

PD-AAA-324-B1

DEPARTMENT OF STATE
AGENCY FOR INTERNATIONAL DEVELOPMENT
Washington, D.C. 20523

CAPITAL ASSISTANCE PAPER

Proposal and Recommendations
For the Review of the
Development Loan Committee

BRAZIL: AGRICULTURE RESEARCH LOAN

AID-DLC/P-747

277

DEPARTMENT OF STATE
AGENCY FOR INTERNATIONAL DEVELOPMENT
Washington, D.C. 20523

UNCLASSIFIED

AID-DLC/P-747
June 21, 1968

MEMORANDUM FOR THE DEVELOPMENT LOAN COMMITTEE

SUBJECT: Brazil - Agriculture Research Loan

Attached for your review are the recommendations for authorization of a loan in an amount not to exceed \$13,400,000 to the Government of Brazil to assist in financing the United States dollar costs of the expansion and improvement of Agricultural Research in Brazil.

This loan proposal is scheduled for consideration by the Development Loan Staff Committee at a meeting on Tuesday, June 25, 1968.

Rachel C. Rogers
Assistant Secretary
Development Loan Committee

Attachments:

Summary and Recommendations
Project Analysis
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BRAZIL - AGRICULTURAL RESEARCH LOAN

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BRAZIL - AGRICULTURAL RESEARCH LOAN

SUMMARY AND RECOMMENDATIONS

1. **BORROWER:** The Government of the Republic of Brazil (the Ministry of Finance). The program will be executed by the Escritorio de Pesquisas e Experimentacao (EPE), the research agency of the Ministry of Agriculture, and the Conselho Nacional de Pesquisas (CNPq) an autonomous public agency, reporting directly to the President of the Republic, and charged with the responsibility of stimulating and promoting the scientific and technological development of Brazil.
2. **AMOUNT OF LOAN:** \$13.4 million to finance dollar costs.
3. **PROGRAM DESCRIPTION AND PURPOSE:** The program is divided into two parts, one part to be administered by the Escritorio de Pesquisas e Experimentacao (EPE) and the other by the Conselho Nacional de Pesquisas (CNPq).

A. The EPE Program

Proposed is a five-year program of professional assistance, academic, professional, and sub-professional training, and commodity and equipment support to: (1) provide technical assistance to EPE in increasing its capacity to plan and execute a national research program; (2) assist EPE and through EPE's cooperative research program, state and university research centers, in substantially increasing the research capacity of their staffs, through academic, professional, and sub-professional training in both the U.S. and Brazil; and (3) substantially increase the input into research in key areas through the provision of professional research assistance and essential research equipment and commodities and services.

The program should be viewed as a program to intensify and expand EPE programs in research and training, with technical assistance being provided to improve the quality of the EPE program (both budgetarily and PL-480 funded) in priority areas.

The program consists of the following:

(a) The major thrust of this program will be a contract* with the IRI Research Institute which will provide 151 loan funded man years of professional researchers to (1) advise EPE in planning and administering its program utilizing the most advanced research administrative methods and research technology, and (2) to augment the quantity and quality of research output and in-service training in EPE (and cooperating state and university research centers) through working in cooperation with Brazilian research teams in the design and conduct of specific high priority research projects and programs.

(b) The second element of this program will be a comprehensive training program to develop the research capacity of the EPE and state and university research staffs. This program will include (1) the training of two hundred newly hired researchers in six months courses in research methodology and techniques, (2) graduate level training of approximately 350 researchers and research dissemination workers both in Brazil and in the U.S., (3) intensive short courses in Brazil in research methodology and specialized subject matter for approximately 360 researchers, and (4) sub-professional training for 200 field foremen and laboratory technicians.

(c) The third element of the program will be research support to EPE (and to state and university research centers) in the form of laboratory equipment, farm machinery, commodities, services, and supplies essential to the conduct of research.

B. The CNPq Program

Whereas the program with EPE is directed toward increasing the research capacity of research centers, the CNPq program has the complementary objective of expanding the graduate program, in agricultural research disciplines, of selected Brazilian universities (herein called "Centers of Excellence")

* The contract services provided by IRI under the grant contract are considered satisfactory and EPE has expressed the desire to continue with IRI. However, if during the negotiations an agreement acceptable to USAID, EPE and IRI is not possible, another contractor will be chosen. While this would cause considerable delay in the project, it would not affect its overall feasibility.

to assist Brazil to develop the capacity to eventually meet manpower requirements in agriculture research. The program with CNPq will provide (a) 360 scholarships for instructors and researchers from other universities and research centers to undergo training at these Centers of Excellence; (b) approximately 30 scholarships for instructors and researchers from these Centers of Excellence to pursue advanced academic training in the U.S.; (c) the provision of 31 U.S. professors to assist the Centers of Excellence in expanding and improving their graduate programs; and (d) support to the Centers of Excellence in the form of imported U.S. equipment (\$150,000) and program support (PL-480) to assist in their graduate expansion programs. This will in effect allow CNPq to expand its program in agricultural research.

4. TOTAL COST OF THE PROJECT:

(\$US 000)

	<u>Loan Funded</u> <u>Dollar Costs</u>	<u>PL-480 Fund</u> <u>Cruzeiros Costs</u>
<u>EPE Program</u>		
- IRI Contract and related local research costs	5,848.8	5,106.0
- Training program	2,960.4	1,648.6
- Equipment and commodity support	<u>3,104.6</u>	<u>4,783.0</u>
SUB-TOTAL	\$ 11,913.8	\$ 11,537.6
<u>CNPq Program</u>		
- Scholarships program & university program support in Brazil	--	4,347.3
- Scholarship program in U.S.	540.9	--
- Provision of U.S. professors	775.0	217.0
- U.S. equipment	<u>150.0</u>	<u>--</u>
SUB-TOTAL	1,465.9	4,564.3
GRAND TOTAL	\$ 13,379.7	\$16,101.9

Additionally EPE and CNPq will contribute funds to agriculture research as follows:

(NGR\$1,000)

	<u>1969</u>	<u>1970</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>Total</u>
EPE	44,000	50,000	56,000	62,000	*	212,000
CNPq**	2,500	3,200	8,300	*	*	14,300

* Estimate not available. ** Agricultural research only.

5. BACKGROUND OF THE PROGRAM: The proposed program will be a continuation of the project initiated in 1963 when USAID contracted with the IRI Research Institute to provide technical assistance to the Departamento de Pesquisas e Experimentacao Agropecuaria (DPEA--now called EPE), and the Associacao Brasileira de Credito e Assistencia Rural (ABCAR) to establish a nationwide program in research and extension. The program has been a successful one (See Annex I for an evaluation) and the Government of Brazil has requested a loan to expand the program. At about the same time that discussions were taking place concerning the possibility of a loan, the CNPq requested assistance for an agricultural research program. Subsequently, the two requests were combined and developed jointly by EPE, CNPq and USAID into the two complementary programs described herein.

6. PRIORITY OF RESEARCH: If Brazilian agriculture is to provide the savings, foreign exchange, food and fiber necessary to support its development goals, a sustained increase in food production of approximately 5% per year will be required. Due to the fact that bringing new land into cultivation is in many cases uneconomic because of distance or lack of fertility, these goals must be met for the greater part by an increase of productivity on existing cultivated land. Such increases will need to be obtained through an increased intensification of farming, through utilization of the modern technology of fertilizer

use, improved varieties of crops, weed and pest control and mechanical improvement. This transfer of technology will be a research task, a task of adapting the technology of the developed world to the soils and climate of Brazil. Such a transfer has already commenced and is best exemplified by the transfer of fertilizer technology to the central and south of Brazil. This is an example of a direct and simple transfer of technology representing a virtually free transfer of knowledge resources, requiring highly scientific but relatively low cost research.

For this transfer Brazil has the advantage of the possibility of the transfer of the large body of fundamental scientific principles and methodological know-how built up in the economically advanced countries over the years. Thus, while the rice varieties that have enabled Japan to increase its rice production may not be successfully transferred to Brazil, the basic scientific principles used by Japanese scientists can help develop improved varieties in Brazil. The transferability of such know-how has made it possible for geneticists in Mexico to develop new varieties of wheat that helped to double that country's yield per acre between 1948 and 1952 and 1960 and 1962.

Some results in Brazil demonstrate comparable possibilities. E.g., new varieties of grasses in Central Brazil can more than double beef production. Proper use of fertilizer and lime in Rio Grande do Sul has demonstrated a threefold increase in yields for corn, soybeans, wheat and livestock. Properly selected varieties of soybeans yield more than double common varieties. Biological control of scale on Pangola greatly increases forage output. Proper feeding of livestock shows increased productivity of two to threefold with very substantial increase in profits. These and other results have been forthcoming from the relatively limited grant funded A.I.D. assistance to the Ministry of Agriculture and University research programs. These research results need to be greatly stepped up and expanded to all parts of Brazil.

7. THE EXECUTING AGENCIES

a) Escritorio de Pesquisas e Experimentação

EPE is the division of the Ministry of Agriculture with the responsibility of preparing, implementing, controlling and evaluating a national program of agriculture and livestock research. EPE and predecessor agencies date back to 1931 which marked the beginning of the federal research effort. EPE accounts for more than half the research personnel and resources in Brazil and is the only research agency with a national scope, and aside from two fairly efficient state research agencies, and several universities, is the only research institution effectively studying state and regional agricultural problems. EPE has its federal headquarters in Rio de Janeiro and conducts its program through 8 regional research institutes which maintain a network of 68 research stations and are responsible for the execution of the research program.

In total EPE has a staff of approximately 700 technicians located in the national headquarters and throughout the research institutes and their research stations. EPE's (and Brazil's) capability to execute the national research program is hindered by an inadequately prepared research staff. It has a serious lack of personnel with advanced academic education in a field which in the U.S. and Europe is dominated by PhDs. Whereas the U.S. has approximately 20,000 PhDs engaged in agricultural research, Brazil has less than ten. EPE accounts for slightly more than half of these. Secondly, the number of researchers at all academic levels is inadequate. Brazil has less than one researcher for 100,000 population as compared to 4.5 for Pakistan, 60 for Japan, 79 for Taiwan and 133 for the Netherlands. Thus neither Brazil's nor EPE's complement of personnel resources has the academic training and accumulated knowledge essential for efficient research. This situation is the reason for this program.

Section II contains a comprehensive evaluation of EPE and its capability and requirements. It is the judgment of USAID based on this evaluation that EPE has both the understanding of its requirements and the interest in technical assistance which create the conditions for a successful TA program to be carried out.

b) Conselho Nacional de Pesquisas (CNPq)

The CNPq was formed in 1951 for the purpose of promoting all forms of scientific and technological research. The CNPq's program consists of providing advance academic training for individual researchers and support for individual researchers and organizations to carry out research. Since 1964 CNPq's program has increased significantly. The CNPq is relatively small, well organized organization which is considered capable of executing the program for which financial assistance has been requested. A detailed description of the CNPq is contained in Section II.

8. BASIS FOR USAID APPRAISAL OF THE PROJECT : The appraisal of the executing agencies and their need for U.S. assistance is based on an evaluation made by the USAID's agricultural division in its day to day contact with the program, on IRI evaluations and semi annual reports, and on an evaluation of the IRI contract performed by Checci and Company in 1967. On the basis of these assessments, the program is considered to be a realistic one, and has good prospects for success.

9. RATIONALE FOR 5-YEAR PROGRAM: Funding has been recommended for this program for a minimum of five years in order to assure continuity of the research efforts to be initiated and carried out under this program. Research programs by their nature are long term with projects requiring five, six or more crop cycles to achieve results. It is considered that at least five years of the assistance of IRI research

assistance will be essential to assure continuity of research programs assisted by IRI, and to allow a significant transfer of technology and methodology to Brazilian researchers.

10. OTHER FREE WORLD FINANCING: IBRD, IDB and the Export-Import Bank expressed no interest in financing this project

11. STATUTORY CRITERIA: All statutory criteria have been met. (See Annex IV).

12. BRAZILIAN ASSIGNMENT OF PRIORITY: The Ministries of Agriculture and Health have indicated their high priority support for this program in a letter of application to USAID in which the Government agrees to increase budgetary resources to research in real terms each year over the five year program.

13. TRANSITION FROM GRANT TO LOAN FUNDING: The present personnel of IRI were brought to Brazil under grant funded project agreements. In developing the loan program, an agreement was reached with EPE that the existing core of IRI researchers would continue on a grant basis through the termination of their current tours. Under this arrangement, a maximum of 14 people would be financed by grant funds in Calendar Year 1969 and 8 in 1970. However, in response to a specific recommendation by AID/W that the costs of the present IRI personnel also be financed from the loan, the Mission will seek, during loan negotiations, to include the present IRI staff under the loan. The total cost of these 22 man-years of services during 1969 and 1970 is estimated at \$695,200 plus 10% contingency. The loan paper has been revised to show the costs of these specialists financed under the loan.

14. SPECIAL CONSIDERATIONS

a) Government of Brazil Budgetary Commitment

Brazil needs to allocate sufficient resources for agricultural research to enable existing researchers and the researchers to be trained under the program to be employed effectively. It has not yet been possible to quantify the funding requirements of the research program; however, as a first step toward increasing resources allocated to research, the Ministry of Planning has committed the Government of Brazil to an annual increase in the agricultural research budget in real terms over the life of this program.

b) Funding Regularity

Historically EPE has experienced a continuous problem with the flow of each year's funds. Although EPE's annual spending level is approved by the Brazilian Congress before the end of December of the previous year, the release of funds by the Ministry of Finance to EPE is often delayed well into each calendar year. The effect of this on EPE's operations is highly disruptive. In 1968 there was an improvement in the flow of funds, and EPE received its first allocation of funds in March. Indications are that flow of the funds for all Brazilian agencies will be regularized in 1969. In view, however, of the importance of a regular flow of funds for research, the Government of Brazil will be requested to make a commitment to assure a regular flow of funds for the research program.

c) Inadequate Salary Levels

The problem of inadequately trained researchers is directly linked to the fact that salaries of researchers are too low to induce young Brazilian graduates in agriculture to undertake training for advanced degrees or to attract top young people to enter agricultural research. If this problem is not solved, EPE will be unable to attract new talent and to induce Brazilian researchers to undertake

advanced study. Currently proposed by CNPq is a program to pay bonuses to researchers. It is hoped that such a program will commence in 1968 and that EPE will be able to participate in the program on a basis which will direct the bonuses toward researchers holding advanced degrees. It is not clear at this point, however, that this program will in fact be initiated and how it will operate. Because of the importance of this problem, the Ministries of Planning and Agriculture have given assurance that the problem of researchers' salaries will be reviewed and appropriate action will be taken to resolve the problem.

15. RECOMMENDATIONS: It is recommended that the loan be authorized to the Republic of Brazil in an amount equivalent to US\$13.4 million to finance the foreign exchange costs of: (a) U.S. technical assistance; (b) training of Brazilian researchers and extension workers in U.S. Universities, in short courses in specialized subject matter in U.S. research institutions, and in other courses in research and extension in the U.S.; and (c) equipment, machinery and commodities considered essential to research and the diffusion of research results.

In order to insure that adequate measures are taken, not only to provide a bonus for senior researchers, but also to establish salary levels which will retain a sufficiently high percentage of the total research personnel trained under the program, specific agreement will be sought during the loan negotiations as to the steps to be taken, and the timing of such steps. The adequacy and effect of the measures taken will be examined as part of the annual project progress evaluation.

I - Terms

- a) Repayment will be made in U.S. dollars within forty (40) years from the date of first disbursement, including a ten (10) year grace period;
- b) Interest at two (2) percent per annum during the ten (10) year grace period, and two and one half (2-1/2) percent per annum thereafter.

II - Major Conditions and Covenant

- a) The Government of Brazil shall covenant to increase the amount of budgetary resources allocated to the EPE national research program.

- b) The Government of Brazil shall covenant to assure that budgetary funds allocated to research are made available on a regular and timely basis in accordance with the requirements of the research program.
- c) The Government of Brazil shall covenant to study ways and means of establishing higher salaries for researchers with advanced academic training and shall adopt appropriate means to provide an incentive to researchers to undertake advanced academic training and to enter the field of agricultural research.
- d) This loan shall be subject to such other terms and conditions as A.I.D. may deem advisable.

16. PROJECT COMMITTEE:

Chairman	Dwight B. Johnson, USAID/B - ADCD
Agricultural Advisors	Richard R. Newberg, USAID/B - ARDO Ervin T. Bullard, USAID/B - ARDO
Legal Officer	Francis DeRosa, USAID/B - LGS
Drafting Officers	Dwight B. Johnson, USAID/B-ADCD Richard R. Newberg, USAID/B-ARDO Ervin T. Bullard, USAID/B-ARDO John Ogilvie, USAID/B-ADCD

Approved by:

S.H. Van Dyke, USAID/B-DOM _____
H.Kleine, USAID/B-DDOM _____
D.B. Johnson, USAID/B-ADCD _____
R.R. Newberg, USAID/B-ARDO _____

SECTION I - BACKGROUND AND PLACE IN THE PROGRAM

A. Introduction

Given the predominance of agriculture in most under-developed economies, it is this sector that must of necessity provide, at least in the early stages, the bulk of development resources. From agriculture must come the workers, the food to feed the workers, and many of the raw material inputs necessary to modern industry. From agriculture must come savings to finance investment in both the agricultural and non-agricultural sectors. Agriculture must further provide most of the exports required to finance the growing economy's needed imports of capital and intermediate goods. On the other side of the ledger, the infant industries of a developing country depend heavily on the purchasing power of the rural sector to provide an expanding market for industrial products. All of these contributions depend eventually on increases in the productivity of the agricultural sector.

Although still characterized by very low productivity of both land and labor, Brazilian agriculture has contributed substantially to national growth. With gross domestic product per capita growing at an average annual rate of about 2.5 percent since 1953, and population rising about 3.2 percent annually, the demand for food is estimated to have risen about 5 percent per year (assuming an income elasticity of demand of 0.7). In comparison, available statistics show that total agricultural production has risen over the same period at an average annual rate of over 4 percent. The period from 1953 to 1958 may be divided into three major parts. The first from 1953 to 1956 showed fairly satisfactory rate of growth, and expansion in use of fertilizer. The period from 1956 to the beginning of 1961 showed a very significant drop-off in the rate of growth particularly in output of food crops and livestock. Fertilizer use ceased to increase. The period from the beginning of 1961 to 1967 has shown a very significant increase in the rate of growth, essentially making up for the decline in rate during 1958/63. Fertilizer use also has increased rapidly. As of the present, Brazilian agriculture supplies better than 5 percent of domestic food and agriculture raw materials consumed.

The value of Brazilian agricultural exports were only slightly more in 1967 than they had been ten years earlier. However, they were up substantially from 1960. The increase was particularly significant for non-traditional export items (excluding coffee and sugar). Agriculture continues to provide more than 85 percent of the nation's export earnings. Export earnings of \$1,495 million compared favorably with imports of agricultural products totalling only \$308 million, more than half of which was accounted for by wheat.

Despite this record of apparent achievement, Brazilian agriculture suffers severe limitations which darken the prospects for continued growth and may act as a brake on development in the rest of the economy. Brazilian agriculture is marked by low yields per hectare and by low labor productivity. The latter is reflected in the fact that although 50 percent of the labor force is engaged in agricultural activities, the sector produces only about 23 percent of the net domestic product. In the past, increases in agricultural output have been achieved largely through the simple application of more labor to more land. It is estimated that in excess of 80 percent of output growth since 1948 is the result of putting more land into production. As this becomes an increasingly difficult and expensive means for raising output, emphasis must be shifted to the application of yield increasing inputs and techniques.

Moreover, low productivity and lack of mobility leave a large portion of Brazil's rural population at the fringes of the market system. Able to provide themselves with little more than subsistence, the rural masses are unable to provide a market for the output of the industrial sector. Unlike nations industrializing in the 1800's, that were able to find ready markets abroad for their manufactured goods, Brazil will continue to depend heavily for a considerable time on the domestic market for her industrial products.

The achievement of the economies of scale necessary to make Brazilian industry competitive in world markets will depend to a large extent on rising incomes in the agricultural sector.

Development policy prior to the 1964 Revolution, which included export restrictions, an overvalued currency, and price controls on farm products, placed agriculture at a disadvantage via à vis industry, and agricultural growth slowed particularly in the export sector. These disadvantages were intensified by an inadequate marketing system, lack of storage, the high cost of seeds, fertilizer, and livestock mineral supplements, and the lack of reliable research results on yield increasing technology. As a result of these policies and of the availability of new lands and cheap labor, and also because of tradition and lack of information, Brazilian agriculture has been characterized by the extraction of soil nutrients to the point that yields have been depressed and the nutritional values of foods and forages have been reduced. It has been simpler and cheaper to cultivate new land than to invest in the maintenance of land fertility (i.e., fertilizer, crop rotation, crop-livestock balance, etc.) Thus, as indicated above, increased output in Brazil has been primarily achieved through increased acreage. Cultivated area expanded from about 1 million hectares in 1950 to over 30 million in 1963, while output per hectare actually decreased slightly for many crops and many areas. The expansion of acreage has reached the point in many areas where rapid expansion of cultivated acreage is uneconomic. Most new lands are located in areas distant from the markets and are lagging in investment in supporting transport, processing, storage, and other areas, and climate conditions over much of Brazil's uncultivated land are such that, even

on newly cleared land, the basic plant nutrients in the soil have been depleted through leaching, erosion, and other losses. The natural fertility of these soils is so low that the application of fertilizer and lime is generally required immediately or within a couple of years after putting it into cultivation.

