTOCK	TOTAL	6.548.3	6.685.9	6.583.9	6.876.7	7.417.6
	Production		6.409.3	6.509.9	6.357.5	6.829.6	7.368.7
	Imported		139.0	176.0	226.0	47.1	48.9
3.	FORESTRY	TOTAL	1.626.6	1.676.0	1.633.2	1.712.8	1.997.1
	Production		1.626.6	1.676.0	1.633.2	1.712.8	1.997.1
	Imported		-	-	-	-	-
4.	HUNTING&FISHING	TOTAL	43.2	39.9	40.1	44.3	49.2
	Production		43.2	39.9	40.1	44.3	49.2
	Imported		-	-	-	-	-
		TOTAL SUPPLY	18.466.6	19.699.4	20.180.3	20.368.9	21.590.3
		TOTAL PRODUCTION	17.493.6	18.637.5	19.158.5	19.590.1	20.840.9
		TOTAL IMPORTED	973.0	1.061.9	1.021.8	778.8	749.4

SOURCE: Prepared by the Secretaría Técnica de Planificación - Agriculture and Forestry Sector.

3. Changes in the Supply Structure

The supply structure is composed of agriculture 56.2 percent; livestock, 34.4 percent and forestry, hunting and fishing, 9.4 percent.

Agriculture has been growing in relative importance increasing from 55.5 percent in 1961 to 56.2 percent in 1965 (Table 25). This compares to 54 percent in 1956. By 1963 agriculture had reached 59 percent only to fall in the following years because of increases in livestock and forestry.

Livestock represented 35.5 percent of the total supply in 1961 falling in 1962 and 1963, to rise again in 1964 and 1965 (Table 25).

Forestry contributed a greater proportion in 1965 than in the foregoing years.

The supply from national origin grew consistently, increasing from 94.7 percent to 96.5 percent, revealing the greater strength of national production and the ability to substitute for imports thus to satisfy the growing external demand without reducing internal supply. The period 1956/60 was opposite in that national production progressively diminished while the imported component grew constantly (Table 25).

In 1960 the relation was 93.1 and 6.9 percent for national production and imports respectively.

IV. SERVICES

A. TECHNICAL ASSISTANCE AND AGRICULTURAL EXTENSION

The various National Institutions carrying out technical assistance include the Ministry of Agriculture (with its technical divisions by products and the agricultural extension service), the National Development Bank, by means of technical assistants in charge of supervising agricultural credit, the Institute of Rural Welfare by means of technical assistants giving technical advice and credit to the colonists, and the Credito Agricola de Habilitación (a supervised credit program) by means of field personnel working in the zones of its influence.

The Ministry of Agriculture is the National organization charged with orientation of the agriculture and livestock policy of the country. Its principal responsibility is to give technical assistance to the rural producers by means of technicians specializing in different lines of products (Divisions of tobacco, cotton, fruits, cereals, etc.) and by the extension service which carries technical knowledge to the producers in rural communities. The best proof of the success of the extension service is the numerous requests for the creation of new agencies in

TABLE 25

TOTAL SUPPLY STRUCTURE

(Percent)

	SECTORES	1961	1962	1963	1964	1965
1.	AGRICULTURE	55.5	57.4	59.1	57.6	56.2
2.	LIVESTOCK	35.5	33.9	32.6	33.8	34.4
3.	FORESTRY	8.8	8.5	8.1	8.4	9.2
4.	HUNTING & FISHING	0.2	0.2	0.2	0.2	0.2
	TOTAL	100.0	100.0	100.0	100.0	100.0
	NATIONAL	94.7	94.6	94.9	96.2	96.5
	IMPORTED	5.3	5.4	5.1	3.8	3.5

SOURCE: Prepared by the Secretaría Técnica de Planificación - Agriculture and Forestry Sector.

the diverse productive zones of the country, and by the growing desire of producers to take advantage of technological advances throughout the agricultural and livestock activities.

The strict relationship which exists between agricultural extension and the programs of research, credit and agricultural promotion, points out the necessity of developing a proportional expansion for each, thus obtaining a balanced assistance for the rural producers.

The agricultural Extension Service presently has 22 agencies in the different districts of the country as follows:

San Lorenzo	Coronel Oviedo
Ñemby	Villarica
Yaguaron	Caazapá
Carapeguá	Caaguazú
Acahay	Juan Leon Mallorquín
San Juan Bautista	Pto. Presidente Stroessner
San Ignacio	San Estanislao
Coronel Bogado	San Pedro
Encarnación	Concepción
Arroyos y Esteros	Horqueta
Eusebio Ayala	Pedro Juan Caballero

These 22 agencies which employ 79 administrative office and field personnel cover only 12 percent of the 180 districts in the country. The basic team of an agency consists of the Extension Chief, a 4-C Club Agent, the Home Economics Agent, and in some cases there are also Assistant Extension Agents.

The agricultural Extension Service has promoted the organization of 140 agricultural farmer committees, 14 associations for the development of 4-C Clubs and 28 special committees (such as campaigns against the Ysaú, horticulture, dairy, etc.), as well as 307 Juvenile 4-C Agricultural Clubs with a total of 8,355 memebers.

Nevertheless, it must be pointed out that the methods prefered by the Extension Service (education of the producers in the application of more modern Techniques) does not permit evaluation as to what extent the service has contributed to the improvement of production and productivity in the zones of its influence; neither can it be determined whether such improvements are satisfactory in terms of the costs of the service. It would be necessary to evaluate the progress achieved in quantitative terms, in order to compare the Extension Service benefits with other methods of agricultural assistance.

For the year 1966 it is planned to open 13 new office which will bring the total number of agencies to 35.

The National Development Bank provides technical assistance with 26 specialists in agronomy and five specialists in livestock and veterinary medicine.

The Institute of Rural Welfare, charged with the execution of Agrarian Reform and Colonization, supplies social and technical assistance and credit to the producers in the new colonization zones by means of a department of technical assistance and promotion which in 1965 covered five colonies of the Eastern axis and three colonies of the Northern axis with a total of eight agronomos, two veterinarians, and two assistant veterinarians to carry out the technical assistance; plus 13 agronomos to cooperate with the National Development Bank in the program of technical assistance and credit. The social assistance of IBR is supplied by home economic agents. This type of assistance is of extraordinary importance for the development of the new production areas of colonization. This added to the favorable natural and human conditions could add very significantly to the increase of agricultural production in the colonies.

The country's supervised credit program, known as Credito Agrícola de Habilitación, charged with the program of supervised credits has been operating in eight departments of the Eastern Region covering 57 districts and 12.146 farmers. The borrowers of the supervised credit program are classified in two groups: "Active" those still receiving credit and technical assistance, and "Inactive" those not receiving credit because of the lack of operating capital of the institution, but which are still receiving technical and social assistance.

The available field personnel of CAH is as follows:

Description	1961	1962	1963	1964	1965
No. of Districts	57	57	57	57	57
Agriculture Supervisors	102	97	93	88	89
Home Economic Agents	20	17	17	16	18

SOURCE: Credito Agrícola de Habilitación

Nevertheless, although the technical personnel is maintained at relatively constant levels, the lack of operation resources and credit funds, has caused a strong decrease in the efficiency of the CAH.

B. AGRICULTURAL RESEARCH _/

The National Agronomy Institute (IAN) emphasizes research in those crops of greater economic importance having better prospects of adaptation to the local ecological conditions; and on the production of seeds and plants selected from the best species and varieties. Advice on specific problems of agriculture is also given to official organizations and to private persons.

Research by IAN has determined that four new varieties of corn and two hybrid varieties have not demonstrated any production superiority to Venezuela, a national corn variety which continues to show excellent results.

1. Wheat: Wheat research is occupying most of the time of the personnel during the winter, because wheat, along with oats, peas and winter forage crops, constitutes one of the principal crops of the winter season.

From the world wheat collection, 592 varieties of spring wheat and 270 varieties of winter wheat were seeded in 1961. From this material, 67 spring wheat varieties were selected to be studied in more detail. In addition, from the international collection for the years 1958, 1959, and 1960, varieties being studied include 78 which offer interesting characteristics.

Varieties selected for study in 1955 and 1957 and which began to be distributed to farmers in 1962 are tested annually for the purpose of maintaining and applying pertinent studies. The studies fully comfirm the results of former years, whether in experimental plots or in multiplication parcels.

Two "Factorial" wheat fertilization trials were conducted in 1963 and the results are being analyzed. A preliminary examination appears to comfirm the same tendencies registered in previous years.

The IAN produced 22,000 kgs. of selected wheat seeds with pertinent controls in 1965. These varieties (numbers 1.6, 8, 9 and 11) have been seeded and distributed in the zones stablished by the "National Wheat Program", presently in execution.

