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# The Agriculture Sector of Paraguay

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SECTOR - A/PA

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CURRENCY EQUIVALENTS

Since 1960:

1 guarani = 0.00793 US dollars

1 dollar = 126 guaranies

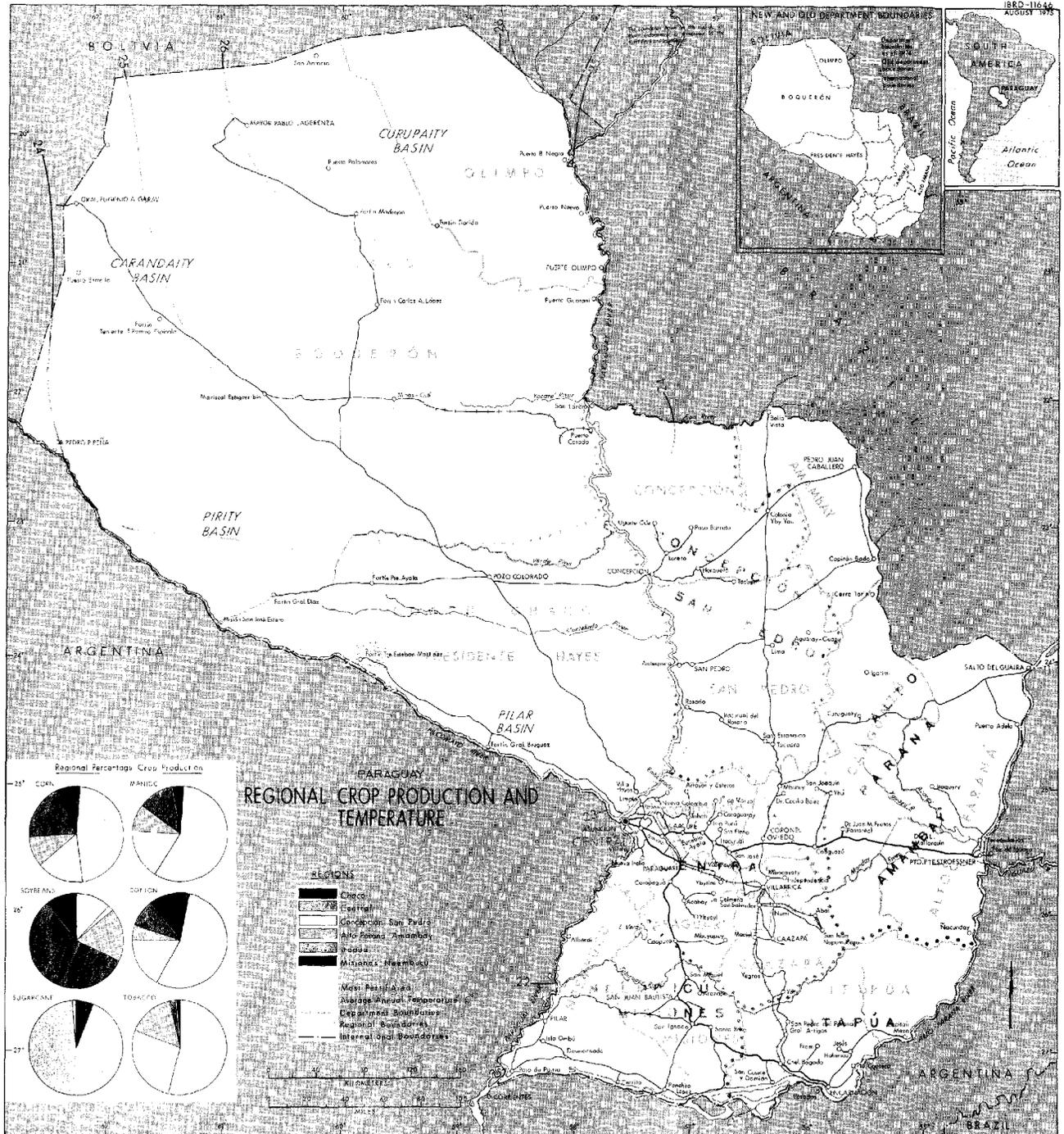
This report is based on the findings of a mission to Paraguay during March-April 1975, composed of Eduardo R. Conesa (Chief), Rolando Arrivillaga (Investment Advisor) and Walter Price (Rural Development Specialist). Mr. Alfredo Gutierrez (Economist) collaborated in the preparation of this report.



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## SUMMARY AND CONCLUSIONS

i. Although agriculture is the most important activity of the Paraguayan economy, the country has barely tapped its agricultural potential. In 1974, the sector accounted for nearly 38% of GDP, 97% of exports of goods (including processed agricultural raw materials), and 50% of total employment. Moreover, its recent growth performance (9% per annum) has been noteworthy as agriculture has responded effectively to favorable external demand and prices. This response was rendered possible by the large investments in transport infrastructure carried out in the 1960s as well as by a comprehensive set of programs aimed toward a diversification of the country's export base. Nevertheless, the country still has abundant unused land resources suitable for crop production. It is estimated that out of a total of approximately 40 million ha, the country has 8 million ha that could be used in efficient crop production of which only about 12% are currently used. Paraguay's comparative advantage in agriculture lies in such products as soybeans, cotton, oilseeds, sugar, and tobacco. All these products are expected to have a strong demand in world markets in the medium-term, and thus, exports of agricultural and agroindustrial products can be expected to be one of the main engines of growth during the next five years.

ii. For analytical purposes, the country can be divided into two main regions: the Chaco and the Eastern region. The Chaco is characterized by extensive grazing land containing 40% of Paraguay's livestock. The Eastern region is mostly covered by forest land. The Eastern part contains about 97% of the population and most of the 8 million ha considered suitable for agriculture. This report deals principally with the possibilities of the Eastern region where the vast majority of the population and the small farmers are living. About 50% of Paraguay's 2.4 million population lives from agriculture. Of the 162,000 farm units, 158,000, or 97% are located in Eastern Paraguay. Of these, 100,000 are less than 10 ha in size and about 60,000 below 10 ha are concentrated in the minifundia zone in the Asuncion area.

iii. The Government, aware of the country's unexploited agricultural potential, has committed itself to a policy of increasing the production of exportable agricultural commodities and expanding the area under cultivation through the colonization of virgin lands. In 1962, the Government established the Instituto de Bienestar Rural (IBR) to deal with all aspects of land reform and land settlement. The IBR has established 250 colonies of over 40,000 families on unused State lands for settlers from the Asuncion minifundia zone which led to a proliferation of potentially viable farm units in more fertile areas of Eastern Paraguay. The colonization program has concentrated on settling the largest number of families at the lowest possible cost, basing development largely on the self-reliance of the family. Although this policy opened rich new lands to agricultural production and brought about major changes in the land tenure structure, existing institutions were unable to provide colonies with needed services and infrastructure, and as a result, the standard of living of many colonies is barely above that of minifundistas. The neglect of the already colonized areas should be reversed to prevent the deterioration of settlements and proliferation of subsistence farming.

iv. The realization of Paraguay's agricultural potential will depend on a strategy to open new lands and to provide more infrastructure and services to small and medium-size farmers. A strategy designed to foster economic growth through the fuller exploitation of the country's comparative advantage in agriculture is likely to succeed in simultaneously accelerating GDP growth and spreading its benefits. Recent experience indicates that despite the shortcomings of the colonization program, much of the increase in agricultural production has come from small and medium-size farmers who received their lands from the Government. In the future, the Government should aim its development effort toward overcoming some basic constraints: (a) limited availability of developed land; (b) the low level of capitalization at the farm level, including a shortage of medium and long-term credit; (c) lack of adequate roads and marketing infrastructure; (d) inadequate institutional capacity for sector planning and for service delivery; and (e) seasonal labor shortages.

v. An expansion of the cultivated area will involve sizeable investments in land clearing and land improvement as the potentially productive areas are covered with dense tropical forest and bush or lack infrastructure such as access roads. The design of a rural development program and a low cost colonization program is necessary to rehabilitate existing colonies, and to continue to provide new lands to a rapidly growing rural population which is expected to increase by about 22,000 families per year during 1976-80. Investments in feeder roads and penetration roads should complement these programs. A high priority project is the construction of the road linking the Itapua and Alto Parana regions (Pirapo-Pto. Presidente Stroessner). These two areas have the most fertile soils in the country and their development could possibly double the current area under cultivation provided that sufficient medium and long-term credit is available for productive investments in land clearing, land preparation and harvesting.

vi. A major constraint to output growth is the low level of capitalization at the farm level and the limited availability of credit. At present, only 6% of the sector's capital stock consists of farm equipment and only 7% of Paraguay's farmers receive institutional credit. It is unlikely that Paraguay could undertake a comprehensive program of agricultural development unless corrective action is taken to effectively channel increasing financial resources to small and medium-size farmers. There is a need to define a strategy to improve the institutional credit channels to the agriculture sector. Present institutions such as the Banco Nacional de Fomento (BNF) and the Credito Agricola de Habilitacion (CAH) are in a weak financial position. BNF's financial difficulties consist of a liquidity problem in the short-run and a high debt equity ratio over the longer-term brought about by lack of financial planning and a poor loan recovery record. CAH lends exclusively to small farmers but its programs are limited in scope. The most important source of credit to the small farmer is the comerciante who does not satisfy the needs of most small farmers due to excessive credit charges (the effective rate of interest on noninstitutional credit is 50-75%). CAH will need assistance to enable it to reach the low-income farmers and help them shift from a predominantly subsistence and traditional type of agriculture

towards the production of cash crops. A viable framework for the joint provision of credit and technical assistance has been developed by CAH and CREDICOOP. Under this "directed credit" program, farmers must meet certain conditions regarding farm management methods in order to qualify for credit. Farmers who have received credit under these terms have substantially increased production and net earnings, emphasizing the importance of adequate extension service delivery.

vii. Increases in productivity are possible by strengthening and expanding the Government extension services and research programs. Paraguay has serious deficiencies in extension service capability with only one field officer per 2,500 farms and a duplication and lack of coordination in activities among various agencies. IBR, BNF and CAH provide extension services which are, in principle, a responsibility of the Servicio de Extension y Ganaderia (SEAG). It may be desirable to consolidate all extension programs under SEAG and increase its manpower capability and budget to lower the density of coverage to a level of 500 farms per agent. Moreover, SEAG should reformulate its operating procedures to meet the technical assistance needs of specific development projects rather than preparing work programs on the basis of types of extension activities (demonstrations, field days, etc.). Increases in productivity can also be obtained through the use of modern inputs such as fertilizer and agricultural lime as most soils are deficient in phosphorous and microelements, and also are extremely acid. Fortunately, the country has abundant lime deposits which can be exploited. It will be desirable to develop a program to determine the most appropriate input mix in the production of the main crops. Currently, fertilizer use is low because its cost is high as all fertilizer is imported in bags and in small quantities. Considerable cost savings could therefore be attained by establishing an appropriate infrastructure for handling fertilizers in bulk form, and by establishing a decentralized distribution and warehousing system.

viii. Similarly, improvements in the efficiency of marketing of commodities should also foster output growth. Government action could be very effective in regulating the marketing process through an appropriate warehousing law. There is a need for establishing some minimum level of storage capacity, including drying, to handle a rapidly growing volume of grain production. Reduction of transport costs, however, may be the single most effective measure for increasing the effective prices received by farmers. Freight rates are unduly high presently because the lack of adequate feeder roads increases truck maintenance and depreciation costs. Moreover, import duties on trucks and spare parts discourage investments in the trucking industry, thus causing a growing shortage of cargo capacity. A revision of the import levy structure on these items is currently being undertaken by the Government.

ix. Another constraint to accelerated output growth is the shortage of labor during seasonal peaks of agricultural production. This problem has emerged during the last three years as the expansion of production of relatively labor-intensive commodities was combined with emigration to neighboring Argentina (amounting to about half of the annual increments in the labor force) and the relatively rapid expansion in the secondary and tertiary sectors

of the economy. As a result, daily wages increased considerably during the 1972-75 period. This trend is likely to continue as a result of the increase in the demand for labor for the construction of the projected hydroelectric projects on the Parana River. A sound farm mechanization program accompanied by a program of land clearing, integrated with the opening of new roads, could help to reduce peak labor requirements and increase the availability of permanent employment opportunities.

x. In the different colonies, the construction of penetration roads allowing for a better access from farms to markets, and farm families to community and health centers and schools are essential prerequisites to foster further development. Also, a strengthening of IBR to assure a rapid pace and orderly distribution of land titles should receive high priority.

xi. An expansion of agricultural production within a strategy of export led growth should be bolstered by the relatively favorable prospects for Paraguay's exports over the medium-term. Moreover, the continuation of the export drive is necessary as Paraguay's domestic market is too small to sustain a rapidly rising level of output. A further expansion in the production of exportable crops such as soybeans, sugar and tobacco appears feasible as their prices are forecasted to increase in real terms by the end of the decade, notwithstanding the recent drop in prices from the high levels which prevailed in 1974. Cotton prices are expected to experience a major downward adjustment over the next three years as production is likely to exceed consumption requirements. During 1977-80, however, cotton prices are projected to remain stable in constant terms at levels which should enable Paraguay's exports to be competitive in world markets. The situation concerning beef exports will remain somewhat uncertain pending the resolution of marketing problems in the U.S. and the EEC. A small decline in real prices can be expected during 1975-77 and an increase in real terms by the end of the decade. Full implementation of plans to expand beef production should await the resolution of the present crisis in the world market for beef. These plans should be aimed at increasing the breeding stock through imports, establishing new ranching operations, and improving the productivity of existing operations through supplemental winter feeding.

xii. With regard to forest products, prices of tropical hardwood logs (veneer logs, saw logs, and railroad ties) are expected to rise markedly during the 1970s and beyond because of an expected chronic shortage. Paraguay's efforts should be directed at rationalizing the exploitation of its vast resources rather than increasing the volume of production. The Government needs to protect and manage the country's reserves and to promote the development of integrated forestry industries to maximize the value-added content of wood exports.

xiii. A fixed investment program consistent with an export-oriented strategy for the agriculture sector is estimated to cost about US\$305 million (1974 dollars) during the 1976-80 period. The proposed program focuses on the need to modernize the sector and to increase labor productivity by concentrating the allocation of resources on critical areas such as land clearing and

improvement, and on-farm investments. Gross investment is projected to increase from about US\$38 million in 1975 to US\$86 million in 1980 representing a growth rate of about 18% per annum which is required to sustain a 9% sectoral growth rate. Direct public sector investment will account for about 15% of the proposed investment program. Accordingly, the Government will need to improve the institutional framework for channeling credit to the sector. A projected improvement in public savings should permit the Government to finance about 20% of the proposed investment program. An additional 38% could be provided by private savings and available BNF resources. The remaining US\$129 million (42%) are projected to be financed through external sources.

xiv. The proposed program is designed on the basis of specific investment requirements rather than on the kind of beneficiary of the program. Recent experience indicates that the Government may aim at allocating a significant share of resources among small farmers. The backbone of the program consists of five projects in the area of rural development and colonization, two regional development projects, two livestock development projects, two commodity production projects (sugar and wood processing), and one agricultural credit and on-farm investment project for commercial farm units.



## I. INTRODUCTION

1. The Paraguayan economy faces a transitional period which justifies a reassessment of the the agriculture sector. Favorable world market conditions for the country's crop and forestry exports, and expected increases in the domestic demand for foodstuffs generated by the large investments programmed for the development of the hydroelectric resources of the Parana River, have created unique circumstances, which, if properly assessed and taken advantage of, should enable Paraguay's agricultural sector to sustain satisfactory growth rates throughout the 1980's. These prospects highlight the importance of evaluating an economic plan for agricultural development during the 1976-80 period.

2. The analysis throughout this report identifies the main elements of an agricultural development strategy, and analyzes how the Government can create the preconditions for agricultural development by removing or easing the constraints on output growth. The discussion focuses on the country's factor endowment, availability of inputs, technology, marketing, and prices. It also examines the alternative approaches for reaching and extending the benefits of growth to the rural poor. Particular attention is devoted to identifying a program of action to incorporate the small farmer into the process of agricultural development. Finally, with regards to an investment program in agriculture, the analysis identifies a package of projects to increase the rate of growth of the sector and improve rural welfare. It is estimated that an agricultural investment program of about US\$300 million (1974 prices) will be required over the next five years if a 9% sectoral target growth rate is to be achieved. The external financial requirements amount to US\$129 and the remainder (58%) is projected to come from domestic sources.

### The Environment and the Regional Setting

3. Paraguay, situated near the center of the South American continent between the major climate systems, has no well-defined topographic barrier and is thus open to currents of cold air from the south and warm air from the north. Its climate (described as continental subtropical) is characterized by contrasts in temperatures and precipitation. Temperatures may fluctuate from 104°F in the summer to around 32°F in the winter. Mean annual temperature varies from 70°F on the southern border to about 79°F in the north. The amount of annual precipitation decreases sharply from the very humid climate prevailing in the Eastern region to the semi-arid climate of the Western or Chaco region, an area affected by its proximity to the Andes Mountains. The annual rainfall varies from 67 inches near the Parana River in the east, to 20 inches in the vicinity of the Bolivian border.

4. The Chaco region, composed by a land area of 24.7 million hectares west of the Paraguay River, is virtually flat, sloping southward imperceptibly with a grade of less than one percent, reaching an altitude of 300 feet at the confluence of the Pilcomayo and the Paraguay Rivers. Its temperatures

are usually high, and rainfall, averaging some 30 inches annually, is seasonally variable, thus making the region subject to periodic drought. Occasional flooding also occurs, however, as the Chaco's rivers swell with melting snow from the Andean highlands. Fresh water supplies are limited and saline ground water limits the use of its relatively fertile land. It consists of two distinct subregions: the Lower and the Upper Chaco. The lower Chaco (department of Presidente Hayes) forms a great inverted triangle of about 5.8 million ha. The surface is level, forming a plain of small elevations with slow surface drainage. Much of the area is covered with water during a fourth of the year. The depth of the water table varies from a few inches to 3 feet. It is covered by natural pastures and small concentrations of forest in the drier areas. The Upper Chaco, on the other hand, comprises an area of about 18.8 million ha. Its soils are similar to those of the lower Chaco, except it has a smaller incidence of flooding due to higher elevations and slope. The soils are mainly salty and alkaline. The predominant plants are pasture grasses, semi-arid tropical forests and cacti, which are found in the higher elevations in the north. Abundant water resources suitable for human consumption and agricultural use, mainly livestock, have been found at depths of about 100 to 250 meters below the surface.

5. Eastern Paraguay, comprising about 40% (16 million hectares) of the country, is a region of spacious planes, broad valleys, and low plateaus. Its local relief features seldom exceed 100 feet and the highest peak rises to 2,300 feet above sea level. Rainfall averages 60 inches annually and is generally well distributed throughout the year. It is estimated that about 30% of the area consists of soils suitable for intensive agriculture, 20% are suitable for moderate agriculture and livestock use, 40% are mainly suitable for livestock, and the remaining 10% are suitable for forest use only. The most fertile soils of Paraguay are concentrated in Itapua and Alto Parana in the Eastern region. The Itapua subregion embraces an area of about 1.5 million ha., of which about two-thirds are suitable for intensive land use. The Alto Parana subregion has an area of about 5.1 million ha. and, although its soils are considered among the best in the country, it is sparsely populated and not yet developed.

#### The Role of Agriculture in the Economy

6. Agricultural production, including livestock and forestry, constitutes the most important productive activity of the Paraguayan economy. In 1974, it accounted for more than a third (35.4%) of the Gross Domestic Product (1972 prices) and provided employment for about 49% of the labor force. It was also the main source of foreign exchange earnings, accounting for about 97% the value of exports in 1974. About two-thirds of these exports consist of semiprocessed agricultural commodities.

7. During recent years the agriculture sector experienced a strong growth performance relative to that achieved during 1964-69 when production grew at a rate of only 1.3% per annum. The expansion of crop, forestry, and

livestock production during 1969-74 resulted in a sectoral growth rate of 6%, exceeding the estimated 2.6% annual rate of growth of population. The table below summarizes the level of growth rates attained by the sector and each subsector:

Table 1: Agriculture Sector Growth 1964-1974

	1964-1974	1964-1969	1969-1974
Crops	4.8	1.9	7.5
Livestock	2.8	1.1	4.5
Forestry	3.5	(-)	4.6
Fisheries and Hunting	3.2	13.5	0.8
Agricultural Sector	<u>3.9</u>	<u>1.3</u>	<u>6.0</u>

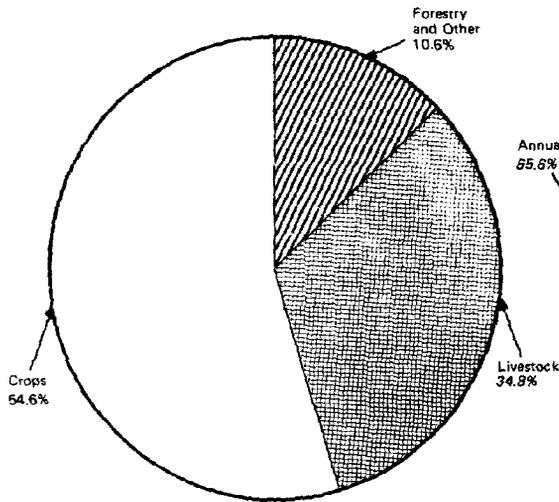
Medium and Long-Term Economic Prospects of Paraguay

Source: Statistical Appendix, Table 2.2

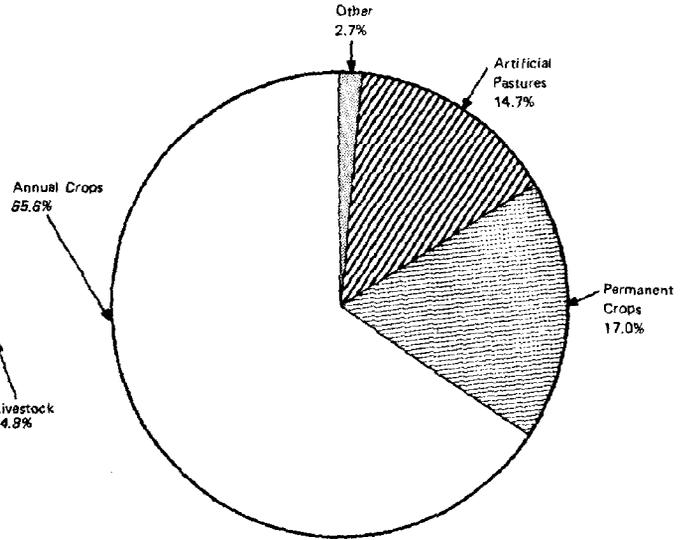
8. Crop production accounts for the major and expanding portion of GDP in agriculture (from 50% in 1969 to 54% in 1974). During the last five years the expanding share of crop production, mainly accounted by soybean production, has been accompanied by a decline in the share of livestock (from 38% in 1969 to 35% in 1974) as the better lands are being shifted from extensive livestock operations to intensive crop production. This trend should continue in the future although in absolute terms both activities can be expected to increase rapidly during the coming years. Chart 1 highlights some of the main structural features of the agriculture sector.