B. Pattern for Future Development - Modern Agricultural Technologies

With the national territory occupying almost half the continental area of South America, Brazil has the world's largest unused reserves of soils which, from standpoints of climate, soil texture, and topography, are physically suited to the practice of high-productivity capitalized agriculture. If these reserves were brought into their technical potential for production, Brazil could become a major contributor to world food supplies. Although physically suited to modern agriculture, this reserve is characterized by low natural fertility and hence is not suited to agriculture use under the practices of traditional agriculture. These reserves are not yet contributing significantly to the Brazilian economy because the technologies and capital that would permit their development have not been available to Brazilian farmers.

If Brazilian agriculture is to provide the savings, foreign exchange, and food and fiber necessary to support its development goals, a sustained increase in food production of 5-6% per year will be required. Due to the fact that bringing new land into cultivation is in many cases uneconomic because of distance or because of lack of fertility, these goals must be met for the greater part by an increase of productivity on existing cultivated land. Such increases will need to be obtained through increased intensification of farming, through the utilization of the modern technologies of fertilizer usage, improved varieties of crops, weed and pest control, and mechanical improvement. Increased impetus has already been given to the utilization of fertilizer through the establishment of a broad gauged fertilizer program including: (1) the release of price controls which has made the use of fertilizer more profitable, (2) a national subsidized fertilizer credit program (AID assisted), (3) the lowering of tariffs on fertilizers, (4) the creation of a low-cost fertilizer industry (AID assisted), (5) increased research in soil fertility and soil testing, to improve physical input output ratios for the various types of soils and soil conditions in Brazil, and to maintain fertility on fertilized land. This transfer of fertilizer technology to Central and South Brazil was an example of a direct and simple transfer of technology which represents a virtually free transfer of knowledge resources requiring highly scientific but relatively low cost research. To fully exploit the technology however, additional research will be required to improve the physical input output ratios of fertilizer use (thereby lowering costs) and to find methods of economically utilizing fertilizers on the cerrado soils and tropical soils of the interior and the Amazon region.

A transfer of technology of this type can be effective only when governments enthusiastically support agricultural development by providing realistic and stimulatory price policies; by arranging for adequate supplies of fertilizers, pesticides, seeds, and other inputs; by mobilizing credit; by assuring farmers of ready and accessible markets; and by mobilizing and integrating extension and research efforts to permit an effective flow of materials and information from research centers to farmers.

Since 1964, the GOB has taken substantial steps toward creating these necessary conditions for stimulating farmer adoption of modern technology. In 1964 and 1965 the Government essentially eliminated price controls on all agricultural products except coffee, sugar, and milk. It reduced taxes and simplified exports to provide better incentives and stimulate production. It greatly improved the minimum price system, expanded the network of agencies and allocated additional funds with the provision for price adjustments during the year to compensate for inflation. (This system has not yet allocated sufficient resources however and current minimum prices are considered to be too low.) Steps were taken to reduce the cost of fertilizer through expanded fertilizer credit and national subsidies on fertilizer for use on basic food and forage crops, resulting, in 1967, in an increase in fertilizer use of almost 40% in the consuming areas of Central and Southern Brazil.

C. The Need for Agricultural Research

Given the prevailing economic conditions which are considered satisfactory for the stimulation of agriculture, Brazil needs to adopt the modern technologies needed to increase its agricultural productivity. The modern agricultural technology which has made the farmers of the United States, Western Europe and Japan so productive, must be made available to Brazil. Few technological transfers

will be so direct as that of fertilizer to South and Central Brazil, and the transfer of technology will be fundamentally a research task, a task of adapting the technologies of the developed world to the soils and climates of Brazil. Unfortunately, as is the case with most other developing countries, Brazil's research facilities are inadequate for the task. For example, the number of researchers per 100,000 people in Brazil is .7, as compared with 60 for Japan, 79 for Tawan, and 133 for the Netherlands. Further, Brazilian researchers are inadequately trained, and work with less adequate facilities and support personnel. Further, Brazil lacks the decades of accumulated local research knowledge necessary to a transfer of technology.

On the plus side, however, Brazil has the advantage of the possibility of the transfer of the large body of fundamental scientific principles and methodological know-how built up in the economically advanced countries over the years. Thus, while the rice varieties that have enabled Japan to increase its rice production may not be successfully transferred to Brazil, the basic scientific principles used by Japanese scientists can help develop improved varieties in Brazil. The transferability of such know-how has made it possible for geneticists in Mexico to develop new varieties of wheat that helped to double that country's yield per acre between 1948 and 1952 and 1960 and 1962. According to experts in Israel, research has enabled Israeli farmers to increase their yield of cereals from 600 to over 5,000 kilograms per hectare, on unirrigated land. Numerous other technological transfers have been successfully made from more developed to underdeveloped countries, especially to commercial sectors growing major export crops.

Some results in Brazil demonstrate comparable possibilities. E.g., new varieties of grasses in Central Brazil can more than double beef production. Proper use of fertilizer and lime in Rio Grande do Sul has demonstrated a three fold increase in yields for corn, soybeans, wheat and livestock. Properly selected varieties of soybeans yield more than double common varieties. Biological control of scale on Pangola greatly increases forage output. Proper feeding of livestock shows increased productivity of two to three fold

with very substantial increase in profits. These and other results have been forthcoming from the relatively limited grant funded A.I.D. assistance to the Ministry of Agriculture and University research programs. These research results needed to be greatly stepped up and expanded to all parts of Brazil.

D. Why Research

The need for increased productivity is clear. Brazil is low in yields per acre in nearly all major crops and can only be expected to raise productivity levels through the introduction of modern technology, i.e., fertilizers, improved seeds, improved crop varieties, pest control, mechanical improvements, etc. (See Annex I, Exhibit 1 for a comparison of yields in Brazil and in the U.S.)

Perhaps some new crop varieties and methods of growing them could be transferred quickly to Brazil by people who know these methods in other areas. However, experience has shown such course is lined with dangers; crop plants are living organisms that are affected by their total environment. Between and within countries there are many environmental differences in soil and weather conditions, in cropping systems, and in the distribution of pests and pathogens. Optimum results in crop production can be obtained only by using materials and methods that are well adapted to their environment.

It would be a matter of luck if a single selection of materials and methods developed for special conditions within one country could be utilized immediately in a distant country; even if soil and weather conditions are similar, pests and pathogens are likely to be different. Generally large quantities of varieties and techniques must be screened to find an accepted contribution. Often this must be coupled with some basic work.

Some may begrudge the time required for experimentation to determine the suitability of plant materials for a new environment, but to plunge rashly into the unknown without prior exploration is to invite disaster. Failure in a few experimental fields may be disappointing, but failure in thousands

of farmer's fields can be catastrophic and neither national nor outside aid programs can afford such catastrophes.

Even when there may be some very significant early results through introduction of a new variety (E.G. rice or wheat) constant alternation is needed because mutations of new more virulent fungus or bacterial strains and the frequent occurrence of deterioration of a variety over time unless careful plant selection is practiced.

Some of the agricultural technology of advanced nations can and should be transferred directly to developing nations, particularly to those of similar latitude and climate, but the degree of transferability is commonly over-estimated by a wide margin. Therefore a comprehensive research program is essential to the modernization of agriculture.

E. USAID Assistance in Research To-Date

Since 1964, the USAID has been assisting the GOB to upgrade and increase national capacity for conducting agricultural research and for translating research findings into increased agricultural production. This has been done through a series of contractual arrangements through which

U.S. technical assistance from U.S. universities and agricultural research institutions has been supplied to Brazilian federal and state research agencies and universities. As part of this program, the IRI Research Institute was placed under contract in 1963 to assist the EPE in upgrading its research capacity, program content, administrative procedures and inter-agency coordination with universities and non-federal research agencies (see Annex I, Exhibit 2 for an evaluation of the IRI contract). Starting in 1963 with 3 U.S. technicians, IRI now has 20 research technicians assisting EPE and 7 extension specialists assisting the Brazilian extension service. The U.S. research technicians are located in each of the EPE research regions and in the national headquarters. IRI has been very successful in obtaining the services of first class technicians in the fields of livestock, crops, entomology, soils, economics, pathology, horticulture and extension. The contract calls for participant training of 40 Brazilian technicians per year and EPE wants to increase this to an average level of 65 per year under the loan program. U.S. equipment is purchased under the contract to improve research facilities of the agricultural experiment stations. The EPE expects to use approximately five hundred thousands dollars per year for purchase of U.S. equipment under the loan fund. The technical assistance provided to EPE through the IRI contract has been well received, effectively used, and its continuation is included in the loan request received from EPE.

In addition to the assistance to EPE through the IRI contract, USAID has provided assistance to four Brazilian agricultural universities (Ceará, Minas Gerais, São Paulo and Rio Grande do Sul) through contracts with four Universities (Arizona, Purdue, Ohio State, and Wisconsin). Local training in agricultural research technologies and participant training in the U.S. are important features of this assistance to Brazilian universities. Total cumulative DG grants (including assistance to the University of Minas

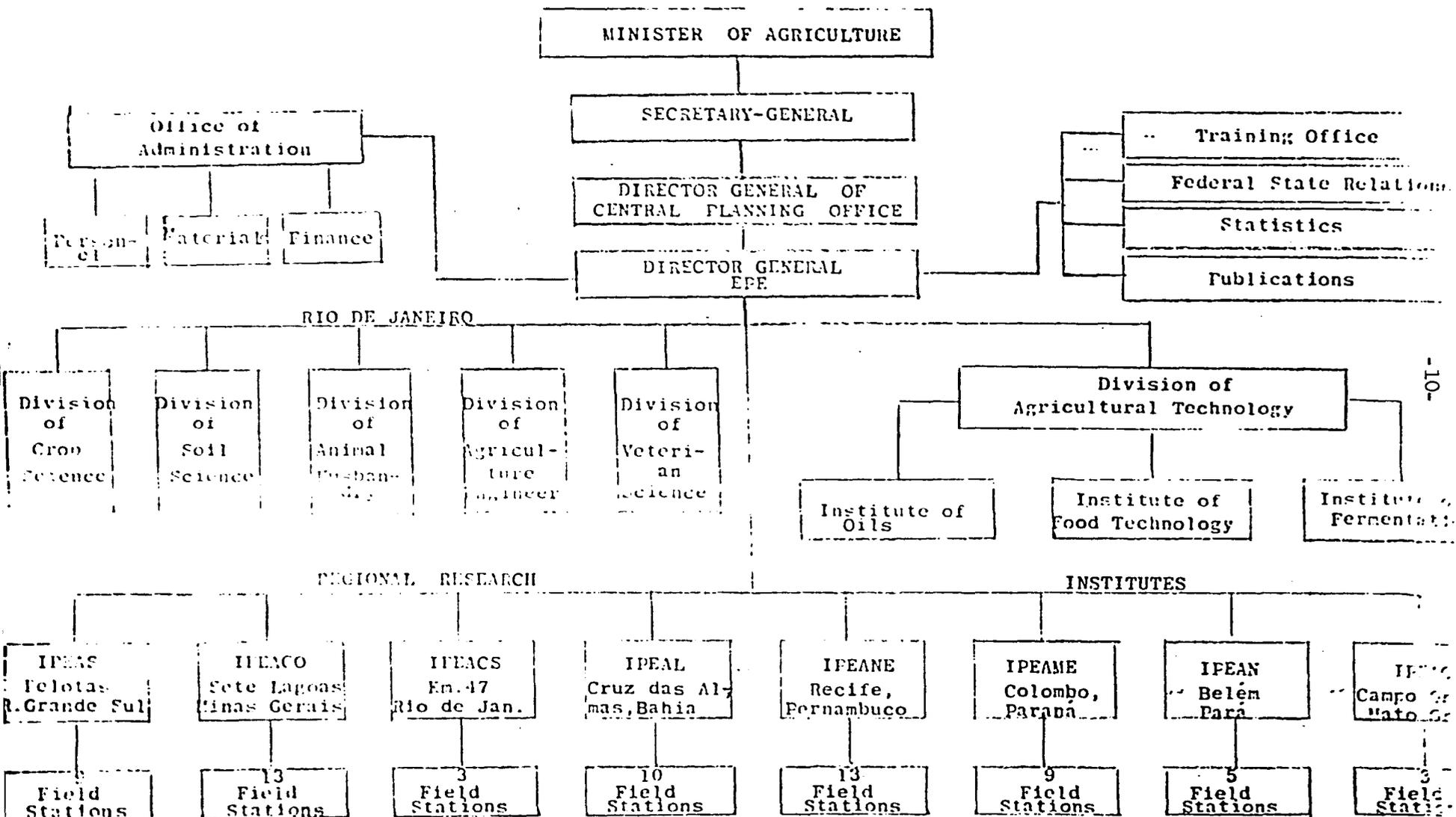
Gerais which began in 1932) through FY 1967 have totalled US\$17.9 million. U.S. personnel engaged in these university contracts have increased from 10 in 1963 when only the Minas Gerais project was in operation to 50 recently.

F. Place in the Program

Within this context the proposed loan program is an extension and an expansion of an on-going grant program to create the research base necessary for the transfer of modern agricultural technology to Brazil, to provide for rapid analysis and publication of results and to forge a strong link between research and extension to insure that research results are rapidly placed in the hands of farmers.

The systematic expansion of research knowledge is essential both to the development and use of productivity increasing techniques and to the reduction in risks and consequently the costs of such adoption. This in turn bears on the ability of Brazil production to compete in the world and the cost of feeding its populations. There presently is some accumulation of knowledge not being used in Brazilian farms, but this is very inadequate to meet adoption demand with policies, credit and other incentives to adoption of improved techniques now in effect. Further much of the available information is fragmentary and incomplete. Information may be available on scattered varieties on fertilizer or disease controls but it is not the comprehensive type of information required to enable a farmer to implement a total modernization program on his farm. It is essential that the rate of production of information be accelerated to remove this major obstacle to progress. Further, the process of diffusion of results to farmers must be improved. The program is aimed at these two problems. The removal of the obstacle will serve the needs of expanded commercial production for domestic consumption and export. It will also provide an essential element in raising rural level of living of small farmers, renters and workers. It is an essential tool for a lasting Agrarian Reform program.

ORGANIZATIONAL CHART - ESCRITÓRIO DE PESQUISAS E EXPERIMENTAÇÃO (EPE)



-10-

SECTION II - THE EXECUTING AGENCIES

Loan funds will be allocated as previously explained to both the Conselho Nacional de Pesquisa (CNPq) and the Escritorio de Pesquisas e Experimentação (EPE) for program execution.

A. Escritorio de Pesquisas e Experimentação (EPE)

1. HISTORY AND BACKGROUND

The first efforts in agricultural and livestock research were made by Dom Pedro II in the late 1800's. Under his direction an agronomic institute was set up in Campinas in the State of Sao Paulo to conduct research on the problems of coffee production. This institute, which was taken over by the State of Sao Paulo during the 1880's, has prospered over the years and is today Brazil's outstanding agricultural research organization, particularly in the areas of crops and soils. It maintains a full-time professional staff of over 200 and is funded almost completely by the state government.

Research efforts by the federal government did not begin until about 1931 when a livestock research section was established within the Animal Production Department of the Ministry of Agriculture. Initial efforts centered around the evaluation of various cattle breeds, with the work being carried out on a rather informal basis at the Ministry's breeding stations throughout the country.

Federal research efforts on crops and soils began about 1937 when the first of what were later to be known as the Regional Research Institutes was set up at Km 47 on the old Rio-Sao Paulo highway. Shortly thereafter, similar research stations were established in Recife, Pelotas, Belem, and Cruz das Almas. The most recent of the Institutes, Sete Lagoas, was opened in 1962. Control of these regional research centers was vested in CNEPA, Centro Nacional de Ensino e Pesquisa Agropecuária. As its name implies, CNEPA was also responsible for the development and control of the federal agricultural universities.

Organizational changes in federal agricultural and livestock research activities have picked up speed in the 1960's. In 1962 DPEA (Departamento de Pesquisas e Experimentação Agropecuarias) was formed when the previously-separate research activities in agriculture and livestock were joined. Overall control, however, continued to be exercised by CNEPA. This relationship was broken in 1967, when responsibility for the federal agricultural universities was transferred from the Ministry of Agriculture to the Ministry of Education. At that point CNEPA ceased to exist, and DPEA was granted full control of all federal agricultural research activities.

In 1968, as a result of recommendations contained in the Carta de Brasilia of 1967, there was a further re-organization of research activities. The net result was EPE (Escritorio de Pesquisas e Experimentação), which is essentially the DPEA organization with new divisions added in agricultural engineering and veterinary sciences. It is this organization that will implement the majority of the proposed Agricultural Research Loan.

2. FORMAL RESPONSIBILITIES

The formal responsibilities of EPE are as follows:

- 1) To prepare, implement, control, and evaluate national programs of agricultural and livestock research which have been approved by the Central Planning Council of the Ministry of Agriculture.
- 2) Cooperate with other public and private agencies on research programs affecting agricultural and livestock production.
- 3) Enter into agreements with national and international groups for technical and other assistance which will help attain national objectives.
- 4) Conduct and promote studies and research activities which will result in standards and patterns for use in agricultural and livestock production.

- 5) Provide public and private bodies with its opinion on technical and/or physical questions involving agricultural and livestock production.
- 6) Cooperate with the other agencies of the Ministry of Agriculture in the up-grading of technical personnel.

3. ORGANIZATION AND STAFF

To carry out these functions, EPE is organized into a series of divisions and Regional Research Institutes. The divisions, of which there are six, are located in EPE headquarters in Rio de Janeiro, and have overall responsibility for each of EPE's six areas of activity: crop science, soil science, animal husbandry, agricultural engineering, veterinary science, and agricultural technology. There are 8 Regional Research Institutes which, located throughout Brazil, maintain a network of 65 field stations and are responsible for the implementation of the overall EPE research program. Each of these divisions and Regional Research Institutes --- its responsibilities, staffing, and operation --- is described briefly below.

A. Central Divisions

Division of Crop Science

This division has responsibility for planning and, evaluating EPE's national program of crop research. To meet this responsibility, it has organized a series of Commodity Groups (about 20), each of which is charged with developing and evaluating the program for one or more particular crops. Separate Commodity Groups have been set up for all major crops on which EPE conducts research such as rice, corn, sorghum, cotton, peanuts, soybeans, and forage crops. As will be explained later, each Commodity Group is composed of 5 to 25 or more technicians and managers from within the EPE network, each of whom has had practical

Division of Agricultural Technology

This Division plans, implements, and evaluates a research program into the various aspects of food production and food technology. This program is conducted through 3 Institutions (Oils, Food Technology, and Fermentation) supervised directly by the Division. Each of these Institutes will be described briefly below:

The Institutes

Institute of Food Technology

With its own laboratory facilities in Rio de Janeiro, this organization conducts theoretical and applied research in food technology and food processing. Past efforts have included work on animal fats, the possibility of utilizing previously-discarded agricultural by-products, and the effective utilization of farinha in bread. Its technical staff is composed of 4 agronomists, 5 veterinarians, and 18 chemists.

Institute of Fermentation

This Institute, the second of three reporting to the Division of Agricultural Technology, conducts research into the crops used for beverage production and into the technology used to produce such beverages. Work to date has centered on wine grapes and caju (cashew). The Institute of Fermentation also has responsibility for maintaining quality standards for all beverages produced and/or marketed in Brazil. Research efforts are carried out in 13 field stations throughout the country. A network of analysis centers is utilized to fulfill the Institute's responsibility for determining and maintaining beverage quality standards. The Institute operates with a technical staff of 41 agronomists, 12 chemists and 1 other technician.

Institute of Oils

The third of the institutes reporting to the Division of Agricultural Technology, the Institute of Oils, conducts a broad range of research efforts into the production, chemical composition, and utilization of various animal and vegetable oils. A technical assistance agreement with the French Government has helped the Institute broaden its activities, particularly in the North and Northeast of Brazil. Its technical staff consists

of 4 agronomists, 12 chemists, and 4 other technicians.

B. The Regional Institutes

While the six Divisions described briefly above are responsible for planning and evaluating EPE's national research program, it is basically the Regional Research Institutes that are charged with the implementation. These bodies, plus the three institutes reporting to the Division of Agricultural Technology, are discussed below.

1. Responsibilities

These DPEA regional headquarters have the following responsibilities:

- a) Within their respective regions, to carry out agricultural research within the limits of the national plans established by the national headquarters;
- b) After having fulfilled priorities of the national program to initiate research of regional or local interest, directly or through agreements with other public or private entities;
- c) To give technical assistance in agricultural research to the state governments within their respective regions;
- d) to maintain and operate the network of research field stations within the respective regions;
- e) Analyse and publish the results of the research work.

Instituto de Pesquisas e Experimentação
Agropecuários do Norte (IPEAN)

One of the earliest Regional Research Institutes to be established, IPEAN is responsible for implementation of EPE's research program in the states of Acre, Amazonas, Pará, and Maranhão and in the Federal Territories of Amapá and Roraima. Efforts have been concentrated on the rubber tree, Pará nut, dende oil, and pepper plant as well as the use of perennial plants throughout the Amazon area. IPEAN maintains a network of 5 field stations and is staffed by 46 agronomists plus 12 other technical personnel.