2. Sugar Cane: Tests with and without fertilizers are being carried out for varieties added to the collection now existing. Also a field to introduce and test varieties, and another factorial fertilizer test was set up on the property of Sr. Carlos Friedman in Iturbe.

3. Cotton: Cotton research includes studying the aspects having greater influence over yields and quality (variety, sanitation, and soil fertility).

_/ From "Las Memorias Anuales" of the National Agronomy Institute

4. Potatoes: Two groups of varieties introduced include six from Germany and seven from Argentina. Tests with and without fertilizers are being carried out.

5. Mandioca: Compartive tests of the six best varieties of the collection revealed that the best variety is San Quintin with 40 percent more production than Toledo, the number 2 varity.

6. Tobacco: Research consists in a study of varieties of each type, and pure seed production within the strong, dark wrapping, and light tobacco varieties. The tobacco seeds of pure variety are produced annually and distributed by the Ministry of Agriculture.

7. Sweet Potatoes: The Institute maintains a collection of 10 varieties of sweet potatoes which were tested for yields. From these were selected the best five for further testing.

8. Peanuts: The existing 23 varieties are hybrids of the 6th generation introduced in the country from the Salta Experimental Station (Argentina). Two vine varieties were included. All of them produced very well for both forage and seed.

9. Forage Plants: The seeding and collection of forage grasses and legumes include more than 200 species and varieties. Also great attention had been given to seed multiplication for pastures because livestock producers are becoming more and more convinced that improved pastures have a proved advantage over natural grazing.

10. Horticulture (Fruits): The necessity to have plants from different species and varieties and propagation material free from virus, has resulted in a program of importing buds from seed stock in the U.S. Also propagation material from some already known varieties has been imported in greater quantity for distribution among those interested in plants of high quality from certified buds.

11. Vegetables: Research with vegetables consisted in adaptation tests of species and varieties, comparative tests of varieties, and tests with fertilizers and seed production.

12. Silviculture: Forestry research has emphasized the production of species for sale, principally: paraíso, tipa, jacarandá, chivato, pinos, eucalyptus, lapachos, cipres, ovenia, lluvia de oro y grevillea. There is also a collection of pines maintained for growth observation.

This brief summary of the agricultural research carried out over the past 20 years, is evidence of efforts to provide producers with better varieties and more adequate cultivation methods suitable for the different ecological condition which is reflected in economic benefits profitable to the farmers.

The unsung but profitable labor of the National Agronomy Institute (IAN) constitutes a solid base for the future development of agriculture in the country. This pioner effort merits special mention of the Director of the Program of Research, Ing. Hernando Bertoni, who by his patient effort, his great knowledge and experience has ably led national research to supply the country's needs.

C. CREDIT

Credit policy of the country is developing within traditional molds with no guide for orientation toward economic development. The great volume of bank credit is channeled toward secondary and tertiary activities, with private banks showing marked preference for allocating a great part of their funds to short term comercial credit.

From the 9,998 million Gs. of credit extended by the private banks in 1965 about 65 percent (6,596 million Gs.) went to the comercial sector, while the agricultural sector received only Gs. 57.5 million representing scarcely 0.5 percent of the total.

CREDIT ISSUED BY PRIVATE AND OFFICIAL BANK

(In million Gs.)

	1961	1962	1963	1964	1965
Agriculture	87.4	158.0	227.3	371.7	543.4
Livestock	311.0	488.2	671.2	1,034.0	1,268.9
Industry	813.7	1,299.7	2,281.9	2,425.3	2,925.6
Business	1,776.4	3,276.0	3,516.4	5,723.4	6,882.0
Construction	28.4	1.6	82.2	51.1	147.6
Social Development	0.3	-	-	-	-
Others	116.7	71.0	72.9	108.8	102.6
TOTAL	3,133.0	5,294.5	6,851.9	9,714.3	11,870.1

This clearly indicates that the private banking system, which captures the greater part of the internal savings, is participating very little in economic development by preferably financing secondary and tertiary activities

In the five years period (1961/65) analyzed, credits conceded by the total of private and official banks increased from 3,133.0 million Gs. in 1961 to 11,870 million Gs. in 1965.

Also a greater volume of credit was channeled to the comercial sector with an increase of 5,106 million Gs. for the period as compared to an increase of only 456 million Gs. in agriculture.

TABLE 26

BANK CREDIT SUPPLIED TO AGRICULTURAL AND FORESTRY SECTOR

(In million ₲s.)

	SECTORS	1961	1962	1963	1964	1965
1.	Total Agriculture	62.7	160.9	375.7	375.6	547.3
	Banco del Paraguay	1.3	(0)	(0)	(0)	(0)
	Banco Nacional de Fomento	23.8	91.0	166.0	234.5	485.7
	Private Banks	33.1	67.0	61.2	137.1	57.5
	C.A.H. (Supervised Credit Program)	4.5	2.9	6.5	4.1	4.1
2.	Total Livestock	310.9	488.2	671.4	1.034.4	1.268.9
	Banco del Paraguay	3.7	(0)	(0)	(0)	(0)
	Banco Nacional de Fomento	23.9	57.6	111.3	160.4	351.1
	Private Banks	233.3	430.8	560.1	874.0	917.8
3.	Total Forestry	113.7	308.8	363.1	441.7	449.1
	Banco del Paraguay	s/d	(0)	(0)	(0)	(0)
	Banco Nacional de Fomento	s/d	157.3	72.6	135.8	121.7
	Private Banks 1/	113.7	151.5	290.5	305.9	327.4
	TOTAL	487.3	957.9	1.268.2	1.851.8	2.265.3

(0) Ceased to operate November 21, 1961

1/ Forestry is estimated to represent 15% of the total loans to the sector.

Although receiving a much greater allocation of credit, the comercial sector contributed 20 percent to the Gross National Product as compared to 24 percent from the agricultural sector. Credit allocated to the industrial sector increased by 2,111.9 million Gs. in the period 1961/65.

The relatively small amounts of credit supplied to the most productive sectors which with adequate credit could greatly stimulate the economic system points up the need to adjust the credit policy toward the real necessities of economic growth.

1. Agricultural Credit

Agricultural credit has been slowly recovering from the levels prior to 1961, a year in which the amount of credit conceded to this sector was greatly reduced. This reduction is largely explained because it was the transition period between the closing of the Bank of Paraguay and the opening of the National Development Bank on more dynamic and functional foundations designed to a more adequately respond to the needs of modern economic life.

Since 1962, the growth of agricultural credit had been gradual and progressive. The 62.7 million Gs. of credit in 1961 increased to 547.3 million in 1965, representing an increase of 484,6 million guaranies and an annual growth of 70 percent(Table 26)

This recuperation is largely due to the National Development Bank which expanded rapidly and progressively in the various areas of the country; and has set up a program of agricultural and livestock promotion. Of the total credit to agriculture in 1965, about 88 percent came from the National Development Bank as compared to 11 percent from private Banks.

The decrease in activity of the Credito Agricola de Habilitación (supervised credit agency) has hindered agricultural credit from reaching high levels. Another hindering factor is the relatively small contributions from private banks despite the fact that some of then have set up agencies in the principal cities of the interior.

Although the agricultural credit program has not reached the desired level, it has made notable improvements in recent years, particularly by means of the progressive action of the National Development Bank. The following is a comment on the activities of this bank from its beginning, including a table broken down by loans made in accordance with the various credit programs; credit from its own funds, special funds for sugar cane and a program for agricultural and livestock promotion from an external loan of 2.9 million dollars by the Interamerican Development Bank. In 1962,Iabout 60.9 million Gs. were loaned to 4,550 borrowers covering an area of

35,940 hectares; in 1965 these figures were increased to 387.4 million Gs. loaned to 7,856 borrowers representing an area of 52,264 hectares. This is a net increase of 16,324 hectares (45%), 3,356 borrowers (75%); and 326.5 million Gs. (36%).

The total number of borrowers attended in the four year period 1962/65 was 30,235 farmers with 847.2 million Gs. representing 190.256 hectares of crops. By 1965 the average loan was 7,400 Gs. per hectare, as compared to only 2,000 Gs. per hectare in 1962. Thus it is undoubtably true that agricultural financing by bank credit has had a highly dynamic development in the last five years after the abrupt fall in 1959/61.

It can be noted that the credit conceded per hectare reached only 196 Gs. per hectare in 1961, then improved rapidly until 1965 when it reached to 1,415 Gs. per hectare reflecting the dynamic situation operating in the credit sector. By 1965 the National Development Bank was loaning an average of 7,400 Gs. per hectare (referring to the total of benefited borrowers only). This is a good indication of the real financing necessities of the agricultural sector. Credit plays a very important role in the promotion of national agricultural development because the great majority of the producers are at very low levels of capitalization and income; low capitalization reflects a very traditional technology and low income impedes a self progressive capitalization of the farmer. These are true development strangulations which must be broken by efficient instruments such as credit, technical assistance and rural training.