PARAGUAY

STRUCTURE OF GDP  
IN AGRICULTURE, 1973

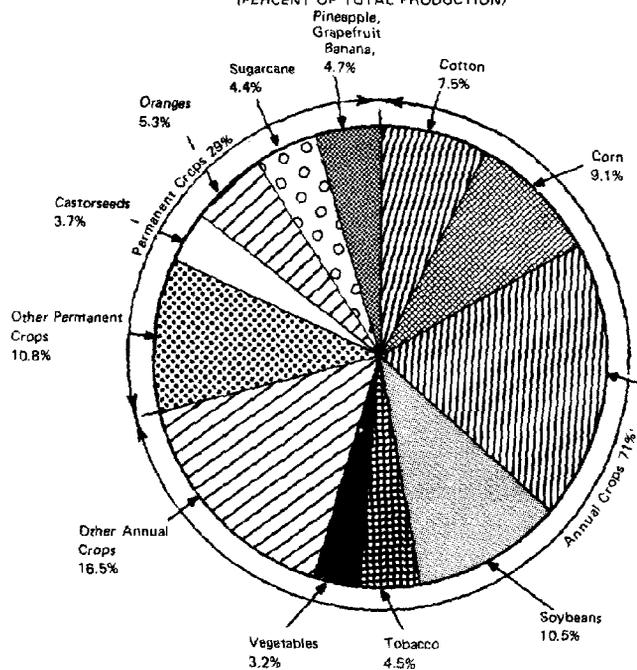


STRUCTURE OF  
HARVESTED AREA, 1973

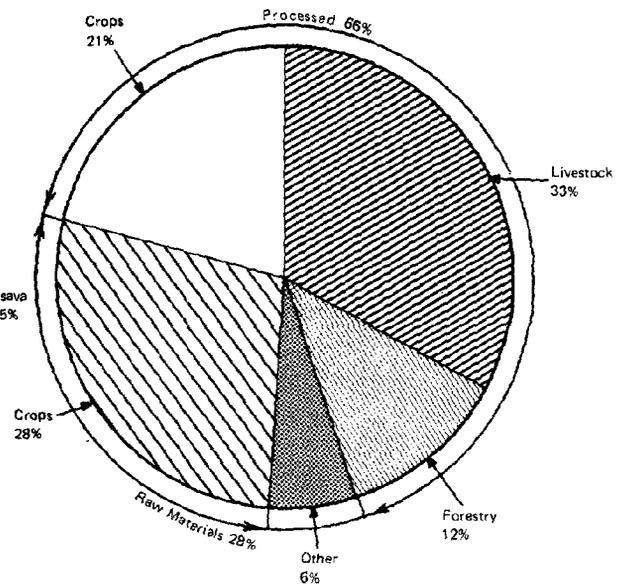


STRUCTURE OF CROP  
PRODUCTION SUBSECTOR  
1973

(PERCENT OF TOTAL PRODUCTION)



SECTOR COMPOSITION OF  
EXPORTS, 1973



## II. STRUCTURE OF PRODUCTION

### A. Crop Production

9. Agricultural development in Paraguay can be expected to result in some diversification of the regional structure of crop production. The major portion of crop production is presently concentrated in the Central subregion. This area accounts for about half of the total output of the most important crops: cassava, soybeans, corn, cotton, tobacco, oranges, sugarcane, castor seed, and coffee. The other important producing subregions are Itapua, Concepcion-San Pedro, and Alto Parana which together account for about 40% of total crop production. Table 2 below shows the regional structure of crop production in 1972. Future expansion of production is likely to occur in Itapua and Alto Parana as these regions already have two well established poles of development in between which lie about 1.0 million hectares of undeveloped land suitable for crop production. Development projects programmed for the Concepcion-San Pedro region will enhance its growth prospects. Among these, the improvement of the Coronel-Oviedo-Yby Yau road and the establishment of a sugar mill are likely to have the most important impact. Crop production in the Chaco region is not likely to increase significantly during the next five years as its potential lies mainly in extensive livestock production during the medium term.

Table 2: REGIONAL STRUCTURE OF CROP PRODUCTION <sup>1/</sup>, 1972  
(Main Crops)

	<u>Chaco</u>	<u>Central</u>	<u>San Pedro</u>	<u>Alto Parana</u>	<u>Amambay</u>	<u>Itapua</u>	<u>Misiones</u>	<u>Neembucu</u>
		Percentage of Total Production						
Corn	0.3	47.0	16.3	9.6	19.3	7.2		
Manioc	0.1	57.8	16.7	9.6	11.7	3.8		
Beans	0.8	56.1	13.0	9.9	7.8	13.9		
Sugarcane	5.9	93.0	0.6	-	-	-		
Cotton	3.2	55.0	16.6	5.0	9.4	10.5		
Wheat	0.1	21.4	34.8	3.9	25.2	14.3		
Soybeans	-	12.8	2.7	18.4	57.4	11.5		
Rice	-	45.7	-	-	28.7	25.3		
Peanuts	21.5	49.9	11.1	3.1	6.7	7.2		
Tobacco	-	54.4	27.2	15.6	2.0	0.6		
Total	<u>1.3</u>	<u>49.6</u>	<u>13.1</u>	<u>9.9</u>	<u>19.1</u>	<u>6.8</u>		

<sup>1/</sup> Share of the gross value of production for each crop.

Source: Encuesta Agropecuaria por Muestreo, MAG, 1972

### The Role of Small Farms in Crop Production

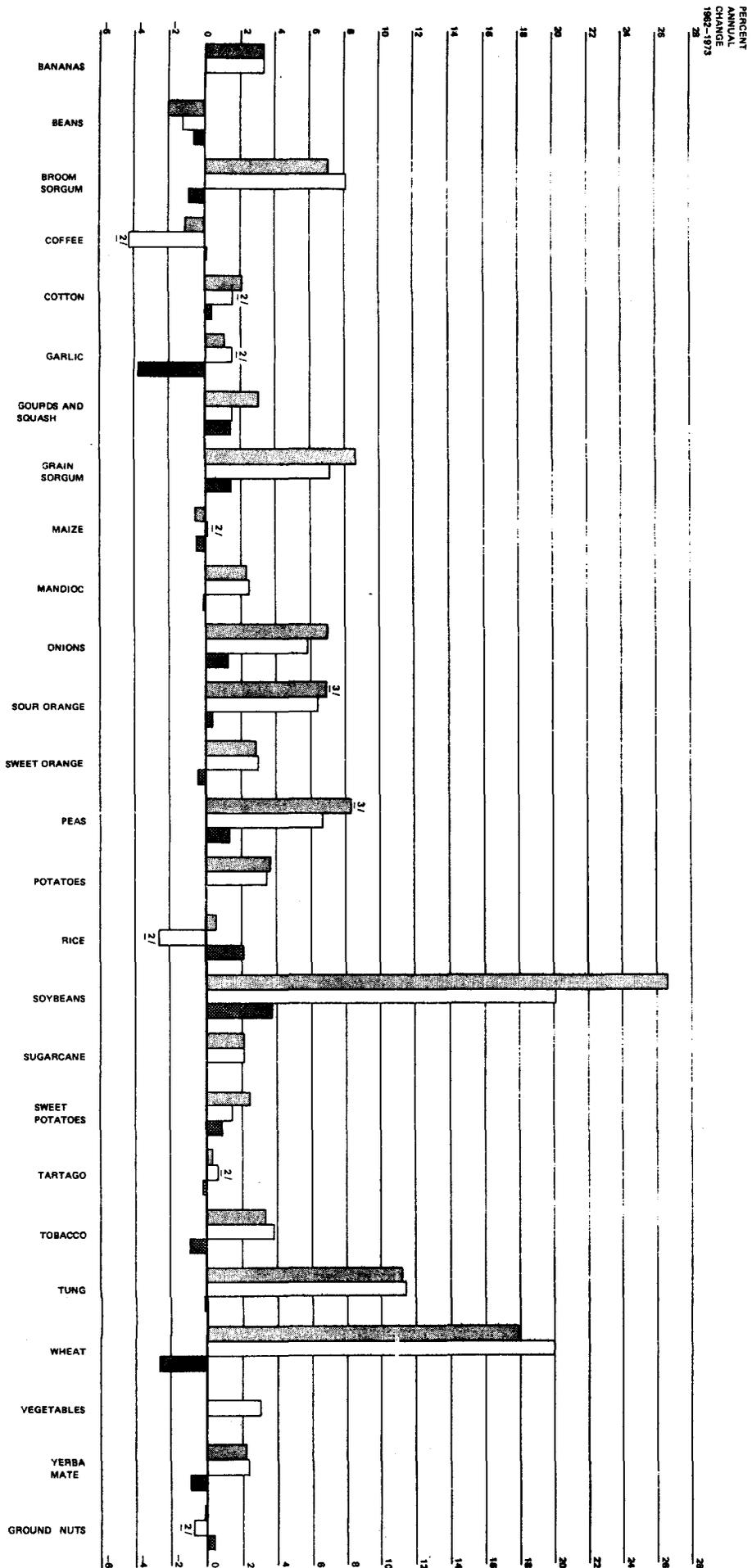
10. Small farmers in Paraguay are an important source of crop production and the Government's policy and programs for expanding production have been consistent with their needs. Small farmers in Paraguay produce a wide array of crops and account for over two-thirds of Paraguay's production of cotton, peas, sweet potatoes, cassava, peanuts, soybeans and tobacco. They also produce about half of the annual production of sugarcane, onions, lima beans, corn and potatoes. Three of the major Government commodity programs involve soybeans, cotton, and tobacco which are the crops that offer the greatest potential for improving small farmers' income. The National Soya Program was designed to increase the area planted by 100% during a three-year period (from 73,000 ha in 1972 to 146,000 ha in 1974). The targets were nearly met in 1973, when the area harvested reached 140,000 ha. This is a significant accomplishment and its success explains the rapid rate of growth of soybean production during the last three years. Considerable success has also been achieved in implementing the cotton and tobacco programs. The area planted with cotton more than doubled in a three-year period (33,000 ha in 1971 to 81,000 ha in 1974), while the area planted with tobacco increased by 50% over the same period. These three crops accounted for nearly 30% of commodity export receipts in 1974 and it can be expected that they will continue to play a key role in export performance in the future.

### The Main Export Crops

11. Soybean production has been expanding rapidly during the last few years (see Chart 2), but further expansion will be closely linked to increases in drying capacity. The drying capacity is insufficient and large losses occur at harvest time when the humidity is high. Soybean prices and exports are regulated by the Ministry of Agriculture, which encourages local processing and sets minimum prices. These prices are not effective, however, because producer prices are set by market forces in the absence of a Government purchasing program, and because of illegal trade across the country's borders. A program designed to increase the production of this crop will involve five basic activities: (a) opening new areas, mainly in Itapua, Misiones and Alto Parana; (b) improving the soils in existing areas of production (mainly liming); (c) helping commercial farmers to acquire farm machinery and drying equipment; (d) increasing the processing capacity of the local oil extracting industry; and (e) providing small farmers with services, particularly drying and storage.

12. Cotton production in Paraguay is characterized by low yields and excess processing capacity. Production consists mostly of short fiber varieties grown by small farmers in the Departments of Paraguari, Coaguazu, Concepcion and Misiones. Productivity per hectare could be increased through farm mechanization and irrigation which should improve the utilization of existing capacity. At present, part of the total production is processed by 11 cotton gins with a total capacity of 300,000 tons, about 200,000 tons in excess of the current level of production. There is also a modern multipurpose textile plant in Pilar considered among the best in LAFTA. This plant, however, also operates below capacity. Cotton exports are in the form of cotton lint and are marketed in Uruguay, UK, France, Germany and Japan.

PERCENT ANNUAL GROWTH RATE OF SELECTED CROPS 1982-1973<sup>1/</sup>



 = AREA HARVESTED  
 = YIELD PER HECTARE  
 = PRODUCTION

<sup>1/</sup>  $Y_t = Y_0(1+r)^t$   
 $\log Y_t = \log Y_0 + t \log(1+r)$   
 Where r is the growth rate  
 2/ Not significant at 0.90 level of confidence  
 3/ Mission estimate

13. Although tobacco production has experienced a favorable growth rate in recent years (12% in 1973-74), further expansion is dependent on increased external demand which in turn will depend on Paraguay's ability to improve quality, particularly curing and classification methods. Investments in curing facilities at the farm level appear to be absolutely essential. Paraguay produces three types of tobacco: the "Suave," a very light type; the "Flojo," a mild variety with low levels of nicotine, and the "Fuerte," a variety high in nicotine. The latter enjoys a stable demand in Argentina, France and Spain.

14. Sugarcane could become one of Paraguay's major exports in the future. Foreign investors may construct two modern sugar mills north of Asuncion which would double the current level of production. At present, most of Paraguay's sugarcane is grown in the Departments of Guaira, Presidente Hayes and Paraguari. Most of the existing mills are obsolete and their production costs are high. In addition, production is fragmented and the farm units are too small. In the Department of Guaira, for example, about 94% of the farms producing sugarcane were under 5 ha and the area devoted to sugarcane about 1 ha. If Paraguay is to compete effectively in the world market, the Government will need to encourage the establishment of more viable farm units (at least 5 ha planted to sugarcane).

#### Main Crops for Domestic Consumption

15. Cassava is one of the main crops produced for domestic consumption and is grown as a staple crop all over the country. It has a good export potential in the form of chips and flour as indicated in a study carried out under the sponsorship of the UNDP. The study showed that a plant could be technically and economically viable provided an appropriate management and ownership structure was established. The investment cost for a 100,000 ton plant of chips or pellets is estimated at US\$5.0 million.

16. Corn is the second most important domestic crop after cassava. Although most of the production is consumed internally, some is exported to Brazil and Argentina. Export levels, of course, depend very much on the availability of surpluses which fluctuate widely according to production performance. Corn production could be expanded significantly if its demand as a feed grain increases with an expansion in livestock fattening activities.

17. Paraguay is self-sufficient in rice production although some exports may be possible to neighboring countries. In 1974, about 35,000 tons were produced, of which 83% corresponded to irrigated rice and 17% to dryland rice. Most of the rice produced is medium-grain but farmers are experimenting with long-grain varieties. Dryland rice can be grown as a summer crop in rotation with wheat. Its production can be increased significantly by utilizing the areas adjacent to the Parana, Paraguay and Tecubiary Rivers, where about 200,000 ha of recent alluvial deposits offer an opportunity for large-scale production.

18. Sorghum production for domestic consumption, mainly in the livestock subsector, could be increased significantly. Sorghum is drought resistant and will grow well in areas where summer rainfall is limited. It also has the advantage of being less demanding in terms of soil fertility. The Upper Chaco subregion appears to have the best conditions for increasing the production of this crop. At present, only 6,000 tons are being produced.

19. Paraguay continues to be dependent on imported wheat despite Government efforts to reduce this dependence. In 1967, the Government formulated a wheat program that called for a rapid expansion in the area planted by introducing large scale mechanized farming methods, modern inputs, and basic on-farm infrastructure. The main vehicle was a credit program administered by the Agricultural Department of BNF and funded by AID (19% of the cost), suppliers' credit (19%) and local resources, particularly those from the Central Bank (about 40%) and BNF (22%). The program was initially successful but bad weather, in 1967 and 1969, caused serious financial losses to growers. In 1972, there were serious losses caused by blight infection. These losses seriously strained the financial situation of farmers who, unfortunately, had loan repayment commitments spread over a relatively short period of time. The net result was an overall financial crisis for wheat growers and the National Development Bank. The latter failed to properly assess the viability of each borrower and as a result granted loans with unreasonably short repayment periods and with inadequate collateral. This, in part, reflected the structure of the original program's financial plan, which was based on relatively short-term loans. While by itself the program was not successful, it encouraged the planting of soybeans as a summer rotation crop to spread machinery costs and reduce the risk associated with monoculture. Soybean production was thus successfully stimulated. A careful reassessment of the weak points of the program is necessary. Present limitations to its expansion are: (a) the unavailability of high-yielding varieties of seed adapted to Paraguay's environment, and (b) the sparse use of fertilizer and lime. A solution to these problems could lead to some progress towards the self-sufficiency goal.

#### B. Livestock Production

20. Paraguay's ecological characteristics, its ample availability of land, and the relatively favorable long term market prospects for beef indicate that the subsector will continue to play an important role. In 1974, livestock production accounted for about 12.4% of GDP and about one-third of Paraguay's exports. It employed about 5.5% of the labor force, and utilized about 37% of the country's land area. In addition, it accounted for about 82% of the country's capital stock in the agricultural sector. Grazing land for cattle

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1/ In 1973 the herd consisted of about 39.5% cows (3 years and older); 19.0% heifers (1 to 3 years); 16.2% calves (under 1 year), 17.7% young bulls and steers (over one year); 3.6% bulls and 4.0% oxen.

production comprises an area of about 14.3 million ha. of which 40% are in the Eastern region and the rest are in the Chaco region. With a cattle population of 2.9 million head in the Eastern region and 2.0 million head in the Chaco 1/, the average density in each region is estimated to be about 2 ha per head and 4.3 ha per head respectively. The grazing density for the country as a whole was estimated at 2.9 ha per head. Potentially this could be as low as 2.0 ha per head, thus permitting a 45% increase in the herd without a danger of overgrazing existing pastures. The adoption of improved practices such as fencing, pasture rotation, pasture improvement, supplemental winter feeding and breeding is an important requirement for increasing the size of the herd.

21. The Paraguayan breeding stock originated from the different types of cattle brought by the Spaniards (Creole). Through the years, it underwent a process of adaptation and has been improved by crossbreeding with English breeds (Hereford, Shorthorn and Sussex) and with Zebu cattle imported from Brazil (mainly Nellore and Guzerot breeds). Although the existing breeds may be adequate, the shortage of pure-bred cattle may be a constraint for improving the genetic quality of the stock. The present number of registered cattle is insufficient to meet the demand for breeding sires without incurring excessive inbreeding. This demand is estimated at 20,000 replacement sires per year, but there are only about 1,300 registered cows. It will therefore be advisable to increase the genetic base through importation.

22. Improvement of production efficiency through appropriate investments and technological improvements should be a long-term objective closely linked to research results. Productivity of cattle is low in Paraguay for a variety of reasons. The calving percentage is low (45%), the mortality rates high (about 10%), the length of time required for getting steers ready for the market long (4-5 years to reach 370 kg liveweight), female productive life is short (3 to 4 calves), and extraction rates are relatively low (14%). Furthermore, the majority of the 85,000 cattle ranches consists of subsistence type of operations (those having less than 20 head) not fully specialized in this activity. If these operations were excluded, the number of specialized livestock ranches would be about 20,000. The table below summarizes the number of ranches by size of herd.

Table 3: Structure of Cattle Ranches by Size of Herd

<u>Category</u>	<u>Size (Head)</u>	<u>No. of Ranches</u>	<u>% of Total</u>
Subsistence	1-19	66,116	77.7
Marginal	20-99	15,746	18.5
Small Commercial	100-1,999	2,920	3.4
Large Commercial	2,000 and over	299	0.4
Total		<u>85,081</u>	<u>100.0</u>

Source: Diagnostico del Sector Agropecuario, Ministerio de Agricultura.

Meat Marketing System

23. The meat marketing system in Paraguay is separately geared for the export and domestic markets which results in various inefficiencies. During the past several years about 71% of the cattle slaughtered were for domestic consumption and the remainder for export. The exportable surplus, however, fluctuated from a level of 22% in 1969 to about 44% in 1972. The cattle available for the export market are slaughtered in 10 packing houses, and those for domestic consumption are slaughtered in 69 slaughterhouses. The Government's policy is to set export quotas and to restrict the slaughterings for export to specific time periods. Since packing houses depend to a great extent on the volume processed to obtain a profit, individual firms are induced to expand their processing capacity in order to capture the largest possible share of the overall quota during the allowed slaughtering period. The overall effect is that all packing houses combined operate at 56% of their capacity. Most of the slaughter houses for the domestic market operate under poor conditions and waste some of the valuable byproducts from the slaughtered animals. In addition, since they operate with low levels of fixed investments, and frequently evade taxes and sanitary inspections, they effectively prevent export packing houses from competing in the domestic market when export prices are falling vis-a-vis domestic prices. 1/ When the relative export price rises 2/, however, local slaughter houses cannot compete with the packing houses because they do not meet sanitary requirements. The system is

1/ The current closure of the European market for beef has caused serious financial problems to export slaughterhouses, which have built sizeable inventories and also have financial commitments falling due in the short-term.

2/ Per capita consumption of beef averaged about 36 kilograms during the 1962-72 period. In 1972, however, it declined to 29 kilograms as result of the strong increase in external demand which caused prices to rise sharply.

therefore very unstable and action must be taken to resolve these problems. A sound strategy will be to centralize all slaughterings for the Asuncion market. This should help increase sanitary standards (infested animals are sold in the market) and encourage more efficient utilization of cattle byproducts and existing capacity.

#### Expanding Beef Production

24. To increase beef production in Paraguay, which accounts for about 60% of livestock production, the Government should take measures to utilize more efficiently the country's abundant land resources. As a first priority, the Government should aim at increasing the breeding stock through imports, both of purebred and mixed cows, and at reducing the level of female slaughterings through an expanded breeding retention program. Consistent with these objectives, the Government should encourage the establishment of new ranching operations and also aim at increasing productivity by providing financial assistance to established operations in areas of high density to increase the carrying capacity. Finally, the Government should design a program of cattle feeding (possibly supplemental winter feeding) to shorten the time period required for finishing a steer for slaughter. Full implementation of plans to expand beef production should await, however, the resolution of the present crisis in the world market for beef.

25. The Government should encourage the development of unused lands to promote the establishment of new operations. There is a great potential for incorporating vast areas in El Chaco and in the Eastern region, but local entrepreneurs do not have the financial capacity to do this. Unless the Government wishes to finance this expansion through foreign investment, financial resources for establishing new operations with local entrepreneurs will be needed (a large proportion of the land and the herd is already controlled by foreign interests). As a first step, it will be advisable to design a pilot program aimed at establishing well-planned land settlement schemes based on livestock production. Fondo Ganadero, the main lending channel for livestock development, has already established a model farm in the Upper Chaco. Its first experiences have been successful and could serve as the basis for establishing a large-scale colonization program to develop about 1.0 million ha for livestock production during the next ten years. The total investment cost per ha is estimated at about US\$350. This cost, of course, includes all investments needed to make a new ranch fully operational: i.e. land clearing, water, artificial pastures, fences, breeding stock, housing, vehicles, machinery, and building structures. The resources required to finance an undertaking of this magnitude depend very much on the phasing of the program. However, under the assumption that the program will aim at developing 100,000 ha per year, the total investment cost for a five-year period would be about US\$47 million, or about US\$9.4 million per year. More than half of these resources would have to be provided by public credit sources.

26. With regards to a program designed to increase productivity on existing operations, it will be necessary to put some emphasis toward long-term on-farm investment on small or medium-size farms and to develop a program of action to deal with the main physical constraints limiting the level of

productivity. These factors are: the low rate of survival of calves in the Chaco region and the low conception rates in breeding herds in the Eastern region. The first problem is caused by excessively large paddocks and extended areas of bush impeding the control of breeding stock particularly during calving time. This could be solved through better herd management once an adequate infrastructure has been constructed within the ranch. Calving paddocks, better water supply facilities, paddock sub-division as well as seasonal mating are essential to avoid high calf losses in the Chaco. The Eastern region, in contrast to El Chaco is affected by problems related to the physical characteristics of its soils: soils are acid, and generally deficient in minerals, mainly phosphorus. This deficiency is responsible for the low conception rates. Supplementation with phosphorus and microelements such as copper and zinc have led to substantial increases in calving rates, but this practice is limited by the intake of the animal and the poor palatability of bone flour. Top dressing of both natural and cultivated pastures with phosphatic fertilizers should help to eliminate phosphorus deficiencies in cattle and also stimulate the growth of tropical legumes (the cheapest and most effective source of protein). Before embarking on any substantial effort to supply phosphorus to cattle in this way, however, it will be essential to determine the most economical amount of phosphatic fertilizers to be applied on natural and cultivated pastures, and the most strategic use of these pastures in relation to the nutritional requirements of cattle, particularly weaners and breeding stock. Therefore, a practical series of phosphatic fertilizer research experiments on this subject will be needed in order to determine whether future investments in this field are justifiable.