Instituto de Pesquisas e Experimentação
Agropecuárias do Nordeste (IPEANE)

With headquarters in Recife, Pernambuco and a network of 13 field stations spread throughout the Northeast, IPEANE covers the states of Alagoas, Ceara, Paraíba, Piauí, Pernambuco, and Rio Grande do Norte and the Federal Territory of Fernando Noronha. Major attention has been given to vegetable crops, particularly sugar cane and cotton. The technical staff consists of 45 agronomists, 11 veterinarians, and 11 chemists.

Instituto de Pesquisas e Experimentação
Agropecuárias do Leste (IPEAL)

Implementation of EPE's national research program in the states of Bahia and Sergipe is the responsibility of IPEAL. Stationed at Cruz das Almas, Bahia, this Regional Research Institute has done extensive research on a wide variety of animal and vegetable products. Special efforts have been made with tobacco, cocoa, castor oil, citrus fruits, and cotton. The network of 10 field stations is manned by a technical staff of 50, including agronomists, veterinarians, zoologists, and librarians.

Instituto de Pesquisas e Experimentação
Agropecuárias do Centro-Oeste (IPEACO)

One of the newer Regional Research Institutes, IPEACO was established in Sete Lagoas, Minas Gerais in 1962 with responsibility for EPE's program in the states of Minas Gerais and Goiás, and the Federal District (Brasília). The technical staff of 73 directs the implementation of an extensive research program which puts particular stress on developing methods for opening and recovering the vast lands of Brazil's central interior. A total of 13 field stations are maintained.

Instituto de Pesquisas e Experimentação
Agropecuárias do Centro-Sul (IPEACS)

Located at Kilometer 47 on the old Rio-São Paulo road, IPEACS is the oldest of the Regional Research Institutes, having been opened about 1937. In terms of diversity of technical activities and size of qualified staff, it is also the largest. On the agricultural side, particular attention has been paid to the problems of sugar cane, corn, cotton, coffee, rice, beans (feijão), and vegetables. Work has also been done to develop disease-resistant varieties of potato and citrus fruits. In the area of livestock, IPEACS has extensively studied the problems of pasture management and the adaptability of various pasture grasses to the Brazilian soils and climates. In these studies the nutritive value of different grasses and their resistance to disease has also been carefully analysed. Additionally, IPEACS has separate departments for the study of animal diseases (which works closely with the Animal Defense Service) and for the development of certified lines of poultry for both eggs and meat. IPEACS, responsible for the states of Espírito Santo, Rio de Janeiro and Guanabara, maintains a full-time technical staff of 139 and operates through a network of 3 field stations.

Instituto de Pesquisas e Experimentação
Agropecuárias do Sul (IPEAS)

IPEAS was established by the Ministry of Agriculture in Pelotas, Rio Grande do Sul in 1943 to conduct

agricultural research. With the formation of DPEA in 1962 livestock research, which had been controlled until then through the Animal Production Department of the Ministry, was also incorporated. Maintaining field stations and staffed by 133 technical personnel (108 of whom are agronomists), IPEAS covers the Southern states of Rio Grande do Sul and Santa Catarina. Agricultural research efforts have been directed principally to problems of wheat, rice, corn, potato, soybean, beans (feijão), vegetables, and temperate climate fruits (particularly the peach). Livestock research has concentrated on nutrition studies and the analysis of forage crops.

Instituto de Pesquisas e Experimentação
Agropecuárias do Oeste (IPEAO)

IPEAO has only recently been formed, and its technical staff and research activities are both limited to date. It has responsibility for covering the state of Mato Grosso and the Federal Territory of Rondônia and is based in Campo Grande, Mato Grosso. Three field stations are maintained.

Instituto de Pesquisas e Experimentação
Agropecuárias do Meridional (IPEAME)

IPEAME is, like IPEAO, very recently formed and is only operating on a limited scale. It accepts responsibility for the implementation of EPE's program in Paraná, and São Paulo, is based in Colombo, Paraná, and conducts its research efforts through 9 field stations.

While the 6 Divisions and 8 Regional Institutes (11 if the 3 Institutes reporting to the Division of Agricultural Technology are included) described above are basically responsible for the planning, implementation, and evaluation of EPE's national program of agricultural and livestock research, there are also a number of staff groups that assist in this task. These are shown on the EPE organization chart and described briefly below.

C. Staff Groups

Training Office

The Training Office is located in EPE headquarters and is responsible for determining training needs and handling training programs. The newly-begun program of scholarships to finance up to a year of study and/or experimentation by EPE technical personnel who have an approved research project is being implemented through this office.

Federal-State Relations Office

SERPA is a newly-created office within EPE whose purpose is the promotion of joint federal-state activities in agricultural research. Designed to operate much like the U.S. Federal-State Office for Research, SERPA has a small staff and has begun limited operation. One possibility currently being explored is the use by this office of federal funds to finance joint federal-state research activities.

Statistics

This is a staff group in EPE headquarters responsible for maintaining central records and a filing system on research activities. It is also involved in the statistical preparation and analysis of research results. EPE intends to involve this office with the Divisions and Institutes to a greater degree in the future.

Publications Office

Among other EPE publications this office produces Brazil's only professional journal of agricultural research. This is a recent development, partly the result of IRI assistance, and is considered a necessary element in promoting agricultural research to the level of a profession and in broadcasting its results to those involved and interested.

Office of Administration

Located within EPE headquarters, this office is divided in three sections - personnel, materials, and finance.

It is responsible for all elements of cost and material control. As discussed later, both its staff and operating methods need improvement.

D. Personnel

Technical research personnel of the EPE organization are located at the Rio de Janeiro headquarters, Regional Research Institutes and field stations. The total number of technical personnel is 706 of which approximately 500 are located at the regional institutes and field stations.

Most of the technical staff have received their education in Brazil, with an education equivalent to a B. S. degree level at one of the agricultural universities. A few have been trained in foreign countries and have M. S. and PhD degrees in specific areas of specialization.

The length of service for most of the employees has been good. The salaries paid are low compared to the United States but the retirement system is very good. The employees retire on full salary and the time spent for education is considered as retirement time if the employee has been previously hired by the Ministry of Agriculture. This type of retirement system discourages the technicians from seeking other employment during their career. The number of other agencies that compete for agriculture researchers is quite limited.

There are approximately 1200 to 1500 research technicians working in agricultural universities as well as Federal and State organizations. Of this amount the EPE has 706 technicians on their staff which is about 50 per cent of the total. It should be pointed out that many of the research employees are working on a part time basis, several of the research technicians also teach classes in Universities as well as handling consultant jobs. The State Secretariats of Agriculture in Pernambuco, Rio Grande do Sul, São Paulo and Minas Gerais are actively engaged in research programs.

While the technical staff of EPE is 706, the total number of personnel is several times this size, largely due to the many semi-skilled or unskilled laborers needed to implement the research activities at the Regional Research Institutes and field stations. Many of the institutes and stations suffer from an excess of "year around" unskilled and semi-skilled workers. The number of workers needed fluctuates with the growing seasons and changes in level of research activities. The number available fluctuates with availability of funds. Lack of funds and timely releases often prevent employment of additional personnel to meet seasonal needs.

E. Research Performance

Turning, however, from a statement of organization to an analysis of what EPE has accomplished in various regions, the following synopsis of recent research results gives some indication of the breadth of the EPE research activities and of the type of results that are being obtained.

Region I (See Map, Annex VII for location of Regions)

Introduced and evaluated water Buffalo with the result that some 40,000 now serve as an important source of beef and milk for the region.

Assembled a nursery of cube plants and analysed these for toxins so that evaluated material is on hand to develop a domestic rotenone industry. *

Provided pioneer work with black pepper with the result that the region is a major producer of this product.

* Received some technical or other assistance from AID or predecessor agencies.

Selected and improved planting stock for rubber, developed the double graft technique of obtaining required combination of disease resistance to Southern leaf blight and high yield; developed mass production of grafts to the level of 3,000,000 young budded trees annually for distribution to planters within the region. **

Region II

Developed and multiplied for farmer use a variety of perennial (Mocó) cotton that is now in common use in the dry (Sertão) zone of the Northeastern region. This is an exceptionally high-quality long staple cotton that commands premium prices. It is produced in zones generally too dry for production of other commercial crops such as Rio Grande do Norte.

First evaluated and introduced grain sorghums in zones where irregularity of rains make corn production extremely uncertain (Pernambuco).

Developed and distributed to farmers improved pasture grasses from which ranchers obtained three times as much beef production per hectare as compared with gains on natural vegetation (Bahia). **

Tested and distributed superior strains of beans and castor beans that now account for significant portions of national production in these crops. (Bahia).* Introduced seed corn developed by the Ministry of Agriculture. See Region III.

* Received some technical or other assistance from AID or predecessor agencies.

** Received very considerable technical and or other assistance in development.

Region III

Developed and distributed cane varieties that presently account for 80% of the national production.

Developed disease resistant varieties of white potatoes that can produce well under tropical conditions and arranged a complicated but effective system for the evaluation of planting stock for tropical production centers.

Adapted U.S. technologies of broiler and egg production to local conditions with result that most of the poultry and eggs consumed by the urban areas come from efficient modern production technologies. **

Developed, evaluated and distributed improved budded citrus plants and disease and insect control programs that are now in wide use within the zone. (São Paulo State was a major contributor).

Developed, and evaluated synthetic and double cross corn hybrids now widely used. The synthetic variety now widely adaptable, does not require the purchase of new seed each year.

Studies have shown that products derived from corn and manioc production can be added in substantial quantities to wheat flour without significantly altering the resulting bread. A method for the industrial utilization of this process has been prepared for national application.

Semi-automatic machines for soil analysis were designed, produced, and installed at the Regional Research Institutes. Use of these machines allows a greatly-expanded number of soil tests to be made by the same number of personnel. It provides more precise analyses of soil for establishing nutrient requirements. This is used uniformly throughout the country now.**

Developed 36 varieties of coconuts which have increased production yields of Brazilian commercial plantations.

Conducted research on rabies in cats, bats, and cows. Much of this research is being done for the first time in Latin America.

Region IV

Developed, evaluated and distributed wheat varieties that make up most of the Brazilian production. These varieties initially yielded 20 to 30% higher than the varieties being replaced, but due to development of new fungi organisms, these new varieties, will need to be replaced every 4 to 5 years.

Evaluated and distributed improved varieties of soybeans as a new crop within the region. The production now has a value of US\$20 million. National production continues to increase rapidly. Yield levels in certain areas often are comparable to those in the U.S. **

Conducted integrated research on selected vegetable crops with results that Rio Grande do Sul now provides much of Brazil with canned green beans and peas. *

Evaluated rice varieties and developed large-scale production methods with result that Rio Grande do Sul is now an important exporter of rice.

Developed and distributed corn hybrids(See Sec. III)

Region V

On Cerrado soils with an uneconomic level of corn production (7 bu./acre), developed fertility management that resulted in corn yields of 60 to 100 bu./acre. **

Showed that by use of molasses and urea supplements to cattle on pasture it is possible to double liveweight gains per hectare. **

Introduced, tested and distributed varieties of grass such as Pangola, Colonião and Jaragua that are high producing and much more economical sources of feed than presently used varieties. **

Distributed corn hybrids (see Sec. III).

F. Problems

Inadequately Prepared Research Staff

Any evaluation of EPE -- its organization and/or its performance -- must start with the realization that its complement of personnel resources, in other words its staff, does not have the academic training and accumulated knowledge necessary for efficient research. There is a serious lack of people with advanced education in a field which, in the U.S., is dominated by PhD's. Whereas the U.S. has approximately 20,000 agricultural researchers with PhD's, Brazil has less than 10 with PhD's and less than 50 with MS degrees.

Considering that existing levels of knowledge and information must serve as point of departure for developing new useful information, productive researchers must have a level of professional competence and a knowledge of the existing status of information and technologies that will enable them to extend knowledge beyond present existing limits. Moreover, they must have continuing access to current advances in their respective technical fields. Lacking these conditions the useful productivity of the researcher necessarily will be low as compared with adequately prepared colleagues. The lack of PhD's indicates Brazil's and EPE's knowledge gap by this standard.

Accepted standards for judging preparation of researchers are the advanced research degrees earned and the quality of research accomplished. Standards for judging productivity of a researcher are based upon the content, number and frequency of publications reporting accomplished research. Judging the EPE research staff as a whole by these standards, the percentage of advanced research degrees is quite low and the productivity per average researcher is not impressive.

Secondly the number of researchers is small. EPE accounts for slightly more than one half the agricultural researchers in Brazil, which has less than one researcher per 100,000 people as compared to 4.5 for Pakistan, 60 for Japan and 79 for Taiwan, and 133 for the Netherlands.

EPE is keenly aware of the need to upgrade the professional level of its research staff, as is evidenced by this loan request. Currently EPE has 35 technicians studying for advanced degrees in the U.S. under the AID grant program, and is proposing to expand its training program with the assistance of this loan.

Salary Levels

The problem of inadequately trained researchers is directly linked to the fact that salaries for researchers are too low to stimulate young Brazilian graduates in agriculture to undertake advanced training for MS and PhD degrees, or to induce top young people to enter the agricultural research field. This salary problem, if not solved, will make it impossible for the research profession to attract new talent, and to induce Brazilian researchers to undertake advanced study. The CNPq intends to initiate in 1968 a program to pay bonuses to researchers; EPE researchers will be eligible to participate in this plan, hopefully on a basis which will direct

the bonuses to those researchers holding advanced degrees. This bonus will result in about a 25% tax free increase in salaries for those researchers eligible. It is not clear at this time how this program will operate. If operated in such a way as to reward researchers with advanced degrees, it will undoubtedly be an important step toward resolving the salary problem. As an important contribution toward this loan program and this problem, the Ministries of Planning and Agriculture have given assurances that the problem of researcher salaries will be reviewed and appropriate action will be taken prior to 1970 to provide higher salaries to researchers holding advanced degrees. This will be a covenant of the loan agreement.

Funding Regularity

Historically, EPE (or its predecessor agencies) seems to have experienced an almost continuous problem with the flow of each year's funds during the year. Although EPE's annual funding level is approved by the Brazilian Congress before the end of December of the previous year, the release of funds by the Ministry of Finance to EPE is often delayed well into each calendar year. It is not all funds that are delayed, but those funds which cover EPE's costs for expendable materials, supplies, and "temporary" labor. EPE's "permanent" staff, i.e., the 700/odd technicians and limited supporting staff which are members of the Brazilian Civil Service, are paid on time. The length of this delay in the receipt of funds varies from year to year. However, receipt of initial funds (for other than the "permanent" staff) before April is rare, and in many years the first disbursement of funds to EPE is not made until early September.

The effect of such a situation on EPE operations, while varying from year to year and from region to region, can realistically be stated to be highly disruptive. In practice what happens is that research activities at the Regional Research Institutes

are slowed down, sometimes halted, because there is not enough money to pay the operating costs. To the extent possible, the Institutes rely on local supplier credits to purchase gasoline, fertilizer, seed, and other needed material. And many times the Institutes are successful in persuading their temporary workers to work without pay for several months. However, there is an extreme to which these emergency measures can be pushed. There inevitably comes the time when the Institute's director is forced to stop work on certain projects (or decide never to start them).

The result is that some projects are not implemented well. Others are not implemented at all. Suppliers are not happy, and temporary workers are likely not to return the following year to apply the skills they have developed. It is a situation which has re-occurred with consistency in most of the Institutes almost every year.

Unfortunately, however, the effects of the funding problem do not end here. Under Brazilian law, government funds that are not spent by the end of each calendar year must be returned to the Treasury and are not in any way credited to the supplying agency.

Thus, EPE receiving the bulk of its funds after September, is forced to spend them by the end of December if it is to get any benefit from them. By the time funds are received, however, the growing season is usually so far advanced that large parts of the research program initially agreed upon can no longer be implemented. The result is that EPE scrambles in the last 4 to 6 months of each year to allocate its funds to projects, and activities.

In 1968, there was a significant improvement in the flow of funding, and EPE received its first allocation of funds in March. Further the Ministries of Finance and Planning have announced that they are taking steps to assure a regular flow of funds to all

programs, and that this problem will be substantially eliminated in 1969. In view however of the priority nature of this program and the importance of a regular flow of funds to the program, we are requesting that the Government of Brazil make a special commitment to assure a regular flow of funds to the research program.

Funding Level

Considering the magnitude of the production problems in agriculture and the benefits in the form of increased agriculture production which will certainly result in the application of modern technologies in Brazilian agriculture, the amount of resources allocated to agriculture research is clearly inadequate. There is no point however in attempting to set funding levels at the percentage of agriculture production or at any other arbitrary level until more comprehensive research planning is undertaken and more refined national goals are established. In any event the total amount of resources which can be effectively utilized in research is limited by the number of researchers available to carry out research. However resources allocated to EPE are presently insufficient to effectively utilize the available researchers, and it is obvious that unless resources made available for research are increased, the people to be trained under the loan program and the U.S. scientists to be brought to Brazil under this program will not have the resources at their disposal to carry out effective research. In large part the PL 480 funds to be allocated to research under this program will alleviate this problem, however additional funds will be required. Therefore as a Brazilian contribution to this program the Government of Brazil has committed itself to increase the amount of funds allocated to agriculture research by 10% per year in real terms each year from 1970 through 1974. This commitment will be formalized in the covenants of the loan agreement.

Economics

The creation of new agricultural technology may not be very meaningful unless its application is profitable to the individual farmer. Recent advances in agricultural economics have developed scientific procedures which should be incorporated into the design of physical and biological research and into the analysis of the results. EPE has indicated a recent awareness of this requirement and has requested man-years of economic advisory services under the IRI contract. Additionally, it plans to train 12 economists at the MS and PhD level under the training portion of this program. Tentatively recommended for EPE is the creation of a small central economic staff which will assist in developing research goals based on projected levels of supply and demand for the various agricultural crops, to develop research data on the input-output cost relationships and other conditions required to stimulate farmers to adopt crop yield increasing practices recommended by research. It is also recommended that economists be placed in each of the regional institutes to perform the following functions:

- 1) to help in designing experiments and research so that economically meaningful results can be derived from them;
- 2) to interpret the results of the physical research from the economic standpoint. (This is especially important in fertilizer and animal nutrition research, but even such things as disease and insect control have an economic dimension.)
- 3) to develop a program of farm management research. This will involve the synthesization of the results of the physical research into

economically profitable systems, and the conduct of farm management surveys which will indicate what is taking place in the rural sector and serve as a basis for developing new systems of farming.

4) to design studies of the general agricultural economy of the region to provide economic information essential to the establishment of biological research. Considerations which must be taken into account in this area are the relative economic importance of the product, the relative income elasticity of demand, market potential, etc.

Continuity of Research Leadership

Research continuity is affected by a frequent turnover of EPE top administrators which are appointed by the Minister of Agriculture. It is not uncommon for each new Minister to appoint new directors for the divisions and regional research institutes. As the position of Minister of Agriculture has historically not been a very stable one (there were 6 within the past 4 years) it is not difficult to realize that turnover of EPE administrators has been high and that this has had its resultant effects on the continuity of the program. While it is certainly the prerogative of any Minister to appoint men in whom he has confidence to key positions, these appointments obviously should not be so extensive as to jeopardize the continuity of programs such as research which are by their nature easily damaged by lack of continuity.

Extension Coordination

In the past, the federal agricultural research agencies have had poor channels for passing information to farmers. In fact, research results frequently were published in a diversity of journals that were not universally available to the researchers themselves and much less so to extension workers and

farmers. This latter situation is beginning to be remedied through a new centralized technical publication of DPEA to which the IRI/USAID has contributed advisory assistance. However, this new journal does not yet have permanent status as a line item in the DPEA budget. Channels through which research information will reach farmers is to be improved by locating extension specialists (trained with IRI/USAID assistance) in each of DPEA's regional headquarters. This plan is already in effect in three of the six regions. The most potentially effective channel for passing benefits of research to farmers is the Agricultural Extension Service. The Extension Service, jointly supported by the Ministry of Agriculture and the respective state governments, makes personal contacts with a sizeable proportion of Brazil's farmers. The DPEA is just now beginning to utilize this channel and the Agricultural Extension Service is just beginning to look to the agricultural research agencies for source material. Much closer and effective relationships between the research and extension agencies is needed. Through the joint efforts of USAID/IRI, ABCAR and EPE of the Ministry of Agriculture, a protocol was signed between these various organizations to resolve the problems previously stated. The protocol puts on a formal basis a joint cooperative effort between EPE of the Ministry of Agriculture and ABCAR and its affiliates so that research results will reach the hands of the farmer as rapidly as possible in those areas covered by the Rural Extension Service. The Extension Service has been handicapped in making good use of research findings because they have not yet developed a corps of extension subject-matter specialists (e.g. livestock management, soil fertility, pasture management, etc.) who are needed to bridge the communication gap between research findings and farm practice. The Extension Service is beginning to recognize the need for subject-matter specialists and assistance to this end is being provided under the USAID/IRI contract. Aside from the Extension Service, the Ministry of Agriculture uses its Section of

Agricultural Information as a channel for dissemination of policies, programs and any other information or news developed within the Ministry as a whole. This service operates principally through press and radio media. Although the service has Ministry-wide responsibilities, it can provide some assistance in passing research results to farmers.