2. Livestock Credit

Credit in the livestock sector demonstrated a sustained increase during the period 1961/65, rising from 311 millions Gs. in 1961 to 1,268.9 million Gs. in 1965; an annual growth rate of 42 percent. (Table 26)

The greater proportion of credit given to the livestock sector came from private banks: Seventy-two percent of the total credit in 1965, was loaned by the private banking system and only 28 percent by the National Development Bank (Table 26). Although private banks channeled a greater volume of credit to the private sector, the majority of these were short term loans indicating that they had been loaned for marketing operations. Long term credit is needed for a substantial improvement of the livestock units.

A credit program of great encouragement for the livestock sector was started in June, 1964 by the execution of livestock credit (47 P.A.) with funds obtained from the World Bank (BIRF) in the sum of 3.6 million dollars, and administered by the Central Bank of Paraguay. This credit administered by an interbank commision

made up by representatives of the National Development Bank and the Central Bank of Paraguay. The sub-loans are payble over a 12 year term and have an annual interest of nine percent with four years of grace.

From the first disbursement in June, 1964 to the end of December 1965, the total credit under this program amounted to 472.8 million Gs. from which 449.3 million Gs. were loaned to livestock producers and 23.5 million Gs. for contractors to construct water supply works.

The utilization of livestock credit was employed in the construction of 518 water holes, 119 dams, and to repair 40 water holes. The remainder was invested in the digging of 105 wells, the instalation of 14 motor pumps and motors, nine wind mills and 20 Australian tanks.

Other funds were invested in the construction of ditches, fencing, corrals, livestock chute, etc. Such investments in fixed capital can be expected to produce a substantial future improvement in the efficiency of the livestock industry.

It can be affirmed that credit services to the livestock sector have reached relatively satisfactory levels and that with the contemplated increases it is reasonable to expect important improvements in the production and productivity of livestock farms.

3. Forest Credit

The volume of forest credit has been determined on the basis of estimations and by omitting 15 percent of the total industrial credit given by private banks. The development registers a sustained growth; from 113.7 million Gs. to 449.1 million Gs. in the period 1961/65; an annual increase of 41 percent. Seventy-three percent of the credit ceded to the forestry sector in 1965 was channeled through private banks and 27 percent by the National Development Bank. (Table 26)

Forestry contributes four percent to the Gross National Product, showing that the added value to the economy from forestry activities is relatively low as compared to the value of the forest riches exploited in the country.

D. MARKETING OF AGRICULTURAL PRODUCTS

1. General

a. Relation of Weight and Value

Agricultural products have a great disadvantage in marketing because of the relatively high ratio of volume to prices as compared with manufactured goods. For this reason, transportation and storage costs tend to be very high with relation to value.

b. Perishability

Most agricultural products are subject to deterioration and losses if not quickly transported to consumers. This means that marketing services must supply the conditions necessary to avoid or to diminish such losses.

c. Seasonal Supply

All agricultural products are dependent on biological processes which act as a limiting factor, resulting in periods of relative abundance and scarcity which affect market prices. If demand is of a permanent nature, this gives rise to a seasonal disequilibrium between supply and demand. Further, the limitation of supply may be due to factors affecting both volume and quality of products which are not under the control of man. Marketing must overcome all such difficulties as far as possible, in order to avoid losses. Ways must be found to accommodate the interests of both producer and consumer by means of an efficient movement of products at lowest costs compatible with the services desired by consumers. This can best be obtained if there is a large volume of production and consumption.

2. Present Functioning of the Marketing System for Agricultural Products in Paraguay

The greater part of agricultural products marketed are by a similar process. The individual producers turn over their products to the local buyers (acopiadores) who in turn sell to businesses, whether they be industries, exporters, or simply intermediate wholesalers. There is no national organization to establish marketing norms, which places the producers in the weakest positions and subjects them to unjust treatment on the part of the local buyers who take advantage of the situation to make elevated profits. Of course, it would not be the most effective procedure to establish norms in defense of the producers without providing them with a effective program to supply the means whereby they can defend themselves.

The marketing of agricultural products in the country has the following characteristics:

a. Structure of Production

The fundamental characteristic of agriculture in Paraguay is the family Chacra, producing highly diversified crops on a small scale. The greater part of production is subsistence with marginal quantities for the market. Perhaps the greatest obstacle to the establishment of a modern system of marketing is the production structure which originates a series of inconveniences, as for example: difficulty of grading, and excessive cost of services due to the scattered production zones, etc.

b. Participation of Middlemen

The present system of marketing basically rests on the active participation of local buyers (comerciantes acopiadores) in all productive centers.

The practices of local buyers are characterized by the following:

1) Local credit is offered to the producers, mostly in species, during the growing season of the crops on the condition that the creditors receive the crops when harvested.

2) The agricultural producer, overcome by necessities and with scarce resources, has to sell his products as soon as harvested because credit is no longer available. This is when the buyer takes advantage of the producer and buys his products at prices very much below those later established.

3) The situation created for the farmers in the preceding point is aggravated if the merchandise which he has acquired during the credit operation was charged at excessive prices.

4) The local buyers located in the centers of production generally lack adequate facilities for storing and handling products, and careless handling also contributes to quality losses.

5) In addition, the producer does not receive any incentive to improve his production system. If with all these inconveniences of the "acopiador" system of marketing, the producers go on patronizing them, it is not due to ignorance, but to the fact that they feel impotent because of no other alternatives. For this reason, and despite the inconveniences of the system, as long as no better conditions are created it must be recognized that the local buyers are performing an important function because they are substituting for the lack of an adequate organization capable of a just allocation of the agricultural production.

The acopiador is the only channel through which the producer can dispose of his products, and if he did not participate in the marketing system, the results would be worse, because in that case the farmer would have no incentive whatever to produce.

c. Middlemen Margin generally represents a very high percentage of the product price when it reaches the consumers, indicating that the weakness of agricultural producers is translated into a high margin of profit for the local buyers. An adequately functioning marketing system should reduce the difference between the price paid by the consumer and the price received by the producer.

d. Distribution Centers

1) Direct Consumption - The principal consumer buying center is Asunción where products arrive from all parts of the country. The principal center of

distribution in the capital is Market No. 4, where all perishable products are concentrated. Here, diverse products arrive directly from the producer by way of truckers or local buyers (comerciantes acopiadores). In all cases the products are turned over to a selling agent established either in a space rented from the municipality or in some fruit warehouse.

The selling agent generally has no way to finance his operations, which are carried out on credit without any guarantee for the seller. This process is practically unavoidable under the present lack of adequate marketing organizations. The producer who tries to sell directly without the services of selling agents is faced with even greater obstacles because credit is necessary in any market at all levels. He is obligated to dispose of his products without receiving the corresponding value and with the added inconvenience of having to see a great number of persons (often dishonest) scattered through the market instead of dealing with one person, the selling agent.

Frequently market No. 4 is limited to certain products with an almost complete lack of others, a further indication of the disorganization of the present marketing system for agricultural products.

In the present stage of marketing the producer is the most affected and finds himself in a very uncomfortable condition. Many times he is not able to satisfy the needs of the consumers, and both the producer and the consumer do not receive the benefits which could be supplied by an efficient marketing system.

2) Agricultural Products for processing are concentrated in the different processing plants and come from the various centers of production by means of the local buyers (acopiadores) which are generally buying agents of the industrial enterprises.

3) Material for Export: The majority of the exporters establish warehouses in the ports of embarkation where they concentrate all products from the different centers of production by means of their purchasing agents located throughout the country.

The work of grading and packing is done in the warehouses; for example, in tobacco, the office of control carries out the following activities over the portion to be exported:

a) Inspection and grading
b) Regulating the weight and dimensions of the tobacco bales
c) Smoke curing

Generally exporters use middlemen buyers but occasionally they also carry out transactions directly with the producers.

One characteristic distinguishing trade in fruits for export is that the exporters generally use specialized personnel to harvest the fruit in order to avoid losses from nonconformity to contract specifications.