27. Paraguay could also increase productivity in the livestock sub-sector by utilizing locally-produced feeds in a program of supplemental cattle feeding. This should have two advantages: first, it would help increase the value-added content of Paraguay's agricultural produce, and second, it would promote an economic activity which would help utilize small farmers' labor more efficiently. Supplemental feeding should enable Paraguay to make better use of cakes and expellers now being exported to countries where these products are used in the cattle-feeding industry. Moreover, supplemental feeding particularly in the winter, should help increase the demand for labor in those periods when its demand is low.

28. Supplemental winter feeding should also help increase beef production as the availability of forage in the winter decreases by as much as 50% from the levels attained in the spring. This causes weight loss or retards animal growth. Supplemental winter feeding would appear to be economically viable even if its benefits would just cover its costs. This is so as the major gains would arise from an increase in the annual level of meat production per hectare which could increase by at least 30% from its present levels. Research carried out by the National Livestock Research Program (PRONIEGA) showed that through supplemental winter feeding, it is possible to increase the average daily weight gain per head by about 14%. PRONIEGA's results are summarized below:

**Table 4: AVERAGE DAILY WEIGHT GAIN  
(Kilograms per head)**

	Fall	Winter	Spring	Summer	Year
Without Supplement	.223	.120	.374	.402	.280
With Winter Supplement	.250	.234	.382	.409	.319

Source: PRONIEGA

29. PRONIEGA research during the last four years has also shown that sorghum silage, grain sorghum and minerals are the most economical supplements. The first two are used mainly as sources of energy and protein. The latter, however, are needed to meet mineral deficiencies which arise because soils in Eastern Paraguay lack some essential microelements. The cost and benefits of various alternatives are summarized below:

**Table 5: COST AND BENEFITS OF SUPPLEMENTAL FEEDS**

	Cost		Benefits		Net Benefit (¢)
	Quantity (kg)	Value (¢)	Annual Net /1 Weight Gain (kg)	Value (¢)	
Peanut Expeller	45	900	11	550	(350)
Grain Sorghum	45	450	17	850	400
Silage (Sorghum)	396	675	25	1,250	575
Peanut Expeller/Silage	90	1,220	12	600	(620)

/1 All feeds were supplemented with minerals (bonemeal and salt in a 2:1 proportion). Adding microelements to diet increased the returns for each alternative.

Source: PRONIEGA, 1974 Annual Report

**Dairy Products, Poultry and Pork Production**

30. Production of poultry, pork, and to a lesser extent, dairy products constitute activities which could increase the earnings of small farmers and help to reduce seasonal underemployment. Promotion of these activities will require provision of technical assistance, and medium and short-term credit.

### Dairy Products

31. Dairy production, despite relatively good prices, is growing slowly. It is not keeping pace with the demand because of:

- (i) high feeding costs;
- (ii) high concentration of dairy production in the surroundings of Asuncion combined with exceedingly small farm sizes, thus limiting the feasibility of a milk production system based on pasture; and
- (iii) high cost of imported cows, poor adaptability and breeding performance, bad management practices, and, as a consequence, high percentage of dry cows.

32. Milk production comes mainly from 400 dairy farms concentrated around Asuncion. Limited production is also carried out in Caaguazu, Misiones and the Mennonite colonies of the Chaco. In the vicinity of Asuncion there are approximately 12,000 dairy cows of which 50% are of Holstein-Frisian origin, the rest being criollo or crossbreeds. Yields from good Holstein cows average 2,000 liters per lactation and feeding is based mainly on high cost concentrates. On the other hand, the Mennonite colonies in the Chaco have a relatively cheap production system based on the utilization of cultivated pastures, and minimal use of concentrates with breeds well adapted to the local environment.

### Poultry

33. With a total of 7 million birds in Paraguay, poultry production supplies approximately 2,200 tons of meat and 27 million eggs annually and the industry has been growing at an estimated rate of 2% per year. Twenty percent of the birds are concentrated in commercial enterprises of 10,000 to 20,000 units. The main producing areas are the Mennonite colonies in the Chaco, the Japanese colonies in the Eastern Region and the surrounding areas of Asuncion. Day-old chicks are generally imported from Argentina or Brazil but some are also hatched locally. Feed concentrates are produced in Paraguay based mainly on maize, wheat bran, soya and groundnut expeller.

34. Due to the rising costs of concentrates, the erratic supply of components and the effects of the cattle cycle, the commercial poultry industry has been stagnating. The presence of a "de facto" monopoly controlling supply of concentrate components is restraining the expansion of commercial poultry production. In response to this situation, the Government, through credit programs and technical assistance, is encouraging poultry production at the small farmer level using family labor, relying mainly on farm by-products and scavenging, and operating with minimal inputs.

### Pork

35. With the exception of a few commercial enterprises and some colonies, pig production is carried out mainly by small farmers and seldom

constitutes a specialized enterprise, being usually a sideline. In 1972, the estimated pig population of the country amounted to 0.6 million head, growing at 2% to 3% per year. Annual output is approximately 776,000 head slaughtered. Main improved breeds are Landrace, Large White, Duroc Jersey, and Berkshire. Pigs are generally marketed between 100 and 150 kg liveweight and the tendency has been to produce a lard type. Semi-extensive methods of breeding are based on feeding manioc and maize and letting the hogs graze and scavenge on cultivated pastures. Prevailing diseases are hog cholera and swine fever, responsible for high mortality in 1971.

36. Like the poultry industry, expansion of the pig industry is limited by high cost of inputs, principally concentrates. Government policy has been oriented towards production on small farms, aiming principally at self-sufficiency in feeds grown on the farms. Some credit and technical assistance have been provided for this purpose mainly by BNF. This approach seems to have been widely adopted but its impact on the implementation of a beef substitution policy will be minimal, particularly due to problems of physical access to markets, management and the fact that retail prices are exceedingly high compared with those of beef.

### C. Forestry

37. Commercial exploitation of Paraguay's forest is feasible, particularly in the area east of Coronel Oviedo, classified as high forests (Bosques Altos). Paraguay has about 21.1 million ha of forest classified as temperate-warm-humid (54% of the total land area). Its reserves are located in the Eastern region between the Paraguay and Parana Rivers. An inventory of Paraguay's forest resources carried out by FAO between 1967 and 1972 showed that more than 50% of the forest area in Paraguay contains commercially valuable timber. In the area surveyed alone, there were more than 105 million m<sup>3</sup> of woods with some commercial value. Most of these areas were privately owned (about 80%). The FAO survey showed that the forest area contains about 16 m<sup>3</sup> per ha (in log equivalent) and about 75 young trees per ha of exportable types of wood.

#### Forest Management Problems

38. The survey pointed out the need for improving the management of the country's forest resources which are not being efficiently exploited. It showed that the annual rate of extraction of valuable species exceeded the process of natural growth and regeneration and indicated that the existence of a large number of small operations contributed to the accelerated rate of extraction (about 1.4 m<sup>3</sup> log equivalent) per year. In the cases where the areas were large and operated by a large firm, the rates of extraction were relatively more rational.

### The Wood Processing Industry

39. Paraguay's wood processing industry is still at a relatively low level of development. There are about 100 firms that produce furniture and a paper mill that produces cardboard and wrapping paper. There are also about 150 sawmill firms (each consuming more than 5 m<sup>3</sup> per day), and about 200-300 hand-operated family sawmills. About 50% of the wood is processed in the Asuncion - Puerto Presidente Stroessner axis. Other areas in the northeast are being opened while those in the south are declining. The basic problems of the industry is that the equipment is somewhat obsolete. This limits the possibility of increasing the value-added content of forestry products and at present, only 5% of the logs cut are used for producing wood products. In addition, it is estimated that the sawmill industry operates at about 50-65% of capacity. Their operations are somewhat inefficient and could be improved significantly with some additional investments to modernize equipment.

### Prospects for Forestry Development

40. In order to rationalize the exploitation of forest resources and to increase the value added of their output, it will be necessary to implement a comprehensive program to deal with the main problems affecting the subsector. This program would need to cover the following points:

- (i) regulation of the rate of extraction, and development of enforcement capability;
- (ii) a program of reforestation (natural and planned);
- (iii) an investment and technical assistance program to increase productivity in sawmill operations; and
- (iv) an investment and export promotion program aimed at increasing the value-added content of Paraguay's wood products.

### Forestry Regulation and Enforcement Capability

41. The National Forestry Service (NFS) was established in 1973 under the jurisdiction of the Ministry of Agriculture (MAG). The forestry law provided for NFS to protect, conserve and increase the forest resources of Paraguay. It also provided for NFS to: (a) incorporate into the economy those areas which would remain exclusively as forest reserves; (b) protect the hydrologic resources of the country; (c) promote reforestation and protect agricultural areas; (d) enhance and protect the natural beauty and landscape, including the development of tourism centers; (e) coordinate with the Ministry of Public Works in the planning and construction of access roads; and (f) protect wildlife. The tasks assigned to NFS are cumbersome and beyond its current manpower and financial capability. To enable NFS to accomplish its task, the Government needs to provide it with sufficient financial resources.

42. The Government should accelerate the implementation of a program aimed at decentralizing NFS's operations. There is an urgent need for NFS to concentrate its resources in the following activities:

- (i) developing economic, technical and financial criteria to plan the use of land resources, including, inter alia, identifying areas for forest reserves, for active commercial forests operations and for agricultural production;
- (ii) implementing a program of National Parks to be established in both private and public lands;
- (iii) accelerating the preparation of a program of reforestation both with native and rapid-growth adapted species;
- (iv) establishing a forest management system to rationalize the exploitation of existing resources.

#### Reforestation

43. Reforestation is feasible in Paraguay's eastern region which has the ecological characteristics required for the establishment of forest plantations, either with native or with tropical coniferous species. Reforestation with native species would involve a simple program of activities aimed at complementing the natural reforestation process. The areas more suitable for such a program would be those which have low densities of valuable species but which could be set aside as forest reserves for future use. Reforestation with adapted species in Misiones, Argentina has shown that tropical coniferous species can adapt well to the ecological characteristics of areas which are very similar to those of Eastern Paraguay.

#### Investments in Sawmill Operations

44. The Government has encouraged the modernization of the sawmill industry, but progress has been slow and the results not fully satisfactory. Log exports were eliminated by decree 30760 of 1967 but the incentives provided by the Government under law 216 encouraged the expansion of capacity rather than the modernization of the industry. Although the Government's policy was well-founded, the overall result was not the most desirable outcome as there was already some excess capacity. The installed capacity increased by more than 100% from 1971-74. In the future, the Government's objective should be to increase productivity through improvements in technology rather than to promote the expansion of capacity.

#### Investments in Wood Processing Industries

45. Over the medium term, Paraguay should aim at increasing the value added of its forest products. In this regard, an investment program to help expand and improve productivity in furniture industries, as well as

integrated forestry plants, should be accorded high priority. Paraguay's furniture industry has been gradually acquiring expertise, and with appropriate technical and financial assistance, it should be possible to produce finished goods for export. The World Bank, through the International Finance Corporation, recently financed the establishment of FINAP, a model integrated forestry industry which will have a significant impact on the economic exploitation of Paraguay's forest resources. The Government needs to identify those operations which are potentially capable of following FINAP's approach. This is essential to facilitate the flow of additional external financial assistance for the subsector.

### III. MARKETING AND PRICES

#### A. Marketing

46. The market for agricultural commodities in Paraguay is competitive; on the supply side there is a large number of sellers and on the demand side, there is a sufficient number of buyers. There is little evidence of monopolistic practices, and, therefore, prices are set near efficiency levels. The market is influenced by supply and demand conditions from abroad, particularly Argentina and Brazil, as a result, domestic prices follow closely the movements of world market prices.

47. Paraguay does not have a commodity purchase program. The Government nevertheless establishes minimum prices for sugarcane, wheat, and soybeans delivered to the mill. In the case of the first two, the minimum prices are enforced as it is relatively easy to control the price at the mills. This is not the case for the latter. In some years, the Government has also resorted to export quotas which, except for the one set for beef, are inoperative because of the prevalence of an illegal trade across its vast borders. The quotas apply mainly to exports of soybeans and cattle.

#### Marketing Channels

48. Farmers in Paraguay sell their produce mainly to intermediary buyers and to a lesser extent to cooperatives and Government agencies. Intermediary buyers, usually merchants, farmers or truckers, purchase the farm products within their localities and frequently use secondary agents to help them contact all producers in their area. They own available storage facilities, generally very rudimentary, and use their own resources for financing their operations. They are not fully devoted to marketing and hence, also depend on other activities for their livelihood. The main problems limiting their efficiency are the following:

- (i) lack of storage capacity to meet peak requirements;
- (ii) low level of technology (a major cause of losses at the storage stage); and
- (iii) lack of sufficient resources to finance investments in structures, transport equipment, and an adequate level of operations.

49. The cooperative movement has gained some momentum in Paraguay. Its development has been promoted by foreign immigrants who have settled in various areas. Some successful cooperatives have been established by Mennonite colonies in El Chaco. Others have been established by German and Japanese settlers in the Itapua and the central regions. Recently, the movement has spread to small farm areas through the Union Paraguaya de

Cooperativas (UNIPACO), a marketing organization that is expanding its activities with USAID assistance. UNIPACO engages in the purchase, sale, storage and marketing of grains, cotton, tobacco, essential oils, and other commodities produced by small farmers. At the end of 1973, UNIPACO had a net worth of about US\$112,000. Its volume of sales grew from US\$229,206 in 1972 to about US\$2.3 million in 1973. Further expansion and growth is likely as a result of a US\$1.2 million aid loan for the construction of physical facilities for grain storage, barge loading, feed mill and related structures. With these investments, UNIPACO will expand its marketing service to a level of about US\$14.7 million in 1980. UNIPACO's network of local cooperatives cover 21 locations in Eastern Paraguay and it is expected to increase to 24.

50. While cooperatives such as UNIPACO and those established by various immigrant settlers are the most viable alternatives for helping small farmers, other approaches such as farmer corporations should also be considered. The principal difference between a farmer "corporation" and a "cooperative" is that the decision-making authority in the former is proportional to the volume of operations of its members, rather than the equal representation principle of the latter. Both small and large farmers have a need for improving marketing channels, and to this extent, they share common problems. It may, therefore, be appropriate to take advantage of the management skills of larger farmers to benefit those at the lower income level. In a cooperative setup, large farmers are at a disadvantage vis-a-vis smaller members and they are, consequently, reluctant to join these groups. In a corporate relationship, large farmers, particularly the more progressive ones, would not be reluctant to lead marketing groups where the decision making process is closely linked to each individual's level of operations. It would therefore be desirable to encourage the establishment of such corporations. As a first step in this direction, however, it will be necessary to extend to these types of associations the same privileges granted to cooperatives.

#### Improving the Marketing System

51. To improve the marketing system, it will be necessary to increase the efficiency of private intermediaries, to increase the coverage of marketing cooperatives and to improve the Government's services. It will be appropriate to provide some financial assistance to intermediaries for making investments in storage and drying facilities, and to provide short-term credit for expanding their marketing operations to more economic levels.

#### Government's Role in Marketing

52. The Government has made some progress in the area of marketing. The old department of marketing in the MAG has been restructured into a Division of Marketing and Agricultural Economics consisting of two units: Operations and Engineering, and Standards and Marketing. The Division has increased its staff from 8 in 1971 to 39 in 1975. In addition, there are nine temporary

employees who are working as grain receivers or inspectors. The Inter-American Development Bank has provided the Government with some assistance to improve its services in the area of marketing. Through the Agricultural Development Program (PIDAP), IDB helped design an ambitious program of investments in marketing infrastructure. It contemplated: (a) renovating and constructing a network of silos with a grain storage capacity of 14,000 metric tons; (b) organizing a national grain and elevator service; (c) creating a marketing fund to finance inventories; (d) establishing a price stabilization scheme; (e) establishing regulatory legislation for grains; and (f) providing technical assistance, including training of personnel and investment programming. Progress in implementing this marketing program has been slow, and at present it is being reformulated.

#### Price Stabilization and Storage

53. A major unresolved issue in the area of marketing is the question of whether or not the Government should get involved in a price stabilization scheme. If such involvement were appropriate then a rapid expansion in publicly owned storage would be justified. However, since most of the grains produced in Paraguay are internationally tradeable commodities with prices determined externally, it does not appear that it is necessary to establish an expensive price stabilization scheme. While a large public grain storage infrastructure may be unnecessary, a minimum level of storage and drying capacity will still be needed. It will also be necessary to strengthen the basic regulatory mechanisms, particularly those concerning warehouses.

54. A basic warehouse and warehouse receipt law was passed in 1970 which contains various weaknesses that minimize its effectiveness. For example, it only permits corporations to act as general warehouses and to issue negotiable receipts. This provision excludes cooperatives and individual firms which account for about 90% of the trade. The law also prohibits warehousing firms from purchasing and selling commodities. Moreover, it does not provide for adequate bonding or insurance protection. This latter aspect is of critical importance for making such a law effective insofar as the value of a warehouse receipt as a financial instrument depends very much on the level of confidence which institutions and investors attach to it. A low level of protection increases the risk of incurring financial losses and reduces the demand for these instruments.

#### Other Problems Affecting Marketing

55. Transport rates are high in Paraguay because there is a shortage of cargo capacity, particularly at harvest time. This problem has resulted because the Government levies an import duty of more than 100% on trucks and spare parts, and as a result, the growth of the truck fleet has been retarded. This policy is inconsistent with those of most developing countries. It will therefore be advisable to eliminate or lower this duty to levels which reduce amortization and maintenance costs. The Government is currently considering a revision of the tariff structure applicable to trucks and spare parts. It will also be appropriate to provide credit on adequate terms to help expand the

truck fleet. This is a high priority program which should enhance competition among intermediaries and also lower transport rates.

B. Prices

56. From 1968-74, agricultural prices increased steadily and stimulated output growth. The GDP's implicit deflator in agriculture increased at an annual rate of 14.6%. Moreover, the growth of agricultural prices exceeded that of industrial prices by 5 percentage points.

Table 6: IMPLICIT GDP DEFLATORS  
(1972 = 100)

	1968	1969	1970	1971	1972	1973	1974
<u>Agriculture</u>	<u>73.9</u>	<u>77.4</u>	<u>78.4</u>	<u>87.5</u>	<u>100.0</u>	<u>130.2</u>	<u>158.6</u>
Crops	82.3	87.4	86.6	95.4	100.0	135.9	164.7
Livestock	61.3	62.6	63.4	74.8	100.0	125.5	153.2
Forestry	78.8	81.6	90.4	93.1	100.0	119.4	146.9
Hunting and Fishing	122.0	122.8	119.9	99.3	100.0	114.1	138.0
<u>Industry</u>	<u>85.1</u>	<u>87.2</u>	<u>88.5</u>	<u>101.2</u>	<u>100.0</u>	<u>120.3</u>	<u>147.3</u>
<u>GDP</u>	<u>81.7</u>	<u>84.3</u>	<u>85.1</u>	<u>92.2</u>	<u>100.0</u>	<u>121.0</u>	<u>149.0</u>
<u>Price Ratios</u>							
Agriculture/Industry	86.8	88.8	88.6	86.5	100.0	108.2	107.7
Agriculture/GDP	90.4	91.8	92.1	94.9	100.0	107.6	106.4

Source: Statistical Appendix, Table 9.1

57. Although the input/output price relationship turned slightly against agriculture during the 1971-74 period (total input cost rose by about 75% and output prices by about 73%), a shift to more profitable agricultural activities helped stimulate output growth, particularly that of export products. Since labor accounted for about 60% of the increase in input costs, farmers that depend on hired labor changed their cropping pattern to less labor intensive activities. For example, there was a rapid expansion in soybean production, a crop whose labor requirements are relatively low (soybeans utilize about 34 man/days per hectare, compared to 74 man/days per hectare for cotton, 92 man/days per hectare for rice, and 139 man/days per hectare for tobacco). The rapid increase in soybean prices and its lower manpower requirements permitted most farmers to improve their overall welfare. The table below summarizes the price movements of selected annual crops and beef (liveweight basis) from 1968-1973.

Table 7: PRICES OF SELECTED COMMODITIES 1968-1973

(000 of Guaranies per ton)

Crop	1968	1969	1970	1971	1972	1973	% Annual Change
Garlic	177.0	179.2	166.7	129.9	142.9	275.0	3.7
Cotton	14.9	14.8	13.8	17.6	21.0	24.0	11.1
Rice	9.7	9.0	6.9	13.1	13.2	17.0	14.5
Corn	4.1	4.5	7.1	8.0	6.5	9.0	15.9
Peanuts	12.7	12.9	12.6	13.0	15.0	18.0	6.6
Cassava	2.9	3.0	3.0	3.0	3.5	4.0	6.1
Beans	10.8	11.9	12.4	15.7	14.0	18.0	9.8
Soybeans	8.0	7.5	7.5	10.0	11.0	23.5	21.5
Tobacco	24.3	24.3	27.7	31.8	28.0	50.0	12.7
Wheat	10.7	10.7	9.6	10.1	10.0	14.0	3.6
<u>Beef (live weight)</u>	<u>18.5</u>	<u>18.8</u>	<u>19.1</u>	<u>25.6</u>	<u>37.7</u>	<u>47.3</u> /a	<u>16.5</u>

/a Estimated

Source: Technical Secretariat of Planning and Ministry of Agriculture.

IV. BASIC CONSTRAINTS TO OUTPUT GROWTH

58. Over the medium-term, the growth prospects of Paraguay's agricultural sector appear favorable provided the Government is able to design an effective plan of action to help overcome some resource constraints. The most important among these are: (a) limited availability of developed land to increase the area under cultivation; (b) low level of capitalization at the farm level, including a shortage of medium-and long-term credit for investment purposes; and (c) a limited and inadequate institutional capacity for sector planning and for service delivery; and (d) seasonal labor shortages.

A. Land

59. The first major constraint is related to the inherent difficulties associated with a program to increase the area under cultivation. Paraguay has barely tapped its vast land resources, and an expansion of the area under cultivation will involve sizeable investments in land clearing and land improvement. Recent experience indicates that Paraguay is successfully dealing with this challenge. During the 1962-73 period, the growth in agricultural production was primarily based on the expansion of the area planted. For example, 85% of the annual increase in crop production is explained by increases in the area planted.

60. Soil surveys of Paraguay's land resources indicate that about a fifth (8 million ha) of its land area is suitable for crop production and that the area presently under cultivation with annual and tree crops can be expanded eightfold provided certain improvements are made. Much of the land now classified as forest (24 million ha) consists only partially of commercially exploitable high forest, while the larger part--mostly in the Chaco--contains mostly scrub forest of little commercial value. An additional 5 million ha could be brought into production by clearing brush and by planting artificial pastures for livestock production.