Planning

Planning in EPE has been characterized in the past by the decentralization and lack of sophistication as well as lack of emphasis on planning.

Through a recent policy change, national research planning is now to be centralized and responsibility for developing national agricultural research program and priorities have been assigned to the national headquarter of DPEA (*). The procedure followed in developing the national program now utilizes recommendations of research of technicians from all parts of the country. To the extent that each technician understands the farmer needs, the

(*) Logically the national planning function should utilize the recommendations of the technical commodity commissions primarily for short-term priorities but should frame these within research needs required for achieving long-term (10-20 yrs) goals of national agricultural production, the latter being based on a compromise between national resource capability and national projections of agricultural supply and demand. Although national research programming along these lines obviously is greatly to be desired, the fact is that EPE does not possess this capability nor should this level of sophistication be expected of it. The U.S. attempted to draw up a national agricultural research program for the first time in 1967. Even with its breadth and depth of technical talent and with the benefit of reliable statistics, either for reasons of inability or for reasons of professional integrity, the U.S. did not presume to relate its national research plan to quantitative and qualitative projections of need.

the market demands, and the physical production potentials and limitation of the geographic area he represents, the recommendation developed in the national commodity commissions form a reasonably rational basis for preparing national programs and priorities in agricultural research. Among the disadvantages of this system are: (1) the research specialist in a given commodity is not likely to be very knowledgeable in affairs outside his own speciality and; (2) the national EPE headquarters receives no recommendations concerning problems of a nature represented by none of the technical commissions (e.g. farm mechanization, insect and disease control).

The shift to centralized national planning by EPE should be regarded as a desirable change only with certain reservations. Brazil now has in use essentially all of its soil resources that are capable of supporting traditional agriculture and must now look to modern capitalized agriculture for future expansion of production. However its unused reserve of soils suited to modern capitalized agriculture are so large and potentially capable of producing any tropical or subtropical product in such quantities that a national program, schedule, and geographic and commodity priorities are absolutely necessary not only to obtain most efficient return per unit of research investment but also to permit orderly development of this potential in a manner that will avoid frustrating imbalance in domestic and even in foreign markets for agricultural commodities. (The crop season in some regions of Brazil alternates with that of other regions, thus offering opportunities of stability in supplies of perishables through planning on a national basis. Similar regional complementarity exists with respect to the temperate and tropical agricultural zones of Brazil).

Initiative by EPE national headquarters in the exercise of planning and programming functions should be limited to such considerations of a truly

national nature as the foregoing. However if the national headquarters of EPE should at some future time follow literally its directive concerning national planning to the extent of by-passing its field research staff, the result of this centralized programming would be local irrelevance of program content. Such a situation developed under centralized national research programming by a predecessor of EPE. The diversity in climate, resource capability, agricultural needs and stage of development from one region to another in Brazil is so great that imposition of nationwide uniformity in research programming inevitably results a very costly amount of local absurdities and inapplicability. The technical staff of IRI can provide assistance in avoiding some pitfalls such as the foregoing but the benefit of top-level research administrators will be needed on a consultant basis to provide experienced guidance in some fields of national research planning and programming.

Cooperation with Non-Federal Research Institutions

At the present time, the amount of federal funding channelled through EPE for cooperative research with state experiment stations is small. However, under a recent government policy (Carta de Brasilia calling for centralized planning but decentralized execution), the EPE will sharply increase the percentage of its funds to be used for cooperative research programs delegated to the states for execution. The EPE has set up a new division, SERPA, to administer federally-financed cooperative research with the states, more or less on the same lines as the U.S. federal funding to the states through the former Office of Experiment Station of USDA. The EPE expects to channel some 30% of its research budget in the cruzeiro loan to cooperative research with the states through its SERPA program.

The loan program proposed herein is designed so that the services, training and commodities to be provided will also be channelled through a cooperative research at the states.

Management and Control

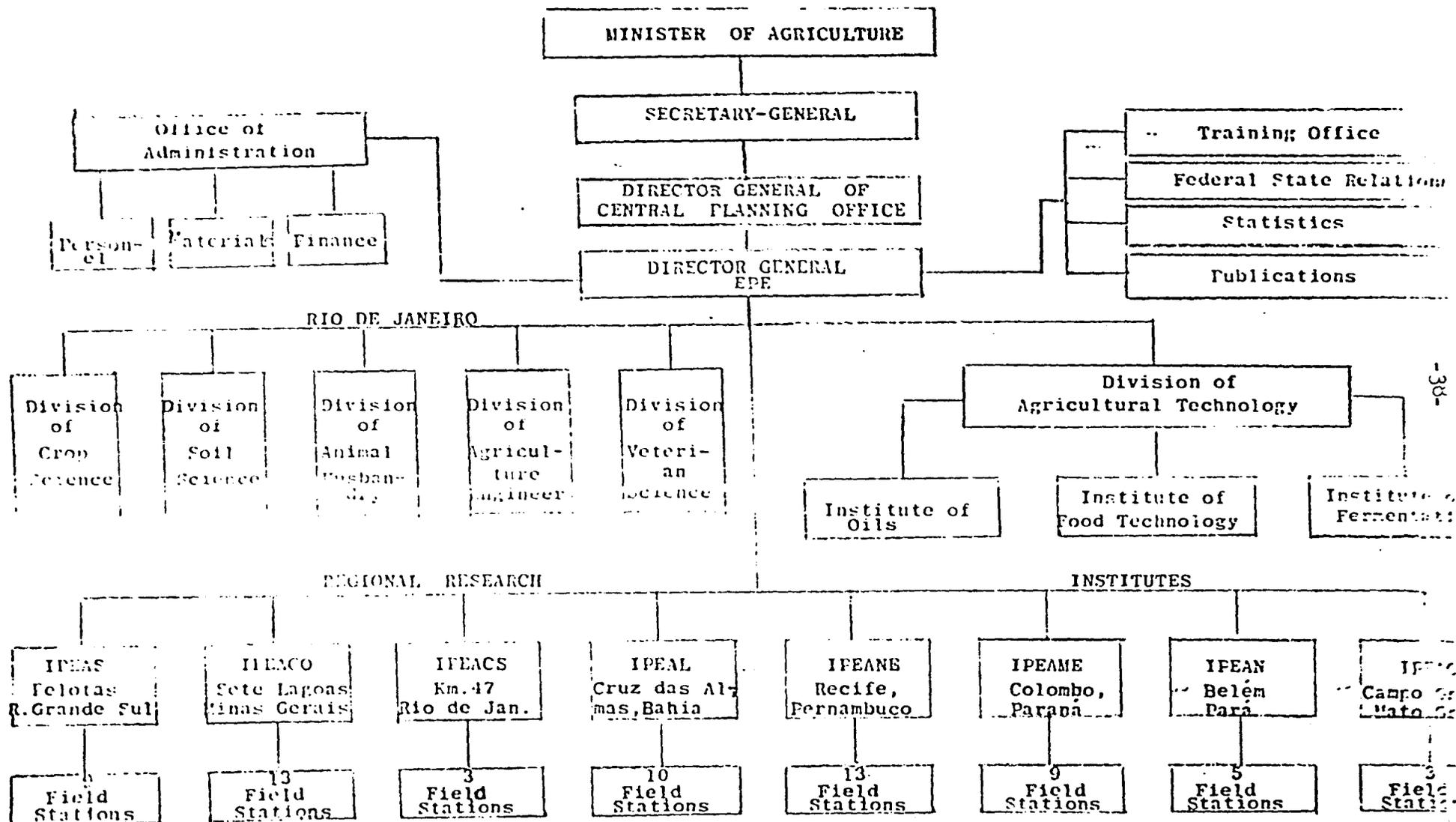
EPE has yet to develop the necessary system and controls necessary to control research costs and to adequately control inventories of commodities and fixed assets. Cost data on research is not collected and controlled by project and there is no method of control and evaluation of projects on a cost basis. Procedures and criteria for estimating research costs are not clearly established for the budget planning process, and thus the budgeting procedure is somewhat haphazard. Provision is being made under the loan to provide assistance to EPE in this area.

G. Conclusion

EPE's directors are competent administrators and researchers, who are thoroughly cognizant of EPE's shortcomings, and they have, in EPE's most recent annual report, elaborated a complete set of recommendations on policies and programs to improve EPE's efficiency. The key portion of this program is the training program and technical assistance to be provided under the proposed loan.

Further EPE has a staff of dedicated researchers and administrators who welcome technical assistance. It is the judgement of USAID that EPE has both the institutional base and the interest in technical assistance which create the proper conditions for a successful technical assistance program.

ORGANIZATIONAL CHART - ESCRITÓRIO DE PESQUISAS E EXPERIMENTAÇÃO (EPE)



B. CONSELHO NACIONAL DE PESQUISAS (CNPq)

1. History and Background

The Conselho Nacional de Pesquisas (National Research Council), otherwise known as CNPq, was formed in 1951 for the purpose of promoting all forms of scientific and technical research. Its efforts until 1964, however, were quite limited largely due to an inability to persuade the Brazilian Government that the development of trained researchers and the strengthening of research organizations deserved a higher priority rating in the Federal Budget. This funding problem was compounded by continual delays in the receipt of funds and frequent cuts in allotted resources.

Significant improvement was made, however, after the revolution of March 1964. In 1965 CNPq was able to provide financial assistance to a total of 853 researchers, up 42% from the number assisted in 1964. This progress was continued into 1966 when 1,160 scholarships were granted, 36% above the 1965 level. As will be shown later in terms of funding levels, CNPq's program rose almost 70% between 1966 and 1967. Total expenditures rose from NCr\$8.3 million to NCr\$13.9 million, both figures expressed in terms of 1967 price levels.

Future plans of CNPq call for attaining a researcher level of 200 scientists for every million inhabitants (20 per 100,000). CNPq feels such a target is reasonable, provided funding levels continue to grow and the universities cooperate in placing their technicians in teaching, as well as research, positions. At the same time, CNPq intends to pay increasing attention to the problems of laboratory capacity, the adequacy of research equipment, and the availability of trained auxiliary personnel. CNPq is exploring the possibility of cooperation and financial assistance from the National Economic Development Bank (BNDE) in these efforts.

Finally, CNPq intends to focus more directly on some of the larger problems of Brazilian development where research and technological studies can be of material assistance. Already under attack are the questions of a new agricultural technology (or technologies) for the

Northeast and economic methods for opening up the vast, unused lands of Brazil's interior known as the "campos cerrados". Studies in these areas are being spearheaded by a series of Advisory Commissions set up under CNPq auspices.

2. Formal Responsibility

The objective of CNPq is simply and broadly stated in the law which created it:

"to promote and stimulate the development of scientific and technological investigation in all areas of knowledge".

3. Organization and Staff

By law, CNPq was created as a legal entity reporting directly to the President of Brazil. It has autonomy in scientific, technological, administrative, and financial affairs. Funding is obtained through the normal budget process, as with other agencies of the Brazilian Federal Government.

The organization of CNPq, which is set out in its chartering law, is small and compact. Operating responsibility is vested in a president and vice president, both of whom are appointed directly by the President of the Republic of Brazil. The president is assisted by a staff of 4; the vice president, by a staff of 3. An additional staff group handles external correspondence, documentation, and preparation of the annual report. The Legal Department is the only other office that reports directly to the president.

Overall control of CNPq's policies and activities is vested in a Board of Directors (Deliberative Council). Its 27 members, all of whom are directly appointed by the President of Brazil, consist of the president and vice president of CNPq, 7 representatives from the various

Ministries (of which the Ministry of Agriculture is one) and the Armed Forces, and 18 representatives from a variety of cultural, civic, military, economic development, and academic organizations. Members, whose terms overlap, are appointed for a term of 3 years and can be re-appointed at the discretion of the President of Brazil. By law, the Board of Directors must meet a minimum of 4 times a year. Decisions are reached by a simple majority vote.

The Board of Directors has two primary responsibilities. First, to examine and approve CNPq's plans for promoting scientific and technological research. Second, to review and approve budget levels and actual expenses. Other responsibilities include recognizing the interest of the military in research activities, deciding on the extension of financial assistance to individuals and organizations, and determining which organizations can be utilized in the implementation of CNPq's plans.

All operating matters are handled by two Departments, both of which report directly to the president. The first of these, the Scientific-Technical Department, is responsible for programming and implementing plans approved by the Board of Directors. It is organized into a series of nine technical offices and a supporting staff which collects basic data on program implementation and prepares reports for external circulation. The technical offices are responsible for the major areas in which CNPq promotes the development of researchers and research institutions: agriculture, biology and medicine, social science, geology, physics and astronomy, mathematics, veterinary science, chemistry, and technology. Each is composed of a director and a small supporting staff.

The second Department is the Department of Administration, divided into four Divisions: Budget and Control, Treasury, Personnel, and General Services. Its responsibility is to control and document the use of CNPq's personnel, monetary, and material resources. The total staff in the Department of Administration is approximately 100.

In general, the personnel standards found at CNPq appear to be high. All the top management (i.e. president, vice president, department heads, and directors of the technical offices, 13 in all) have a minimum of a B.A. degree and usually a lifetime of practical experience in their field of expertise. Thus, the principle advisor of the technical office for agriculture is Dr. Ady Raul da Silva, holder of an agricultural Ph.D. from the United States and former director of EPE in the Ministry of Agriculture. Similarly, especially qualified people appear as members of the Board of Directors. Turnover of top personnel has not been abnormally high (on the Board of Directors, at least, which is regulated by law) and does not appear to have caused any serious problems of program continuity. While one might perhaps accuse CNPq of being unduly understaffed for its task, this appears to be the only major way in which the adequacy of its personnel can be challenged.

4. Performance

Historically, CNPq's program has been divided rather evenly between support for individual researchers and support for research-oriented organizations. Each of these areas is discussed below.

a. Assistance to Research-Oriented Organizations

As determined by Brazilian Law, there are presently 5 research-oriented agencies of the Brazilian Federal Government which are subordinated to CNPq and dependent on it for funding and general guidance. Acting under their own autonomous management, these agencies carry on a broad range of research activities throughout Brazil. Each of them is described briefly below.

Instituto Nacional de Pesquisas da Amazonia (INPA)

Created by decree law in 1952, INPA is headquartered in Manaus, Amazonas and is organized into divisions covering chemistry, lake and water-body study (limnology), zoology, and botany. A reorganization study was completed in 1966 which will expand the technical staff to include experts in soil science, hydrology, forestry and medicine.

INPA's objective is a broad one: "to study possible means for improving conditions of life in the Amazon region". Work to date has covered such diverse areas as studies into the chemical composition of the water of the Rio Negro and study of the transmission of malaria by monkeys, various forestry studies, and the collection and classification of Amazon-region plants. INPA, staffed by a total of 69 research personnel, maintains an extensive program of personnel up-grading, conferences, and publications.

Included in the annual appropriation for INPA are funds for Museu Paraense "Emilio Goeldi". Founded in Belem, Para in 1866 as a private museum of natural history, it is now owned by the State of Para and operated by INPA under a 20-year contract. The museum is organized into departments of anthropology, botany, zoology, and geology. It also maintains botanical and zoological gardens.

Instituto Brasileiro de Bibliografia e Documentacao (IBBD)

Founded in 1954, IBBB has three main functions: (1) promote the development of bibliographical and documentary services; (2) stimulate communication and cooperation between such documentation centers and libraries; and (3) promote better use of existing bibliographical and documentary material, particularly in the fields of scientific and technological research. Its organization consists of a president and vice president, an executive director, and divisions for bibliographic services, cataloging, information, publications, reproduction, and administration. IBBB also maintains a substantial library.

In 1966 IBBD compiled over 300 bibliographies, covering the fields of psychology, sociology, administration, education, physics, chemistry, medicine, engineering, agriculture, and technology. Additionally, more than 500 individual requests for information were answered. A total of 32 works were translated into Portuguese, including books originally in German, English, Russian and Japanese. The second edition was published of Guide to On-Going Brazilian Research Projects.

Instituto de Matematica Pura e Aplicada (IMPA)

Founded in 1956 and reorganized in 1966, IMPA conducts research and gives classes in various fields of mathematics. Teaching efforts are mostly made at the post-graduate level and cover both theoretical and applied mathematics. Research is generally of a theoretical nature, with results usually being published in English.

The administrative structure consists of a Director, a Board of Directors, a scientific body of teachers and researchers, a library, and an administrative group. IMPA is also actively involved in holding short courses, conferences, and seminars. It cooperates closely with the mathematical departments of Brazilian universities, from which are usually drawn the members of the Board of Directors.

Instituto de Pesquisas Rodoviaras (IPR)

Created in 1957 and composed of a Technical Council, a Directorate, a Scientific-Technological Section, and a Department of Administration, IPR aims at promoting all forms of road and highway research and at improving the use of such research results. Overall control is exercised by the Technical Council, whose members are drawn from CNPq, the DNER, the Ministry of Army, the Brazilian Engineering Association, and the Brazilian Highway Association. The activities of IPR have expanded rapidly in the past few years: in 1966 alone, research posts were established in Para, Ceara, Rio de Janeiro, and the Federal District. Also, IPR was successful for the first

time in obtaining financial support from most of the state DER's, the DNER, and SUDENE, PETROBRAS and RODOBRAS.

During 1966 IPR was directly involved in research efforts into such problems as the quality of various paving surfaces, economic limits to axle weight, general guidelines for future road construction projects, and the composition of Brazilian asphalts. Much of this work was conducted through IPR's network of 10 research posts spread throughout Brazil. Scholarship assistance was granted to 14 engineers for work on specific research problems. Financial assistance was given to an additional 93 individuals and organizations to conduct research efforts, establish courses, or attend research-oriented seminars and conferences. IPR itself gave 11 courses during 1966 covering such topics as highway paving practices, highway policy, traffic control, use of pre-stressed concrete, application of computers in highway design, and highway economics.

Grupo de Organizacao da Comissao Nacional de Atividades Espaciais (GOCNAE)

This agency, better known as GOCNAE, was created in 1961 and reports directly to the president of CNPq. Its organization consists of a president, an advisory council, a technical division, an administrative division, and a project group. GOCNAE is responsible for all activities of the Brazilian Federal Government in fields of space development, space research, and space policy.

The rocket-launching station outside of Natal, better known as Barreira do Inferno, is a major GOCNAE activity. Using such U.S.-made rockets as the HASP, ARCAS, NIKE, and AEROBEE, GOCNAE has been studying various aspects of the world's atmosphere since 1965. This base is now being expanded to handle satellite tracking and more advanced research efforts. In 1966 GOCNAE studied the solar eclipse from a temporary base set up in Rio Grande do Sul. Research laboratories and a library are maintained at the Space Laboratory in Sao Jose dos Campos. Research efforts, usually with

the assistance of NASA specialists, are conducted in such areas as meteorology, the ionosphere, X-ray, astronomy, satellite tracking, and magnetics.

b. Assistance to Individual Researchers

While approximately one half of CNPq's resources goes for the support of the research organizations described above, the other half is used to assist individuals in carrying out their research efforts and in developing their skills. In 1966, this program extended a total of 1,160 scholarships with a value of NCr\$13.9 million. These resources were spread among the various technical areas and the levels of research study as shown below.

<u>Sector</u>	<u>No. of Scholarships</u>
Agriculture	189
Biology	396
Social Science	14
Geology	118
Physics and astronomy	120
Mathematics	62
Chemistry	134
Technology	86
Veterinary Science	<u>41</u>
Total	1,160

<u>Study Level</u>	<u>No. of Scholarships</u>
Beginning Research	619
Research Programs	175
Post Graduate	84
Research Assistant	125
Researcher	53
Research Supervisor	<u>27</u>
Total in Brazil	1,083
Foreign Study Programs	<u>77</u>
Total	1,160

CNPq's program for 1966 represented a considerable jump over that executed in 1965, as the total number of scholarships jumped from 853 to 1,160. At the same time funds expended for scholarship assistance rose from NCr\$4.9 million to NCr\$6.4 million. CNPq is predicting this expansion to continue in 1967: the number of scholarships is expected to rise to 2,000, including 100 outside of Brazil.

As shown above, the overall program actually consists of nine sub-programs, each covering an area CNPq has identified as having particular importance. These sub-programs are described briefly below.

Agriculture

CNPq extended a total of 186 scholarships in 1966 for research efforts in agriculture. While the majority of these went for Beginning Researchers (129), emphasis was also given to Post Graduate Study (27) and Researchers (11). Of the total 186, there were 82 researchers involved in soil studies, 39 in plant and crop science, 6 in zoology, 5 in statistics, and 5 in rural economics. While study was conducted in most parts of Brazil, there were heavy concentrations in the states of Rio de Janeiro, Sao Paulo, Rio Grande do Sul, and Pernambuco. The 3 scholarships for overseas study financed research scholarships in Belgium, Italy and the United States.

Additionally, CNPq provided financial assistance to 31 separate Brazilian organizations (mostly universities and agricultural schools) to further some aspect of agricultural research. These funds were used for such things as equipment acquisition, hiring of needed specialists, financing attendance at research reunions and seminars, and publications.