The fruit is packed in large open boxes, called harvest boxes, for transportation to the grading and packing plants. The Ministry of Agriculture regulates the packing of fruits for export.

e. Channel of Distribution to the Consumer

From the principal supply market, No. 4, products pass to the consumer by means of direct sales through so-called "revendedores" (re-sellers) which have posts in the same site, or peddle their wares from house to house in the city. Also Market No. 4 distributes products to other markets belonging to the municipality. In recent years "model markets" have been established to serve consumers in various districts of the city. The dominant proprietors of these are of Japanese origin which indicates an integration of marketing from farm to consumer.

f. Price Formation of Agricultural Products

One of the problems which plagues the agricultural sector is the marked tendency for the prices of its products to decrease relative to other goods and services. For the following analysis it is necessary to classify the products according to destination, because destination affects the different behavior of prices.

g. Internal Consumption

The irregular supply of agricultural products is the most determinant factor in the instability of prices in consumer markets. Frequently the prices of one product fluctuate widely in the same day, a powerful indication that the prices of agricultural products depend in great measure on the system of marketing. The present marketing system of agricultural products for internal consumption strongly affects price instability.

h. Processing of Agricultural Products

Because there are relatively few processing plants most agricultural products are marketed in the primary state. Many perishable items could be preserved by processing which would not only convert items into higher quality products, but would also provide greater consumer satisfaction. If Agricultural products were processed the difficulties of storage and transportation, plus the disadvantaged exchange value for other products, one of the principal obstacles of agriculture, would be avoided.

3. Deficiencies of the System

a. Problems of grading and regulating Products

The present structure of agricultural production provides a hindrance to the efficient functioning of the marketing system. Grading is difficult for products which come from different farms, using seeds from different varieties. The lack of adequate grading restricts the total market of the products, because occasionaly it does not respond to the buyers needs.

The products most affected by grading deficiency are corn and tobacco. In the case of corn, this is a true obstacle for reaching the external market, because of the difficulty of satisfying contract specifications. A lack of grading tobacco is even worse, because the production structure includes a rudimentary form of curing. Thus tobacco producers are exposed to the exploitation of the local buyers who grade according to their own interests, leaving a wide margin for themselves. Adequate grading helps buyers to select the product most suitable for its intended use, inducing them to pay higher prices.

b. The Lack of Adequate Financing

All developing countries face the problem of insufficient financing for all types of enterprises. This insufficiency is felt with great intensity in the marketing of agricultural products; producers have neither the capital nor the credit to meet necessities during the time they are in possesion of products waiting for sale. Wholesale and retail purchases in these countries are faced with equal financing difficulties.

The lack of capital and insufficiency of credit, the high administrative costs, and great risk of losses cause interest to be excesively high to the small farmers.

Although there exists a law establishing a maximum limit on interest rates there is no credit organization capable of substituting for the personal loans which carry high rates of interest.

Credit for the promotion of agricultural development is absolutely insufficient to finance marketing. This exposes the producer to injustices at the time of selling his product because he is so pressured by necessity he can not wait for a better price.

c. Lack of Organization of the Producers

Agricultural production units are characterized by small size, a diversification for crops for sale constituting a small proportion relative to subsistance production; a low technical level; a lack of mechanized implements; scarcity of

financial resources; etc., factors which sum up to place the agricultural producer in a very uncomfortable position.

This disadvantaged situation in which producers find themselves, is not attenuated by uniting their forces to present a common front of defense. They do not take advantage of the cooperative to defend their own interests. In the marketing of agricultural products, there is a complete lack of producer organization, leaving a wide field for local buyers (acopiadores) to profit by the individual weaknesses of the sellers.

Some producer cooperatives of producers exist in the country, but the greater part of these are functioning in a deficient manner for various causes, whether it be from the lack of financial resources, the absence of a feeling of cooperation, a scarcity of cooperative leaders, or the lack of an adequate mechanism to stimulate the formation and functioning of agricultural cooperatives among farmers.

Among foreign immigrants, some cooperatives are functioning well and these can serve as examples for the rest of the nation's producers.

d. Absence of Technology and Handling Agricultural Products

All agricultural products are exposed to deterioration and losses due to bad handling; to date necessary attention has not been given to the problem of handling which is causing highly significant losses in Paraguay. For example fruits are frequently thrown into transport vehicles, causing great losses.

In the majority of cases, marketing procedure is totally rudimentary, without using any techniques whatever for storing or improving the quality of the product. In market No. 4, there is an absolute lack of the minimum conditions required to carry out efficient product handling. This is also observed at the farm level.

e. Lack of Marketing Information

Marketing information helps farmers to know how much, where, how, and who can advantageously sell his products. In Paraguayan agriculture there is no efficient way to disseminate such information. The excessive individualism which exists among farmers contributes much to the difficulty of adequate information because it impedes the easy conection by which a local organization in a producing area could keep in contact with the principal markets.

STICA presently performs an information function by means of its radio broadcast over the National broadcasting system providing all information of interest to the producers.

The air network has also experienced great progress with the construction of a modern airport in Asunción as well as others in the interior of the country.

2) Means of Transportation Found in the Country

a) Water Transport

By means of the National Merchant Fleet, modern transport units are carrying out transportation for the exterior markets. In 1955 about 12.5 percent of the total tons transported were carried by the national fleet as compared to 33.3 percent in 1963. Water transportation in the interior of the country did not experience the same progress.

With the installation of refrigeration plants the transportation of perishable products has been facilitated without the risk of loss or deterioration.

Export items, constituted in its greater part by agricultural products, are directly benefited in their marketing stage by having warehouses available and by having adequate technical conditions for carrying out efficient transportation.

Water transportation has an appreciable advantage compared to the other systems because of the lower cost, which favors its use for foreign trade.

b) Transportation by Railroad

Railroads are losing ground as compared to the advance of motor transport. The only railroad line, C.A. Lopez, is a deficient mean of transport not considered a dynamic element in the marketing process.

c) Motor - Transportation is the one of better prospects in the transport system; a large number of trucks already move out to the production areas to transport products toward centers of consumption.

There are no organized large scale transportation enterprises. Freight is still generally hauled by individual truck owners with the freight charges usually established by negotiations between the affected parties.

Transportation agencies function in Cnel. Oviedo whereby agents put truckers in contact with the owners of the freight. This practice is very current for the transport action of mandioca which usually requires about 15 eight to ten ton trucks daily serving the zones of Cnel. Oviedo and Caaguazú.

Nevertheless, such agencies have no responsibility to the owners of freight, often causing important losses when the truckers do not pass to collect perishable products.

The relatively high freight costs are largely passed on the consumers after paying very low prices to the producers.

The high cost of motor-freight is due to the following factors:

(1) The high cost of the units of transport (amortization)
(2) The high cost of maintenance (repairs, etc.)
(3) The high cost of lubricants and fuels.
(4) The bad conditions of highways, secondary and penetretation roads.
(5) The relatively small volume of freight.
(6) The short hauling distances.
(7) The lack of continuity in the use of the truck (closing of highways in case of rain).

Despite these handicaps, motor transport does perform a function of the first order in moving products from production to consumption centers, and is a dynamic factor in marketing of agricultural products. All the new colonization areas along the trunk roads are able to enter immediately into the market economy due to motor transport which connects the farms of the agricultural producers with the principal consumption centers.

Perhaps the greatest obstacle to the development of motor transport is the lack of all weather transit; the asphalted highways still represent only a little more than ten percent of the total highways, and many regions remain isolated during the frequent rains which impede the traffic by dirt roads. For example the mennonites colonies in the Chaco have on various occasions lost farm products (eggs, etc.) because the lack of all weather roads.

d) Aerial Transportation

Occasionally, aerial transportation is a solution for the failure of other systems, as in the case of closing the highways due to rain. Despite the high cost of aerial freight, airlines are sometimes used in special circumstances. For example, the mennonites colonies in the Chaco have used air freight for the transportation of eggs, poultry, etc.

Air transportation of passangers is being extended throughout the country and is serving as a means of conection for businesses of the various regions of the country.

3) Principal Limiting Factors

A fundamental obstacle to the development of transportation is the great investments of slow maturity for the construction of highways, railroads, canals etc. The present financial resources of the country do not permit the necessary investments to cover all requirements. But thanks to external financing the asphalting of one of the principal highways will improve automobile traffic for the zones of Itapuá and Misiones.

b. Storage and Preservation

"The loss of agricultural products is due to the bad storage conditions in all marketing phases from the farm to the final consumer"

"The access to storage is necessary in all marketing centers, thus enabling the various classes of products which remain unsold for a day to have later opportunities for sale without fear of deterioration".

Because of the seasonality of agricultural production, storage is necessary to conserve the products until market conditions are more favorable. This could assure a supply throughout the year.

Every attempt to improve the system of marketing agricultural products must take into account storage services because this function is essential for an efficient system.

1) Available Storage

The following is quoted from a report to the Banco Nacional de Fomento by Ing. Rafael Behar in July, 1964:

"If the silos (above and below ground) administered by the National Development Bank were placed in operation they could assure a storage capacity for approximately 15,000 tons of grain. According to present information there also exists a capacity of 8,000 additional tons in private enterprises.