Table 8: ACTUAL AND POTENTIAL LAND USE

	Actual (1972) <sup>/1</sup>		Potential <sup>/2</sup>	
	'000 ha	%	'000 ha	%
Crops	952	2.32	8,000	19.7
Pasture Land	14,849	36.53	14,050	34.5
Forest	23,929	58.85	18,625	45.8
Total	40,675	100.00	40,675	100.0

<sup>/1</sup> Encuesta Agropecuaria, por Muestreo

<sup>/2</sup> IBRD Agricultural Sector Report 1972

### Removing Physical Constraints

61. The expansion of the area under cultivation could be achieved by providing medium and long-term credit for investments in land reclamation and improvement. In the area of land reclamation, long-term credit is needed for: (a) removal of forest; (b) removal of bush; and (c) removal of stumps. The latter is of particular importance in the rich agricultural area of Itapúa, and in several land settlement schemes where a large percentage of the land under cultivation cannot be intensively used or mechanized as stumps, from a partial land clearing, still remain on the ground. The removal of bush is of particular importance for the upper Chaco subregion, where millions of hectares could be planted with artificial pastures. Medium-term credit is needed for financing land improvements such as (a) liming, (b) on-farm water supply, and (c) drainage. The first item is important as yields per hectare could be substantially increased by proper soil treatment with agricultural lime since soils in Eastern Paraguay, particularly in the rich agricultural areas of Itapúa and Alto Parana, are very acidic. To carry out a large liming program, however, it will be necessary to expand the production of lime as it is estimated that about three to five tons are needed per hectare. With respect to water supply, financing is needed for drilling wells to supply farm units in the upper Chaco with sufficient water for human and animal consumption. In this regard, the UNDP has been sponsoring a water research program in El Chaco since 1969. If the available water can be supplied economically, an area comprising about 1 million ha of land could be brought into production. This area's soils are good, and rainfall is sufficient to enable the establishment of artificial pastures. Finally, long-term credit will be required to enable farmers, particularly in the Eastern region, to improve internal and external drainage. Such a program will benefit farms that lie in the lowlands and which are periodically affected by flooding.

### Removing Institutional Constraints

62. More equitable distribution of potentially productive land in Paraguay has been achieved primarily through colonization of Government-owned land and in some cases of privately owned land. This effort has helped ease the pressure on land even though a numerical evaluation of the land tenure structure and distribution still indicates that there is a skewed distribution of land holdings (see Table 9). While improvements could be made in land apportionments in the private sector through expropriation, particularly in Eastern Paraguay, a careful analysis reveals that most of the large holdings are situated in the Chaco region and in the less productive or undeveloped areas of Eastern Paraguay. These holdings are devoted to extensive livestock ranching or forestry and do not necessarily represent a misallocation of land resources under present conditions.

**Table 9: DISTRIBUTION OF LANDHOLDINGS BY SIZE IN THE PRIVATE SECTOR (1961-1970)**

<u>Farm Size</u>	1961		1970	
	<u>No. of Units</u>	<u>%</u>	<u>No. of Units</u>	<u>%</u>
Less than 1 ha.	7,937	5	11,887	7
1 - 4.9	66,622	41	56,441	35
5 - 9.9	37,735	24	31,565	19
10 - 19.9/20.9	26,451	16	40,080	25
21 - 50.9	-	-	21,708	8
20 - 49.9	13,700	9	-	-
50 - 99.9	3,053	2	2,642	2
More than 100 ha.	<u>5,279</u>	<u>3</u>	<u>6,888</u> <sup>/1</sup>	<u>4</u>
Total	<u>160,777</u>	<u>100.0</u>	<u>162,211</u> <sup>/2</sup>	<u>100.0</u>

/1 of which 2,370 in the Chaco (mostly ranches).

/2 of which 158,387 in Eastern and only 3,824 in the Chaco.

Source: Technical Planning Secretariat

63. The greatest problem regarding land tenure and land use is the low level of income of farmers settled by the Institute of Rural Welfare (IBR). IBR has concentrated on settling the largest possible number of people on hitherto unutilized state lands. While its operations have eased the pressure on land, its approach has cost the settlers considerable hardships as the settlement of large numbers of new farmers in relatively inaccessible areas without sufficient preparation, financial support or technical assistance has led to the proliferation of subsistence farming. In the 11 years since its inception, IBR has colonized three times more land than had been settled in the previous half century; its programs benefited about 3,000 families per year. On the basis of an average family size of six persons, it is estimated that over 21% of all Paraguayans now live in official Government colonies. This effort has been largely financed out of IBR's own resources and at a relatively low settlement cost (approximately US\$300 per family). Taking into account health, educational and other services provided by Government, the total settlement cost per family is estimated to be about US\$500, extremely low compared with settlement schemes in other parts of the world.

64. To enable small farmers in IBR settlements to raise their standard of living, it will be necessary to design a rural development program and to strengthen the technical capabilities of IBR. IDA recently financed a rural development program along these lines. The project was designed to help provide the infrastructure and credit needed to consolidate three IBR settlements. The task ahead, however, is cumbersome as there are more than 400 colonies already established and in need of similar assistance.

65. In addition, further investments in land settlement are necessary. This should help prevent a deterioration of the existing land tenure structure since it is estimated that between 1976 and 1980 the number of families may increase by as much as 112,000, or an average of 22,400 families per year. This will require a sizeable settlement effort which should be rationalized in a five-year colonization program.

#### Feeder Roads

66. In addition to the implementation of programs of action aimed at removing physical and institutional constraints to land expansion, it will be necessary to establish an institutional mechanism to plan and implement a feeder road construction program. This is important if undeveloped areas of high agricultural potential are to be brought into production. At present, the construction of feeder roads is under the responsibility of Juntas Viales (local feeder road committees). This mechanism is inadequate for launching a major development effort as it is not properly coordinated with the overall agricultural strategy. As a first step, therefore, it may be advisable to create an institution, either within the Ministry of Public Works or as an autonomous agency, to handle this activity. The good features of the current approach, mainly the participation of the local community in the decision-making process, could still be retained.

Table 10: COST ESTIMATES OF A LAND EXPANSION AND IMPROVEMENT PROGRAM

<u>Investment Item</u>	<u>Investment Cost</u>		<u>Total Investment Cost</u> (US\$ Millions)
	Cost Per Ha (US\$/Ha)	No. of Ha (1000 Ha)	
<u>Land Clearing</u>			
Partial Clearing of Forest	120	150	18.0
Clearing of Stumps <u>/1</u>	400	100	40.0
Clearing of Brush <u>/2</u>	<u>100</u>	<u>200</u>	<u>20.0</u>
Subtotal	173.3	450	78.0
<u>Land Improvement</u>			
Liming	150	100	15.0
Water Supply <u>/3</u>	20	200	4.0
Drainage	<u>20</u>	<u>50</u>	<u>1.0</u>
Subtotal	57.1	350	20.0
Total	<u>217.8</u>	<u>450</u>	<u>98.0</u>

/1 Cost estimated for Itapua subregion.

/2 Clearing of bush includes planting of artificial pastures (about 7.3% of clearing cost) in upper Chaco.

/3 Includes drilling, pumps, pipes for a 5,000 ha farm unit model in upper Chaco.

Source: Mission estimates

67. The construction of two major roads should help expand significantly new areas of cultivation. The most promising areas are the Itapua subregion, which is already one of the main production centers; the Alto Parana subregion, not yet developed; and the upper Chaco. The first two areas will be connected by a road (Pirapo-Pto. President Stroessner) whose opening could possibly double the current area under cultivation. These two areas, which are adjacent to each other and have the best soils in the country, will have easy access to Brazil and Argentina once the road is built. With respect to the Upper Chaco, its potential will be enhanced with the current construction and improvement program of some sections of the Trans-Chaco Road, being financed with IDB's assistance.

## B. Capital

### Structure

68. One of the main characteristics of Paraguay's agricultural sector is the low level of capitalization in the crop subsector. The Technical Planning Secretariat (TPS) estimated that in 1973 the total capital stock in the sector was about \$ 136 billion (1973 prices), of which 86.3% consisted of live capital (breeding and draft animals), 7.8% of on-farm improvements, mainly buildings and structures, and the remaining 5.9% of farm machinery and equipment. This low level of capital in directly productive items explains, in part, the low farm productivity. The capital output ratio for the sector as a whole is 2.8 and only 0.69 if livestock is excluded. Recent farm surveys have confirmed this situation. For example, a survey of small farms carried out by the Centro Paraguayo de Estudios Sociologicos (CPS), showed that the capital output ratios were 2.5, 2.9, and 6.7 for farms of under 5 ha, for farms in the 5/20-ha range, and farms of over 20 ha, respectively. However, if land, buildings and livestock were excluded, the ratios would have been only 0.43 for farms of under 5 ha, 0.46 for farms in the 5/20-ha range, and 1.16 in the over-20-ha level. In terms of gross capital per ha, the survey revealed that, if livestock and land were excluded, the level of capital would have been US\$220 per ha for the under-5-ha farm, US\$129 per ha for the 5/20-ha farms, and only US\$45 per ha for the over-20-ha farm.

### Accumulation of Capital

69. The process of capitalization of Paraguay's agricultural sector has been slow (from 1962 to 1973, the level of gross capital grew at an annual rate of about 1%), which can be explained in part by the relatively large proportion of investment allocated to replace obsolete and depreciated equipment (about 52%). This was the result of the economic conditions following the devastating war against Bolivia in the 1930s and a civil war in the 1950s which prevented farmers from undertaking any significant investments until the early 1960s. Before the 1960s the stock of capital consisted mainly of livestock, which due to the extensive system of production used in Paraguay could increase only at a low rate. Recently (1968-73), however, gross capital in agriculture has been rising faster as a result of the external financial assistance provided by IDB through its agricultural promotion program, by AID through its farm mechanization and small farmer credit program, and by the World Bank through its livestock credit programs. During this period, the stock of farm machinery and equipment increased at an annual rate of 8.5%, farm buildings at 22.6% and farm structures at 14.5%. The stock of capital in livestock animals, however, remained stagnant (an annual rate of growth of 0.6%) due to severe losses in the cattle herd during the 1968-70 period when droughts and floods, as well as cattle diseases, increased the cattle mortality rate. The table below summarizes the evolution and structure of the sector's capital stock.

Table 11: STRUCTURE OF CAPITAL STOCK IN AGRICULTURE  
SECTOR, 1962 and 1973

	Value and Structure						Growth Rate 1968-73
	------(Millions of \$)-----						
	1962		1968		1973		
	Value	%	Value	%	Value	%	
<u>Farm Improvements</u>							
Buildings	200	0.2	210	0.2	560	0.5	22.6
Construction	-	-	105	0.1	224	0.2	14.5
Land Improvements	2,601	2.6	3,057	2.9	4,032	3.6	6.0
Permanent Crops	<u>2,301</u>	<u>2.3</u>	<u>3,684</u>	<u>3.5</u>	<u>3,920</u>	<u>3.5</u>	<u>1.8</u>
Sub-total	6,902	5.1	7,051	6.7	8,736	7.8	4.7
<u>Machinery &amp; Equipment</u>							
Machinery	2,102	2.1	3,473	3.3	5,153	4.6	8.6
Transport Equipment	<u>600</u>	<u>0.6</u>	<u>946</u>	<u>0.9</u>	<u>1,456</u>	<u>1.3</u>	<u>9.0</u>
Sub-total	2,702	2.7	4,470	4.2	6,609	5.9	8.7
<u>Breeding Stock</u>	<u>42,270</u>	<u>92.2</u>	<u>93,891</u>	<u>89.1</u>	<u>96,688</u>	<u>86.3</u>	<u>0.6</u>
Total	<u>100,074</u>	<u>100</u>	<u>105,362</u>	<u>100</u>	<u>112,033</u>	<u>100</u>	<u>1.5</u>

Source: Secretaria Tecnica de Planificacion

Constraints to Capital Accumulation

70. The single most important constraint on the expansion of the capital stock is the limited availability of medium- and long-term credit to finance on-farm investments. This problem originates from the inability of the Government to develop a strong institutional setup for channeling investment credit to the sector, particularly to the crop producing subsector. Under the present institutional structure, it is unlikely that Paraguay will be able to undertake a comprehensive program of agricultural development unless corrective action is taken to effectively channel an increasingly large flow of financial resources to farm growers.

71. Institutional credit for investments in agriculture is provided mainly by three public credit institutions: (a) the National Development Bank (BNF), (b) the Livestock Fund (LF), and (c) Credito Agricola de Habilitacion (CAH). BNF is Paraguay's major source of medium- and long-term development loans for crop production; LF is the most important source for livestock development credit; and CAH provides short-term production credit to small farmers. The total loan portfolio in agriculture, as of December 1974, amounted to about US\$104 million, of which US\$61.0 million (59%) was

for crop production and US\$43 million (41%) was for livestock. While available data are not sufficient to permit assessment of the term structure of loans for crop production, it appears that about 90% of the loans are made for a relatively short period of time, probably not exceeding five years. Loans granted by the Livestock Fund (59% of the loan portfolio in livestock) are mostly long-term (12 years, including four years of grace). The loan balances, including private banks, as of December 1974, are shown in the table below:

Table 12: LOAN BALANCES FOR AGRICULTURE SECTOR

<u>Institution</u>	<u>Loan Balances, December 1974</u> (Millions of US\$)		
	<u>Crops</u>	<u>Livestock</u>	<u>Total</u>
National Development Bank	54.2	8.9	63.1
Livestock Fund	-	25.1	25.1
Commercial Banks	4.7	8.1	12.8
Ex-Banco del Paraguay	<u>2.1</u>	<u>0.5</u>	<u>2.6</u>
Total	<u>61.0</u>	<u>42.6</u>	<u>103.6</u>

Source: Central Bank of Paraguay

72. Institutional credit reaches only a small proportion of Paraguay's farmers (about 7%). The bulk of the credit is provided by non-institutional sources and goes to some 17% of the farmers. Under these circumstances, unless the availability of institutional credit is expanded and the institutional channels improved, productivity in the crop producing subsector will remain low.

73. BNF's financial difficulties consist of a liquidity problem in the short run and a high debt equity ratio over the longer run. This situation resulted from a combination of factors such as lack of financial planning, and a poor loan recovery record. BNF's consolidated balance sheet as of December 31, 1974 shows total assets of ¢ 15,258 million and an equity of ¢ 3,399 million. Its total debt, on the other hand, was estimated at ¢ 11,681 million, of which ¢ 2,975 million is due within a period of 12 months. The problem, however, is that out of a loan portfolio of ¢ 12,658 million (US\$100.5 million), only ¢ 8,922 million (US\$70.8 million) is recoverable. If the non-recoverable portion were accounted as losses, BNF's capital would be negligible or negative.

74. If the flow of financial resources to the sector is to increase in a significant fashion, it may be necessary to take some steps to correct BNF's financial problems. An assessment of BNF should consider:

- (i) writing-off from BNF's books all loans that are non-recoverable and improving its loan recovery procedures.
- (ii) preparing a financial plan for the next five years, including: (i) sources of finance, (ii) new paid-in capital, (iii) loan recoveries on existing portfolio, (iv) levels of domestic financing, and (v) external financial requirements; and
- (iii) strengthening BNF's administration and organization.

Action on the abovementioned areas could help strengthen BNF and make it possible to expand its level of lending to the agricultural sector. Prior to the implementation of a rehabilitation plan, however, it will be necessary to carry out a full diagnosis of the institutional credit framework.

#### Expanding Investments in Agriculture

75. Provided the present weaknesses of the agricultural credit system are resolved, it should be possible to increase the level of investment in agriculture at a rapid rate. The main investment items would be: (a) land improvement, mainly land clearing to expand the area under cultivation; (b) livestock development, mainly establishment of pastures, watering facilities and breeding stock; (c) water supply; (d) liming and (e) farm mechanization.

76. A farm mechanization program should be designed to complement an overall land expansion program. It would consist of (a) investments in farm machinery, on-farm storage, and drying equipment; and (b) short-term credit for purchasing inputs. The cost per farm unit (200 hectares model) is estimated at US\$70,000 for long-term investments and US\$50,000 for short-term working capital. The total cost of the program is estimated at US\$120 million. This program would cover about 200,000 hectares, of which about 100,000 (10% of the total area currently under cultivation) would consist of newly opened lands.

Table 13: FARM MECHANIZATION PROGRAM 1976-1980  
(US\$ 000)

	Unit Cost <u>/a</u>	No. of Units	Total Cost
Long Term investments	70.0	1,000	70,000
Working Capital	<u>50.0</u>	<u>1,000</u>	<u>50,000</u>
Total	<u>120.0</u>	<u>1,000</u>	<u>120,000</u>

/a Estimated on the basis of a 200-hectare farm unit.

Source: Mission estimates.

Small Farmer Credit Needs for Working Capital

77. There exists an acute shortage of agricultural credit within the small farmer subsector of the Paraguayan economy. The Banco Nacional de Fomento was originally established to provide credit to small and medium-size farmers but the major share of its loans go to the large-scale farms. The Instituto de Bienestar Rural estimates that less than 10% of colonists receive loans from the BNF. Credito Agricola de Habilitacion lends exclusively to small farmers but its programs are limited in scope. CAH's 1974-1975 lending program totals only \$ 120 million to a total of 3,150 families.

78. The most important source of credit to the small farmer is the comerciante which supplies over 80% of credit used on small farms. In contrast, 98% of credit used on farms over 20 hectares is supplied by commercial banks. Comerciantes, however, are not satisfying the needs of the existing market. A recent AID study stated that sixty-six percent of all farmers surveyed did not use credit but needed it. The two most frequent reasons given for not using credit were that it was not available and/or was too expensive. The effective rate of interest on noninstitutional credit is estimated to be between 50 and 75%.

79. Available evidence suggests that credit financing of annual costs could enable farmers, particularly those in minifundia areas, to expand their area under cultivation significantly. Even farmers in the less than 5-hectare range have an estimated .2 hectare of fallow land; those within the 5-20 hectare range have an average of nearly one hectare of fallow land. Credit financing of purchased inputs and labor should enable farmers to bring this land under cultivation.

80. An alternative approach for increasing productivity per unit of land could be to provide financing for working capital in connection with technical assistance. A viable framework for the joint provision of credit and technical assistance has been developed by CAH and CREDICOOP. Under this "directed credit" program, farmers must meet certain preconditions in order to qualify for a loan: (a) farmers must agree to participate in technical assistance classes in their community; (b) each individual farmer must collaborate with the extension agent in determining the crop mix to be planted and practices to be followed on his farm; (c) farmers must agree to a "calendar of activities," such as date of soil preparation, planting, number of insecticide applications to be made, etc., and (d) farmers must agree to collective "hauling" of produce to market. This is considered a preliminary step which will lead to a full collective marketing venture. Farmers who have received credit under these terms have substantially increased production and net earnings. For example, the experience of CAH during the 1973-1974 crop year indicated that farmers who cultivated 2 hectares of cotton and one hectare of tobacco using new technology increased their net income by US\$260 over that of farmers who cultivated the same 3-hectare crop mix using traditional practices.

81. Medium-term credit is also needed by small farmers to finance land clearing and to purchase oxen, fumigators, plows and other implements. Over 50% of farmers interviewed in an AID-sponsored survey indicated a need for such multi-year credit.

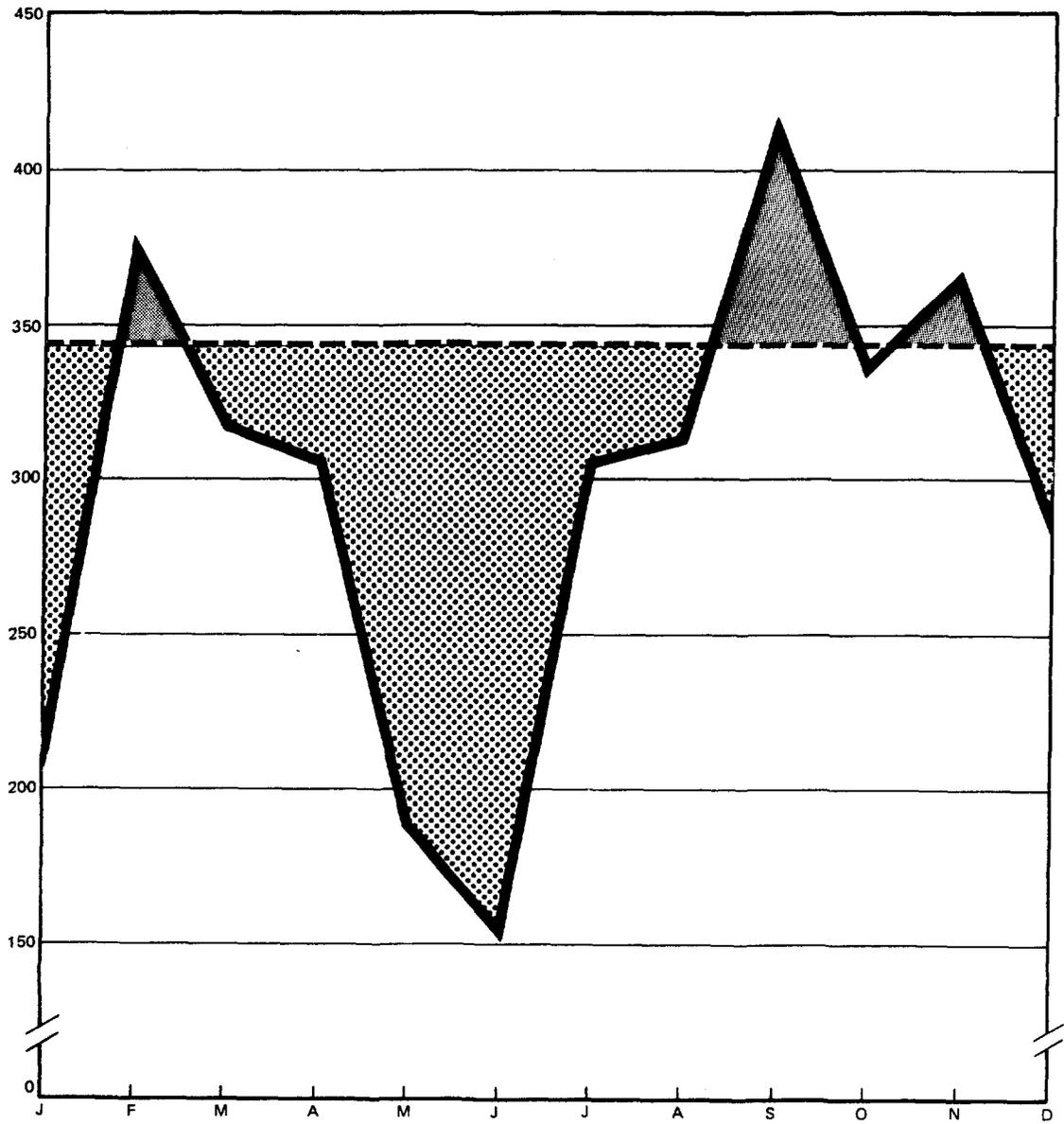
### C. Labor

82. Another constraint to accelerated output growth is the shortage of labor during the seasonal peaks of production, a problem that has emerged during the last three years as a result of three factors: the rapid expansion of production of relatively labor intensive commodities; the emigration to neighboring Argentina amounting to about half of the annual increments in the labor force; and the relatively rapid expansion in the secondary and tertiary sectors of the economy. As a result of these forces, there was a rapid rise in wages, which increased from a level of \$ 150 per day in 1971 to about \$ 350 to \$ 500 per day (depending on the area) in 1975, an increase of between 48% and 111% in real terms. Over the longer term, this trend may continue, since the demand for labor is expected to exceed its supply. According to the 1972 Census, the agricultural labor force consisted of about 364,000 workers (about 48% of the economically active population), 94% of whom were male. The average age was 34.8 years, and a relatively high proportion had some educational training. It was estimated that 84% had had at least one year of primary education and that 44% had had from three to five years of schooling. About 94% of agricultural labor was engaged in crop production and the remaining 6% in livestock. Some of the labor engaged in crop production, however, also devoted some time to livestock activities.