Biology

A total of 384 scholarships were extended by CNPq in 1966 to promote research efforts in biology. As with the agriculture program described above, the majority

went for Beginning Researchers, 152 scholarships, But there were also 111 for Researcher and Research Assistants and 5 for Post Graduate work. Research efforts covered a wide variety of biological problems and were conducted mainly in the states of Guanabara (158), Rio Grande do Sul (60), Sao Paulo (53), and Pernambuco (46). Five scholarships financed research study in France, Scotland, England, and the United States.

Additional financial assistance was provided to approximately 59 organizations to procure equipment and services related to a program of biological research.

Social Science

This program, only created in 1965, began its activities in 1966. A total of 14 scholarships were granted, of which half were for Post Graduate work in Brazil. Research efforts covered such fields as social anthropology, comparative sociology, rural sociology, rural economics, and social psychology. There were no overseas scholarships. Supplemental assistance was provided to 7 institutions for their research efforts in this area.

Geology

Scholarship efforts in this area, which totalled 107, went mainly for Beginning Research (71) and Research Programs (15). There was only 1 scholarship for Post Graduate work. Of the total, 37 worked directly in geology, 19 in paleontology, 16 in petrology, and 10 in minerology. Most of the researchers were in the states of Guanabara (34), Rio Grande do Sul (24), Pernambuco (15), and Bahia (15). There were 11 individuals pursuing research activities outside of Brazil with CNPq assistance.

Physics and Astronomy

CNPq extended 104 scholarships for study in these areas in 1966, of which 80 were for Beginning Research

and 14 for Post Graduate work. Areas covered included astronomy, nuclear physics, electronics, solid state physics, and low temperature physics. Work done in Brazil was concentrated in the states of Guanabara (61), Ceara (22), and Sao Paulo (21). Eleven students abroad were in England, France, Germany, and the United States. Additional financial assistance was provided directly to 23 Brazilian institutions to defray part of their expenses for research in this area.

Mathematics

Forty six scholarships in Brazil were extended by CNPq to assist in the study and research of mathematics, of which 40 were for Beginning Research. There were 16 students abroad, mainly in the United States. Studies covered a wide range of mathematical subjects, including algebra, differential equations, statistics, and functional analysis.

Chemistry

There were 130 individuals studying with CNPq assistance during 1966 in chemistry. Of these scholarships, 77 were for Beginning Research and 24 were for Post Graduate work. Efforts covered such fields as biochemistry, enzymes, bromatology, rare elements, chemical engineering, plant chemistry, mineralogy, inorganic chemistry, toxicology, vitamins, and organic chemistry. The bulk of the study was in Guanabara (67), Minas Gerais (34), and Sao Paulo (10). Five students were in England, Germany, Japan and the United States with CNPq assistance.

Technology

Study and research scholarships in various fields of technology were granted by CNPq to 72 individuals in 1966. Work was performed in such diverse areas as ceramics, alcoholic fermentation, proteins, hydrology, vacuums, construction materials, cellulose and paper, and metallurgy. Forty of the scholarships were for study in Guanabara; 15,

for study in Rio Grande do Sul. Fourteen individuals were overseas with CNPq assistance, usually to gain a Master or Ph.D. degree in such fields as engineering, mechanical engineering, applied thermodynamics, and servodynamics. Additionally, CNPq provided financial assistance to 70 individuals who were directing on-going research projects in various Brazilian organizations, mostly universities.

Veterinary Science

As with the Social Science program, CNPq's activities in Veterinary Science began during 1966 and have thus been quite limited. Nevertheless, 41 scholarships were granted in this area in 1966, of which 28 went for Beginning Researchers. Twenty-eight of the recipients were studying in Rio de Janeiro and eight in Rio Grande do Sul. Work was concentrated in such areas as zoology, physiology, pathology, and parasitology.

CNPq's total program is presented in monetary terms in the Financial Section of this Paper. Figures prior to 1967 have been adjusted to account for inflation and allow meaningful comparisons to be made. While financial data for 1967 are presented here, the previous analysis of CNPq's program has been based on the 1966 period, since this is the latest year for which CNPq's annual report is available.

As is readily evident from these figures, CNPq's program has more than doubled since 1960, as actual expenditures have risen from NCr\$5.6 million in 1960 to NCr\$13.9 million in 1967. Growth has been particularly rapid since 1964, for the reasons discussed earlier.

Program expenditures, averaging about 90% of all expenditures, seem to be split rather evenly between support for research organizations and individual study. Thus, in 1967 supporting funds for the research organizations totalled NCr\$6.3 millions while that for scholarships totalled NCr\$6.4 million. In general, this relationship had held true in the past. The additional 10% of total expenditures has gone historically for administrative costs.

While the figures describing each of CNPq's scholarship programs do not match entirely with the above description of programs (for instance, there is no line item for Veterinary Science), the basic outlines are still visible. Working with 1966 figures, of total scholarship expenditures of NCr\$4.9 million, NCr\$1.2 went for Biology, NCr\$1.0 went for Physics and Astronomy, and NCr\$0.7 million went for Technology. These three areas, then, accounted for NCr\$2.9 million, or 59% of total scholarship expenditures. Agriculture was in sixth place with NCr\$0.5 million, about 10% of the total available.

5. Problems

There seem to be two main areas in which CNPq has troubles, or in which noticeable improvement could probably be made: planning and funding. Each of these is discussed briefly here.

a. Planning

While annual plans are made and while they are approved by a Board of Directors whose members are well qualified, the planning effort lacks factual data on which decisions can be based. For example, there appear to have been virtually no manpower studies made by or for CNPq of the priorities and needs of Brazilian research.

Another reason for the apparent lack of planning is that given the extreme shortage of Brazilian scientists (as compared to other countries) in all fields, the CNPq has been, quite rightly, more concerned with developing programs to train scientists in the knowledge that the immediate requirement is for more scientists in all fields.

CNPq is evidently now attempting to develop methods of determining manpower requirements for scientists and to assign priorities. One newly assigned priority is agricultural research.

b. Researcher Salary Levels

CNPq is looking for the solution to the lack of economic incentives for people to enter the research fields. Most research jobs in Brazil are in the public sector and the pay involved is not commensurable with the long years of study required. Some research agencies have been given autonomous status and are able to pay higher salaries, but this is a solution which obviously cannot be applied to all areas of research. To help alleviate this situation, the CNPq has requested authority to initiate in 1968 a program to pay a supplemental bonus to qualified researchers. This program will offer a partial solution to the problem. The ultimate solution to this problem will undoubtedly have to await a solution to the overall civil service problem in Brazil.

6. Conclusion

The CNPq has the capacity to successfully execute the proposed program.

SECTION III - PROJECT DESCRIPTION. THE EPE PROGRAM

A. Introduction

To achieve its national agricultural output and modernization goals, Brazil requires technical assistance of senior scientists well acquainted with the world's research findings and materials in plant and animal science to help: (1) in the identification and definition of problems limiting improvement in agricultural production and (2) in the planning and execution of effective research programs to solve these problems within an acceptable economic limit. Additionally, it will need an expanded training program to train scientists in advanced research material and methodology.

B. Summary of the Project Description

Proposed is a five-year program of professional assistance, academic, professional, and sub-professional training, and commodity and equipment support to assist EPE in: (1) increasing its capacity to plan and execute a national research program; this will be accomplished through the provision of professional researchers who will advise EPE and assist in the evaluation of needs and in the adoption and the utilization of modern methodology in developing and carrying out research and dissemination of results; (2) substantially increasing the research capacity of its staff, through academic training in both the U.S. and Brazil; and (3) substantially increasing its input into research in key areas through the provision of professional research assistance and essential research equipment and commodities, and payment of a small part of related local costs of research projects.

In summary the assistance will be provided as follows:

1. The major thrust of the program will be a contract with the IRI Research Institute to advise EPE in planning and administering its program utilizing the most advanced research administration and research technology. The contract will provide U.S. professionals, researchers at the PhD level with extensive experience in techniques, planning, and operations, who will be assigned to EPE national headquarters and at the regional institutes.

These research scientists will provide assistance in research evaluation and planning, and improvement in methodology.

2. To assist in developing the professional research capacity of EPE to effectively conduct national research programs, there will be implemented a comprehensive training program which will: (a) train newly hired researchers in research methodology and techniques; (b) provide graduate level training in both Brazil and the U.S. leading to M.S. degrees and PhD degrees in agricultural sciences and economics for approximately 500 researchers and extension agents, (c) provide for intensive short courses in research methodology and specialized subject matter for approximately 360 researchers; (d) provide sub-professional training for field foremen and laboratory technicians.

3. To augment quantity and quality of research output and in-service training and to assist EPE in executing its program, experienced U.S. researchers at the PhD level will be assigned under the IRI contract to specific research projects and programs at research centers to work with Brazilian researchers. They will train research teams in specialized research expertise in the development of work plans, in experiment design and interpretation, and in the adaptation of modern research techniques. Additionally, they will conduct seminars and short courses in their subject matter specialities. Also to be provided are short term consultants to assist in the conduct of specific research projects and to deal with special research problems requiring expertise not available from the long-term scientists.

4. Additionally, support will be provided to the EPE program in the form of laboratory equipment, farm machinery, and commodities essential to the conduct of the program of agricultural research.

5. This program will also provide assistance in research extension and cooperative programs to improve the speed and effectiveness with which research results once obtained are published and disseminated to other professional researchers and to the extension system and farmers. This will include assistance to EPE in the establishment of publication plans and schedules for individual research projects, and assistance to ABCAR in the establishment of publication facilities, training of editors and extension specialists to translate research results into forms usable by farmers.

For purposes of this presentation, the program has been sub-divided into three sub-projects as follows, which will be discussed in detail in the remainder of this section:

1. The IRI Technical Assistance Contract.
2. The Training Program.
3. The Equipment and Commodity Procurement Program.

Sub-Project I

Professional Services Contract with IRI Research Institute

A. Project Description

The major element of the program with EPE will be a contract between a qualified U.S. private, university or U.S. government research institution similar to the present contract between IRI and AID ^{1/} which will provide research professionals to assist EPE to: (1) increase its capacity to plan, develop and coordinate a national research program, (2) to develop a training program, both in-service and formal, to improve the professional capacity of its staff, and (3) provide special research expertise in the execution of the program. The major elements of the assistance, to be provided under this contract are described in detail below:

1. Technical Assistance in Research, Evaluation, Planning, Improvement in Methodology, Development, and Carrying Out a National Training Program.

To provide under a contract senior scientists to work with national programs of research and training with the programs of the divisions of Crop Science, Soil Science, Animal Husbandry, and Agriculture Engineering. They will provide assistance in the evaluation of needs, research programming and administration, in adoption of modern techniques of research, and other work. One scientist will be assigned initially to work with SERPA (Federal Cooperative Research Program) in developing a program of cooperative Federal-State-University research.

Duties of all professionals will include conducting seminars and courses in research, and research methodology, programming and administration, and to assist in the evaluation and planning of commodity committees.

All scientists to be assigned will be researchers at the PhD level who have had at least five years of experience in research. This represents the initial staffing pattern which is subject to change during the program as the requirements of EPE evolve, and as the two year tours of the professionals expire and come up for renewal.

^{1/} The contract services provided by IRI under this contract are considered satisfactory and the EPE has expressed the desire to continue with IRI Research Institute. However, if during the contract negotiations an agreement acceptable to USAID, EPE and IRI is not possible, EPE may enter negotiations with another qualified U.S. supplier of these services.

Initial adjustment of these professionals have been programmed as follows:

EPE Headquarters and National Program

<u>Department</u>	<u>Technical Speciality of Spec. Assistants</u>	<u>Number of Man-years</u>
EPE Headquarters	Senior Research Advisor ^{1/}	5
SERPA	One General Research Advisor ^{1/}	2
Dept.of Crop Science	One Crop Scientist ^{2/}	4
Dept.of Animal Science	One Livestock Scientist ^{2/}	2
Dept.of Soil Science	One Soils Scientist ^{2/}	2
Dept.of Ag.Engineering	One Ag.Engineer ^{2/}	2
EPE Headquarters	One Ag. Economist	4
	Training Advisor ^{3/}	4
	Business Management Assist. ^{3/}	<u>4</u>
	Subtotal	- 29
	Less Grant Funded ^{4/}	<u>12</u>
	Total Loan Funded	17

Thirty man months of short term consulting service also will be provided for this program.

- ^{1/} To be combined after two years
- ^{2/} To be combined after two years
- ^{3/} Duties defined in following sections
- ^{4/} Approximately 12 man years to be grant financed after December 31, 1968.

2. Management Assistance

To provide under the contract with IRI, a Business Management Advisor to assist in preparing documents and maintaining records on all commodities, services and equipment procured under the loan, and assist in the procurement of commodities financed under the Loan. Currently, under the grant contract IRI maintains a separate accounting system, operated by local-hire contract personnel, to maintain records on all commodities and equipment financed by the AID grant, and maintain records of the local costs of all AID-financed support to the research program. Under this program, this accounting responsibility will be gradually transferred to EPE and if feasible broadened to cover the total EPE program. In addition, the Management Advisor will assist EPE in analyzing its management requirements and recommending solutions. Therefore, in addition to the duties directly related to accounting for the AID financed program, the Management Advisor (assisted by a locally contracted employee(s)) will assist the EPE in:

- (1) Reviewing accounting systems and procedures in order to establish better internal control and simplify flow of work;
- (2) Improving the internal audit system;
- (3) To examine the feasibility of mechanizing or computerizing accounting and procurement records;
- (4) Modernizing record-keeping for inventories of commodities and fixed assets;
- (5) Developing a system of financial reporting by project and program;
- (6) Reviewing procurement procedures in order to simplify and expedite procurement.

Qualifications of the Management Advisor will include a CPA with three year's experience in management. Four man years of advisory services are proposed for this portion of the program.

3. Research Training Assistance

A specialist with experience in U.S. graduate school curricula, in standards and procedures, and training of researchers to assist in developing the EPE training program and to assist in arranging U.S. training. This will include assistance in selecting candidates, preparing candidates for U.S. universities (i.e., arrange English language training and preparing courses of study) making arrangements with U.S. universities and preparing documentation required for participants, including sponsors statements and commitments for re-employment, and follow-up on returnees. This professional will be assigned to SAPT, the training department of EPE, and will also advise and assist it in developing its formal training and in-service training programs which are described later in the paper. Brazilian personnel will be assigned to work with him - to acquire experience to handle the job by the end of the 4th year. Four man-years of advisory service are proposed for this program.

4. Technical Assistance in Applied Research

To provide scientists for a total of approximately 110 man-years, in selected research disciplines, at the eight regional institutes and at University and state research centers as follows:

<u>Discipline</u>	<u>Number</u>	<u>Man-Years</u>
Plant Science	11 <u>1/</u>	35 <u>1/</u>
Soil Chemistry	1	2
Soil Fertility	3	10
Soil Physics-Consultants only		
Animal Husbandry including Nutrition	8	24
Veterinary Science Mainly disease and parasite control	6	20

<u>Discipline</u> (continuation)	<u>Number</u>	<u>Man-Years</u>
Farm Managem. and Production Econ.	2	8
Ag. Eng.-Irrigation, Drainage and Machinery	2	5
Ag. Eng.-Storage	1	3
Food Technology	<u>1</u>	<u>3</u>
Total	35	<u>110</u>
Less grant funded ^{2/}		<u>7</u>
Total Loan funded		103

NOTE:

1/ Tentative programming of man years is as follows: Pulses (soybeans, beans, peanuts) 4; Food grains 3; Tubers 2; Vegetables 5; Tropical fruits 2; Temperate fruits 2; Wheat 3; Forages 5; Plant Pathology 5; Economic Entomology (on biological control) 4; Plus consultants. One weed control, nematology, corn, sorghum, sugar cane additional consultants will be provided but no long term personnel.

2/ Out of this total approximately 7 man-years will be grant funded after December 31, 1968.

These "professors" will be made available to both EPE research institutes, state research centers, and universities on request. Before such a request will be fulfilled, however, the requesting institute must give assurance that the "professor" will be assigned to research which is of national priority, and that the institute is prepared to (1) assign at least five researchers (from the institute, or a combination of institutes) to work full time with the "professor", (2) assure adequate materials and labor for the "professor's" research projects and program.

The above "mix" of technical specialities has been tentatively programmed in accordance with the known requirements of the regional institutes, state, and university research centers and national research priorities. However, in view of the fact that "professors" will not be assigned, but will rather be made available on the basis of requests, the above mix is only illustrative.

7) Assist in the selection and preparation of researchers for advanced training in Brazil and the U.S.;

8) Assist in the preparation of specifications for equipment and commodities to be utilized in research programs;

9) Provide consultant assistance in their specialties throughout the country, as requested by EPE;

10) Assist in obtaining short-term consultants for special research problems;

11) Assist in long-range planning in their specialties.

Research professionals financed under the program will be selected on the basis of experience, as well as education. All researchers will have PhDs and will, as a general rule, have had at least five years of experience in a position similar to the one for which they will provide assistance. Additional experience may in some cases offset the lack of a PhD.

5. Consultant Assistants in Research

The provision of 15 man years of short-term research consultants to assist in the conduct of specific research projects and programs requiring specialized knowledge unavailable in Brazil or from the permanent contracting group. These consultants will assist in designing experiments dealing with problems in their areas of specialty, conduct seminars and give lectures in their specialty, and recommend solutions and design research for emergency agricultural problems. Short-term contracts of this nature will make it possible to obtain the services of outstanding researchers who will not be available on a longer term basis. These services are programmed as follows:

<u>1969</u>	<u>Man years</u>		<u>1972</u>	<u>1973</u>	<u>Total</u>
	<u>1970</u>	<u>1971</u>			
3.0	3.0	3.0	3.0	3.0	15.0

6. Program for Diffusion of Research Results

One of the main problems that limits efficient agriculture production is the delay in relaying applied research results to the farmer.

The Minister of Agriculture realized that this was a serious problem and took action in 1966 to improve the situation. A committee was established consisting of members of EPE, ABCAR, USAID and IRI. It was recommended that extension specialists be located at each of the major research institutions to assist in the publication of research results in a form that could be readily understood by the farmer. The extension specialists would also assist in conducting demonstrations and field trials as well as assisting extension personnel in the region in carrying out an efficient extension program.

As a result of the committee's recommendation an agreement was approved under which the extension service would provide one technician at each institute. EPE agreed to provide office space at each institute for the extension specialist, and USAID agreed to furnish communication media equipment for the publication and general diffusion of research information.

This program is now in operation and ABCAR has provided four extension agents to four of the research institutes. The institutions have provided office space and IRI has provided some of the visual aid equipment through the USAID contract.

It is the intent of this project to stimulate such a cooperative program at all major federal, state and university research locations.

Funding under this loan will provide necessary additional equipment which is indicated under the section on commodities to allow the system to operate on a full scale basis over a period of the

next five years. Some assistance will also be provided where universities and state research stations develop similar programs with ABCAR at state, regional, and local levels.

It is anticipated that through this liaison system at least 30% of the farmers in each region will be reached through radio programs, television shows, extension publications, field days, demonstrations, movies, and film strips. (See commodity section).

U.S. technicians provided under this program will assist in development of these cooperative programs. They will also help to carry out methodological research to improve the process of diffusion of research results. Part of the time of the publication specialists and part of the time of the diffusion specialists will be directed to this effort.

The contract will provide for 12 man-years of advisory service and 30 man-months of consulting service as follows:

a) An information and publication specialist to work with EPE on a national program of review and publication of research with particular emphasis on getting results published quickly in different media.

b) A specialist to work with EPE and ABCAR on development of more effective cooperative research-extension programs including:

(1) field days for farmers at research locations, seminars for extension workers, joint courses in regional production problems, etc.

(2) EPE-ABCAR review of research results for selection of priorities for extension dissemination.

(3) to establish a training program, both in Brazil and the U.S., for subject matter specialists who will act in a liaison capacity between research and technicians, and establish working relations between research and extension.

(4) to assist in establishing joint programs including ABCAR offices at or near experimental sites.

(5) to develop and carry out studies of extension methodology.

c) To provide one Diffusion Media Specialist at the doctorate level or with equivalent experience, to assist EPE-ABCAR in: (1) organizing a smooth flow of research information to the farmers through all available communications media (radio, TV, movies, newspapers, journals, etc.); (2) carrying out studies to determine effectiveness of the various media in communicating agricultural technology to various types of farmers; (3) coordinating studies to develop communications methods for dealing with different levels of farmers.

d) Thirty man-months of specialized consulting services in developing programs in various news media, i.e., radio, TV, films, etc., and to give seminars in research extension methods, and to provide such other special assistance as may be required under the above programs.

B. Project Execution - Cost Estimates

1. Research/Training Teams - Cost Estimates

a) Scientists and trainees

In accordance with the operating guidelines for development of the research program, teams of senior and junior scientists will be assembled to work with the senior scientists.

This either may require that the senior scientists (Brazilian or U.S.) be sent to a location where most of the team components are, or it may require that most of the team components be sent for temporary duty at a location where the senior scientist is located, or on occasion it may mean locating the entire team temporarily at a center having best local conditions for the particular kind of research and training to be undertaken. Maximum flexibility will be provided for these arrangements.

The team research functions will be carried out in a manner to permit participating members to acquire specialized research skills that are needed in their normal research assignments. Team members must be selected considering the adequacy, presently or programmed, of their respective home institutions to provide the basic conditions for application of the acquired skills.

Funding is provided herein for support costs of temporary assignments of senior Brazilian scientists and of junior scientists to the extent required for the assembly and smooth functioning of the research/training teams.