There are also warehouses available in Asunción, under the administration of the National Development Bank and operated by the O.R.T. These warehouses have a capacity for 15,000 bales of tobacco, with additional warehouses of 4,000 tons capacity rented to the Rice Cooperative of Paraguay. There also exists additional space estimated at 5,000 tons.

The present conditions of these warehouses are not ideal because some compartments would require a large investment for improvements.

The railroad has a lot of storage space for various zones which could be made available.

In the port of Asunción there are six warehouses for the storage of general merchandise plus other outside storage places for merchandise which can be left out in the weather.

With respect to refrigeration storage, there is the National Refrigeration Plant, under the administration of the National Development Bank, which has a two-story building of some 3,000 metric tons capacity.

The capacity of refrigeration is: For fruits, vegetables, eggs, and milk products, 900 tons; for meat, beef, horse, pork, chicken etc., 300 tons.

2) Conditions of Functioning

From the foregoing it may be deduced that a great percentage of the installed storage capacity is in bad condition and that great investments are needed for repairs.

The silos under the administration of the National Development Bank have not been used for many years, even including those which are in a good state of repair.

3) Ownership of the Storage Facilities

The principal owner of storage facilities is the National Development Bank and it does not report any benefit whatever to the national economy. Today there exists no marked tendency for property to be concentrated among the hands of a few, or the State, but rather than small installations belong to cooperatives in various production centers.

The storage and conservation service is a totally passive factor in the marketing of agricultural products in the country and one of the principal obstacles to the establishment of a more improved system.

V. AGRICULTURAL PRICES

A. DEVELOPMENT OF AGRICULTURAL PRICES AT THE LEVEL OF THE PRODUCERS

The general price index of 47 agricultural products reveals that prices received by farm producers during 1961/65 experienced significant increases in the first two years and then remained stationary (Table 27 and 28).

1. Permanent Crops: The price index for permanent crops shows a rising tendency in the first two years, then falls to rise again in the last year, but without reaching the 1963 level. The 1964 fall in prices was basicaly due to the irregular behavior of tung prices which suffered vary sharp oscillations significantly affecting the general price level. The indexes of most other products behaved more or less regularly with a slight rising tendency.

There were significant rises in coco and grapefruit prices, while castor beans and pineapple suffered significant drops. The prices with the sharpest oscillations were related to export products, explained principally by changes due to external causes.

2. Annual Crops: The index of prices for annual crops showed a significant rise in the first two years of the period, a light rise in the third year, later falling to the beginning levels. The price index of annual crops followed the same tendency of the general index of prices for all agricultural products which were almost stationary for the last three years, of 1961. Although prices of some products

TABLE 27

GENERAL PRICES INDEX AT THE FARM LEVEL

1961
(00)

	1961	1962	1963	1964	1965
Permanent Crops	100	113.09	122.71	117.78	120.77
Annual Crops	100	108.05	116.09	117.72	116.18
TOTAL	100	109.25	117.54	117.17	117.15

INDEX OF QUANTITY PRODUCED

Permanent Crops	100	106.29	114.20	114.02	115.65
Annual Crops	100	109.37	116.72	115.10	120.32
TOTAL	100	108.68	116.16	114.86	119.27

SOURCE: Prepared by the Secretaría Técnica de Planificación - Agricultural and Forestry Sector.

TABLE 28

PRICE INDEX OF AGRICULTURAL PRODUCTS

(at the farm level)

PRODUCTS	1961	1962	1963	1964	1965
A. PERMANENT CROPS					
a. Avocado	100	115.49	118.69	121.96	125.58
b. Banana	100	102.86	117.14	111.43	108.57
c. Coffee	100	110.40	112.62	115.84	118.81
d. Prune	100	115.40	118.48	121.56	124.88
e. Coco	100	100	128.57	135.71	143.86
f. Peaches	100	115.42	118.58	122.53	127.27
g. Guava	100	115.48	119.05	122.62	126.19
h. Lime	100	115.48	119.05	122.62	126.19
i. Lemons	100	231.01	237.22	143.77	150.72
j. Mango	100	115.38	118.34	125.44	133.73
k. Papaya	100	115.41	118.58	121.74	225.10
l. Apple	100	115.49	118.69	148.37	148.37
m. Orange	:	230.88	242.40	242.40	242.40
n. Sour Orange (leaves)	100	100	111.14	122.70	136.71
ñ. Tangarine	100	151.61	135.84	135.84	135.84
o. Pears	100	115.49	118.69	121.66	121.69
p. Pineapple	100	100	95.65	95.65	108.70
q. Grapefruit	100	145.45	134.85	162.12	160.61
r. Castor Beans	100	81.25	97.25	113.09	113.26
s. Tung	100	161.90	183.33	114.29	119.05
t. Grape	100	100	100	100	100
u. Yerba Mate	100	101.04	104.21	109.38	114.58

SOURCE: Prepared by the Secretaría Técnica de Planificación - Agricultural and Forestry Sector - Data from the Ministry of Agriculture and Livestock.

TABLE 28

(cont.)

PRODUCTS	1961	1962	1963	1964	1965
B. ANNUAL CROPS					
a. Garlic	100	122.26	124.81	127.07	130.08
b. Alfalfa	100	111.11	122.22	130.56	138.89
c. Cotton	100	117.42	121.21	121.97	118.94
d. Rice	100	90.64	122.81	118.91	113.06
e. English peas	100	103.74	123.36	123.36	127.10
f. Batata	100	111.11	111.11	111.11	118.52
g. Pumpkin & Squash	100	92.31	92.31	92.31	92.31
h. Sugar Cane	100	108.69	110.91	136.78	136.78
i. Onions	100	107.28	100	74.83	132.45
j. Strawberries	100	105.88	117.65	123.53	147.06
k. Beans & Peas	100	215.38	231.73	238.46	213.46
l. Corn	100	104.65	111.63	111.63	111.63
m. Peanut	100	111.32	126.42	134.91	125.47
n. Potatoes	100	140.20	179.41	150.98	124.51
ñ. Watermelon	100	115.47	115.47	115.47	115.47
o. Candaloupe	100	105.56	105.56	108.33	108.33
p. Tobacco	100	103.44	109.62	113.40	90.00
q. Wheat	100	93.51	107.79	111.69	115.58
r. Vegetables	-	-	-	-	-
s. Mandioca	100	108.33	116.67	116.67	116.67
Mandioca for forage	100	108.33	116.67	116.67	116.67
t. Grain Sorghum	100	104.65	139.53	148.33	157.67
Broom Corn	100	104.65	102.33	102.33	102.33
u. Soybean	100	90.57	90.57	92.45	75.47

experienced significant rises. The index of prices for alfalfa, sugar cane, peanuts, potatoes, beans and grain sorghum, showed increases superior to 30 percent in the last, as compared to the first year, but the effect on the general index was relatively light because of the relatively small proportion of the total (less than 16 percent) represented by these crops. Other products behaved regularly with a tendency to rise, except pumpkins, cabbage, onions, and soybeans, which suffered relatively appreciable drops, especially soybeans, which suffered a sustained fall during the period.

Classifying crops by internal consumption and export, and by considering the principal products of both groups, the behavior of the respective prices indexes exhibit the following relationship to the general index furing the five years period.

a. Internal Consumption (Table 29)

1) Sweet Oranges - Representing 6.13 percent of total production, practically all are sold in the internal market. The price index shows a significant rise in the first year, (15 percent); a light rise in the second year, and then maintained stationary for the rest of the period. The price index growth of 4.2 percent annually did not present great divergences from the general index.

The price tended to be stationary because increases of internal demand had no great variations with respect to supplies.

2) Yerba Mate - This traditional product maintained a sustained rise during the period but with little significance, because the annual rate did not reach the general price index. The restrictive internal market and a limited Argentine market significantly impeded the price. In addition it must not be forgotten that the supply of this product can be very elastic because the production capacity of the country's yerbales (Yerba Mate graves) is very superior to present demand.

3) Rice is one of the agricultural products of internal consumption most affected by price fluctuations; the index shows that rice suffered a significant fall in the first year to rise 35 percent the following year, caused by the decrease of supply. For the rest of the period the price index tended to fall due to greater supply. The acumulative index of prices was superior to the general index by a little more than one percent, subject to great fluctuations.

4) Sweet Potatoes - The price index of sweet potatoes had a significant rise of 12 percent in the first year and remained stationary until the last year when it experienced another rise. Compared with the general index of prices sweet potatoes was much higher.