83. Employment in Paraguay's agricultural sector is characterized by seasonal variations in manpower requirements. An analysis of manpower requirements in crop production for 1973 indicates that during the seasonal peaks about 407,735 man/months equivalent are needed during September and 372,000 during February. On the basis of the current availability of labor (about 345,000 for crop production), it would appear that severe shortages of labor occur during these months (18% and 7.8% of the labor supply, respectively. See Chart 3). These shortages are probably being met by using female workers, traditionally not part of the labor force, and by increasing the number of working days per worker. A critical shortage, however, still prevails in the Itapua region, the main crop producing area, which faces serious manpower deficits and must resort to the use of migrant laborers who generally prefer to work on the Argentinian side where wages are higher. If the Itapua region is to continue to expand its production, it will be necessary to develop an investment program aimed at reducing the seasonal peak requirements.

# PARAGUAY – SEASONAL LABOR REQUIREMENTS IN CROP PRODUCTION

THOUSANDS OF PERSONS



- Labor force in agriculture
- Labor requirements in crop production
- Seasonal surpluses
- Seasonal deficits

### Labor Productivity and Per Capita GDP

84. Labor productivity (agricultural GDP per worker) has increased at a faster rate than population growth and this has permitted an increase in output per capita in the rural sector. The sector's GDP per worker, measured in 1972 prices increased from US\$727 in 1965 to US\$821 in 1974, an annual rate of growth of 1.4%. The sector's GDP per capita increased at about the same rate (1.3% per annum) during the period, growing from US\$175 in 1965 to about US\$197 in 1974.

### Small Farmer Productivity

85. While there has been some improvement in productivity over time, low productivity per worker is still a serious problem among the rural poor in Paraguay. This problem is greatest in minifundia areas due to the lack of complementary capital inputs and services, and the lack of gainful off-farm employment opportunities. Overall, output per worker is higher in established colonies because seasonal fluctuations in employment are less severe where employment is not so closely tied to the cropping cycle. Colonists utilize time between planting and harvesting to clear new land, thereby expanding the productive base of their farm units.

### Easing the Labor Constraint

86. A strategy of development will need to incorporate an approach for dealing with the labor constraint. It may be appropriate to aim at reducing the seasonal peak labor requirements by providing financial assistance to farmers to acquire tilling and harvesting equipment. A sound farm mechanization program, accompanied by a program of land clearing, should not only reduce peak labor requirements and underemployment but also increase the availability of permanent employment opportunities, the level of income, and the level of production. Farm machinery pools, or farm mechanization services provided by private contractors, could also help small farmers. Short-term credit, however, still remains as the main limiting factor for small farmers as they are not fully utilizing all their land because of their inability to contract labor at peak times. In the small farmer areas, labor is relatively more abundant and could be hired if credit were available.

#### D. Technology

87. Traditional practices still dominate Paraguayan agriculture and the level of productivity, therefore, remains low. The improvement of agricultural productivity will require a program to encourage the adoption of a profitable new technology. This is important since in a technologically stagnant agriculture, small farmers are already relatively efficient producers and a simple reallocation of resources currently available to them will not necessarily lead to an increase in productivity.

88. Technological improvements, however, do not assure higher returns on investment for some commodities due to market price fluctuations and high input costs. For example, consistently higher cotton yields are obtained by following the research station recommendations but these techniques expose small farmers to excessive risks. Risk aversion is a fundamental factor which may discourage small farmers from adopting new practices, whose profitability vis-a-vis traditional methods is subject to wider variations (see Table 14).

Table 14: RELATIVE PROFITABILITY OF ALTERNATIVE COTTON TECHNOLOGIES

	<u>Modern Technology</u>		<u>Traditional Practices</u>	
	<u>1973/74</u>	<u>1974/75</u>	<u>1973/74</u>	<u>1974/75</u>
Cost per ha	24,322	31,885	10,612	12,125
Yield/ha kg	1,500	1,500	800	800
Value per kg	40	30	40	30
Gross Value	<u>60,000</u>	<u>45,000</u>	<u>32,000</u>	<u>24,000</u>
Net income per ha	<u>35,678</u>	<u>13,115</u>	<u>21,388</u>	<u>11,875</u>

Source: Credito Agrícola de Habilidadacion

#### E. Complementary Services

##### Research

89. A major obstacle to the development of a profitable technology is that research programs do not properly assess the financial implications of their recommendations. Agricultural research in Paraguay is carried out by both the Ministry of Agriculture and the National University. The professional staffs of these agencies have been assisted by various foreign experts over

the past ten years. Their work programs are crop-oriented, primarily in terms of technical factors, i.e. correct soil preparation, correct planting distances, use of improved seed, use of fertilizer, etc. This is a necessary prerequisite for improving yields and productivity; however, this effort has not been accompanied by a thorough economic and financial assessment of their viability.

90. External lending institutions could do much to influence the quality of research output by financing research components in their rural development projects. Financial support for these programs could be channeled indirectly through the agency executing the rural development project or directly to the research institution. In this way, it may be possible to tie the research program directly to the project area and assure that research efforts will be of practical benefit to farmers.

### Extension

91. The problems affecting Paraguay's technical assistance programs are lack of coordination, dispersion of manpower resources, and budgeting deficiencies. The latter problem affects staff salaries and the operational capability. Several government institutions provide technical assistance to farmers: the Ministry of Agriculture through its various commodity divisions, the Extension Service, the Institute of Rural Welfare (IBR), the National Development Bank (BNF), and the Credito Agricola de Habilitacion (CAH). The main responsibility for providing technical assistance to farmers at the field level, however, rests with the Servicio de Extension Agricola y Ganadera (SEAG). SEAG has 23 field offices distributed throughout the country. These offices cover 12% of the number of districts in Paraguay (estimated at about 180). It has a technical staff of 79, and a countrywide coverage of about one officer per 2,500 farmers. SEAG concentrates its work on promoting export crop development, particularly tobacco and cotton. Some demonstration plots have been established on farmers' land and have proved effective despite severe staff limitations. Overall the structure and coordination of the agencies providing extension services appear to be too fragmented. To utilize existing resources more efficiently, it may be desirable to centralize all of these services under SEAG.

92. The major factor affecting SEAG's efficiency is the low salary level paid to its staff and the low level of financial resources available for operational activities and for equipment. SEAG's personnel is relatively well qualified. Most of SEAG's staff has had some training abroad and a program financed by the UNDP has strengthened SEAG's training capability. The quality of its staff, therefore, is not a basic problem. The financial problem may be alleviated by following the simple budgeting principle of allocating roughly one-fourth of the budget resources for operational expenditures (instead of the current 10% level) and three-fourths for fixed expenditures.

93. The available extension services are presently spread too thin to effectively reach the farmers. In the future, it will be desirable to have

a more adequate density of extension officers per farmers. For example, if the target group were established at 120,000 farms (small farms), and the density of coverage at one officer per 500 farms, about 240 professionals and some 480 technicians, including farm leaders, would be needed. The density, of course, is a parameter which depends on the intensity and efficiency of the services. Nevertheless, if the farmers were to receive financial assistance, in addition to technical services, the density of professional staff to farmers should not exceed 500. On the basis of these estimates, after the consolidation of the services, an additional 75 professional and some 350 technicians would be required. Such an expansion in services would require a considerable increase in SEAG's budget.

94. With respect to the coordination of technical assistance activities, it will be desirable for SEAG to prepare annual work programs on the basis of specific project activities being implemented by other institutions. To this end, it will be appropriate to make SEAG responsible for implementing the technical assistance components of specific agricultural development programs. This approach should involve a working methodology and an organizational structure based on the provision of services to other agencies; for example, an IBR program, a BNF support program, and a CAH program. The traditional approach of preparing work programs on the basis of specific extension activities (demonstrations, field days, etc.) should be avoided.

#### F. Purchased Inputs

95. The use of fertilizers and insecticides remains low vis-a-vis recommended requirements although there has been a steady increase in their use in recent years. Chemical fertilizer is used by less than 10% of Paraguayan farmers. This low level of consumption is related to the high cost of importing the product into the country. Fertilizer is imported in bags (mostly from Brazil) and it is distributed through Government channels at relatively high prices. The main fertilizers are phosphates, used in Eastern Paraguay, and nitrogenous fertilizers, used in Western Paraguay. The level of fertilizer use still appears to be too low to justify the development of a blending plant. This is particularly true for phosphates, a product whose transportation for processing at consumption sites is not particularly profitable. Paraguay, nevertheless, needs to assess carefully the alternative approaches for reducing fertilizer costs. To this end, it should explore the feasibility of establishing a system for transporting and distributing fertilizer in bulk form.

96. To improve the availability of high-quality seeds, it will be desirable for the National Seed Service to carry out a program of seed multiplication, particularly through well established cooperatives and strategically located commercial farmers. Production and importation of seed and planting materials is currently the responsibility of the Ministry of Agriculture. While there have been no shortages of these inputs, quality control problems have arisen as the National Seed Service has been established only recently. The Service is currently dealing with maize, soya, cotton and

wheat. It is also responsible for the importation and marketing of recommended vegetable and potato varieties. Its staff is limited, consisting of about two professionals and three technicians. Five inspectors are responsible for advising on all aspects of production.

97. Another input which is fundamental for increasing productivity is agricultural lime. Soil analysis of the major production areas have shown that the soils in Eastern Paraguay are extremely acid and that it is necessary to lime in order to neutralize the pH level. To carry out an extensive liming program, however, it will be necessary to overcome two basic constraints: (a) limited supply of agricultural lime and (b) the limited financial capacities of farmers for undertaking such a program. The availability of agricultural lime is limited because of low production capacity. Vast deposits of lime exist in Concepcion (Northeastern Paraguay), Guaira and Caaguazu (Central Paraguay). These deposits have not been fully exploited because of the lack of financing for the establishment of a plant. The investment required to establish a plant with a production capacity of 15,000 tons per year of calcium hydroxide and 10,500 tons per year of calcium oxide is about US\$600,000. With regards to the farmers' financial capacity to carry out a liming program, it is generally recognized that liming is an activity with a payoff spread over a five to seven-year period. Farmers, therefore, can only undertake a program of this nature if credit is available on a medium-term basis. A farmer will need to use from three to five tons of agricultural lime per hectare at a cost of US\$95-150 per hectare.

V. AN AGRICULTURAL DEVELOPMENT STRATEGY  
AND THE ROLE OF THE GOVERNMENT

A. Development Strategy

98. The underlying factors that led to the formulation of a strategy of export-led growth in the 1971-75 National Development Plan, based on the expansion of agricultural production, have not changed. Paraguay's domestic market is relatively small and the country is endowed with abundant unexploited land and forest resources suitable for agricultural and livestock production. Over the coming years it will be important to concentrate the development effort on bringing into production those undeveloped areas with high production potential (Itapua, Alto Parana and the Upper Chaco). This strategy will require the formulation of investment programs to expand the area under cultivation. The agricultural expansion programs should also aim to ease the seasonal labor shortages and to reduce underemployment.

99. The economic growth achieved during the last four years benefited the rural poor significantly and can be expected to do so in the future. This was possible as production and prices of soybeans, tobacco and cotton, the main crops produced by small farmers, as well as rural wages, rose rapidly. While some improvements have been made, a continued effort is needed to raise the standard of living of those at the lower part of the income distribution scale. The target group may be defined as those farms under 20 hectares which represent about 87% of the total number of farms in Eastern Paraguay and about a third of the country's population. A recent survey indicated that the net income per capita for farms of less than 5 ha. was about US\$61 and US\$137 for farms between 5 and 20 ha. The average income of the latter group approximately corresponds to one-third of the national per capita disposable income in 1974, reflecting in part the large number of families on land settlement schemes which still remain at a low level of income.

Export Prices and Marketing Prospects

100. World market prospects for Paraguay's exports appear relatively favorable over the medium-term. Prices for soybeans, sugar, and tobacco are forecasted to increase in real terms by the end of the decade, notwithstanding the recent drop in prices from the high levels which prevailed in 1974. Cotton prices are expected to experience a major downward adjustment over the next three years as production is likely to exceed consumption requirements. During 1977-80, however, cotton prices are projected to remain stable in constant terms at levels which should enable Paraguay's production to be competitive in world markets. The situation concerning beef exports will be somewhat uncertain pending the resolution of marketing problems in the United States and the European Economic Community. A small decline in real prices can be expected during 1975-77 and an increase in real terms by the end of the decade. Prices of tropical hardwood logs (veneer

logs, saw logs and railroad ties), on the other hand, are expected to rise markedly during the 1970s and beyond because of an expected chronic shortage. In view of these prospects and the country's resource endowment a strategy of exported growth continues to be appropriate.

## B. The Role of the Government

101. The Government views its role in the agriculture sector as being regulatory and promotional. The main responsibility for the production of agricultural goods is assigned to the private sector. The Government is therefore responsible for creating an institutional and economic framework which will enable private entrepreneurs to respond effectively to market incentives.

### Price Policy

102. Although in the past the Government's price policy has been consistent with its stated role of noninterference with the market mechanism, recently there have been attempts to introduce a price stabilization program. Under present circumstances, it appears inappropriate for Paraguay to engage in price control or stabilization mechanisms. The availability of resources to finance such programs, and the vulnerability of the Paraguayan economy to price movements in Argentina and Brazil make such programs infeasible. A price support mechanism is an expensive system which requires considerable buildups of inventories during periods of abundance and draw-down of inventories in periods of scarcity. Moreover, the products must be bought relatively high in periods of abundance and sold relatively cheap in periods of scarcity. The Government's policy alternatives are especially limited given that it is difficult to prevent the illegal trade of any commodity across the vast Paraguayan borders. A more viable alternative may be to promote competition among intermediaries, including farmers' cooperatives and corporations, and to increase the efficiency of the marketing system. This could be accomplished by improving marketing services such as on-farm storage, ports, transport services, wholesale markets, and market information. Also, it will be important to formulate consistent packages of policies regarding the level of transport costs and export taxes since these affect significantly the level of prices paid to farmers. Government efforts to reduce transport costs could be particularly effective if aimed at improving the highway network, constructing feeder roads, and adopting a more liberal fiscal approach for the importation of transport equipment, particularly trucks and their spare parts.

103. The authorities should aim to maintain the level of export taxes at a minimum since the inherent disadvantage of Paraguay's geographic position causes transport costs to be high and profit margins to be relatively low. The existing taxes on export products are: (a) a tax applied to the foreign exchange equivalent; (b) an income tax; (c) stamp taxes; and (d) export duties. In 1973, export taxes were relatively high for unrefined Petit Grain Oil (15.4%),

hides (12.8%), yerba mate (11.8%), soybeans (11.8%), cotton fiber (10.3%) and tobacco (1.03%), the differences among products could cause resource misallocation. The Government has established a system of preferential tax treatment for exports of processed commodities in an effort to promote the development of agroindustries and increase the value added of exports. This approach, although well-intended, could be counterproductive, since it may effectively reduce incentives to produce those commodities for which the country has a comparative advantage, particularly when domestic processing is inefficient. Insofar as the Government needs to generate fiscal revenues from the agricultural sector, the Government should consider the establishment of a presumptive income tax on land. This tax would be a more efficient tool to raise revenues without affecting resource allocation.

### Credit Policy

104. The Government's credit policy should be aimed at regulating the availability and allocation of credit resources, the cost of credit, and improving institutional lending channels. Medium-term and long-term credit are relatively scarce. If a sustained development effort is to be maintained during the next five years, the Government will need to ensure credit availability and reduce its cost, particularly for financing investments which may ease production constraints.

105. The Government could help reduce the cost of borrowed money by making some adjustments in the existing banking regulations. In the unorganized market, rates of up to 75% per year prevent many farmers, particularly the small ones, from ever considering the use of credit. Rates in the organized market range from an annual level of 12% charged by BNF to 16% and 22% charged by private banks. A feature of this market is the high reserve requirement placed upon demand and time deposits (currently 42%) which increases the cost of money. Although the Central Bank regulates the rates charged by commercial banks (it sets a ceiling of 12% per annum) commercial banks are able to charge rates above the legal maximum by charging commissions not legally defined as interest rates and by lending mostly on a short-term basis. The Central Bank may consider redefining its ceilings on nominal interest rates and following a practice of periodically reviewing the upper levels of nominal interest rates, including minimums for public credit institutions. This policy would require a careful assessment of the cost of money.

### Interagency Planning

106. Government action to increase agricultural production should aim at strengthening the institutional mechanism for transferring resources and technology to the private sector. The Government needs to integrate the various institutions in the planning process to develop a coordinated planning approach. At present, the Ministry of Agriculture is in the process of consolidating a recently established sectoral planning office which is responsible for

coordinating overall sector planning and for defining the tasks of the various agencies. It may also be appropriate to reassess the current planning approach based on specific commodity programs. Planning on the basis of regional farm models may be more desirable since it is more consistent with the need of farmers to plant various crops at different times of the year.

#### Coordination of Service Delivery at the Field Level

101. The problem with service delivery at the local level is that the coordinating and decision-making authority is generally concentrated at an administrative level geographically removed from the project site. Efforts to coordinate programs at the local level by field staff are often disrupted by guidelines from higher administrative units. Lack of coordination has encouraged some agencies to undertake all activities on their own. CAH, for example, is considering expanding its program to encompass marketing of small farmer produce. CAH is already involved in farmer organization, technical assistance, and provision of inputs and credit. By engaging directly in the marketing process, CAH believes that it can provide a complete package of small farmer services and thus reduce dependence on UNIPACO and other marketing schemes. IBR is also exploring the possibility of expanding its marketing department and offering agricultural credit. Diversification appears to be an inefficient method for delivering services at the field level and should be discouraged. Instead a sound coordination mechanism should be developed.

108. The National Council of Social Progress (CNPS) is one of the most promising instruments for achieving interagency coordination at the field level. CNPS has acquired some planning and coordinating experience in rural development but its role could be enhanced by providing it with legal status and full responsibility for planning and coordinating all activities in the field of rural development. External assistance would be required to upgrade its planning and administrative capacities. Two characteristics of CNPS make it particularly suitable for a broader coordinating role. First, members of an interagency technical committee involved in project preparation are later transferred to the operations level, thus assuring continuity between project preparation and implementation phases. Second, the project coordinator, in charge of overall project implementation, is assigned to the local level but is an employee of an interagency development board at the national level. The basic advantage of this type of organization at the local level is that the project coordinator has under his control all the staff inputs needed to implement the project, and has flexibility to redeploy staff relatively quickly to face contingencies unforeseen during project preparation. Problems of interagency rivalry are also less likely to occur under this arrangement than in situations where project coordinators are employed by one of the participating agencies. This approach is being successfully followed in an IDA financed Small Farmer and Rural Development Project for which CNPS is the coordinating agency.

### Increasing Rural Welfare

109. A strategy to help improve the welfare and productivity of the rural poor needs to focus on two distinct groups: farmers in the minifundia area where land availability is a basic constraint, and farmers in land settlement areas where sufficient land is available but only a limited portion is under cultivation. The nature and timing of investments will therefore vary greatly depending on the type of farmer. Substantial production and income expansion among minifundistas depends on the increased availability of services and short-term credit. Farmers on land settlement areas, on the other hand, should benefit most from comprehensive development projects providing long-term credit for land reclamation and infrastructure.

110. The expansion of assistance to small farmers and the promotion of large corporations established with foreign capital should not be permitted, however, to hamper the availability of credit to medium-size commercial farmers. This type of farmer has been instrumental in the development of key crops later adopted by subsistence farmers. Adequate access to long-term financial resources should permit increases in productivity and help to reduce the country's dependence on foreign investment in the agricultural sector.

### The Role of Farmer Associations

111. The role of farmer groups and associations in rural development should be given greater emphasis by the Paraguayan Government. A strategy should be formulated to foster farmer organizations through the provision of agricultural services and inputs. Without some type of farmer groups or associations, the cost of implementing rural development projects will be much higher in terms of providing technical assistance, marketing and credit services, and infrastructure. Wholesale purchase of consumer goods and inputs from other sectors or collective marketing of output cannot be carried out in the absence of local leadership and organization. The experience of CAH indicates that low-income farmers will form associations but a complete package of services (technology, inputs, technical assistance, credit and marketing) is needed to assure their participation. These activities must be coordinated at the project level in order to be effective. A special unit within the Ministry of Agriculture should be organized to promote farmer associations. Likewise, a specialized department should be established within BNF to handle financial aspects of these programs. Employees of this unit should be assigned at the field level within all integrated rural development projects. They should work closely with local communities to assure continuity in service delivery and involvement of local residents.

VI. AN INVESTMENT PROGRAM IN AGRICULTURE

112. The proposed investment program in agriculture focuses on the need for increasing the allocation of resources toward the critical factors limiting output growth: low level of land under cultivation, soil deficiencies, water availability, low level of capitalization, and seasonal availability of labor. The proposed program amounts to about US\$308 million (constant 1974 dollars) for the 1976-80 period which is required to sustain a 9% sectoral growth rate. Total gross investment in the sector is projected to increase from about US\$38 million in 1975 to about US\$86 million in 1980, representing a growth rate of about 17.6% per annum. This acceleration in gross investment is necessary to modernize the sector in order to enable Paraguay to expand production of its main export commodities. Although gross investments in the agriculture sector grew at an annual rate of about 12% from 1962 to 1973, its impact on the sector was diminished by the relatively high proportion of investment which went into the replacement of obsolete and depreciated equipment. In the future, as the sector modernizes, it is expected that net investment will grow faster and that the proportion of gross investment allocated for depreciation will decline to a level of about one third of gross investment instead of the past level of about 50%. The proposed program is summarized in the table below.

Table 15: PROPOSED INVESTMENT PROGRAM 1976-80

Investment Item	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1976-80</u>
	(Millions of 1974 US\$)					
A. Land Clearing	7.8	11.7	15.6	19.5	23.4	78.0
B. Land Improvement	2.0	3.1	4.0	4.9	6.0	20.0
C. On-farm Investments	7.0	10.5	14.0	17.5	21.0	70.0
D. Incremental Working Capital	4.0	2.0	2.0	2.0	2.0	12.0
E. Physical and Social Rural Development Infra- structure	7.2	7.2	4.1	1.8	0.1	20.4
F. Livestock Develop- ment	11.1	14.6	20.7	27.4	33.8	107.6
Total	<u>39.1</u>	<u>49.1</u>	<u>60.4</u>	<u>73.1</u>	<u>86.3</u>	<u>308.0</u>

Source: Mission estimates

113. During the 1976-80 period, the Government will need to continue increasing the share of expenditures allocated for agriculture out of the budget. Public sector investment will account for about 15% of the proposed investment program. Of particular importance will be the need for consolidating and expanding extension services. Such a program will require an increase in the total level of annual expenditures of about US\$2.3 million. These resources should cover staff and equipment requirements to reach 120,000 small farmers. Additional resources will be needed to strengthen IBR's financial structure to enable it to undertake a more active role in the process of consolidating existing land settlements and in planning and regulating the process of spontaneous colonization. The share of the agriculture sector in total public fixed investment is projected to increase from about 9% during the 1971-74 period to about 11% in 1976-80.

### Financing

114. A plan to finance the proposed investment program is outlined below. The financial plan estimates that about 58% of the costs will be available from domestic resources (about 20% from private savings, 20% from public savings and 18% from resources already available at the National Development Bank) and about 42% from external sources. A projected improvement in public savings should enable the Government to provide US\$62.0 million for financial investments in the sector. The level of resources provided by the private sector reflects the emphasis on small farmers and long-term productive investments. External assistance of US\$129 would be required to cover the resource gap during the 1976-80 period.