Support costs of assembly and operation (exclusive of research project costs) of these research/training teams are estimated as follows:

Support costs for scientists temporarily relocated as a part of
team research and training program
(Cruzeiro costs in thousands of US\$ equivalent)

	<u>1969</u>	<u>1970</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>Total</u>
Senior Scientists						
Man Years	16	24	24	24	24	112
Costs <u>1/</u>	96	144	144	144	144	672
Junior Scientists and Trainees	32	48	48	48	48	224
Costs <u>1/</u>	96	144	144	144	144	672
Total man years	48	72	72	72	72	336
Total costs <u>1/</u>	192	288	288	288	288	1,344

1/ Cost estimated on basis of \$6,000 per year including travel, per diem, transportation, housing and salary supplement for Senior Scientists and \$3,000 per year for Junior Scientists.

These estimates are based on total of 168 team years led partly by Senior American and partly by Senior Brazilian Scientists.

b) Local Personal Services Required for Implementation
of Research/Training Team Functions

The Research/Training teams will require support services, on a temporary basis, over those normally available from local staffs of the institutions where the teams will work. This need will be especially important where personnel are brought together from different locations on a temporary basis with no intent to establish the work on a permanent basis. Funding is herein provided for support of personal services, contracted on a temporary basis, for field and shop work, operation of laboratory facilities, and secretarial work.

Local Services for Research and Training Team

	<u>1969</u>	<u>1970</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>Total</u>
Team years	24	36	36	36	36	168
<u>1/</u> Man yrs support service	72	108	108	108	108	504
<u>1/</u> Cost on thous. of \$	72	108	108	108	108	504

1/ Estimated on basis of an average of 3 support personnel for each team with an average cost of \$1,000 equivalent per man year.

2. Local Support Provided in Conjunction with U.S. Technicians.

In order to provide the professional services required under the contract, and to maintain accounting control of U.S. commodities and equipment to be provided under the loan, EPE will contract with local personnel to perform certain services not available from present Ministry of Agriculture personnel and resources. These will consist of:

- (1) bi-lingual secretarial and translation services;
- (2) three technicians including an assistant business manager, a mechanical engineer, and an agronomist;
- (3) an accounting service;
- (4) a mechanical engineer and four mechanics to develop a national program of maintenance and for training of operators of field and laboratory equipment;
- (5) drivers and messengers for the various office locations;
- (6) local travel and transportation, including vehicles

Funds will be provided for IRI to contract directly in accordance with Brazilian and AID regulations for the following personnel to help administer its contract:

- (1) an assistant business manager
- (2) three accounting clerks
- (3) two secretaries

Funds also will be provided to IRI to pay per diem and school and housing allowances to its employees.

The cost estimate for both these types of services are itemized in Annex III A, Exhibit 1. These cost estimates are based on the historical costs of IRI under the grant program. The part of local support for which IRI will contract directly, will be charged at cost and all records of such costs will be open for inspection by both EPE and AID. A summary of the total support costs follows:

Local Support Costs to be Paid from Project Funds

	<u>1969</u>	<u>1970</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>Total</u>
	(cruzeiros in thous. of \$ equivalent)					
Support Personnel <u>1/</u>	130.7	137.2	144.1	151.3	158.9	722.2
Office Equip. Materials & Supplies	20.0	20.0	20.0	20.0	20.0	100.0
Transportation & vehicles	128.0	128.0	128.0	68.0	68.0	520.0
Travel	48.0	48.0	48.0	48.0	48.0	240.0
Travel Per Diem	<u>36.0</u>	<u>36.0</u>	<u>36.0</u>	<u>36.0</u>	<u>36.0</u>	<u>180.0</u>
Total.....	362.7	369.2	376.1	323.3	330.9	1,762.2
Plus 15% unforeseen Contingencies	<u>54.4</u>	<u>55.4</u>	<u>56.4</u>	<u>48.5</u>	<u>49.6</u>	<u>264.3</u>
	417.1	424.6	432.5	371.8	380.5	2,026.5

3. Cost Estimate - IRI Contract Group

a) The cost estimates for the permanent group of U.S. technicians are based on historical IRI costs under the grant program; this cost per technician is listed in dollars and cruzeiros by the various components in Annex IIIA Exhibit 2. Cost estimates are based on an average cost per year per technician of \$31,600/year in dollar costs plus \$7,150 in local costs. A summary of costs per year is shown below:

1/ included 5% contingency per year for increases in technical service salaries.

- (1) Total man year of professional services to be provided in the five years are:

<u>Man Years of IRI Professionals Per Calendar Year</u>						
	<u>1969</u>	<u>1970</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>Total</u>
Total Man Years-Loan	26	33	33	33	26	151

(See Annex III A, Exhibit 3 for detailed summary of man-years)

- (2) The cost per man-year broken down by dollar and cruzeiro costs are as follows:

dollar cost/man year..... \$31,600
 cruzeiro cost/man year.... \$ 7,150 (dollar equivalent)

- (3) Total annual costs of the program are estimated as follows:

<u>Dollar Costs of IRI Professionals</u> (thousands of dollars)						
	<u>1969</u>	<u>1970</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>Total</u>
Loan funded costs	821.6	1,024.8	1,042.8	1,042.8	821.6	4,771.6
10% contingency on loan funds	<u>82.2</u>	<u>104.3</u>	<u>104.3</u>	<u>104.3</u>	<u>82.2</u>	<u>477.2</u>
Total loan funds	903.8	1,147.1	1,147.1	1,147.1	903.8	5,248.8

<u>Cruzeiro Costs of IRI Professionals</u> (thousands of dollars)						
	<u>1969</u>	<u>1970</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>Total</u>
(thousands of dollars equivalent)						
Trust fund	100.1	57.2				157.3
PL 480	85.8	178.8	236	236	185.9	922.5
Plus 10% PL 480 contingency	<u>8.6</u>	<u>17.9</u>	<u>23.6</u>	<u>23.6</u>	<u>18.6</u>	<u>92.3</u>
Total PL 480	94.4	196.7	259.6	259.6	204.5	1,014.8

The costs estimated above are considered sufficient to cover the costs of the IRI contract based on past experience. Costs for each technician will be based on the following formula:

- (a) salary -- all salaries will be approved by both EPE and AID. No salary paid for researchers recruited by IRI shall exceed the past annual salary of the professional by more than 10%.
- (b) travel -- travel by tourist class will be paid or reimbursed on a cost basis.
- (c) baggage allowances will be the same as for AID personnel and will be paid or reimbursed on a cost basis.
- (d) education and housing allowances will be the same as for AID personnel and will be so paid.
- (e) all other costs will be paid or reimbursed on a cost basis.
- (f) overhead will be paid in accordance with the actual overhead costs of IRI and will be subject to audit.

4. Cost estimate of Short Term Consultants

These costs were estimated on the basis of a \$100/day consulting fee for five days a week plus international travel for a total of \$2,500 month. Local costs are estimated as an average (for all Brazil) per diem of \$500 per month. Local air travel is estimated at \$300 per month.

SUMMARY
(in thousands of US\$)

	<u>1969</u>	<u>1970</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>Total</u>
Dollar cost	120	120	120	120	120	600.
Cruzeiro cost	43.2	43.2	43.2	43.2	43.2	216.0
No. of man months:						
Central office	6	6	6	6	6	30
Diffusion	6	6	6	6	6	30
Research	<u>36</u>	<u>36</u>	<u>36</u>	<u>36</u>	<u>36</u>	<u>180</u>
Total.....	48	48	48	48	48	240

The short term consultants will be contracted by IRI and will be approved by EPE and AID. Per diem will be paid at the same rate as for U.S. government personnel travelling in Brazil.

5. Contracting Procedure

A core group of IRI professionals consisting of 14 people, currently on board, will be financed with grant funds through completion of their present tour and tours initiated prior to January 1969. After initiation of the loan they will be transferred to loan funding. This core group is currently in Brazil under a contract between USAID and IRI. A contract will be negotiated between IRI and EPE to finance all personnel to be loan funded. The loan funded contract will be approved by AID and will contain all provisions required by AID legislation and regulations.

6. Timing

Assuming that all conditions precedent to disbursement can be fulfilled by October 1968, IRI will commence recruiting additional personnel by that date. It is

estimated that the program will be fully staffed by the end of December 1969. Procurement for other services and equipment to be financed under the loan will begin as soon as conditions precedent can be met.

7. Payment Procedures

Dollar costs of the contract will be financed with dollar loan funds and the local costs of the program will be financed with PL 480 counterpart. Dollar costs of the program will be disbursed under a procedure whereby AID will open a letter of commitment in favor of EPE in a U.S. bank, and EPE will authorize the U.S. bank to make payments to IRI. Cruzeiro costs of the contract will be estimated on an annual basis. The PL 480 funds to be used to finance the contracts will be placed in a special program account and will be released to EPE on a quarterly basis. EPE will pay IRI in accordance with procedures and documentation to be established in the contract between IRI and EPE.

8. Taxes

In order to prevent AID funds from being utilized for the payment of taxes, and so thereby increasing the cost of the program, EPE will be asked to assume responsibility for obtaining tax exemption or to assume all tax liabilities of IRI and its staff. Further, EPE will obtain duty free import permits for the importation of household goods for the professionals.

9. Personnel Approval

All IRI personnel will be approved by both EPE and AID. Professionals hired under the contract will normally be contracted for two years, subject to contract renewal and or extension for an additional period of time, with home leave of approximately one month granted between full 2 year tours. The performance of the IRI staff will be reviewed regularly along with the specific technical assistance requirements of EPE. The staffing pattern will be adjusted accordingly.

10. Summary Cost Estimate for E.P.E. Program:

(a) Dollar Loan Funds:

(thousands of dollars)

	<u>1969</u>	<u>1970</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>Total</u>
IRI Professionals	903.8	1,147.1	1147.1	1147.1	903.8	5,248.8
Short-term Consul.	120	120	120	120	120	600.0
Total Loan Funds	1,023.8	1,267.1	1267.1	1267.1	1023.8	5,848.8

(b) Trust Fund:

(thousands of dollars equivalent)

	<u>1969</u>	<u>1970</u>	<u>Total</u>
	100.1	57.2	157.3

(c) PL 480

(thousands of dollars equivalent)

	<u>1969</u>	<u>1970</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>Total</u>
Local Costs of IRI Profes- sionals	94.4	196.7	259.7	259.7	204.5	1,015.0
Short-term Consul.	43.2	43.2	43.2	43.2	43.2	216.0
Local Support Costs	417.1	425.1	432.5	371.8	380.5	2,027.0
Sub-Total PL-480	554.7	665.0	735.4	674.7	628.2	3,258.0

(d) Team Costs

Brazilian Scient.	192	288	288	288	288	1,344.0
Support Personnel	72	108	108	108	108	504.0
	264	396	396	396	396	1,848.0
Total PL-480 Cost	818.7	1061.0	1131.4	1070.7	1024.2	5,106.0

Sub-Project II

EPE Training Program

In order to create, within EPE, and other research institutions cooperating with EPE, the research knowledge in agricultural disciplines necessary for an effective agricultural research program, there will be financed under this program:

1. Training of 40 students per year in applied research (for a total of 200 students for six months each) at the IRI Research School at Matão, São Paulo, or equivalent.
2. Master of Sciences training in Brazil of 156 researchers.
3. Short courses and seminars in specialized subject matter areas to be conducted by IRI professionals for 360 researchers.
4. Short course training for 200 field foremen, field assistants.
5. Master of Sciences Training in the U.S. of 71 researchers.
6. PhD level training in the U.S. of 49 researchers.
7. Training of 64 researchers in the U.S. in short courses and seminars in selected research subjects.
8. Training of 46 specialists in the U.S. in short courses and seminars in specialities related to dissemination of research results.

In addition, a training program will be carried out in communications, information and dissemination of research results in cooperation with ABCAR. Basically the need in this area is in interpretation, preparation and publication of research results in a form for dissemination to the farmers.

This will require training of some subject matter specialists especially in new areas of work and specialists in research and extension editing and writing of publications, and in the use of communications media. Some of these will be employed by ABCAR in ABCAR national and state offices and some will be employed by EPE to work with extension in institutes and at other research locations. The training proposed will include:

- 1, Master of Science training in Brazil of 66 specialists.
2. Master of Science training in the U.S. of 23 specialists.

Training of the MS and PhD level in both Brazil and U.S. has been oriented toward the disciplines in which the national program has given priority attention; for this reason formal academic training will be concentrated in applied research in crops, soils, animal sciences, and economics.

A. Project Description

1. Training Program in Brazil
 - a) Matão Training School

The training of forty newly hired university graduates in agronomy, veterinary medicine, and economics per year (200 over the five year period) in elementary field research and laboratory techniques. This training consists of six month courses of twenty students each at the IRI training school in Matão, São Paulo. Under this program new graduates from Agricultural schools are contracted for one year on a trial basis and sent to a six months' course at Matão, and are then sent to research stations throughout Brazil to work under the supervision of an experienced researcher. These newly contracted students are closely observed during this year and if they perform well are hired as permanent employees. The more promising are selected for

further graduate level training. Economists to be hired by EPE will also attend the Matão training course before receiving advanced training in economics. The school at Matão is owned and operated by IRI, and the costs of instruction at the school will be financed from PL-480 funds. To date, in two years of existence, approximately 60 students have received training at the school. Inasmuch as this training will be a continuing requirement, EPE should establish its own training program either in its own facilities or in cooperation with universities or other agencies. This could be accomplished by the absorption of the IRI school or by the establishment of a new institution, perhaps absorbing the instructors now at the IRI school. USAID will ask EPE to make a commitment under the loan to establish such a training program by 1972.

b) Graduate Level Training in Brazil

In the past three to five years, four American University Contractors (Purdue, Ohio State, Wisconsin and Arizona) have helped initiate graduate agricultural programs (at the MS level) in Brazil. There are approximately 350 graduate students now enrolled in these assisted schools. It is planned under the program to assist 156 researchers and 66 specialists in communication and information obtain MS degrees in Brazil. Students will be selected from among the promising young researchers in EPE and from newly recruited personnel, and some from personnel working with ABCAR. EPE and ABCAR will pay their salaries while in school and the costs of training will be financed from PL-480 funds. Students will be required to commit themselves to work for EPE and ABCAR for at least two years after completion of their graduate work, and EPE and ABCAR will guarantee them employment in a position equal to or superior to the ones previously occupied by the students.

Annex III, Exhibits 1 & 2 contain the number of students in each discipline to be trained during each year of the program. In summary, the number of man-years of training is as follows:

	<u>Number of Personnel to be Assigned to Training in Brazil by years</u>					
	<u>1969</u>	<u>1970</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>Total</u>
Research	23	27	32	38	36	156
Diffusion of Research Results.	12	13	14	14	13	66

c) Short Courses and Seminars in Specialized Subject
Matter Areas

To acquaint researchers in the field with the most recent research results and knowledge and up-to-date methods of problem approach, EPE with the assistance of IRI specialists, will hold a series of courses and seminars at the regional institutes and at the Rio headquarters, and a series of short courses at Matão. Per diem and travel costs will be financed with PL-480 funds. It is estimated that 360 researchers will attend such courses in the five-year period. Courses will vary from two weeks to three months in length, and will be in the following subjects: soil testing, soil tillage, soil drainage, irrigation, pasture research techniques, animal nutrition, plant nutrition, plant breeding, weed control, pesticides, insect control, and plant disease identification and control. Man-months of training are estimated (on the basis of an average of 2 months per course) as follows:

	<u>1969</u>	<u>1970</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>Total</u>
No. of trainees	72	72	72	72	72	360
Man-Years	12	12	12	12	12	60

d) Sub-Professional Training

Personnel to be trained under these courses are field foreman, laboratory assistants, field assistants. Curricula for such courses will be developed under the program and will be established at selected institute headquarters. Courses will be held to train approximately 200 such personnel. PL-480 funds will finance equipment and material costs plus travel and per diem costs. Courses are programmed to be three months in length. Man-years of training are estimated as follows:

	<u>1969</u>	<u>1970</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>Total</u>
No. of Trainees	30	50	50	50	20	200
Man-years	7.5	12.5	12.5	12.5	5.0	50

2. Training Program in the U.S.

a) Graduate Training

Training of researchers and extension workers at the M.S. level in disciplines or specialties not taught at Brazilian universities and at the PhD level is programmed for 71 researchers and 23 information and communications specialists at the MS level, and 49 researchers at the PhD level. Students will be selected from among promising professionals in these areas. The number of researchers to be trained in each discipline is set forth in Annex III, B, exhibits 3 and 4.

PL-480 funds will be utilized to finance local travel and the local costs of preparing researchers for training in the U.S., and EPE and ABCAR will pay the salaries of personnel in training status. Dollar loan funds will be utilized to finance U.S. training costs.

Total man-years of training are summarized as follows:

	<u>Man-Year of Training</u>							
	<u>1969</u>	<u>1970</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>Total</u>
Research								
M.S. (71)	10	20	28	28	24	10.7		120.7
PhD (49)	6	16	24	31	31	29	10	147
Total	16	36	52	59	55	39.7	10	267.7
Publication & Diffusion of Research Results (23)	4	8	9	9	6	3.1		39.1

Basis: 20 months to obtain an M.S. degree and 36 to obtain a PhD.

b) Study Tours

Training in the U.S. will also include training of specialists in specialized research and diffusion courses in the U.S. and Puerto Rico as follows:

	<u>1969</u>	<u>1970</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>Total</u>
Research: <u>1/</u>	8	14	14	16	12	64
Information, Communica- tions and Diffusion of research results <u>2/</u>	8	12	12	8	6	46

1/ Short courses will be provided in the following areas:

- | | |
|------------------------------|--------------------|
| Economic of Agri. Production | Farm Mechanization |
| Research Administration | Tropical Forestry |
| TVA Fertilizer Course | Grain Storage & |
| Agri. Planning | Processing |
| Range & Pasture Management | |

2/ Short courses will be provided in following area - Diffusion of research results, use of communications media, agricultural information, and editorial techniques.

B. Project Execution

1. Cost Estimates

a) Matão Training School

Cost of training at the Matão Training School are based on historical cost records of IRI. A breakdown of these costs is set forth in Annex III, B. Exhibit 5. Cost per trainee for the course is estimated at \$1,000 each or (\$2,000 per man year) for the professional level course of six months. The cruzeiro cost of the five-year program is estimated as follows and is expressed in U.S. thousands of dollars of cruzeiros:

	<u>1969</u>	<u>1970</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>Total</u>
Number of trainees	40	40	40	40	40	200
Man Years	20	20	20	20	20	100
Cruzeiro Costs in Thousands of U.S. dollars	\$40	40	40	40	40	\$200

The training program will be conducted by IRI on a cost basis, and all records will be available for audit by both EPE and AID.

b) Graduate Level Training in Brazil

The cost of graduate level training in Brazil is estimated at \$3,500 per man year (see Annex IIIB, Exhibit 5). Based in this estimate, the cost of such training is summarized as follows:

	<u>Man Years of Training</u>						
	<u>69</u>	<u>70</u>	<u>71</u>	<u>72</u>	<u>73</u>	<u>74</u>	<u>Total</u>
Man Years-Research	23	38.5	45.5	54	55	18	234
Man-years-Diffusion of Results	12	19	20.5	21	20	6.5	99
Total	35	57.5	66	75	75	24.5	333
	<u>Cruzeiro costs expressed in thousands of dollars</u>						
Research	80.5	134.8	159.3	189.0	192.5	63.0	819.1
Diffusion of Research	42.0	66.5	71.8	73.5	70.0	22.8	346.6
Total	122.5	201.3	231.1	262.5	262.5	85.8	1,165.7

c) Short Courses & Seminars in thousands of U.S. dollars

The cost of the short courses to be conducted in Brazil have been estimated at \$1,700 per man year, see Annex IIIB, Exhibit 5 for a breakdown of these costs. On the basis of this man

year cost, cruzeiro cost estimates have been developed as follows and are expressed in thousands of U.S. dollars:

	<u>1969</u>	<u>1970</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>Total</u>
Man Years	12	12	12	12	12	60
Cost	20.4	20.4	20.4	20.4	20.4	102.0

d) Sub-Professional Training in Brazil

The average cost per trainee per man year at the sub-professional level has been estimated at \$1,250 per man year; see Annex IIIB, Exhibit 5, for the composition of this cost estimate. Based on this estimate and assuming an average course length of three months, the training has been estimated as follows, for the five-year program, in thousands of U.S. dollars:

	<u>Sub-Professional Level</u>					
	<u>1969</u>	<u>1970</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>Total</u>
No of Trainees	30	50	50	50	20	200
Man Years	7.5	12.5	12.5	12.5	5	50
Cr\$ cost in U.S. Dollars	\$9.4	15.6	15.6	15.6	6.3	62.5

e) Graduate Level Training in the U.S.