5) Peanuts - Used in great part as an industrial product, peanuts experienced a sustained rise until the last year of the period when it suffered a significant drop, completely artificial, because production did not even reach the

TABLE 29

PRICE INDEX OF INTERNALLY CONSUMED PRODUCTS

(at the farm level)

PRODUCTS	1961	1962	1963	1964	1965	Annual Rate 1961/65
Orange	100	115.47	121.25	121.25	121.25	4.2
Banana	100	102.68	117.14	111.43	108.57	2.3
Pineapple	100	100.00	95.65	95.65	108.70	1.2
Grapefruit	100	145.45	134.85	162.12	160.61	10.5
Yerba Mate	100	101.04	105.21	109.38	114.58	3.5
Rice	100	90.64	122.81	118.91	113.06	5.1
Sweet Potatoes	100	111.11	111.11	111.11	118.52	1.2
Sugar Cane	100	108.69	110.91	136.78	136.78	9.0
Corn	100	104.65	111.63	111.63	111.63	2.9
Peanut	100	111.32	126.42	134.91	125.47	6.5
Peas	100	107.69	124.04	130.77	105.77	4.4
Mandioca	100	108.33	116.67	116.67	116.67	3.8

SOURCE: Prepared by the Secretaría Técnica de Planificación - Agricultural and Forestry Sector.

demand of the industrialized plants. Furthermore, the internal consumption for oil is very much higher than local production. The accumulative rate of an increase was superior to the general index.

6) Beans - A traditional consumption product, the price index revealed a sustained rise until the last year of the period when it experienced a very significant drop. Beans are exposed to great price oscillations due to irregularity in supply and demand.

7) Mandioca - Mandioca is an agricultural product of the greatest significance for volume, determined by the demand in its primary state especially in Asunción, the principal center of consumption. Its utilization as an industrial input is insignificant. Around 50 percent is consumed at the farm level and the rest goes to the market. The price index reveals an increase in the two first years to remain stationary for the rest of the period. Prices followed the same fluctuation as the general index.

8) Corn - Corn is principally consumed within the country with an insignificant proportion (3.5 percent) going for export. The price index reveals a rise in the first two years, to maintain stationary for the rest of the period. This product is characterized by sharp price oscillations within the same year as a consequence of the seasonality of supplies as compared to a relatively stable demand.

These oscillations are more intense due to the lack of storage in the principal production centers originating from a deficient marketing system. The price index was below the general index.

9) Sugar Cane - Sugar cane is an industrial input for the production of sugar, whisky, alcohol, etc., and is subject to price control system.

b. Export Goods (Table 30)

1) Cotton: Cotton is exported in a semi-processed state and is one of the traditional cash crops and thus the purchasing power of farmers in great measure depends on cotton prices.

The price index of cotton experienced a significant rise in the first year of the 1961/65 five year period, a less significant rise in the second year, then maintained somewhat stationary unitl the last year, in which it experienced a drop.

The price index followed the same pattern as the general index. More than any other product, cotton is subject to world market fluctuations. Paraguay's production is too small to affect world market prices.

2) Tobacco - Another item of the agricultural sector which the great proportion is exported, tobacco is also one of the traditional cash crops of the agricultural sector.

TABLE 30

PRICE INDEX OF EXPORTED PRODUCTS

(at the farm level)

PRODUCTS	1961	1962	1963	1964	1965	Annual Rate 1961/65
PRIMARY						
Banana	100	102.86	117.14	111.43	108.57	2.3
Coffee	100	110.40	112.62	115.84	118.81	4.0
Grapefruit	100	145.45	134.85	162.12	160.61	10.5
Pineapple	100	100.00	95.65	95.65	108.70	1.2
Soybean	100	90.57	90.25	113.09	113.26	5.9
Castor Beans	100	103.44	109.62	113.40	90.00	0.1
INDUSTRIAL IMPUTS						
Cotton	100	117.42	121.21	121.97	118.94	3.8
Sour Orange (leaves)	100	100.00	111.14	122.70	136.71	5.5
Coco	100	100.00	128.57	135.71	143.86	10.9
Tung	100	161.90	183.33	114.29	119.05	-
Castor Beans	100	81.25	97.25	113.03	113.26	5.9
Soybean	100	90.57	90.57	92.45	75.47	5.0

SOURCE: Prepared by the Secretaría Técnica de Planificación - Agricultural and Forestry Sector.

The behavior of tobacco prices also affects the purchasing power of the agricultural sector because tobacco constitutes one of the principal items generating cash income.

Tobacco lends itself to price speculation and a quality classification system generally serves as a base for prices. At the producer level there are continuous artificial oscilations of prices in the harvest period, generally created by the buyers (acopiadores). The price formation of this product also suffers from the influence of a deficient marketing system.

The index of prices reveals a light rise up to the last year of the period, when it experienced a significant fall, unfavorably affecting the cumulative rate resulting in a negative change for the period.

3) Castor Beans - Castor beans suffered sharp oscilations throught the period; falling significantly the first year to rally in the second but without reaching the level of the base year; this small rise continued during the following year to maintain stationary the last year. The price of this product depends totally on the external market which shows signs of instability.

4) Soy Beans - Soy beans is an export crop which experienced a great deterioration in price index over the period. In price fixing the industries consider the level of moisture which probably decisively influenced the fall in prices because producers do not know yet the best methods for harvesting and drying.

5) Coco - Another industry input, more of forest origen, because cultivation of coco trees does not yet exist. The index of this product reveals a significant rise of 10.9 percent, almost three times that the general index, caused by the constant increase of the demand for this product.

6) Tung - Tung, a product for industrial input, experienced sharp price oscilations during 1961/65. Because tung oil is completely exported its price is subject to the oscillations of the world market; and because prices are subject to very marked fluctuations this could negatively affect production in the long run, because it probably does not offer the producer sufficient security to justify cultivation.

7) Coffee - Was characterized by a sustained rise which reached the general index. The price of coffee is basically determined by the world market and the production within the country is of little significance.

8) Fruits - Are an important item considering that fruits go to the internal market as well as to satisfying external demand. All these crops are permanent, implying a inelastic supply, at least in the short run.

9) Banana - Banana suffers fluctuation during the harvest period which from the third year tends to fall in volume.

There are also fluctuations within the year due to the irregularity of the supply. Furthermore, bananas are subject to the influence of the external market. The accumulative rate of the price index has been lower than the general index.

10) Pineapple - Pineapple suffered a deterioration in price during the period (1961/65) with respect to the general index. The relative irregularity of the supply caused by climatic conditions affected the behavior of prices for this product.

11) Grapefruit - Grapefruit is an export crop showing encouraging signs; ithas certain price fluctuations but has always maintained a level higher than the base year. It is probable that the tendency will be sustained because of the installation of a new packing plant which will improve the quality of product for the external market probably resulting in an increased demand. The annual rate of price index growth reached 10.5 percent, almost three times the general index.

B. THE AGRICULTURAL SECTOR COMPARED WITH OTHERS

1. The comparative Evolution of Prices

For the purpose of measuring the relative position of the agricultural sector with respect to prices paid and prices received, a table had been prepared in which a "market basket" of consumption and a group of capital goods are presented, including the most usual products purchased and the values expressed in Kilograms of raw cotton with prices at producers level. (See table 31)

In general, the rate of growth of the prices paid is greater than the rate of growth of prices received. This places the agricultural producers at a growing disadvantage, as compared to their needs and means to purchase. This has obligated farmers to increase their productive efforts in an attempt to maintain their level of consumption and capitalization.

Among the consumption goods included in the basket, meat experienced a substantial increase in price; in 1965 it would be necessary to sell 3.2 kilograms of cotton to buy one kilogram of meat, as compared to only 1.6 kilograms of cotton needed in 1958. With respect to other goods, the differences were less. Taken all together, it would require an increase of about 160 grams of cotton to purchase the market basket in 1965 as compared to 1958. Beginning in 1961 there was a slight fall in favor of the agricultural producers, reflected from changes in the prices of consumption goods. (See table 31)

TABLE 31

CHANGES IN PRICES OF CONSUMPTION AND CAPITAL GOODS MEASURED IN TERMS OF COTTON

PRODUCTS	1958		1961		1964		1965	
	₲.	Kg.	₲.	Kg.	₲.	Kg.	₲.	Kg.
CONSUMPTION GOODS	137.40	15.200	211.0	16.070	233.0	14.600	240.0	15.360
1 Kg. Sugar	18.90	2.100	21.0	1.600	25.0	1.600	25.0	1.600
" Meat	14.30	1.600	31.0	2.350	40.0 1/	2.500	50.0 1/	3.200
" Yerba	18.00	2.000	19.0	1.450	21.0	1.300	20.0	1.300
" Rice	17.20	1.900	24.0	1.820	27.0	1.700	25.0	1.600
" Spaghetti	19.20	2.100	26.0	2.000	30.0	1.900	30.0	1.900
" Peas	8.20	0.900	14.0	1.050	18.0	1.100	15.0	0.960
" Hog Lard	41.60	4.660	76.0	5.800	72.0	4.500	75.0	4.800
CAPITAL GOODS	1.975.60	219.600	3.629.0	274.650	4.133.0	256.900	4.310.0	274.550
1 Plow	1.637.70	182.000	3.026.0	229.000	3.396.0	211.000	3.580.0	228.000
1 Hoe	96.00	10.700	155.0	11.750	184.0	11.500	190.0	12.100
1 Machete	52.60	5.900	104.0	7.900	136.0	8.500	120.0	7.650
1 Axe	189.30	21.000	344.0	26.000	417.0	25.900	420.0	26.800
	2.113.0	234.800	3.840.0	290.720	4.366.0	271.500	4.550.0	289.910

1/ Average Values

RESOURCE: Prepared by the Secretaría Técnica de Planificación - Agricultural and Forestry Sector.