Table 16: FINANCING OF PROPOSED INVESTMENT PROGRAM

	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1976-80</u>
	(Millions of 1974 US\$)					
Public Savings <u>/1</u>	8.0	10.0	12.0	15.0	17.0	62.0
Private Savings <u>/2</u>	8.0	10.0	12.0	15.0	17.0	62.0
BNF's Resources <u>/3</u>	19.0	9.0	7.0	10.0	10.0	55.0
Subtotal	<u>35.0</u>	<u>29.0</u>	<u>31.0</u>	<u>40.0</u>	<u>42.0</u>	<u>179.0</u>
Minus: <u>Requirement</u>	<u>39.1</u>	<u>49.1</u>	<u>60.4</u>	<u>77.1</u>	<u>86.3</u>	<u>308.0</u>
Resource Gap	<u>4.1</u>	<u>20.1</u>	<u>29.4</u>	<u>37.1</u>	<u>44.3</u>	<u>129.0</u>

/1 The Government financial investments in agriculture were estimated by assuming a transfer from current savings to cover 20% of requirements.

/2 It was assumed that farmers' savings would cover 20% of the cost.

/3 BNF's recoveries, including rollover on existing long-term credits.

Source: Mission estimates

### Allocation of Investment and Income Distribution

115. The proposed program is designed on the basis of specific investment requirements rather than on the kind of beneficiary of the program. This approach recognizes that the main investment items benefit all farmers in Paraguay, regardless of their size or income, and that the allocation of investment resources by type of beneficiary depends on the policies pursued by the Government. Recent experience indicates that the Government would aim at allocating a significant share of these investment activities among small farmers. The program assumes the continuation of an ongoing program of integrated rural development initiated in 1975 with World Bank assistance. It is assumed that three additional schemes will be undertaken during the next five years. Such a program should benefit about 4,450 low-income families in three areas of the country. In addition to integrated programs, there is also a need for making medium and long-term credit available to small farmers. For example, in some areas not covered by integrated rural development schemes, farmers will need resources for land clearing and land improvement. There is also a need for providing credit for livestock development in medium and small farms. With regards to mechanization, a program of this kind should encourage the establishment of machinery pools under cooperative arrangements. To facilitate the participation of individual small farmers in the overall program, it will, however, be necessary to carefully design specific projects and to strengthen the institutional mechanism for the planning and delivery of services and of investment resources to the rural poor. This should ensure an adequate allocation of resources and help distribute the benefits of growth more evenly among the country's population.

116. To implement the proposed program, the following projects should be prepared with external assistance.

#### Rural Development and Colonization

1. Integrated rural development in the Capitan Meza area.
2. Integrated rural development of the Mallorquin-Monday area.
3. Integrated rural development of the Puerto Presidente Stroessner-Hernandarias area.
4. Colonization of Ybyraborana.
5. Colonization of the Department of Canendiyu.

#### Regional Development

6. Development of the Itapua-Alto Parana Region
7. Upper Chaco livestock development and land settlement scheme
8. Development of the lower Chaco and of the area along the Trans-Chaco Highway

Livestock Development

9. Livestock marketing improvement program
10. Livestock production program

Commodity Expansion

11. Integrated sugar production program.
12. Integrated forestry development program.

Agricultural Credit

13. Mechanization and on-farm investments credit project.

Input Delivery

14. Bulk handling facilities and distribution system for fertilizers, seeds and agricultural lime.

## INSTITUTIONAL STRUCTURE

1. The main institutions servicing the agricultural sector are: (a) the Ministry of Agriculture and Livestock (MAG); (b) the National Development Bank (BNF) and Fondo Ganadero (FG); and (c) the National University of Asuncion. The first is responsible for agricultural policy and basic support services. The other three are responsible for agricultural credit, livestock credit and formal agricultural education, respectively.

### Ministry of Agriculture and Livestock

2. The Ministry of Agriculture and Livestock, created by Decree No. 13681 (August 4, 1950), is responsible for promoting production, fostering technical education, providing research and extension, regulating the agricultural credit system, establishing cooperatives, maintaining agricultural statistics, and regulating and land tenure related matters. To carry out its taaks, MAG has nine operational departments (planning, technical coordination, legal, administration, agricultural education, cooperatives, research and extension, norms and accounting and agricultural economics and marketing) and seven autonomous agencies, among which the most important ones are: Institute of Rural Welfare (IBR)—land tenure matters; Agricultural Credit of Habilitation (CAH)—a financial institution providing credit for marginally creditworthy small farmers; Foot and Mouth Disease Control Institute (SENALFA)—produces and distributes foot and mouth disease vaccines; and the National Forestry Service (SNF)—an institution responsible for regulating and protecting the country's forest resources. (See Chart on page 4 of Appendix I for the organizational structure of the Ministry of Agriculture).

3. Institute of Rural Welfare (IBR)--The Institute of Rural Welfare was established under Law 852 of 1963 as an autonomous agency with broad powers to determine and execute policy in respect to land reform, land settlement, and rural welfare under the provisions of the Agrarian Statute and related legislation. Its president and five-member council are appointed by the Government for terms of five years, but may be re-appointed. The main sources of finance available to IBR include: (a) Government lands transferred to IBR on its inception; (b) proceeds of timber taxes and quarrying fees; (c) proceeds of sale and renting of lands and grazing fees; (d) annual Government grants; and (f) credits (internal and external). During the period 1969-1974, IBR's income remained at a level of about \$ 110 million. The IBR employs over 400 permanent staff, of whom 75% are in the headquarters in Asuncion. Concentrating mainly on state lands entrusted to its control, IBR's principal activities have been in land settlement. Between 1963 and 1974, IBR settled over 41,000 families in 269 colonies totaling more than 2.8 million ha.

4. Extension Services--The Agricultural Extension Service of the Ministry of Agriculture (SEAG) grew from a US supported project (STICA) which, when completed in 1967, had a technical staff of 59 with field offices in

22 of Paraguay's 180 districts. At present, the field extension service is seriously understaffed with 79 agents and nearly 190,000 farmers to cover. SEAG concentrates its work on promoting export crop development, particularly cotton and tobacco. Technical assistance to farmers is also provided by IBR, BNF and CAH, who have a combined staff of 123 agricultural technicians, 69 agriculturalists, and 17 veterinarians. Insufficient budget has resulted in inadequate and irregular salary payment, and a lack of technical and administrative support for field personnel.

5. Credito Agricola de Habilitacion (CAH)-- The Credito Agricola de Habilitacion was established by Decree Law No. 1611 of December 21, 1943 with the objective of providing financial assistance to small farmers to improve their agricultural practices and raise their standard of living. CAH was originally established as a division within the Banco Agricola del Paraguay, but in 1947 was incorporated into the Banco del Paraguay. Since 1951, CAH has been an autonomous public body under the authority of the Ministry of Agriculture. In 1960, CAH was forced to stop its normal operations and restrict its activities to collection of loans because of a bad repayment position and lack of Government support. At the end of 1969, on the Government's decision, CAH resumed operations. A new president was appointed and the Central Bank agreed to reschedule an old debt and to provide new resources. CAH has a network of 20 regional offices staffed by some 100 employees. During the 1974-75 crop year, CAH provided approximately \$ 120 million in credit to some 3,000 small farmers. Of this amount, \$ 106 million was for short-term production credit. While CAH's total lending program is small, it has developed a highly-effective methodology for combining credit with technical assistance and local organization. Under this "directed credit" program farmers must meet certain preconditions in order to qualify for a loan: (a) farmers must agree to participate in technical assistance classes in their community; (b) each farmer must collaborate with the extension agent in determining the crop mix to be planted and practices to be followed on his farm; (c) farmers must agree to a "calendar of activities," such as date of soil preparation, planting, etc.; and (d) farmers must agree to collective "hauling" of produce to market. This is considered a preliminary step which will lead to a full collective marketing venture.

#### National Development Bank (BNF)

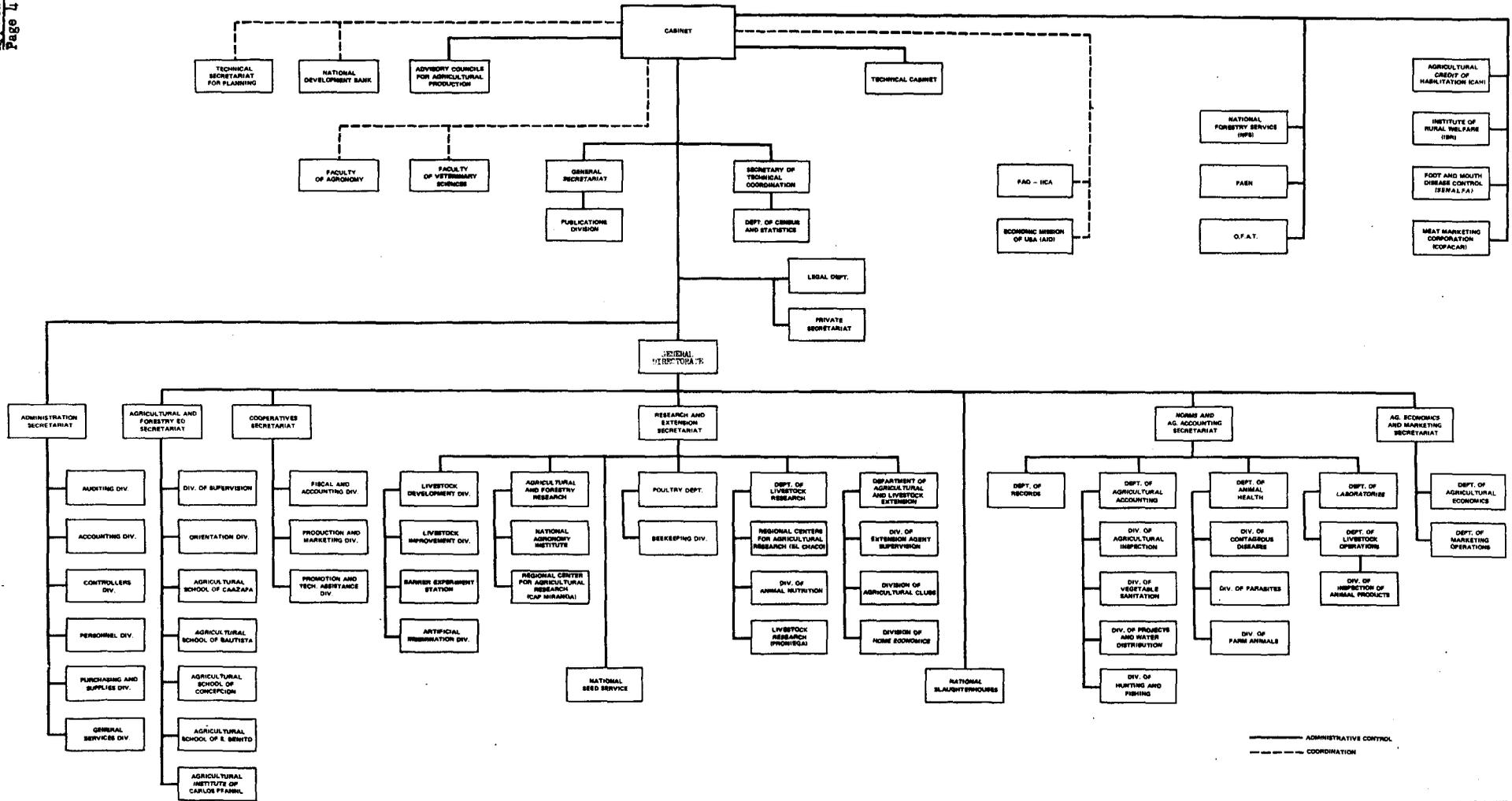
6. The National Development Bank (BNF), an autonomous institution, was established in 1961 following the closure of the Bank of Paraguay. Its stated objectives are to promote and finance general programs and specific projects to develop agriculture, livestock, forestry, industry and commerce. BNF has a network of 21 branches and 16 sub-branches widely spread throughout Paraguay. Staff at December 1, 1972, totaled 832 of whom nearly half had less than five years service with BNF. Furthermore, the large majority comprises accountants and clerks while there are insufficient technical staff at the field level. At the end of 1972, BNF employed three veterinarians, 37 agricultural graduates and 27 agricultural technicians. Staff salaries are similar to CB and private banks and are higher than those paid by

Government and semigovernment agencies for comparative levels of work. BNF provides annually around 17% of all Bank credit in Paraguay but the volume of its lending in agriculture, excluding livestock, during the four-year period 1969-72 constituted 82% of the total.

Fondo Ganadero (FG)

7. Fondo Ganadero (FG) was created in September 12, 1969, as a financial entity under the jurisdiction of Central Bank. FG is responsible for the exclusive administration of all funds of IBRD/IDA assisted livestock projects. It is administered by a coordinating committee of three members: a senior staff member of CB; a senior staff member of BNF, and FG's technical director. Even though FG is under the jurisdiction of CB, it has been granted full legal authority and representation. Financial resources, as of September 30, 1973, were US\$17 million, received from Bank/IDA loan credits; US\$1.3 million equivalent from Government contributions to FG from collection of debts to the ex-Banco del Paraguay, and US\$4.3 million equivalent from accumulated surpluses.

# PARAGUAY MINISTRY OF AGRICULTURE



ESTIMATED INVESTMENT PROGRAM 1976-80

1. To reach an annual growth rate of about 9% during the 1976-80 period, it will be necessary to implement an investment program of about US\$308 million. The main objective of this program should be to foster the accumulation of capital in the private sector. This could be accomplished by making financial resources available to the National Development Bank to finance investment activities at the farm level. These activities would be as follows:

	<u>Private Sector Investment Needs</u>		
	<u>Cost per Ha</u> (US\$/Ha)	<u>No. Ha</u> (1000 Ha)	<u>Total Investment</u> <u>Cost</u> US\$ Million
<u>Land Clearing</u>			
Partial Forest Clearing	120	150	18.0
Clearing of Stumps	400	100	40.0
Clearing of Brush	100	200	20.0
			<u>78.0</u>
<u>Land Improvement</u>			
Liming	150	100	15.0
Water Supply	20	200	4.0
Drainage	20	50	1.0
			<u>20.0</u>
<u>On-farm Investments</u>			
Machinery and Equipment	350	200	70.0
Incremental Working Capital	60	200	12.0
			<u>82.0</u>
<u>Livestock Development</u>			
On-ranch Improvements	15	4060	60.9
New Operations	350	133	46.7
			<u>107.6</u>
Rural Development			
Infrastructure	n.a.		20.4
<u>Complementary Investment Projects</u>			

2. In addition to the above, it would be necessary to make some complementary investments in physical and social infrastructure. These could

be undertaken either as basic components of integrated rural development projects or as specific projects within their respective sectors (transportation, education, public utilities, etc.). It will be necessary to implement, as a minimum, the following projects:

3. Rural Education - a project designed to improve the quality of education in rural areas and to help establish an institutional secondary and tertiary road networks, particularly those facilitating the flow of goods from farms to markets.

5. Rural Water Supply and Sewerage - a project designed to make water and sewerage available to communities of less than 4,000 inhabitants. This project would help improve the health standards of the rural poor.

6. Pirapo-Pto Presidente Stroessner Road - a penetration road, would extend some 160 km south-north from Pirapo to Route VII, leading to Pto. Presidente Stroessner. It would complete the third segment of the Plan Triangulo, a network of primary roads in southeastern Paraguay (an area encompassing about 80% of the country's population) linking Asuncion, Encarnacion and Pto. Presidente Stroessner. The road would link Encarnacion with Pto. Presidente Stroessner, and would provide transport infrastructure to the large hydroelectric projects of Yacyreta-Apipe, Itaipu and Corpus when they are being built. The opening of the road will make possible the development of almost one million hectares of forestry land of great agricultural potential. The study of the road should be complemented by a forestry exploitation and agricultural development study of the area.

#### Rural Development Program and Strategy

7. To help improve the standard of living of the rural poor, it will be necessary to follow a two-pronged strategy: (i) to implement comprehensive integrated rural development projects in selected areas; and (ii) to implement low cost development projects (minimum package approach) throughout the country. The first type of project would be appropriate for areas which could become development poles and in areas where their demonstration effect can be maximized (Capitan Meza, Mallorquin Monday, and the area of Puerto Presidente Stroessner). The main investment items in these areas will be land clearing, feeder roads and other physical and social infrastructure. The total cost of these projects could reach about US\$41 million, or a cost of about US\$1400 per capita.

8. Before the Government undertakes such a program, it will be desirable to study the institutional capacity of existing agencies to undertake the projects and to assess the need for strengthening the National Council of Social Progress (CNPS) to enable this advisory board to act as a coordinating agency for all rural development activities. In addition, it will be necessary to study alternatives for reducing the investment cost per beneficiary to enable the Government to repeat the project throughout the country. This cost analysis should be assigned high priority.

9. With respect to the second approach to rural development, it will be desirable to implement low cost minimum package type of projects to benefit the rural poor in areas where it would not be desirable to implement a full-scale rural development project. It would be desirable, however, to provide, as a minimum, agricultural credit, water supply and feeder roads.

#### Colonization

10. It is estimated that during the next five years the rural population of Paraguay may grow by about 22,400 families per year. This poses the need for formulating a consistent program of land settlement. Since the present land settlement activities are carried out by the Institute of Rural Welfare and the Ministry of Defense, it would be desirable to design a program which takes into account the activities of both institutions so that the resources are allocated to the priority areas. Of particular importance, will be the need for studying the feasibility of expanding the scope of the programs presently executed by the Ministry of Defense. These programs are quite effective and also involve low expenditures per capita. As a priority issue, the Government should therefore consider the need for implementing the Ybyraborana project. Along these lines, there will also be a need for exploring the feasibility of implementing a pilot project in the Chaco, especially around the Santa Rosa area which could set the basis for the development of the vast land resources in the Western part of Paraguay. Insofar as IBR programs are concerned, there is a need for implementing a pilot program in the Eastern region, preferably in the Alto Parana region and another in the Chaco. The latter project should be designed as a pilot scheme for exploring the feasibility of developing the vast land resources of the Chaco through livestock based settlement schemes.

#### Commodity Expansion Programs

11. To increase sugar production, it will be necessary to implement an investment program of about US\$100 million to raise output by about 60,000 tons. This program would be a component of the country's industrial development plan.

12. As far as beef production is concerned, it will be necessary to invest about US\$108 million to increase the level of beef production by about 30,000 tons. The livestock development of new areas. The main objectives should be to incorporate presently unutilized lands into production through the establishment of relatively extensive growth over the longer term. Finally, as regards forestry, it will be necessary to make some investments to develop integrated forest industries. The main objective of this program should be increase the value-added of Paraguay's forest exports.

Recommended Preinvestment Studies Program

Forestry Exploitation and Agricultural Development of the Corridor along the Pirapo-Pto. Presidente Stroessner Road.

13. The Government's policy has been to encourage spontaneous development of virgin lands but this approach so far has resulted in an irrational exploitation of the country's forest resources. To prevent this from happening in the area of Pirapo-Pto. Presidente Stroessner, the Government proposes to undertake a comprehensive feasibility study which would recommend a rational program of exploitation. The study would also formulate an agricultural development program, which would include proposals for colonization schemes, land clearing requirements, sound land tenure structure, a program for feeder road construction and technical assistance and credit requirements.

Rural Development of Capitan Meza

14. In 1974, a mission of the OAS studied employment generating projects in Paraguay and recommended the intensive development of nine colonies north of Capitan Meza, Department of Itapua, covering 40,000 ha and benefiting 1,200 families. Capitan Meza is located between the cities of Encarnacion and Pto. Presidente Stroessner, an area that will receive substantial benefits from the construction of the Itaipu and Yacyreta-Apipe hydroelectric projects. In line with the recommendations of the OAS, the Government proposes to design a project to assist the colonies to increase agricultural production and income. The project would provide credit, technical assistance and community services. About 40% of the project's arable land would be devoted to live-stock production, 40% of fruits and crop production, and 20% to forestry. The feasibility study would outline a marketing and production program, and would identify the requirements with respect to on-farm investments, processing and storage facilities, feeder roads, community and health centers, credit and technical assistance.

Ybyraborana Colonization Program

15. During the last 20 years, the Government's colonization programs have benefited more than 40,000 families. A major weakness of the programs, however, has been the lack of basic backup infrastructure, inputs and services to help encourage increased production. This, and the mandatory two-year military service, have resulted in large urban migration among the rural youth. Servicemen, upon completion of military service, are given by the Government a plot in public lands. However, few of them make use of this opportunity as they know that the settlements lack the aforementioned. To correct this situation, the Government has prepared a pilot program to establish a minimum of five colonies per year at Ybyraborana, Department of Canendiyu, on public land. As part of the program, the Ministry of Defense would allow servicemen after the first year of military service to be sent

on special duty to the colonies in which they would eventually settle. Once there, and as part of the second year of military service, they would work on infrastructure projects (feeder roads, bridges, fences, silos and depots) and receive intensive training on farming would be exclusively communal. Upon separation, they would bring their families and settle in the land assigned; a portion of the plot would still be reserved for collective farming.

16. The study would design a low cost and highly productive colonization program, taking into account sociological factors encompassed in programs involving young people. If successful, this type of colonization would spread to other parts of the country. The elements of the study would be the following:

- (a) Resettlement program - land tenure, farmers organization, community services, and project organization and administration.
- (b) Infrastructure - provision of feeder roads, social services and marketing facilities.
- (c) Production and marketing - mechanization requirements, on-farm investment, crop selection, and credit and technical assistance requirements.

#### Mechanization and On-farm Investment

17. While there is considerable unemployment and underemployment in the urban sector, agriculture as a whole has been suffering from labor shortages. Prosperity (real rural incomes are estimated to have increased by about 70% in the last three years), better land distribution and steadily growing public investment have raised significantly the demand for labor. With the further increase projected in economic activity, rural labor shortages are expected to become pronounced. Consistent with this, a program to increase production and productivity through farm mechanization, particularly in export crops, would appear to be justified. The study would analyze this possibility and would include, among other things, the following:

- (a) establish the need and extent of investments required;
- (b) identify a suitable financial intermediary and lending procedures;
- (c) assess the financial and economic viability of investments; and
- (d) determine the possible sources of finance.



STATISTICAL APPENDIX

Table No:

1. Structure of Agricultural Production, 1962-1973
2. Structure of Annual Crop Production, 1962-1973
3. Structure of Permanent Crop Production, 1972-1973
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Table 1: STRUCTURE OF AGRICULTURAL PRODUCTION  
(PERCENT OF TOTAL CULTIVATED AREA)

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	<u>1962</u>	<u>1965</u>	<u>1969</u>	<u>1973</u>
Annual Crops	74.0	74.6	68.3	65.6
Permanent Crops	20.3	19.5	21.6	17.0
Artificial Pastures	3.1	3.4	7.1	14.7
Reforestation	0.1	0.1	0.5	0.8
Other	2.5	2.4	2.5	1.9
Total	<u>100.0</u>	<u>100.0</u>	<u>100.0</u>	<u>100.0</u>

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Source: Technical Secretariat for Planning, Asuncion.