Annex IIIB, Exhibit 6, contains a breakdown of the cost estimate for a man year of training at a U.S. University. This cost estimate is based on current costs under the grant program, plus an allowance for an estimated increase in costs, plus up to \$100 per month for a family allowance for students who will be in the U.S. for more than one year. This cost per man year has been estimated at \$8,000 per man year. Based on this estimate, the costs of the program have been estimated as follows in thousands of U.S. loan dollars:

	<u>1969</u>	<u>1970</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>Total</u>
<u>Man Years</u> Research	16	36	52	59	55	39.7	10	267.7
Diffusion of Research	4	8	9	9	6	3.1	-	39.1
<u>Cost</u> <u>1/</u>								
Research	128.0	288.0	416.0	472.0	440.0	317.6	800	2,141.6
Diffusion	32.0	64.0	72.0	72.0	48.0	24.8	-	312.8
Total	160.0	352.0	488.0	544.0	488.0	342.4	800	2,454.4

1/ Calculated in basis of an average of \$8,000 per man year in U.S.
See Annex IIIB Exhibit 6.

In order to prepare participants for university level training in the U.S., it is estimated that each participant will need to be provided with one year of English language training; such training will consist of two hours per day of instruction, five days per week, for one year. This training will be provided by the USAID, on a cost basis, through its contracts with private contractors and bi-national centers throughout Brazil. Costs of testing and training have been costed by USAID at \$207.00 equivalent per year plus 20% for materials, for a total of \$247 per year. Based on an estimate of 120 students per year for four years, the cost of English language training has been estimated in thousands of dollars of cruzeiro equivalent as follows:

	<u>1969</u>	<u>1970</u>	<u>1971</u>	<u>1972</u>	<u>Total</u>
Students	120	120	120	120	480
Cr. Cost in Thousands of dollar equivalent	29.6	29.6	29.6	29.6	118.4 <u>1/</u>

f) Short Courses in the U.S.

Historical cost figures indicate that cost of short course training equals \$2,300 per man month (See Annex III, B. Exhibit 6) the costs are estimated at \$2,910 for a 5 week program and \$6,538 for a 13 week program. Based on this figure, the cost of this training has been estimated as follows in thousands of U.S. dollars:

Man Trainees/Year	<u>1969</u>	<u>1970</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>Total</u>
Research	8	14	14	16	12	64
Diffusion	8	12	12	8	6	46
Cost in thousands of dollars.						
Research	36.8	64.4	64.4	73.6	55.2	294.4
Diffusion	<u>36.8</u>	<u>55.2</u>	<u>55.2</u>	<u>36.8</u>	<u>27.6</u>	<u>211.6</u>
Total	73.6	119.6	119.6	110.4	82.8	506.0

1/ On the base of past experience it is estimated that almost fifty per cent additional personnel will need to be trained in English.

2) Summary of Cost Estimates

a) Local costs to be financed from PL-480 Counterpart

These costs are expressed in thousands of U. S. dollars equivalent:

	<u>69</u>	<u>70</u>	<u>71</u>	<u>72</u>	<u>73</u>	<u>74</u>	<u>75</u>	<u>Total</u>
Matão Trng. School	40.0	40.0	40.0	40.0	40.0			200.0
Graduate Level Training	122.5	201.3	231.1	262.5	262.5	85.8		1,165.7
Specialized Short Courses	20.4	20.4	20.4	20.4	20.4			102.0
Sub-Professional Training	9.4	15.6	15.6	15.6	6.3			62.5
English Language Training	<u>29.6</u>	<u>29.6</u>	<u>29.6</u>	<u>29.6</u>	--			<u>118.4</u>
	221.9	305.9	336.7	368.1	329.2	85.8		1,648.6

b) Dollar Costs in thousand of dollar

	<u>69</u>	<u>70</u>	<u>71</u>	<u>72</u>	<u>73</u>	<u>74</u>	<u>75</u>	<u>Total</u>
Graduate Trng	160.0	352.0	488.0	544.0	488.0	342.4	80.0	2454.4
Short Courses	73.6	119.6	119.6	110.4	82.8			506.0
Total	233.6	471.6	607.6	654.4	570.8	342.4	80.0	2960.4

3. Payment

a) All local costs of training as established in the above cost estimates will be financed from PL-480 counterpart. Funds for the training program will be released to EPE quarterly and will be deposited in the special EPE PL-480 account along with funds for the remainder of the program. EPE will then make payment for the cost of the training program from this account.

Matão Training School - Payments for the Cost of Training

Payments for the cost of training at the Matão training school will be made to IRI on a cost basis. Such payments will be made monthly on a reimbursement basis, or if EPE and IRI so agree, EPE may make advance payments to IRI. The method of payment will be agreed to in the IRI-EPE contract.

University Training in Brazil

Payments to the universities will be made in accordance with the agreements to be signed between EPE and the respective universities.

Other Costs

Administrative expenses will be paid by EPE on a current basis. Per diem and travel costs will be paid in accordance with advance and reimbursement procedures to be established.

English Language Training

To the extent possible, USAID will arrange English language testing and English language training under its many contracts with private contractors and bi-national centers. Such training will be provided on a cost basis. In order to allow USAID to provide such services, EPE will advance to the USAID trust fund sufficient cruzeiros to cover costs on a quarterly basis; USAID will provide EPE with an accounting of funds expended for this training on a regular basis, to be agreed upon. In those cases where AID is unable to provide this English language training, EPE itself will contract and arrange for and make payment for such training.

b) Dollar Costs

The costs of training in the U.S. will be handled in the same manner as under the grant program with USAID making all payments to universities and students, and charging such costs against the loan. The procedure for charging these costs will be established in the agreement with EPE. Regular grant documentation will be utilized for each student and EPE will approve all expenditure budgets.

4. Selection and Placement Procedure
University Training

Students to receive graduate training in both the U.S. and Brazil will be selected by EPE or ABCAR and EPE together with IRI assistance from among promising researchers and workers on diffusion of results. Those students to be sent to the U.S. for training will also be approved by AID and will be provided with cultural exchange visas as is currently the case under the grant program.

Once selected, the student will be tested and placed in an English language program. The sponsoring agency (i.e. EPE, and/or ABCAR) will make provision to allow the participant sufficient time for English language training of 2 hours a day, 5 days a week for as long a period as necessary, up to a maximum of 1 year, to prepare himself in the English language.

IRI will arrange for the student's placement in the U.S. university, and will assist in programming courses of study.

Sponsoring agencies will guarantee the student's salary while in a training status, and will guarantee re-employment in a position and salary equal to or superior to that held by the student at the time training commenced.

The student for his part will commit himself to work for the sponsoring agency for at least two years upon completion of training.

Sub-Project III

Procurement of Equipment and Commodities

This part of the program will finance the procurement of equipment, plus some commodities, considered essential for conducting research and for disseminating research information to the farmers. Dollars 3.1 million of loan funds and PL 480 counterpart in a dollar equivalent of \$4.8 have been allocated for such procurement. This will consist of procurement of laboratory and agricultural equipment in the U. S. and procurement of vehicles, agricultural equipment, services, and general program support in Brazil. Of the \$3.1 million, \$368,000 have been allocated for the importation of reproduction and visual aid equipment to be used by EPE and the extension service in a joint program for rapid diffusion of research results.

The equipment and commodities to be procured under this program will be made available to EPE regional research institutes and stations, and, through the Non-Federal Cooperative Research Program, to non-federal research agencies. Tentative plans are for approximately 30% of such procurement to be supplied to non-federal agencies.

A. Project Description

1. Research Commodities and Equipment Procurement in the U. S.

Annex III C, exhibit 2, contains a list of equipment to be procured in the U.S., and Annex III C, Exhibit 2 contains a list of commodities and equipment to be procured in Brazil. A total of \$2,736,100 has been budgeted for procurement in the U. S., and a cruzeiro equivalent of \$4,733,000 for procurement in Brazil. Because of the length of the program and because research

programs by their nature vary greatly as a result of the successes and failures of experiments at various stages, it is impossible to arrive at a firm list of equipment and commodities for a five-year period. Therefore, this list is tentative and will be subject to changes to meet research requirements. The tentative estimate is, however, considered to be a reasonable estimate of the imports required to strengthen and augment their programs. This should not be considered as a program to fully equip the research stations of EPE, or the non-federal research stations, but rather as a modest program to provide commodities and equipment to improve research in certain fields.

2. Reproduction and Visual Aid Equipment for Publication and Dissemination of Research Results

Annex III C, Exhibit 3 contains the list of reproduction and visual aid equipment to be supplied for joint program by EPE and ABCAR to fill their deficit in the printing and visual aid equipment needed to prepare bulletins, film, strips, slides, recordings and other media to transmit research information to the farmer. This equipment will be made available to the various offices on a schedule to be programmed annually and will be integrated with appropriate training courses in the use of equipment. Equipment will only be provided to those offices which are properly staffed with the personnel to write and edit extension material. US\$360,000 have been allocated for this procurement.

3. Procurement in Brazil (PL-480 Funds)

The PL 480 Funds allocated to the

research program will be utilized to improve the current research program and to expand current research, as previously explained. PL 480 Funds will be utilized to finance the following (in addition to the local costs of the IRI contract):

1. Service contracts to provide non-recurring services beyond the capacity of EPE such as overhaul and re-conditioning of equipment and machinery, soil drainage, terracing, equipment installation, rental of computer time and equipment and simultaneous translation equipment and engineering services. Service contracts will also be eligible for financing for non-federal research groups.
2. Limited construction of research facilities, such as greenhouses, animal sheds, weighing scales, seed storage. All plans and cost estimates will be approved by an agricultural engineer. and all work will be supervised by an agricultural engineer, and all payments approved by such engineer.
3. Farm machinery and equipment, vehicles and shop equipment. Due to the serious problems of maintaining equipment, farm machinery and vehicles will only be procured for those institutions which have a farm machinery engineer in residence, and only assigned to those stations within the region which have maintenance facilities and mechanics. Further prior to the procurement of machinery and vehicles, the receiving institutions will be required to institute a program of putting all existing equipment in operation and surveying

that equipment which has no economic use.

4. Fertilizers, lime, insecticides, fungicides, herbicides, pesticides, seed, feed, mineral supplements, and other materials required for research.
5. A mobile pilot lime crusher for EPE.
6. Laboratory equipment and supplies, and office supplies and equipment, fencing, communications media equipment, fencing, communications media equipment.
7. Livestock for experimental work.
8. Publications, books, library equipment.
9. Contract labor for preparing land, crop production, harvesting, etc.
10. Miscellaneous field supplies, administrative costs for meetings, travel, consultations, etc.

Annex III C, exhibit 2 contains the procurement list and cost estimate. This estimate was based on the requirements of the augmented five-year research program, and as such is a program estimate. In actual practice, the procurement will depend, as explained in the discussion on the import equipment needs, on the manner in which the research program develops. Actual procurement with the PL 480 funds will be established annually in a plan which will be combined with regular budgetary resources with PL 480, and dollar loan funds being used as a complement to budgetary resources.

B. Project Execution

1. Procurement in the US

IRI's New York Office will act as the procurement

office under the loan, as it is currently doing under grant funding. The usual AID procurement procedures will be followed.

a. Brazilian Law of National Similars

The categories of equipment and commodities to be ordered are not, according to present information, manufactured in Brazil to research specifications. The advanced research laboratory and scientific equipment, for example, are not manufactured in Brazil, and a review of the categories listed indicated that Brazil has very limited capacity to manufacture the equipment of the specifications required for this program. However, no complete study of the ability to produce these commodities was made, and further the Brazilian capacity to manufacture certain items will undoubtedly change over the implementation period of the plan. However, as previously stated, the intent is to provide equipment and commodity support to research: in view of the much larger magnitude of import needs, compared to those being financed, the funds allocated to imports will, without question, be utilized in full for the import of essential commodities and imports. To the extent that the Brazilian capacity to manufacture essential equipment (now envisioned to be financed in the US) or to extent that CACEX refuses import licenses because of the existence of legitimate similars, PL 480 resources will be utilized for the procurement.

Aside from the similars problem USAID Borrowers have, from time to time, experienced difficulties in obtaining import licenses from CACEX because of CACEX concern with price and specifications. To avoid these problems, a procedure will be developed with CACEX, whereby import licenses are issued prior to the placing of firm orders. In addition, prior approval from CACEX of the commodities and equipment will be a condition precedent to disbursement for equipment. At the annual program evaluation, the equipment list for the following year will be prepared and submitted for CACEX approval.

b. Procurement Procedure

The IRI professionals will assist EPE in selecting

equipment and commodities and equipment locations and in writing specifications for both EPE procurement and for non-federal procurement. In requesting procurement, both EPE and IRI will certify to the essential nature of the equipment, the ability of EPE and other agencies to adequately use and maintain the equipment, and the existence of adequate storage, housing, and complementary equipment. AID will approve all items costing more than \$1,000.00.

IRI is currently, under the grant program, maintaining a record control and location system on all AID financed equipment and commodities; this will gradually be turned over the EPE and expanded where feasible to control all EPE equipment and commodities. On an Annual basis during the implementation period of the Loan, EPE and ABCAR will furnish AID with an annual inventory of all financed equipment.

2. Procurement in Brazil

IRI will assist EPE in developing an annual procurement program for PL 400 funds (covering both EPE's program and EPE's cooperative research program) and will assist in selecting equipment to be procured and in writing specifications. USAID will review the annual program. All procurement will be in accordance with good procurement practice, including competitive bidding for procurement of equipment and machinery, construction services and all orders for which competitive bidding required under Brazilian law. USAID will not review individual procurement with PL 400 funds. All equipment and commodities procured with such funds will be accounted for, however, in the same manner as equipment and commodities provided under the loan. All plans and cost estimates for the construction, authorized for PL-400 financing will be approved by an agricultural engineer, and all construction services will be supervised by an agricultural engineer and all payments will be

approved by such an engineer.

Farm machinery and vehicles will only be procured for those institutions which have a farm machinery engineer in residence and which have established a satisfactory maintenance program. Such machinery and vehicles will only be assigned to those stations within a region which also have satisfactory maintenance program in operation. Further, prior to the procurement of machinery and vehicles for an institute, EPE institutes will execute a program of repair for all existing equipment, and for disposing of all unusable equipment.

3. PL 480 funding

The uses of the PL 480 funds together with procedures for disbursement and documentation requirements will be established in a letter of agreement to be signed by EPE, the Minister of Planning, and AID. This letter of agreement will incorporate the arrangements and procedures discussed in this paper (e.g. disbursements for construction services, must be approved by an agricultural engineer, etc.)

The PL 480 resources will be programmed on an annual basis, in conjunction with the programming of regular budgetary resources, to augment the national research programs. This programming process in which IRI will assist, will establish the PL 480 budget for the year. PL 480 counterpart will then be made available in accordance with this budget.

4. Summary of Cost Estimates

Cost estimates for the procurement of commodities and services under this subproject are summarized as follows:

(thousands of US dollars)

	1969	1970	1971	1972	1973	Total
Extension Dollar Proc.	89.5	96.8	88.6	61.1	32.5	368.5
Research Dollar Proc.	893.0	704.6	558.5	323.3	256.7	2736.1
	982.5	801.4	647.1	384.4	289.2	3104.6
EPE Commodities and Serv	715.0	1210.0	1342.0	871.0	645.0	4783.0

SECTION IV - CNPq PROGRAM

A. The Program

The CNPq/AID program has the basic objective of developing in Brazil a cadre of research scientists, including agricultural economists at the MS and PhD level, who can develop, in Brazilian Universities, graduate courses in agricultural research disciplines necessary to meet the manpower training requirements for agricultural research, and who can carry out university sponsored research.

To assist in these objectives, a US dollar loan and PL 480 counterpart will be made available to finance a CNPq program in agricultural science and related economic studies. This financing will be made available to: (1) provide scholarships at the MS level in Brazilian Universities and at the MS level in the U.S. in fields not available in Brazil and at the PhD level in US universities; (2) to bring to Brazilian universities and research institutes U.S. professors to assist in expanding and improving graduate programs in agricultural research disciplines; and (3) to provide commodities, equipment and budgetary support to universities and research institutes participating in graduate courses in agricultural related and economic science. All financing to be provided with Loan and PL 480 funds will be in addition to CNPq's planned program in agricultural research.

The basic thrust of the CNPq program will be to utilize Brazilian universities and research institutes which are presently most advanced in graduate agricultural programs as "Centers of Excellence", for graduate training in agricultural science and research. These "centers" will then, with the assistance of CNPq, commit themselves to the task of improving and expanding their graduate courses and assisting other Brazilian Universities and research institutions to become "Centers of

Excellence" through the provision of post graduate training to instructors and researchers in the other institutions.

The following institutions are considered "Centers of Excellence":

- a. Minas Gerais: Univ. Rural de Minas Gerais; Escola de Veterinária, UFMG and cooperating research institutes in the State;
- b. Rio de Janeiro and Guanabara: Univ. Federal Rural do Rio de Janeiro IPEACS, Jardim Botânico and other cooperating research institutes in these states.
- c. São Paulo: Escola Superior de Agricultura "Luiz de Queiroz", Universidade de São Paulo; Faculdade de Filosofia, Univ. de São Paulo; Escola de Veterinária, Univ. de São Paulo; Inst. Agron. de Campinas, Inst. de Biologia, Instituto de Botânica, etc. and other cooperating research institutions in this State.
- d. Rio Grande do Sul: Escola Superior de Agronomia e Veterinária, Univ. Federal; Univ. Federal Rural do Sul, Pelotas. IPEAS, Inst. Desidério Finamor, etc., and other cooperating research institute in the State.

Under its program, CNPq will provide to the "Centers of Excellence" U.S. professors, budgetary support, and materials and equipment for research. To other universities and research centers, CNPq will provide scholarships to send researchers and instructors for post-graduate courses at the "Centers of Excellence". An integral part of the post-graduate work of the students under these scholarships will be thesis work in research directed toward problems of national or regional priority. For the purpose of

directing and developing the "Centers of Excellence" graduates and to facilitate the thesis work, the "Centers of Excellence" universities will grant special "University" status and "Professor" status to certain selected research centers and key qualified researchers who will teach, advise, and direct the thesis work of the students. These research units will thus be incorporated into the "Centers of Excellence System". (Thus in speaking of "Centers of Excellence", we are speaking of the selected universities and selected research centers.)

The following research centers, have been selected for the role of directing the research of the scholarship students:

1. Instituto de Pesquisas e Experimentação Agro-Pecuárias do Centro-Oeste (IPEACO), Ministério da Agricultura;
2. Equipe de Pedologia, Ministério da Agricultura;
3. Instituto de Óleos, Ministério da Agricultura;
4. Jardim Botânico, Ministério da Agricultura;
5. Equipe de Teonologia, Ministério da Agricultura;
6. Instituto Agronômico de Campinas, Secretaria de Agricultura;
7. Instituto Biológico, Secretaria de Agricultura;
8. Centro Tropical de Pesquisas e Teonologia de Alimentos, Secretaria de Agricultura de São Paulo;
9. Departamento de Produção Animal e o Centro de Pesquisas de Nutrição Animal de Nova Odessa, Secretaria de Agricultura;

10. Instituto de Botânica, Secretaria de Agricultura;
 11. Instituto de Zoologia, Secretaria de Agricultura;
 12. Serviço Florestal, Secretaria de Agricultura;
 13. Instituto de Pesquisas e Experimentação Agropecuárias do Sul (IPEAS), Ministério da Agricultura;
 14. Divisão de Pesquisas Agrícolas, Secretaria de Agricultura;
 15. Instituto Desidério Finamor, Secretaria de Agricultura.
1. The Scholarship Program of the "Centers of Excellence"

Under this scholarship program with the "Centers of Excellence", CNPq will provide scholarships in the following disciplines:

Minas Gerais: Animal Husbandry and Veterinary Medicine, Sociology and Rural Economics, Agricultural Technology, Crop Sciences

Rio de Janeiro and Guanabara: Natural Resources
Crop Sciences
Veterinary Medicine
Animal Husbandry

São Paulo: Natural Resources
Crop Sciences
Animal Husbandry and Veterinary Medicine
Rural Economy
Agricultural Technology

Rio Grande do Sul: Natural Resources
Crop Sciences
Animal Husbandry and Veterinary
Medicine
Sociology and Rural Economics

Under this scholarship program, CNPq will grant scholarships to researchers from universities and state researcher centers throughout the country to attend the "Centers of Excellence" to obtain M.S. degrees. At least two-thirds of the scholarships will be granted to participants from those states not having "Centers of Excellence". CNPq has programmed a total of 360 man years of training. An average of 15 to 18 months is required to obtain a MS degree; on this basis CNPq expects approximately 300 students to receive MS degrees under the program. Under this scholarship program, CNPq intends to provide comprehensive financial assistance to the "Centers of Excellence" in developing their graduate programs. This will be accomplished through providing funds to the students to cover their costs of school and living, plus assistance to the universities in the form of (1) a contribution of NCr\$6,700 (\$2,094) per student scholarship to assist in developing the graduate program, (2) a contribution of NCr\$13,400 (\$4,198) per student scholarship to cover the cost of the research performed by the student and to assist in the expansion of the research program. The total cost of this program is shown later in this section. Preliminary plans call for the distribution of scholarships and related resources to the four states' "Centers of Excellence" with approximately 33.3% to São Paulo and 22% Minas Gerais, Rio Grande do Sul and Guanabara/Rio de Janeiro.

2. Provision of U.S. Professors

With U.S. dollars, the CNPq will finance U.S. professors to assist the "Centers of Excellence" in expanding and improving their post graduate courses. Total man years of this assistance are programmed as follows:

<u>Centers of Excellence</u>	<u>Man Years</u>
São Paulo	10
Minas Gerais	7
Rio Grande do Sul	7
Rio de Janeiro/GB	7

These professors will provide assistance in:

- (1) Natural Resources
- (2) Plant Sciences
- (3) Animal Sciences
- (4) Veterinary Medicine
- (5) Research Economics and
- (6) Agricultural Technology

3. University Training in the U.S.

In addition to the above program, CNPq will assist the "Centers of Excellence" in sending researchers and instructors to the United States for post-graduate work at the MS and PhD levels.