Prices of capital goods rose more rapidly than cotton prices; in order to purchase the same goods in 1958 it would be necessary to sell 219,600 Kgs. of cotton as compared to 274,550 Kgs. in 1965 (see table 31). This is the effect of a rise in prices of imported goods (plow, hoe, machete and axe).

It is concluded that the agricultural sector is disadvantaged as compared to the products of other sectors with respect to the prices of imported goods and meat, meanwhile there is a balance between prices of the rest of the consumption goods and cotton.

2. Relationship between Prices received and Prices paid (terms of interchange between agricultural products and other goods) (Table 32)

From a comparison of the cost of consumption and capital goods and the income generated by cotton it can be deduced that agriculture experienced a loss of 19 percent in 1965. The greater loss with respect to the capital goods, as explained above, is due to the imported origen, with prices not influenced by the stability of the internal prices level which has existed since 1961.

The reduced losses in 1964 is a consequence of an increase of the price of cotton, which rose 22 percent in 1958.

VI. INSTITUTIONAL ASPECTS

A. THE PROCESS OF SECTORIAL PLANNING

National Planning had its origen with the creation of the Secretaría Técnica de Planificación del Desarrollo Economico y Social directly under the Presidency of the Republic in 1962. The difficulties of organizing an institution of this kind does not permit beginning its tasks immediately. The initial lack of financial resources impeded immediate employment of the better prepared professionals in the country, which as a matter of fact, are still very scare; planning does not yet constitutes a specialty for Paraguayan professionals. The Secretariat of Planning formally began its tasks in the first month of 1963, by preparing the first outline of work for the respective sectors. The initial tasks consisted in assembling all of the available antecedent studies for the various sectors of economic activity, and by an intense educational campaign to promote a understanding of the advantages and usefulness of planning methods for the promotion of national progress.

The assembly of the necessary information permitted a review and evaluation of all existing knowledge as to the different aspects of the economic life in the country. In the agricultural sector, this was given from the first attempt to

TABLE 32

RELATION BETWEEN COTTON VALUES AND OTHER GOODS

	1958	1961	1964	1965
		(Index of a Kg. of Cotton)		1/
1. Consumption Goods	100	105.7	96.7	101.1
2. Capital Goods	100	125.1	117.0	125.0
3. TOTAL	100	123.8	115.6	123.5
1. Consumption Goods	100	94.6	103.4	98.9
2. Capital Goods	100	79.9	85.5	80.0
3. TOTAL	100	80.8	86.5	81.0
Changes in the Terms of Interchange (Percent)				
1. Consumption Goods	-	- 3.4	+ 3.4	- 1.1
2. Capital Goods	-	-20.1	-14.5	-20.0
3. TOTAL	-	-19.2	-13.5	-19.0

1/ The quantity in kilograms of cotton needed to purchase given quantities of consumption and capital goods.

SOURCE: Prepared by the Secretaría Técnica de Planificación - Agricultural and Forestry Sector.

interpret the historical process of agriculture, livestock and forestry. This work called "Antecedents and Preliminary Diagnosis of the Agricultural, Livestock and Forestry Sector" was concluded in September of 1963, and served as a base for discussion, bringing such problems to the attention of the specialized organizations in the Private and Public Sectors, related to agriculture. This first report also pointed out and specified a series of aspects which up to that date had gone unnoticed; at the same time creating more interest in the problem of the country on the part of certain entities specialized in carrying out activities within the sector.

The revision and discussion of the first document served as a basis for amplifying some chapters and adding others, as well as formulating a second general study of the development of the primary sector of the national economy. This produced the second diagnosis of the agriculture, livestock and forestry sector. This document was not published because of the high cost of printing. However, a summary was prepared called the "Synthesis of the Agricultural, Livestock and Forestry Sector Diagnosis", containing the principal conclusions of the above document. The second diagnosis served as a basis for the formulation and preparation of the First Bienial Economic and Social Development Plan, completed in 1964 and submitted to the government as a proposed plan. Those active in the preparation of the Plan for the Agricultural and Livestock Sector included technicians from institutions related to agriculture as follows: Ministry of Agriculture and Livestock, the Institute of Rural Welfare, the National Development Bank, STICA, and the National Institute of Agronomy, etc.

The preparation of the Plan and its distribution made it possible for the Secretariat of Planning to offer the first real example of its activities submitted for an analysis and discussion in various levels of the national activities by professional entities, universities, sectors of the private activity, etc. At the same time this served to create more interest in the subject, and to reach different categories of national opinion with which the idea of planning and the necessity of development gained great popularity. The ditribution was by means of talks, round table discussions and conferences carried out in cities of the interior such as Encarnación, Villarica, Concepción etc. This made it possible to observe the broader sensitivity of the people to interpret and to understand the importance of the planning process within the development effort which constitutes the common aspiration of all the people.

As soon as the Plan was finished the principal emphasis of the agricultural and livestock sector of the Secretariat of Planning was to promote interest in the private and public organizations, in order to achieve a greater participation in future

planning tasks, understanding that the scarcity of studies and resources, as well as techniques and finances, could be partially overcome by the coordinated action of the different organizations having long experience and knowledge of the sectors problems and, above all, without greater cost. On the other hand, the complexity and diversity of the problems which must be attacked within the process of agricultural and livestock development, plus the inexperience to execute action programs and the rigidity of the administrative structure, obliges us to seek methods and practical outlines which can serve as trials to channel the first action activities tending to create confidence and to progressively broaden the system of planning in the execution of the Programs and Sectorial Projects.

With respect to Institutions, there was implanted the necessity of organizing Sectorial Offices of Planning to be receptive units for orientation to specific tasks, of programing and execution as well as centers for the preparation of initial studies of the various programs and projects, which could be more specifically delineated by later studies. In the Agricultural, Livestock and Forestry Sectors, this idea was given a concrete form by the organization of the Department of Planning in the Institute of Rural Welfare (IBR) which began its activities in the first quarter of 1965. Its principal function consisted of studying and programming the tasks relative to the execution of agrarian reform and colonization within the overall program included in the National Development Plan. The Planning Office of the IBR works in direct cooperation and coordination with the division of Agriculture and Livestock Planning of the Technical Secretariat of Planning, within the outline formulated by common agreement.

The approval of the National Development Plan, in July 1965, signified that the Secretariat of Planning would concentrate its efforts in the cooperation with different executive institutions for formulating and organizing the plan for execution and the design of the different lines of economic policies to be adopted in order to achieve the objectives and goals of the plan.

The Agricultural Livestock Division has occupied itself in organizing the works related to the executive programs of the sector and has prepared a methodology of work contained in an internal document submitted to the different organizations for discussion. This methodology includes three different fields of study and programing: "Programs by Product", "Programs by Services" and "Programs by Areas". The initial effort was concentrated on the first of these and after an intense activitiy of institutional coordination, it was successful in setting up the following organizations and entities participated: Ministry of Agriculture and

Livestock, the Ministry of Industry and Commerce, the Central Bank of Paraguay, the National Development Bank, the Technical Secretariat of Planning, FEPRINCO, and the Paraguayan Industrial Union.

The activities of the intersectorial Commission which functions under the coordination of the Technical Secretariat of Planning, began work in September 1965, on the following tasks:

1. Establishment of priorities for the products to be established
2. Formulation of a methodology of work for the study of "Product by Product"; and
3. The organization of work groups charged with the study.

After these tasks, the work groups were integrated to initiate the study of four products: wheat, cotton, tobacco and oils. The various groups are formed by technical personnel from the participating organizations and the present state of the work is as follows:

a. The wheat study was finished in October, and presented to the Government as a National Program for the expansion of this cereal, which after approval is now in full execution as the "National Wheat Program".

b. The diagnosis of Tobacco and the proposal of the Program, is now in final revision by the National Commission and will be presented to the Government soon.

c. The diagnosis of cotton is finished and will soon be submitted for the study of the commission.

d. The study of oils is well advanced and will be finished later.