Table 2: STRUCTURE OF ANNUAL CROP PRODUCTION

	<u>1962</u>	<u>1965</u>	<u>1969</u>	<u>1973</u>
Garlic	0.3	0.3	0.4	0.3
Cotton	6.4	7.3	6.8	10.5
Rice	5.3	4.5	3.2	2.0
Peas	0.2	0.4	0.5	0.4
Sweet Potatoes	4.3	4.3	4.0	3.9
Gourds and Squash	1.5	1.4	1.5	1.3
Onions	2.5	3.5	4.1	4.0
Lima Beans	0.8	0.7	0.6	0.4
Maize	17.3	16.9	11.9	12.8
Groundnuts	3.0	2.5	2.1	2.0
Cassava	22.4	21.3	22.8	18.3
Melon	1.2	1.1	1.2	0.9
Potatoes	1.2	1.5	1.7	1.1
Beans	4.5	4.7	3.4	2.8
Watermelon	2.7	2.6	2.7	2.1
Grain Sorghum	0.2	0.2	0.3	0.3
Broom Sorghum	0.1	0.1	0.1	0.2
Soybeans	1.2	3.1	3.6	14.7
Tobacco	6.6	6.5	8.4	6.8
Wheat	0.8	0.6	3.1	1.0
Vegetables	5.6	5.2	5.5	4.5
Flowers	0.3	0.2	0.3	0.2
Other	0.4	0.4	0.4	0.3
Cassava for Forrage	<u>11.2</u>	<u>10.7</u>	<u>11.4</u>	<u>9.2</u>
	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>

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SOURCE: Technical Secretariat for Planning, Asuncion.

Table 3: STRUCTURE OF PERMANENT CROP PRODUCTION

	<u>1962</u>	<u>1965</u>	<u>1969</u>	<u>1973</u>
Avocado	0.5	0.4	0.5	0.4
Banana	10.8	11.0	12.0	10.5
Coffee	7.8	9.9	6.3	7.8
Sugar Cane	13.2	14.4	12.4	15.3
Plums	0.3	0.3	0.3	0.3
Cocoa	2.3	3.7	4.5	4.8
Peach	0.3	0.3	0.3	0.2
Guavas	0.5	0.4	0.4	0.3
Persian Limes	0.2	0.2	0.2	0.1
Limon Real	0.1	0.1	0.1	0.1
Lemon	0.4	0.4	0.4	0.4
Mango	0.7	0.6	0.6	0.5
Papaya	0.1	0.1	0.1	0.1
Apples	0.4	0.4	0.4	0.3
Mandarin Oranges	5.3	4.9	5.0	3.9
Sweet Orange	22.1	20.4	21.1	18.3
Sour Orange	4.7	4.1	5.7	6.9
Pear	0.1	0.1	0.1	0.1
Pineapple	4.7	4.6	4.5	4.0
Grapefruit	2.0	1.9	1.8	1.8
Castorseeds	11.7	10.5	7.8	12.7
Tung	3.6	2.2	6.8	4.5
Grape	2.9	2.6	2.7	2.2
Yerba Mate	2.4	3.8	3.2	2.1
Alfalfa	2.5	2.4	2.4	2.1
Small Fruits	0.4	0.3	0.4	0.3
	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>

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SOURCE: Technical Secretariat for Planning, Asuncion.

Table 4: PERCENT ANNUAL GROWTH RATES OF SELECTED CROPS <sup>1/</sup>  
 (BY AREA HARVESTED, YIELD, AND PRODUCTION)

1962 - 1973

<u>CROP</u>	<u>AREA HARVESTED</u>	<u>YIELD</u>	<u>PRODUCTION</u>
Bananas	3.35	0.00	3.35
Beans	-1.23	-0.77	-2.00
Broom Sorghum	8.02	-0.89	7.13
Coffee	-1.30 <sup>3/</sup>	-0.11	-1.19
Cotton	1.67 <sup>3/</sup>	0.36	2.03
Garlic	4.33 <sup>3/</sup>	-3.70	0.63
Gourds and Squash	1.56	1.52	3.08
Grain Sorghum	7.18	1.45	8.63
Maize	0.11 <sup>3/</sup>	-0.50	-0.39
Cassava	2.48	-0.12	2.36
Onions	5.88	1.37	7.25
Sour Orange	6.44	0.46	6.90 <sup>2/</sup>
Sweet Orange	2.88	-0.05	2.83
Peas	6.72	1.70	8.42
Potatoes	3.61	0.16	3.77
Rice	-2.66 <sup>3/</sup>	2.16	0.50
Soybeans	21.99	4.65	26.64
Sugarcane	2.01	0.00	2.01
Sweet Potatoes	1.67	0.78	2.45
Castorseeds	0.58 <sup>3/</sup>	-0.27	0.31
Tobacco	3.78	-0.47	3.31
Tung	11.41	-0.03	11.38
Wheat	20.41	-2.51	17.90
Vegetables	3.08	-	-
Yerba Mate	2.15	-0.08	2.07
Ground Nuts	-0.51 <sup>3/</sup>	0.43	-0.08

<sup>1/</sup>  $Y_t = Y_o (I + P)^t$  and  $\text{LOG } Y = \text{LOG } Y_o + t \text{ LOG } (I + P)$

<sup>2/</sup> Mission Estimate

<sup>3/</sup> Not significant at 0.90 level of confidence

**Table 5: PRODUCTION OF ANNUAL CROPS BY AREA HARVESTED**

(HECTARES)

	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
Garlic	388	424	420	436	456	486	500	520	535	550	600	650
Cotton	46,428	55,524	48,783	56,757	61,000	37,400	37,160	60,000	46,000	47,500	50,000	87,500
Rice	17,136	15,149	14,400	13,700	9,250	8,400	8,800	10,860	11,400	12,000	16,570	9,200
Peas	3,000	4,166	3,833	4,353	5,500	6,250	6,700	6,100	6,300	6,500	6,500	6,600
Sweet Potatoes	12,685	12,923	13,131	13,895	15,000	12,900	13,300	13,475	14,000	14,600	14,790	16,700
Gourds and Squash	6,529	6,555	5,368	5,000	5,650	5,800	6,000	6,150	6,400	6,600	6,830	7,200
Onions	2,781	2,821	3,469	3,592	3,860	4,250	4,400	4,250	4,400	4,600	5,100	5,600
Lima Beans	6,857	7,000	7,286	7,066	7,500	8,300	8,400	5,914	6,100	6,300	6,490	6,800
Maize	180,383	184,615	193,846	199,000	200,000	230,900	238,300	156,950	167,000	178,000	186,700	224,000
Groundnuts	24,118	21,176	23,059	22,588	23,300	24,400	25,200	19,050	19,600	20,200	23,600	23,600
Cassava	97,640	100,078	102,150	104,414	107,000	110,200	112,100	116,000	120,000	123,500	124,900	125,000
Melon	3,845	3,873	3,904	4,000	4,120	4,200	4,300	4,200	4,300	4,400	4,430	4,500
Potatoes	1,659	1,500	1,600	2,100	2,200	2,500	2,950	2,525	2,600	2,700	1,925	2,100
Beans	43,750	48,052	46,667	45,250	42,428	49,266	50,900	38,200	39,500	40,700	40,960	43,000
Watermelon	10,780	11,104	11,440	11,600	12,000	12,100	12,500	12,300	12,600	12,900	12,890	13,200
Grain Sorghum	2,453	2,526	2,602	2,679	3,900	4,100	4,200	4,200	4,300	4,500	4,800	4,900
Broom Sorghum	3,010	3,438	3,913	3,833	4,000	4,950	5,100	6,000	6,150	6,300	6,780	6,900
Soybeans	7,300	12,941	13,333	15,000	16,666	8,360	15,300	18,300	28,300	40,000	81,900	100,000
Tobacco	13,333	20,000	12,000	14,400	8,750	11,250	12,800	20,000	20,800	21,600	14,000	21,500
Wheat	9,000	8,750	7,500	9,482	8,200	8,300	20,000	32,000	45,000	58,000	40,000	27,700
Vegetables	2,958	8,963	3,038	3,117	3,217	3,320	3,450	3,541	3,650	3,786	4,000	4,000
	496,235	525,573	521,742	542,242	543,997	557,592	592,360	540,533	568,935	615,230	653,765	740,630

SOURCE: Banco Central del Paraguay

**Table 6: PRODUCTION OF ANNUAL CROPS  
YIELD PER HECTARE**

	Unit	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
Garlic	Bunch	381	358	374	372	366	354	353	346	355	400	166	276
Cotton	Kg	700	715	740	740	474	715	618	676	809	470	780	800
Rice	"	2,200	2,350	2,500	2,700	2,000	2,500	2,220	2,500	3,671	3,288	2,500	2,500
Peas	"	398	600	600	600	600	600	646	600	554	585	600	600
Sweet Potatoes	"	9,034	9,730	9,900	9,500	7,920	9,500	8,824	9,500	9,592	9,473	10,750	10,000
Gourds and Squash	Unit	1,550	1,590	2,000	2,200	2,000	2,000	2,000	2,000	1,980	1,985	1,980	1,970
Onions	Kg	3,200	3,900	3,920	3,920	3,900	4,000	4,235	4,024	4,198	4,217	4,000	4,000
Lima Beans	"	700	700	700	750	750	700	740	700	608	650	650	650
Maize	"	1,300	1,300	1,300	1,300	1,020	1,200	1,142	1,200	1,317	1,219	1,220	1,220
Groundnuts	"	850	850	850	850	850	850	850	850	867	876	900	900
Cassava	Unit	14,000	14,000	14,060	14,098	14,100	14,034	14,016	14,007	13,878	13,822	13,830	14,000
Melon	"	2,400	2,450	2,500	2,500	2,500	2,476	2,500	2,500	2,488	2,468	2,500	2,500
Potatoes	Kg	3,767	3,600	4,000	4,000	4,000	4,000	4,000	4,000	4,465	3,170	4,000	4,000
Beans	"	700	770	750	800	698	700	630	700	745	670	700	700
Watermelon	Unit	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,468	2,450	2,500	2,500
Grain Sorghum	Kg	1,060	1,060	1,060	1,060	1,000	1,000	1,000	1,000	1,116	1,222	1,200	1,200
Broom Sorghum	"	1,422	1,280	1,150	1,200	1,200	1,000	1,095	1,000	1,122	1,254	1,200	1,200
Soybeans	"	800	850	1,200	1,200	1,200	2,168	1,015	1,202	1,413	1,853	1,220	1,200
Tobacco	"	1,200	1,250	1,250	1,250	1,000	1,200	1,408	1,200	865	805	835	1,200
Wheat	"	800	800	800	580	902	1,108	1,245	1,000	778	784	845	900

SOURCE: Technical Secretariat For Planning

Table 7: PRODUCTION OF ANNUAL CROPS  
(TOTAL OUTPUT)

	UNIT	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
Garlic	1,000 Bunches	148	152	157	162	167	172	178	180	190	220	100	180
Cotton	Ton	32,500	39,700	36,100	42,000	28,900	26,750	30,100	40,530	37,230	16,690	40,515	84,000
Rice	"	37,700	35,600	36,000	18,500	21,000	21,380	21,380	27,160	41,850	39,450	41,423	23,000
Peas	"	1,194	2,300	2,300	2,600	3,300	3,750	3,990	3,670	3,490	3,800	3,900	3,960
Sweet Potatoes	"	114,600	126,000	130,000	132,000	118,800	122,500	116,380	128,020	134,290	138,300	159,045	167,000
Gourds and Squash	1,000 Fruits	10,120	10,423	10,735	11,000	11,300	11,600	11,950	12,300	12,670	13,100	13,520	14,196
Onion	Ton	8,900	11,000	13,600	14,100	15,050	17,000	18,000	17,100	18,470	19,400	20,400	22,440
Lima Beans	"	4,820	4,900	5,100	5,300	5,600	5,790	4,280	4,140	3,710	4,100	4,220	4,431
Maize	"	234,500	240,000	252,000	258,700	203,900	277,100	221,600	188,360	220,000	216,920	227,770	273,330
Groundnuts	"	20,500	18,000	19,600	19,200	19,800	20,740	18,000	16,200	17,000	17,700	21,200	21,200
Cassava for Consumption - (Human and Industrial?)	"	683,450	700,540	718,100	736,000	754,400	773,250	792,600	812,410	832,720	853,500	863,742	876,700
Melon	1,000 Fruits	9,250	9,490	9,760	10,000	10,300	10,400	10,480	10,600	10,700	10,860	11,077	11,360
Potatoes	Ton	6,250	5,400	6,400	8,400	8,800	10,000	9,800	10,100	11,610	8,560	7,700	8,470
Beans	"	30,620	37,000	35,000	36,200	29,600	34,500	27,600	26,770	29,420	27,300	28,670	30,100
Watermelon	1,000 Fruits	26,950	27,760	28,600	29,000	30,000	30,240	30,480	30,780	31,100	31,600	32,232	33,070
Grain Sorghum	"	2,600	2,680	2,760	2,840	3,900	4,100	4,220	4,200	4,800	5,500	5,775	5,923
Broom Sorghum	"	4,280	4,400	4,500	4,600	4,800	4,950	6,000	6,000	6,900	7,900	8,137	8,348
Soybeans	"	6,000	11,000	16,000	18,000	20,000	18,000	13,500	22,000	40,000	74,100	100,000	120,000
Tobacco	"	16,000	25,000	15,000	18,000	8,750	13,500	22,000	24,000	18,000	17,400	23,514	25,900
Wheat	"	7,200	7,000	6,000	5,500	7,400	9,200	25,100	32,000	35,000	45,500	16,890	13,000
Vegetables	"												
Flowers	"												
Other	"												
Cassava f.r. Forrage	"	683,450	700,540	718,100	736,000	754,400	773,250	792,600	812,410	832,720	853,500	863,743	876,700

SOURCE: Department of Economic Studies, Central Bank of Paraguay, Asuncion.

**Table 8: PRODUCTION OF PERMANENT CROPS BY AREA HARVESTED**

(Hectares)

	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
1. Avocado	532	546	560	575	600	620	640	650	680	700	720	750
2. Banana	7,368	7,255	7,226	7,587	8,200	8,500	8,700	9,060	9,400	9,700	9,570	10,100
3. Coffee	10,332	11,217	8,762	9,197	9,200	9,500	9,800	6,500	6,800	7,200	8,300	13,800
4. Plums	76	78	80	82	90	90	92	93	95	97	100	102
5. Peach	227	233	239	245	250	260	265	280	290	300	307	315
6. Guavas	1,260	1,280	1,293	1,306	1,330	1,340	1,350	1,395	1,430	1,470	1,500	1,540
7. Persian Limes	847	856	864	879	890	900	910	940	970	1,000	1,025	1,035
8. Lemon Real	304	339	378	421	450	460	470	390	400	415	436	460
9. Sour Lime	325	335	345	355	370	380	390	390	400	415	430	450
10. Mango	2,050	2,070	2,090	2,110	2,140	2,160	2,160	2,240	2,300	2,380	2,390	2,400
11. Papaya	438	459	487	515	560	570	580	585	600	630	634	650
12. Apples	43	46	49	51	50	60	60	60	62	64	65	65
13. Mandarin Orange	2,964	3,048	3,133	3,229	3,330	3,400	3,500	3,600	3,700	3,800	3,900	3,950
14. Sweet Orange	14,230	14,646	15,091	15,560	16,050	16,550	17,100	17,390	17,830	18,300	18,800	19,700
15. Sour Orange	10,460	12,460	14,291	10,458	12,300	14,300	14,900	16,500	17,000	17,600	19,660	23,600
16. Pears	10	11	11	12	13	13	13	13	13	14	15	15
17. Pineapple	1,852	2,015	2,163	2,125	2,200	2,100	2,200	2,300	2,400	2,500	2,550	2,700
18. Pomelo	2,023	2,133	2,142	2,314	2,330	2,500	2,600	2,300	2,400	2,500	2,840	3,100
19. Castor seeds	8,346	10,000	10,000	12,000	12,000	5,600	5,800	13,600	14,000	14,500	7,400	8,800
20. Tung	11,567	11,840	10,467	8,333	18,330	32,000	32,200	28,800	20,500	30,300	30,000	22,700
21. Grape	2,606	2,069	2,167	2,130	2,800	2,900	3,900	3,900	4,000	4,150	4,270	4,050
22. Yerba Mate	5,416	5,086	5,800	6,257	6,860	5,100	5,500	5,700	5,870	6,050	7,670	6,900
23. Morora	-	-	-	-	-	-	-	440	740	1,040	-	-
24. Sugarcane	29,667	28,154	26,667	26,973	26,700	28,300	29,200	25,500	26,300	28,100	35,000	41,100
25. Alfalfa	4,000	4,360	5,500	5,872	6,000	6,700	6,900	6,900	7,100	7,300	7,320	7,700
26. Small Fruits	853	875	900	925	950	975	1,014	1,050	1,100	1,150	1,200	1,600
<b>Total:</b>	<b>117,796</b>	<b>121,411</b>	<b>120,705</b>	<b>119,448</b>	<b>133,323</b>	<b>145,178</b>	<b>149,244</b>	<b>150,576</b>	<b>155,380</b>	<b>161,675</b>	<b>166,102</b>	<b>177,582</b>

Source: Technical Secretariat for Planning, Asuncion.

**Table 9: PRODUCTION OF PERMANENT CROPS  
(YIELD PER HECTARE)**

	Unit	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
Avocado	Unit	14,389	14,440	14,509	14,570	14,403	14,384	14,496	14,615	14,412	14,471	14,520	14,300
Banana	Kg	21,810	24,650	25,502	25,502	25,500	25,400	25,445	25,518	25,700	25,960	25,000	25,000
Coffee	"	595	640	650	650	652	652	750	646	544	596	650	650
Plums	Unit	296,474	297,513	298,950	300,756	282,655	291,700	294,543	301,073	304,210	308,247	308,000	309,800
Cocoa	"												
Peach	"	134,801	135,193	135,933	136,735	138,400	137,308	136,481	135,714	135,172	135,000	135,210	135,200
Guavas	"	116,926	118,133	118,114	118,683	117,293	118,060	119,115	117,993	116,084	114,082	115,153	115,000
Persian Limes	"	69,394	69,352	69,329	69,397	69,213	69,111	69,674	68,830	67,320	65,950	64,980	65,000
Lemon Real	"	23,849	22,212	26,354	19,824	18,242	17,420	19,247	21,103	21,250	21,205	21,190	21,100
Sour Lemons	"	61,649	67,164	80,652	69,085	68,398	68,684	69,870	69,230	69,750	69,398	69,140	69,300
Mango	"	63,147	64,155	64,210	64,455	64,018	64,074	64,500	64,063	62,783	61,260	66,610	62,000
Papaya	"	11,689	14,379	14,374	14,370	13,929	13,860	14,014	14,017	13,933	13,333	13,400	13,400
Apples	"	62,465	69,565	69,383	70,588	76,000	66,666	68,666	70,000	68,387	66,875	66,460	56,500
Mandarin Orange	"	81,444	81,562	81,775	81,820	81,830	82,705	82,943	83,333	83,730	84,265	73,870	74,000
Sweet Orange	"	64,610	64,639	64,688	64,750	64,779	64,888	65,203	65,722	66,197	66,698	62,890	63,000
Sour Orange	Kg	6,000	6,000	6,000	6,024	6,036	5,040	6,185	6,015	6,573	6,023	6,200	6,200
Pear	Unit	69,400	67,273	70,909	68,333	66,923	67,692	69,230	70,000	70,769	66,429	62,670	63,300
Pineapple	"	7,408	7,459	7,535	7,487	7,290	7,448	7,645	7,435	7,250	6,932	7,000	7,000
Grapefruit	"	30,007	30,005	30,018	30,078	30,085	28,360	29,042	30,448	30,708	28,896	28,950	29,300
Castorseed	"	1,679	1,100	1,250	1,250	870	893	1,330	900	1,272	1,241	2,800	2,800
Tung	Kg	3,000	3,184	3,000	3,000	3,000	3,000	3,150	3,000	3,000	4,388	4,650	4,600
Grape	"	3,707	4,833	4,720	5,104	5,094	4,363	3,403	3,000	3,000	2,988	3,000	3,000
Yerba Mate	"	2,123	3,500	3,500	3,500	3,500	3,529	3,463	3,474	3,327	2,605	2,400	2,900
Sugarcane	"	25,968	32,500	36,000	37,000	37,000	36,972	33,060	36,969	41,578	42,806	35,430	35,500
Alfalfa	"	5,000	4,036	4,036	3,900	3,900	3,597	3,647	3,603	3,575	3,425	3,500	3,500
Small Fruits	"	400	400	400	402	404	406	403	402	396	391	383	300

SOURCE: Technical Secretariat For Planning, Ascuncion

Table 10: PRODUCTION OF PERMANENT CROPS

(TOTAL OUTPUT)

UNIT	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	
1. Avocado	1,000 fruits	7,655	7,884	8,125	8,378	8,642	8,918	9,205	9,500	9,800	10,130	10,454	10,726
2. Banana	Ton	160,701	178,840	184,280	193,477	209,100	215,900	223,414	231,200	241,587	251,821	239,224	251,600
3. Coffee	"	3,953	7,179	5,695	5,978	6,000	6,200	6,000	4,200	3,700	4,290	5,400	6,500
4. Sugarcane	"	770,400	915,000	960,000	998,000	988,000	1,046,300	889,400	942,700	1,093,500	1,202,850	1,240,000	1,458,000
5. Plums	"	22,532	23,206	23,916	24,662	25,439	26,253	27,098	28,000	28,900	29,900	30,800	31,600
6. Cocoa	"	72,941	125,000	130,000	140,000	144,200	120,540	173,320	190,650	209,700	249,000	198,553	249,000
7. Peach	1,000 fruits	30,600	31,500	32,500	33,500	34,600	35,700	36,850	38,000	39,200	40,500	41,510	42,589
8. Guavas	"	147,327	151,210	152,722	155,000	156,000	158,200	162,950	164,600	166,000	167,700	172,730	177,221
9. Persian Limes	"	58,777	59,365	59,900	61,000	61,600	62,200	64,100	64,700	65,300	65,950	66,610	67,276
10. Linon Real	"	7,250	7,530	9,962	8,346	8,209	8,013	8,180	8,230	8,500	8,800	9,240	9,702
11. Sour Lemon	"	20,036	22,500	27,825	24,525	25,300	26,100	26,500	27,000	27,900	28,800	29,730	31,216
12. Mango	"	129,452	132,800	134,200	136,000	137,000	138,400	142,100	143,500	144,400	145,800	147,258	148,730
13. Mamon	"	5,120	6,600	7,000	7,400	7,800	7,900	8,100	8,200	8,300	8,400	8,500	8,721
14. Apples	"	2,686	3,200	3,400	3,600	3,800	4,000	4,120	4,200	4,240	4,280	4,320	4,320
15. Mandarin Orange	"	241,400	248,600	256,200	264,200	272,500	281,200	290,300	300,000	309,800	320,210	288,190	291,072
16. Sweet Orange	"	919,400	946,700	976,200	1,007,500	1,039,700	1,073,900	1,106,500	1,142,900	1,180,300	1,220,400	1,182,330	1,239,780
17. Sour Orange	Ton	62,750	74,750	85,750	63,000	74,250	83,500	95,250	99,250	111,750	106,000	121,900	146,280
18. Pears	1,000 fruits	604	740	780	820	870	880	900	910	920	930	940	949
19. Pineapple	"	13,720	15,030	16,300	15,910	16,040	15,640	16,820	17,100	17,400	17,330	17,850	18,743
20. Grapefruit	"	60,705	64,000	64,300	69,600	70,100	70,900	69,700	70,030	73,700	74,740	82,214	90,435
21. Castorseeds	Ton	14,016	11,000	12,500	15,000	10,450	7,500	12,780	12,240	17,814	18,000	20,700	24,800
22. Tung	"	34,720	37,700	31,400	25,000	55,000	96,000	96,000	86,400	88,638	132,957	139,600	69,800
23. Grape	"	9,660	10,000	10,230	10,550	10,850	12,220	11,400	11,700	12,000	12,400	12,800	12,160
24. Yerba Mate	"	11,500	17,800	20,300	21,900	24,000	18,000	18,700	19,800	19,530	15,760	18,400	16,560
25. Alfalfa	"	20,000	21,600	22,200	22,900	23,400	24,100	24,800	24,860	25,380	25,000	25,625	26,906
26. Small Fruit	"	341	351	361	372	384	396	409	422	436	430	460	483