The advantages of the "Programs by Product" may be sumarized in that on one hand they permit the study in depth of the various aspects which make supply flexible such as the location and volume of present markets, and potential markets, the different sector of strangulation, etc., as well as the level of execution permits the carrying out of definite actions in selected regions or zones as well as creating a well defined institutional enviroment of responsibility for a fulled coordination within the areas marked out by the Program.

With respect to area programs there has been prepared with the Institute of Rural Welfare (and with the close cooperation of the Ministry of Agriculture and Livestock, STICA, the National Development Bank and others) a Program which specifies a geographical enviroment an executive plan covering the aspects involved in the idea of "Consolidation of Colonies" enunciated in the plan as an instrument for executing the Agricultural and Livestock Development. This Regional Program has

began to be executed and will serve as a general outline of action for the future preparation of specific projects for the development of colonization zones.

Presently, a Project of Integral Study of credit in the agricultural sector is in its initial phases to be executed by the Ministry of Agriculture and Livestock, the Technical Secretariat of Planning, the Central Bank of Paraguay, STICA, National Development Bank, the Institute of Rural Welfare and the Supervised Credit Program. This project will be advised by an expert of CIDA by means of the advisory Planning group of OEA/BID/CEPAL. This study will cover the first aspect of the "Service Program", which forms a part of the work methodology designed for agricultural and livestock development.

The preparation of Specific Projects has not been neglected by the specialized Division of the National Secretariat of Planning and other national organizations. These are fully convinced that the execution of a Development Plan is materialized by means of Programs and Specific Projects, and as a consequence the Division has oriented its action toward the development of the various specific projects contained in the Plan, lending its cooperation to the entities and institutions interested in this field. Presently there has been initiated a study in charge of the Technical Mission, made up of the Interamerican Development Bank, the Latin American Institute of Planning of the United Nations and the FAO, which is charged with the preparation of a Project called "Consolidation of the Colonies" in charge of the Institute of Rural Welfare. This will be the materialization of one of the fundamental priorities and strategic efforts pointed out in the Plan as an instrument for agricultural and livestock development, and which will have important repercusions in the new production areas of the country as the result of their rapid incorporation to the National economy, by a growing support of goods and services accompanied by an effective improvement in the social conditions of the people.

These tasks briefly described, and now being broadened by details and specific documents in each subject, have made it possible to achieve advances in a mechanism of sectorial planning within the national system of planning. The importance of this is evident and these tasks constitute the base to generate future planning and action which must preferably be concentrated in improving the basic lines of development, intensifying studies to achieve a greater knowledge of the particular aspects which contribute to the development of the sector and to broaden the operative capacity of key government institutions and of the Private Sector in the programmed regions of the country.

B. THE PUBLIC SECTOR

"The scarcity of human and financial resources of the Public Sector devoted to Agricultural field is very notable, despite the high percentage of the population related to Agriculture(64.4%). The State is only allocating a little more than two percent of its technicians to the attention of the problems now facing the agricultural sector. This situation is almost inexplicable if we take into account that the better short run possibilities of the country have to be in the efficient attention to the problems and possibilities which exist in the agricultural and livestock sector".

"The budget assigned to the Ministry of Agriculture and Livestock has been consistently insufficient, the greater part going for current costs, (which include salary, day workers, per-diem, etc. for personnel)"

GENERAL BUDGET OF COST

(million of current Gs.)

	1963	1964	1965
TOTAL GENERAL	5,203.3	4,592.4	5,199.6
Current Costs			
Total Central Government	3,292.1	3,416.3	3,737.3
Total M.A.G.	71.9	90.3	95.4
Capital Costs			
Total Central Government	1,911.1	1,176.1	1,402.3
Total M.A.G.	1.1	1.7	2.9

SOURCE: Budget for 1963, 1964 and 1965

To this deficient budget we can add the marked decentralization in the direction and execution of agricultural and livestock policy, implementing duplication of efforts and the lack of adequate coordination in the tasks carried out by the various organizations responsible for implementing the policies of agricultural and livestock development. This situation may be translated into a low efficiency of public expenditures and consequently in the strangulation of a more acelerated growth of the sector.

TECHNICAL PERSONNEL AND ORGANIZATION

The Public Sector problem is very great, considering the scarcity of technical personnel, together with the duplication of efforts and waste of financial and human resources.

The functions of the Ministry of Agriculture are found dispersed among various organizations which superimpose their activities in the field:

1. The Ministry of Agriculture
2. STICA
3. Institute of Rural Welfare
4. National Development Bank

The number of technical personnel in the country is very limited and the programming of research, agricultural and livestock promotion is dispersed among the various organizations. An analysis reveals that government organizations have 82 technicians of superior level and 293 assistants of medium level distributed among different institutions and specialties (See table 33).

Of 47 ingenieros agronomos, 26 are employed by the National Development Bank. The Ministry of Agriculture and Livestock, attending the needs of all the country, has only 19 Ingenieros Agronomos. The new Technical Department in the National Development Bank pay salaries averaging 30 percent higher than the Ministry which naturally attracts the ingenieros agronomos. To attend the necessities of research and agricultural extension at the level of the whole country STICA has eight Ingenieros Agronomos and one Veterinarian. If we consider the great importance of livestock to the national economy, it can be appreciated that there is only one veterinarian dedicated to research in this sector. Assuming that the ingenieros agronomos and agronomos of STICA dedicate all their time to extension, and work with high efficiency, attending technically 120 farmers each, the team would attend only four percent of the farmers of the country.

The coeficient of Agricultural and Livestock units to each ingeniero agronomos of the Ministry of Agriculture is around 16,880. Considering the total number of ingenieros agronomos of the Public Sector, this coeficient falls to 3,200 units for each ingeniero agronomo.

In the livestock sector, the problem of promotion is found somewhat more encouraging; the Ministry has 23 of 32 Veterinarians employed by the public institutions and this means one Veterinarian for each 113 units specializing in livestock. Nevertheless, the work of sanitary inspection of meat for export absorbs more than half of the labor of these technical personnel, thus weakening livestock promotion.

By projecting the supply of technical personnel expected over the next few years, we can observe a slight improvement in the availability of personnel able to give technical assistance to farmers specialized in livestock and mixed activities (livestock/agriculture). Nevertheless, the available Ingenieros Agronomos with respect to the large number of Agricultural units rigidly limited can be observed in the following table:

TABLE 33

TECHNICAL PERSONNEL EMPLOYED IN

AGRICULTURAL ACTIVITIES - PUBLIC SECTOR

Ministry of Agriculture and Livestock

	Activities	Agricultural Sector	Livestock Sector	STICA	BNF	IBR	CAH	Especiality
1.	Extension Agents	-	-	48	-	-	-	48
2.	Ing. Agronomo	9	-	8	26	4	-	47
3.	Chemists	2	1	-	-	-	-	3
4.	Entomologists	1	-	-	-	-	-	1
5.	Peritos Agronomos	2	-	-	-	-	-	2
6.	Agronomos	74	-	15	-	22	-	111
7.	Engineer (Surveyor)	1	-	-	-	-	-	1
8.	Inseminators	-	-	5	-	-	-	5
9.	Veterinarians	-	23	1	6	2	-	32
10.	Veterinarians Assistants	-	-	-	-	2	-	2
11.	Rural Supervisors	-	-	-	-	-	89	89
12.	Home Economics Agents	-	-	11	-	-	18	29
13.	Social Assistants (Home Eco. Agents)	-	-	-	-	5	-	5
	Total Technicians by Specialty	89	24	88	32	35	107	375

PERIOD: 1966 - 1971

Professionals of the College of Agriculture and Veterinary Science	1966/67	1967/68	1968/69	1969/70	1970/71
Ingeniero Agronomo	10	20	20	30	40
Veterinarians	25	25	30	30	35

The country has 113 agronomos which give services and which must attend 1,345 unit for each agronomos. During the next few years we can expect the following number to be added in the official and private agricultural schools which exist in the country.

YEARS	Rural Assistants Peritos and Agronomos
1967	80
1968	82
1969	85
1970	90

In summary, the availability of technical personnel in the Ministry of Agriculture and Livestock does not satisfy the requirement necessary to improve the agricultural and livestock activities of the country. The Ministry has grown under the presure of a strong demand for its services, as agriculture and livestock expanded This analysis of the present structure and functioning of the Ministry of Agriculture, reveals the necessity of its reorganization in order to carry out the new functions assigned to it within the execution of the agricultural and livestock development policy of the country.