Source: Dept. of Economic Studies, Central Bank of Paraguay, Asuncion

Table 11: PERCENT OF PRODUCTION OF VARIOUS CROPS BY LAND SIZE CATEGORIES  
IN EASTERN PARAGUAY

1971-72 Crop Year

CROP	Less Than 1 Hectare (11,437 Farms)	1 to 10 Hectares (86,128 Farms)	0-21 Ha (138,768 Farms)	10 to 51 Ha (43,623 Farms)	51 Hectares and over (17,714 Farms)	Value of Production In US\$ Millions	
						Total Crop	Small Farmer Share (0 to 21 Ha)
Cotton	1.90	41.81	67.5	39.56	16.72	8.35	5.64
Irrigated Rice	.88	10.02	18.0	11.82	77.27	2.94	.53
Dry Land Rice	.21	7.81	22.7	24.42	67.55	.83	.19
Peas	3.95	50.99	71.4	27.46	17.60	.24	.17
Sweet Potatoes	2.76	52.13	74.1	32.05	13.07	1.73	1.28
Sugarcane for Sugar	3.38	44.08	61.7	23.69	28.85	3.87	2.39
Sugarcane for Molasses	.93	36.11	59.0	26.95	36.01	1.49	.79
Sugarcane for Forrage	1.99	44.12	64.5	30.69	23.21	-	-
Onions	2.91	40.28	63.7	34.25	22.56	1.31	.83
Lima Beans	1.30	35.42	57.3	34.32	28.95	1.07	.61
Corn	2.60	42.22	64.4	32.66	22.53	7.62	4.91
Cassava	4.65	47.65	71.9	32.58	15.12	19.75	14.20
Groundnuts	2.29	54.03	74.1	29.64	14.05	1.62	1.20
Potatoes	.00	29.95	58.1	46.97	23.08	.55	.31
Dry Beans	2.71	51.10	72.2	31.54	14.66	3.66	2.66
Soybeans	.29	12.57	24.7	19.70	67.45	7.37	1.82
Tobacco	4.01	36.82	70.6	49.64	9.54	4.63	3.27
Wheat	.14	6.04	11.7	9.20	84.62	1.23	.14

SOURCE: USAID, ASUNCION

**Table 12: CROP PRODUCTION BY DEPARTMENT IN 1972**  
(Area Harvested in '000 Hectares)

<u>EASTERN REGION</u>	<u>Corn</u>	<u>Manioc</u>	<u>Beans</u>	<u>Sugarcane</u>	<u>Cotton</u>	<u>Wheat</u>	<u>Soybeans</u>	<u>Rice</u>	<u>Peanuts</u>	<u>Tobacco</u>
Central	6.7	9.8	2.5	4.2	0.1	0.06	0.1	0.1	0.8	-
Cordillera	15.6	9.1	4.6	5.4	3.8	1.5	0.8	4.1	2.5	1.5
Paraguaguari	29.6	12.8	8.1	3.0	12.2	4.3	3.3	2.1	3.4	1.1
Caaguazu	19.3	11.9	4.5	1.0	8.7	0.8	2.6	0.4	1.7	6.0
Guaira	12.8	8.4	3.2	11.4	2.4	0.09	2.0	0.6	0.9	0.5
Caazapa	<u>9.4</u>	<u>5.9</u>	<u>3.2</u>	<u>0.6</u>	<u>3.1</u>	-	<u>2.0</u>	<u>1.5</u>	<u>0.5</u>	<u>1.4</u>
Sub-total	93.4	56.9	26.1	25.6	30.3	6.75	10.8	8.8	9.8	10.5
Concepcion	8.3	4.1	1.9	1.2	3.8	0.2	0.3	-	0.6	0.5
San Pedro	<u>17.1</u>	<u>9.3</u>	<u>3.0</u>	<u>0.8</u>	<u>4.7</u>	<u>8.9</u>	<u>1.6</u>	<u>0.03</u>	<u>1.3</u>	<u>3.7</u>
Sub-total	25.4	13.4	4.9	2.0	8.5	9.1	1.9	0.03	1.9	4.2
Amambay	5.5	1.6	0.4	0.4	0.2	0.7	5.9	2.0	0.3	-
Alto Parana	<u>7.6</u>	<u>5.3</u>	<u>2.0</u>	-	<u>2.2</u>	<u>0.02</u>	<u>4.2</u>	<u>2.3</u>	<u>0.2</u>	<u>2.3</u>
Sub-total	13.1	6.9	2.4	0.4	2.4	0.72	10.1	4.3	0.5	2.3
Itapua	31.3	10.1	4.1	1.5	5.6	8.6	44.9	4.5	1.1	0.3
Misiones	8.9	2.6	2.3	0.2	1.8	6.7	8.0	4.8	0.5	0.1
Neembucu	<u>11.8</u>	<u>3.0</u>	<u>6.8</u>	<u>0.3</u>	<u>4.5</u>	-	<u>0.1</u>	<u>0.1</u>	<u>1.3</u>	<u>0.1</u>
Sub-total	20.7	5.6	9.1	0.5	6.3	6.7	8.1	4.9	1.8	0.2
<u>TOTAL EASTERN REGION</u>	183.9	92.9	46.6	29.6	53.9	69.2	77.6	22.5	15.1	17.5
<u>CHACO REGION</u>	0.5	0.4	0.4	0.8	4.1	0.2	-	-	5.5	-
<u>TOTAL</u>	<u>184.4</u>	<u>93.3</u>	<u>47.0</u>	<u>30.4</u>	<u>59.0</u>	<u>69.4</u>	<u>77.6</u>	<u>22.5</u>	<u>20.6</u>	<u>17.5</u>

Source: Escuela Agropecuaria por Muestreo, Asuncion.

Table 13: AVERAGE YIELD FOR 10 MAJOR CROPS BY DEPARTMENT IN 1972

(Kilos per Hectare)

	<u>Corn</u>	<u>Manioc</u>	<u>Beans</u>	<u>Sugarcane</u>	<u>Cotton</u>	<u>Wheat</u>	<u>Soybeans</u>	<u>Rice</u> (irrigated)	<u>Peanuts</u>	<u>Tobacco</u>
EASTERN REGION										
Central	8.68	35.85	6.68	13.58	12.17	3.17	1.71	22.52	7.00	11.43
Cordillera	10.50	125.80	6.64	35.95	9.38	6.68	8.52	16.51	9.57	11.77
Paraguari	9.89	137.26	5.81	37.11	8.64	4.47	7.91	19.62	8.61	11.54
Caaguazu	11.88	151.87	8.65	16.29	11.15	9.60	18.06	15.83	9.73	11.74
Guaira	11.74	116.48	6.38	46.99	10.49	8.22	10.56	30.29	7.21	15.40
Cazapa	9.66	167.95	6.44	37.45	8.76	-	10.06	28.86	7.48	13.59
Concepcion	12.68	193.08	8.80	45.36	9.49	8.11	11.52	32.05	9.95	10.88
San Pedro	13.87	132.85	8.45	19.83	11.07	6.75	13.90	10.00	10.09	15.81
Amambay	15.25	260.74	8.47	5.70	5.59	9.88	16.63	-	12.28	16.01
Alto Parana	15.60	140.23	14.35	10.00	11.57	6.32	17.71	-	8.75	15.98
Itapua	12.94	140.92	6.12	5.12	8.89	5.19	12.07	24.92	10.61	16.08
Misiones	6.65	119.71	4.95	13.92	10.32	3.78	13.63	18.81	5.99	9.91
Neembucu	7.81	49.87	4.91	7.31	8.32	-	2.95	-	7.31	5.69
CHACO REGION	13.12	40.46	7.17	32.00	4.22	.98	4.16	-	6.73	-

SOURCE: Escuela Agropecuaria por Muestreo, Asuncion.

Table 11: COMMODITY PRICES BY DEPARTMENT IN 1972

(Average Price per Kilo in Guaranies)

	<u>Corn</u>	<u>Manioc</u>	<u>Beans</u>	<u>Sugarcane<sup>1/</sup></u> <u>(for sugar)</u>	<u>Cotton</u>	<u>Wheat</u>	<u>Soybeans</u>	<u>Rice</u>	<u>Peanuts</u>	<u>Tobacco</u>
<u>EASTERN REGION:</u>										
Central	6.90	2.22	17.32	5.85	18.58	9.10	10.00	10.76	12.91	22.64
Cordillera	6.20	1.59	17.52	4.47	20.20	10.90	10.22	11.20	12.43	24.86
Paraguari	4.85	2.20	14.82	5.13	20.26	9.80	10.65	9.60	9.31	24.25
Caaguazu	4.55	1.45	12.92	6.88	19.43	9.10	9.71	10.00	11.46	23.41
Guaira	5.38	1.16	15.08	6.41	19.52	11.00	8.65	9.34	14.13	27.99
Caazapa	4.00	2.05	12.31	4.54	18.78	-	8.50	10.91	14.81	22.33
Concepcion	4.29	1.76	13.11	-	20.44	11.00	10.85	-	11.80	39.35
San Pedro	3.80	2.30	17.07	4.00	18.16	8.70	9.89	-	13.36	23.97
Amambay	4.11	1.99	12.08	-	18.08	11.20	10.63	-	14.88	11.00
Alto Parana	3.55	4.43	14.49	7.40	19.39	-	8.11	-	-	26.78
Itapua	4.35	1.88	12.47	-	20.64	8.10	9.34	11.39	10.88	50.74
Misiones	4.43	4.19	15.07	-	20.41	8.00	10.95	10.52	13.75	23.97
Neembucu	8.24	4.61	10.47	-	19.84	-	13.49	-	12.46	26.82
CHACO REGION	7.28	7.94	16.92	7.40	25.58	10.70	-	-	12.62	-

<sup>1/</sup> Price per ton.

SOURCE: Escuela Agropecuaria por Muestreo, Asuncion.

Table 15: Distribution of Cattle Population by Sex, Age and Region  
1972 (1,000 Head)

<u>Age and Sex Categories</u>	<u>Total Cattle in Paraguay</u>	<u>% of Total</u>	<u>Total Cattle in the Chaco</u>	<u>% of Total in Chaco</u>	<u>Total Cattle in E. Region</u>	<u>% of Total in E. Region</u>	<u>Growth Rate 1971-72 %</u>
Total:	4,548.2	100	1,855.9	40.8	2,692.3	59.2	2.0
Cows 3 yrs. old & over	1,776.9	39.06	713.0	38.42	1,063.9	39.51	0.05
Heifers 1 to 3 years	889.1	19.56	378.2	20.38	510.9	18.98	0.9
Calves under 1 year	664.7	14.61	269.7	14.53	395.0	14.67	-1.9
Young Bulls and Steers 1 yr. old and over	887.8	19.52	414.5	22.33	473.3	17.58	10.6
Breeding Bulls, Mixed breeds and Criollos	121.8	2.68	49.3	2.66	72.5	2.69	-2.1
Breeding Bulls, 3/4 Bloods or more	30.2	0.66	12.8	0.69	17.4	0.65	14.0
Oxen and Herd Leaders	177.7	3.91	18.4	0.99	159.3	5.92	4.4

**Table 16:** Area of Natural Grazing Lands, Number of Cattle by Departments and Grazing Density - 1972.

	Hectares of Grazing Lands	%	Number of Cattle	%	Present Density (Has/Head)	Potential Density (Has/Head)
<u>PARAGUAY:</u>	14,333,000	100	4,548,215	100	3.2	2.0
<u>Eastern Region</u>	5,770,100	40.26	2,692,282	59.19	2.1	2.0
Concepcion	1,900,200	13.26	265,400	5.83	7.2	1.0-2.0
San Pedro	697,100	4.86	254,494	5.60	2.7	1.5-2.0
Cordillera	316,400	2.21	196,568	4.32	1.6	No data
Guaira	68,500	.48	144,362	3.18	0.5	1.5-2.5
Caaguazu	176,400	1.23	142,957	3.14	1.2	1.3
Caazapa	368,900	2.57	160,210	3.52	2.3	1.0
Itapua	284,400	1.98	219,440	4.82	1.3	1.0
Misiones	546,700	3.82	312,465	6.87	1.7	1.0
Paraguari	460,900	3.22	399,199	8.78	1.1	1.0-2.0
Alto Parana	11,400	.08	26,780	.59	0.4	No data
Central	56,000	.39	76,419	1.68	0.7	No data
Neembucu	733,000	5.11	415,409	9.16	1.8	No data
Amambay	150,200	1.05	77,379	1.70	1.9	No data
<u>Chaco</u>	8,562,900	59.74	1,855,933	40.81	4.6	No data
Pte. Hayes	4,874,300	34.01	1,482,702	32.60	3.3	No data
Boqueron	3,211,300	22.40	272,890	6.00	11.7	No data
Olimpo	477,300	3.33	100,341	2.21	4.8	No data

Animal Unit is an adult cow with or without calf.

Source: Diagnostico de la Ganaderia Bovina de Carne. Ministerio de Agricultura y Ganaderia. (Version Preliminar) - Asuncion, 1973.

**Table 17:** Percentage Distribution of Ranches by Size and Departments Paraguay, 1972

<u>Percentages of ranches that are:</u>					
Department	Subsistence (less than 20 head)	Marginal (20-99 head)	Small Commercial (100-1,000 head)	Large Commercial (2,000 + head)	Total Number of Ranches
Concepcion	81.3	16.9	1.5	0.4	5,410
San Pedro	68.9	26.6	4.2	0.4	5,247
Cordillera	80.7	17.2	2.0	0.1	8,466
Guaira	90.7	8.1	1.2	*	8,499
Caaguazu	82.6	15.8	1.6	*	9,621
Caazapa	51.6	44.9	3.3	0.3	4,205
Itapua	83.8	14.1	1.9	0.2	6,330
Misiones	79.5	14.3	5.6	0.6	4,070
Paraguari	83.9	13.8	2.3	*	15,335
Alto Parana	91.1	7.8	1.1	0.0	2,150
Central	91.9	7.3	0.8	*	5,928
Neembucu	50.6	42.2	7.0	0.2	6,973
Amambay	18.8	65.4	15.0	0.8	477
Pte. Hayes	42.5**	24.0	25.2	9.1	1,375
Boqueron	42.5**	30.6	24.0	2.9	656
Olimpo	42.5**	20.8	34.7	1.5	331

\* Less than 0.1 percent

\*\* Estimated

Table 18: PARAGUAY: IMPORTS OF INSECTICIDE AND FUNGICIDE  
1963-1974

<u>Year</u>	<u>Volume in Tons</u>	<u>Value In Current US\$</u>
1963	120	119,583
1964	166	134,477
1965	390	393,777
1966	281	255,593
1967	223	166,448
1968	441	225,447
1969	685	263,466
1970	773	582,800
1971	612	775,900
1972	740	617,459
1973	417	531,730
1974	574	588,730

FERTILIZER IMPORTS  
1963-1974

1963	1,024	87,480
1964	1,391	115,209
1965	1,233	108,846
1966	926	63,354
1967	932	80,540
1968	4,039	307,360
1969	9,528	538,452
1970	12,848	914,900
1971	7,233	528,100
1972	10,796	920,017
1973	2,624	296,765
1974	1,663	291,433

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Source: Banco Central del Paraguay. Dpto.  
Compilacion Mecanica.

Table 19: PARAGUAY: DISTRIBUTION OF TOTAL RURAL AND ECONOMICALLY ACTIVE POPULATION (EAP) BY DEPARTMENT, 1962-1972

Departments	-----1962-----			-----1972-----		
	Rural Population	<sup>1/</sup> EAP Rural	Rate of Participation (c=b/a)	Rural Population	<sup>1/</sup> EAP Rural	Rate of Participation (c=b/a)
	(a)	(b)	(c)	(a)	(b)	(c)
Concepcion	56,297	15,609	27.7	82,067	22,733	27.7
San Pedro	74,372	21,121	28.4	116,653	33,130	28.4
Cordiaallera	155,248	46,026	29.6	158,167	46,817	29.6
Guaira	83,082	26,930	32.4	90,578	29,347	32.4
Caaguazu	105,148	32,326	30.7	147,619	45,318	30.7
Caazapa	76,526	21,352	27.9	87,675	24,461	27.9
Itapua	109,755	34,994	31.9	154,261	49,209	31.9
Misiones	39,973	11,941	29.9	47,058	14,070	29.9
Paraguari	167,825	49,493	29.5	178,037	52,521	29.5
Alto Parana	22,126	7,322	33.1	74,212	24,564	33.1
Central	153,399	49,728	32.4	173,335	56,161	32.4
Neembucu	44,251	13,053	29.5	50,795	14,985	29.5
Amambay	21,562	6,849	31.8	41,294	13,132	31.8
Presidente Hayes	21,695	7,503	34.6	30,055	10,339	34.6
Boqueron	34,709	10,458	30.1	17,929	5,397	30.1
Olimpo	1,266	449	35.5	2,467	876	35.5
<u>Total</u>	<u>1,167,234</u>	<u>355,154</u>	<u>30.4</u>	<u>1,452,202</u>	<u>443,120</u>	<u>30.5</u>

SOURCE: PREALC, "La Situacion y Perspectivas del Empleo en Paraguay!"

1/ Economically Active Population in the Rural Sector.

Table 20: PARAGUAY: COLONIES ESTABLISHED BY IBR

(1960 - 1973)

<u>Department</u>	<u>Number of Colonies</u>	<u>Area Colonized</u>	<u>Number of Families Settled</u>	<u>Average Size of lot in Hectare</u>
<u>EASTERN REGION</u>				
Concepcion	31	152,209	5,908	26
San Pedro	46	129,471	8,054	17
Cordillera	18	11,004	1,735	6.34
Guaira	11	25,082	1,733	14.47
Caaguazu	31	158,878	4,037	26.86
Itapua	16	58,685	2,979	19.70
Misiones	3	1,794	188	9.54
Paraguari	20	47,625	1,986	23.98
Alto Parana	17	269,808	4,268	63.22
Central	10	3,836	1,264	3.03
Neembucu	18	35,252	1,558	22.63
Amambay	<u>13</u>	<u>57,605</u>	<u>1,576</u>	<u>36.55</u>
<u>Subtotal</u>	251	1,059,677	40,088	26.44
<u>CHACO</u>				
Presidente Hayes	9	951,733	661	1,439.84
Boqueron	6	206,474	818	252.41
Olimpo	<u>3</u>	<u>627,000</u>	<u>58</u>	<u>10,810.34</u>
<u>Subtotal</u>	18	1,785,207	1,537	1,161.49
<u>TOTAL</u>	<u>269</u>	<u>2,844,884</u>	<u>41,625</u>	<u>68.35</u>

Table 21: Land Titles Issued by IBR and Predecessor Agencies in Paraguay

1915 - 1973

<u>Year</u>	<u>Titles Issued</u>	<u>Titles Issued Cumulative</u>	<u>Area (ha)</u>	<u>Area Cumulative (ha)</u>	<u>Average Size of Lot (Cumulative)</u>
1915-1957	14,289	14,289	349,524	349,524	24.5
1958	1,198	15,487	31,888	381,412	24.6
1959	2,710	18,197	75,554	457,366	25.1
1960	3,205	21,402	101,795	559,161	26.1
1961	7,250	28,652	165,808	724,969	25.3
1962	10,018	38,668	209,191	934,160	24.2
1963	4,500	43,168	156,948	1,091,108	25.3
1964	6,250	49,418	165,280	1,256,388	25.4
1965	6,500	55,918	356,348	1,612,736	28.8
1966	4,007	59,925	255,800	1,868,536	31.2
1967	3,507	63,432	246,343	2,114,879	33.3
1968	3,150	66,582	293,273	2,408,152	36.2
1969	3,382	69,964	111,507	2,519,659	36.2
1970	3,170	73,134	143,635	2,663,294	36.7
1971	2,605	75,739	125,847	2,789,141	37.1
1972	2,281	78,020	182,129	2,971,270	38.4
1973	3,300	81,320	274,549	3,245,819	39.9

Source: Statistical Department, IBR.

Table 22: VOLUME AND F.O.B. VALUE IN THOUSANDS OF U.S. DOLLARS  
OF BEEF PRODUCTS EXPORTED, 1963 to 1972

Year	Type of Beef Products Exported							
	Canned		Extract		Frozen		Total	
	Volume in Metric Tons	Value in Thousands of U.S. \$	Volume in Metric Tons	Value in Thousands of U.S. \$	Volume in Metric Tons	Value in Thousands of U.S. \$	Volume in Metric Tons	Value in Thousands of U.S. \$
1963	16,701	8.562	514	1.198	-	-	25,506	10.525
1964	15,431	9.633	517	3.437	1,902	.838	23,045	14.749
1965	19,614	11.425	509	3.440	4,795	3.017	28,966	18.745
1966	15,153	9.189	526	3.577	977	.570	20,475	13.949
1967	21,921	13.454	650	2.835	166	.077	27,532	17.354
1968	15,112	10.900	506	2.246	22	.012	18,516	13.590
1969	13,639	8.723	286	1.211	390	.220	18,252	11.401
1970	12,550	8.932	268	1.113	9,564	4.691	24,899	15.352
1971	10,756	10.632	439	1.926	12,428	7.523	26,387	20.968
1972	10,603	12.193	276	1.204	19,242	15.538	34,252	30.046

Source: Central Bank of Paraguay, Department of Economic Studies, Monthly Statistical Bulletin No. 180, May 1973, Asuncion, Paraguay.

Table 23: TOTAL HUMAN POPULATION, AND TOTAL AND PER CAPITA  
CONSUMPTION OF BEEF, 1958 to 1972

Year	Human Population (1,000)	Beef Consumed	
		Total (Metric Tons)	Per Capita (Kgs.)
1958	1,630	88,400	54.2
1959	1,675	86,210	51.5
1960	1,722	80,560	46.8
1961	1,770	80,325	45.4
1962	1,819	75,290	41.4
1963	1,866	65,800	35.3
1964	1,915	69,540	36.3
1965	1,965	71,980	36.6
1966	2,016	83,305	41.3
1967	2,069	71,930	34.8
1968	2,123	78,910	37.2
1969	2,178	81,560	37.4
1970	2,235	83,435	37.3
1971	2,294	80,840	35.2
1972	2,354	68,130	29.0

**Table 24: NUMBER OF CATTLE SLAUGHTERED FOR INTERNAL  
CONSUMPTION AND FOR EXPORT, 1958 to 1972**

Year	Internal Consumption		For Export		Total Slaughter (1,000 Head)
	Number (1,000 Head)	Percent of Total	Number (1,000 Head)	Percent of Total	
1958	531,000	75	179,000	25	710,000
1959	520,400	73	195,000	27	715,400
1960	485,800	77	148,000	23	633,800
1961	492,400	73	185,000	27	677,400
1962	460,927	73	173,000	27	633,927
1963	403,944	70	173,000	30	576,944
1964	430,956	70	187,431	30	618,387
1965	448,173	66	230,383	34	678,556
1966	508,624	75	166,176	25	674,800
1967	444,449	66	230,628	34	675,077
1968	484,490	74	170,076	26	654,566
1969	498,375	78	141,125	22	639,500
1970	512,506	74	184,494	26	697,000
1971	477,790	69	217,410	31	695,200
1972	391,779	56	301,754	44	693,533