Programmed for such study are approximately twenty-five to forty students for a total of 811 scholarship months. The actual number of man years of training will depend on the percentage sent for masters degrees and the percentage sent for PhD degrees. It is estimated that MS degrees and PhD degrees will require 15 to 18 months and 24 to 30 months of study respectively. Scholarship months have been tentatively programmed as follows:

<u>Centers of Excellence</u>	<u>Scholarship Months</u>
São Paulo	260
Minas Gerais	180
Rio Grande do Sul	180
Rio de Janeiro/GB	180
CNPq	11

4. Provision of Research Equipment

In addition to the other programs of support, the CNPq intends to grant to the "Centers of Excellence" a very limited amount of research and laboratory equipment and books to be imported from the U.S. These items have not yet been identified, but will be approved from among the many requirements for these items known to exist at the "Centers of Excellence" (all major items of equipment to be procured will be approved by A.I.D.). The total cost of this imported equipment is programmed at \$150,000.

B. Cost Estimates

1. Scholarship Support in Brazil

PI 480 funds will finance 360 scholarships for MS degrees in the 5-year period. By year, scholarships have been programmed as follows:

<u>Year</u>	<u>1969</u>	<u>1970</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>Total</u>
Number of Scholarships	40	80	90	90	60	360

Based on historical experience and adding a contingency for estimated inflation for a 5-year period the CNPq estimated that scholarships will cost NCr\$10,000 per year (\$3,125). This sum is to cover all living costs, books, and fees, or in other words, all costs aside from tuition, and support to the universities.

In addition to the scholarship costs, the CNPq intends to provide support separately to the universities in the amount of (a) NCr\$6,700 (\$2,094) per student to provide assistance in developing their agricultural graduate programs, and (b) NCr\$13,400 (\$4,198) per student to cover the costs of augmenting their research programs and compensating the research institutions for extra research costs

incurred under the centers of excellence programs.

CNPq is also allocating NCr\$3,350 (\$1,047) per student from the 10% allowed for administration, for continuing technical reserve and adjustments. By year, based on these CNPq estimates, the costs of this portion of the program are estimated as follows in thousands of US dollars of cruzeiros by year:

	<u>1969</u>	<u>1970</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>1974</u>	<u>Total</u>
Nº of scholarships	40	80	90	90	60		360
Man Years	40	100	130	135	105	30	540
Cost of Scholarships	125.0	312.5	406.2	421.8	328.1	93.4	1687.0
Cost of University Assistance	83.8	167.5	188.5	188.5	125.6		753.9
Cost of Research Assistance	167.9	335.8	377.8	377.8	251.9		1,511.2
Sub- Total	<u>376.7</u>	<u>815.8</u>	<u>972.5</u>	<u>988.1</u>	<u>705.6</u>	<u>93.4</u>	<u>3,952.1</u>
Cost of Administration & Contingency 10%	37.7	81.6	97.2	98.8	70.6	9.3	395.2
Total	<u>414.4</u>	<u>897.4</u>	<u>1,069.7</u>	<u>1,086.9</u>	<u>776.2</u>	<u>102.7</u>	<u>4,347.3</u>

2. Cost Estimate for Scholarships in the U.S.

Costs for training in the U.S. have been estimated on the same basis as for the EPE program. (See the EPE training program for the cost of participant training in the U.S.) Based on those costs, the costs of training in the U.S. are estimated as follows:

	<u>1969</u>	<u>1970</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>Total</u>
Scholarships Man-Months	100	160	200	200	151	811
Costs thousands of dollar	66.7	106.7	133.4	133.4	100.7	540.9

Students remaining in the U.S. beyond 1973 will be funded by CNPq.

3. Cost of US Professors

The cost estimates for professors is based on USAID experience in financing four U.S. University Contracts for assistance to Brazilian Universities in agricultural science. Less overhead, these costs per professor have averaged \$25,000 dollars per year to cover salary, transportation, shipping, etc. and \$7,000 to cover the local allowances for housing, education, etc.

Costs per man year used for CNPq are slightly lower than costs of IRI technicians because it is expected that CNPq will be able to make much more use of direct contract and short-term assignments with US professors on sabbatical. Costs for this program are estimated as follows:

	(thousands of dollars)					
	<u>1969</u>	<u>1970</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>Total</u>
Nº of professors	<u>5</u>	<u>5</u>	<u>8</u>	<u>8</u>	<u>5</u>	<u>31</u>
Dollar Costs	125	125	200	200	125	775
Local Costs (crus- zeiros in thousand dollars & equivalent)	<u>35</u>	<u>35</u>	<u>56</u>	<u>56</u>	<u>35</u>	<u>217</u>
Total \$	<u>160</u>	<u>160</u>	<u>256</u>	<u>256</u>	<u>160</u>	<u>992</u>

Basis: \$25,000 dollar costs and 7,000 local costs.

C. Plan for Project Execution

For the purpose of supervising the project, the CNPq and the Ministry of Agriculture have formed a special commission called "Comissão Assessora de Pesquisa Agro-Pecuária - "CAPA", which will review and recommend scholarships, theses and equipment to be financed under the program, in accordance with mutually agreed AID and CNPq criteria.

1. Training Program at the "Centers of Excellence"

All scholarships will be recommended by CAPA. Applications for scholarships will be made by individual students and by various sponsoring universities and research centers on behalf of students. These will be reviewed by CAPA to determine that the students have the capacity to successfully complete the post-graduate work, and to suggest what level of CNPq financial assistance is justified. The level of assistance to be given is determined on an ad-hoc basis for each case and is dependent upon the type of assistance being given by the sponsoring university, if any, and the financial means and requirements of the individual student.

In the P.L. 480 financed program commitment satisfactory to AID will be obtained. Where appropriate, the sponsoring agency will commit itself to continue the employment of the student at a certain minimum professional level, and the student will agree to work for the sponsoring agency or within the overall program upon completion of the post-graduate work.

Under the CNPq procedure, students will need to be accepted by the "Centers of Excellence" prior to receiving a scholarship. In addition to

approving each scholarship, the CNPq program calls for a CAPA recommendation on each thesis research project, and requires publication of all research results. USAID will not approve individual scholarships or research projects, but will receive quarterly reports on all scholarships and research project approval, and annual reports on numbers of students graduated, and on support rendered to the "Centers of Excellence", plus copies of reports from the Centers accounting for support funds.

2. Training in the U.S.

Under its usual procedures, CNPq provides financial assistance only to students who have already been accepted for graduate work in the United States, but who do not have sufficient financial means to pay for such training. In order for such scholarships to be financed by CNPq, the student must be accepted in the U.S. University in one of the agricultural research disciplines (this automatically includes passing the English language exam).

Financial support will be essentially the same as for other AID participants.

CNPq normally does not require commitments by the sponsoring agencies to re-employ students, nor a commitment by the student to work for the sponsoring agency upon his return from training. However, these commitments are, in fact, generally established by the nature of the sponsor-student relationship. In the case of the AID financed program, CNPq will make arrangements for a sponsoring agency commitment acceptable to USAID. Additionally, all participants will be required to commit themselves to work within the overall program for at least two years on their return from training,

and where appropriate to work for the sponsoring agency.

In monitoring the program, USAID will accept the participants acceptance by the US University as evidence of academic capacity and English language proficiency, and will accept the issuance of a visa as AID clearance. CNPq will provide to USAID quarterly reports on the names of participants approved and the level of financing provided, annual reports of participant progress, and reports on an annual basis of the participants work after training is completed for the first two years after their return.

All financing of the participants will be handled directly by CNPq on a letter of credit or other AID approved banking basis, and CNPq will provide AID with an annual report of expenditures.

3. Financing of U.S. Professors

CAPA will recommend all professors, all salaries to be paid, and all contract arrangements. All professors to be brought to Brazil will be approved by AID. Their individual contracts will either be approved by AID, or AID and CNPq will agree on standard contract provisions to be included in the contracts to assure compliance with AID regulations and legislation. CNPq will either contract for individual professor directly or through a U.S. entity. All salaries to be paid to U.S. professors will be approved by USAID or will be approved in accordance with specific criteria to be established by AID, and salaries to be paid will not exceed 10% of the current salaries of the professor unless an increase is approved by USAID.

Payment for dollar costs will be effected under the AID letter of commitment procedure. Payment of local costs will be made directly by CNPq from PL 480 funds.

4. Procurement of U.S. Equipment

CAPA will recommend grants of imported U.S. research equipment and commodities to the "Centers of Excellence" on the basis of demonstrated need from the total of \$150,000 over the life of the program. CAPA will satisfy itself as to the need, for the equipment and commodities and as to the ability of the recipient institution to efficiently use and maintain the equipment and commodities. All major procurement will be approved by USAID in accordance with existing regulations.

Payment for such equipment will be effected through the AID letter of commitment procedure.

No problems are expected from the law of similars inasmuch as CNPq's present modus operandi and explicit intent is to import non-similar. In any event, CNPq has been granted the right to import similars for research programs.

5. Summary of Cost Estimates

A summary of the cost estimates for the CNPq is located on the following page.

SUMMARY OF C.N.P.q. COSTS

(Dollar Costs in thousands of U.S. Dollars)

CNPq.	1969	1970	1971	1972	1973	1974	1975	Total
U.S. Technicians	125.0	125.0	200.0	200.0	125.0	-	-	775.0
Training	66.7	106.7	133.4	133.4	100.7	-	-	540.9
Commodities	30.0	30.0	30.0	30.0	30.0	-	-	150.0
Total	221.7	261.7	363.4	363.4	255.7	-	-	1,465.9

(Cruzeiro Costs in Thousands of U.S. Dollars)

U.S. Technicians	35.0	35.0	56.0	56.0	35.0	-	-	217.0
Training	414.4	897.4	1,069.7	1,086.9	776.2	102.7	-	4,347.3
Commodities ¹								
Total	449.4	932.4	1,125.7	1,142.9	811.2	102.7	-	4,564.3

¹ Included with Statement Cost.

SECTION V - ECONOMIC RATIONALE

By its nature, research involves uncertainty, a search for unknowns. The benefits of a particular single basic research project are difficult to predict in both kind and magnitude. Some basic research may show very large returns quickly and some none. The results of one research project may be used to build upon subsequent studies providing indirect benefits only partially foreseen initially.

Applied or adaptive research is directed at the solution of a defined problem or group of problems, the benefits of which may be predicted in advance. The eventual costs of this type of research are generally predicable within rather narrow limits. However, the generation of economic returns requires that the research results be adopted. For example, the development of a better seed will not in itself raise crop yields. Investment will be required for mass production and for distribution of the seeds. Complementary investments may be necessary in soil fertility studies, fertilizer, pesticides, irrigation. Changes may be called for in tax, price, tariff, or other policies to provide the incentives for the on-farm adoption.

Normally research is financed by federal and state governments, because the economics of research is such, that no individual farmer could afford the investment to carry out the necessary research. However, there are some exceptions where farmers carry out considerable research. Many progressive farmers carry out a fairly simple process of experimentation with new varieties and methods. Their success with this experimentation is dependent on the capacity of official research entities to reduce the choices to manageable proportions for farmers.

Effective research may have profound long-range effects on the national economy. It will affect both domestic supply and foreign exchange situations. One can point to the rather modest efforts on rubber research in the Malaya during which period Brazil was making little or no such investment. As a result of research application, productivity

of rubber trees grew very rapidly in Malaya while Brazil made little progress and lost its place in world rubber trade. In contrast, rather modest inputs in citrus research have made it possible for Brazil not only to produce citrus very cheaply for domestic use, but also to develop very substantial exports. At present, Brazil exports approximately US\$3-4 million per year worth of citrus and citrus juice.

Due to a lack of research on temperate fruits, especially apples and pears, Brazil presently imports almost US\$15 million per year in apples and pears. It is estimated that an investment of two to three hundred thousand dollars per year in research on apple and pear production would enable Brazil to produce 50-70% of its normal imports of these two fruits. With an investment in research of about two million dollars spread over ten years and an investment in production and marketing of about twenty million dollars spread over four to five years, Brazil should be able to produce 50-75% of apples and pears otherwise imported. This would save about US\$15 million per year by the time the orchards come into full production in about 10 years. It would also create jobs in production, distribution and related services.

Results of research efforts in recent years in small areas have shown the way to increase productivity several fold through introduction of better varieties of beans, forage grasses, improved management practices, rotation of crops and applications of fertilizer and soil amendments. These results when widely disseminated and adopted will return many fold the investment in research. The results of nitrogen fixing legumes has tremendous potential for the tropical regions. A good legume can be expected to fix 100 kilos of nitrogen per hectare per year in addition to providing large amounts of forage. At present prices this would return \$25 or more per ha. from the nitrogen fixation process alone. If ten million hectares were planted to legumes (a very modest goal indeed) the return would be around \$250 million per year.

The feed value of forage output from nitrogen fixing legumes with the right rhizobium can be expected to equal or exceed feed value of forage production of grasses that have received moderate nitrogen applications. The cost of planting is generally only slightly higher. The right nitrogen fixing legumes and grasses in consortium without nitrogen application will increase production above grasses with nitrogen added. Thus the nitrogen by-product is largely a return to research.

As a rule of thumb it has been accepted that improved varieties will increase productivity at least 10%. Approximately 30% of Brazil's corn is produced with hybrid seed. This hybrid seed provides an annual increment of 400,000 MT to production (about \$15 million).

The GOB three-year plan calls for an increase of about 60% in fertilizer application. The cost of total fertilizer applied in 1970-1971 will run about US\$200 million at the farm level. This should provide an increase in production of US\$400 million in produce per year. Assuming an increase in efficiency of only 10% due to improved varieties and that one half the farmers are reached, the difference in results from sound recommendations would be US\$20 million in added produce per year. Further, a farmer who has his soil tested and knows fairly precisely the returns that he can expect with use of fertilizer and limestone, will more readily adopt new varieties than the farmer who lacks this information. He can afford to adopt at somewhat less favorable input/output price relationships.

Several alternative methods have been attempted for estimating the value (benefits to cost) of agricultural research. Dr. Schultz of the University of Chicago estimated that the investment by Rockefeller in research in Mexico on wheat and corn resulted in a return of 4 to one. That research investment was dependent primarily on basic genetic improvement. Such research has usually required a long time and results have been

less certain. However, even for such research, increased knowledge of genetic processes, expanded germ plasm banks, better scientific equipment for testing new strains, and use of modern computing techniques is reducing time and cost and increasing predictability of results.

The proposal contained herein concentrates more on the higher pay off of applied research. Further, it is primarily institution building that will result in improvement in the quality and increase in output of research results from existing program investments. With this "leverage", benefits to cost above the 4 to one, suggested by Schultz, can be expected.

SECTION VI - FINANCIAL PRESENTATION

A. Summary of Costs

	<u>The EPE Program</u>							
	<u>1969</u>	<u>1970</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>Total</u>
<u>US\$ Costs</u>								
- IRI	537.1	989.0	1267.1	1267.1	1023.8	--	--	5084.1
- Training	233.6	471.6	607.6	654.4	570.8	342.4	80.0	2960.4
- Procurem.	<u>982.5</u>	<u>801.4</u>	<u>647.1</u>	<u>384.4</u>	<u>289.2</u>	--	--	<u>3104.6</u>
Total	1753.2	2262.0	2521.8	2305.9	1883.8	342.4	80.0	11149.1
<u>Cruzeiro Costs in US\$ Equivalent</u>								
- IRI	818.7	1061.0	1131.4	1070.7	1024.2	--	--	5106.0
- Training	221.9	306.9	336.7	368.1	329.2	85.8	--	1548.6
- Procurem.	<u>715.0</u>	<u>1210.0</u>	<u>1342.0</u>	<u>871.0</u>	<u>645.0</u>	--	--	<u>4783.0</u>
Total	1755.6	2577.9	2810.1	2309.8	1998.4	85.8	--	11537.6
TOTAL EPE	3508.8	4839.9	5331.9	4615.7	3882.2	428.2	80.0	22686.7

The CNPq Program

<u>US\$ Costs</u>								
- US Tech- nicians	125.0	125.0	200.0	200.0	125.0	--	--	775.0
- Training	66.7	106.7	133.4	133.4	100.7	--	--	540.9
- Commodi- ties	30.0	30.0	30.0	30.0	30.0	--	--	150.0
Total	221.7	261.7	363.4	363.4	255.7	--	--	1465.9
<u>Cruzeiro Costs in US\$ Equivalent</u>								
- US Tech- nicians	35.0	35.0	56.0	56.0	35.0	--	--	217.0
- Training	414.4	897.4	1069.7	1086.9	776.2	102.7	--	4347.3
Total	449.4	932.4	1125.7	1142.9	811.2	102.7	--	4564.3
Total CNPq	671.1	1194.1	1489.1	1506.3	1066.9	102.7	--	6030.2

B. PL-480 Financing

PL-480 in the amount of NCr\$22 million has been earmarked to be allocated from the emended 7th Sales Agreement to cover the 1969 and 1970 cruzeiro costs of the program. (This NCr\$22 million contains an inflation contingency of approximately 25%). To cover the cruzeiro costs of the last three years of the program, it has been agreed that the program will receive first call from the proceeds of subsequent Sales Agreements, and further, that in the event that funds from subsequent Sales Agreement do not become available in time for the program, that the Central Bank will withdraw from agricultural credit programs financed by PL-480 up to NCr\$46 million to be allocated to this program. In order to guarantee funding in the event that this is inadequate, the GOB will be asked to guarantee resource to meet project requirements.

C. Borrower Budgetary Presentation

1. Past Expenditures - CNPq

Actual expenditures by CNPq during the 1960 to 1967 period are presented in Annex VI, Exhibit 1. These figures show that CNPq's program has more than doubled since 1960, with most of the growth occurring since 1964. Program expenditures which represent 90% of all expenditures have been split rather evenly between support for individual researchers and support for research institutions. Thus in 1967, supporting funds for research organizations totalled NCr\$6.3 million, and scholarships, NCr\$6.4 million. Historically, approximated 10% of CNPq's expenditures have been utilized for administrative expenditures.

2. Past Expenditures - EPE

While actual expenditure data for EPE's past programs exists at the Regional Research Institute level, these data have not been put in usable form and have not been combined

to produce a picture of EPE's overall expenditure pattern. Additionally data on EPE's past programs are not available either by type of research (i.e. soils, crops, livestock, etc.) or by location of research (IPEAS, IPEACO, IPEACS, etc.). Such information has not been collected and centralized by EPE to date. (The loan program includes assistance to assist EPE in establishing a system or program budgeted and accounting).

For this reason, the presentation of the financial outlines of EPE's past programs is limited to the presentation of EPE's past budgets. These budgets, adjusted to the 1967 price level, are presented in Annex VI, Exhibit 2.

Budget data indicates that the level of EPE funding, in terms of 1967 prices, has remained relatively constant at about NCr\$30.0 million per year over the 1963 to 1967 period. Budgeted expenditures rose from NCr\$29.7 million in 1963 to NCr\$32.1 million in 1965 and then declined to NCr\$28.7 million in 1967 (rising to NCr\$32.0 in 1968). With the exception of 1963, expenses for EPE headquarters have remained at about NCr\$4.0 million, or 13% of the total. One shift within the expenditure pattern that is noteworthy is the rise of administrative expenses. Not only in terms of NCr\$ but also in terms of percentage of total EPE expenditures. As noted in Annex VI, Exhibit 2, these expenses (which consist almost entirely of salaries for "permanent" personnel) rose from NCr\$16.6 million in 1963 to NCr\$19.2 million in 1967.

3. Budget Projections - CNPq

Budget projections for CNPq for the 1967, 1968 and 1969 period are presented in Annex VI, Exhibit 4.

While CNPq actually spent NCr\$13.9 million in 1967, it expects to spend NCr\$24.2 million in 1968 (an increase of NCr\$10.3 million) and, for 1969, the budget rises to NCr\$57.5. An increase of this magnitude has never been achieved before. Given the increased priority assigned there is reason to believe that the CNPq budget will increase substantially in 1969; however, it is doubtful that the NCr\$57.5 million level will be realized.

4. Budgets Projections - EPE

Projected budgets for EPE covering the 1968 to 1970 period are presented in Annex VI, Exhibit 3.

It is not possible to compare projected budgets with past budgets. EPE's future budgets are made on a different basis from those of the past. Budgets for 1963 to 1967 were based on type of expenditure, i.e., administration, construction, research, etc. Budgets for 1968 to 1970 period, on the other hand, are based on a break-down by Regional Research Institute and by National Programs.

Acknowledging these drawbacks however, one can only make some general observations about EPE's projected budgets. The first of these is that EPE is planning to grow at a considerable rate over the 1968 to 1970 period whereas the historical budgets from 1963 to 1967 indicates no growth at all. EPE projections call for total expenditures to rise from NCr\$32.2 million in 1968 to NCr\$49.4 million in 1970, an increase of 53.4%.

The second observation is that based on past budgets the 1968 starting point for this growth, NCr\$32.2 million appears high. Budgeted expenditures for 1967 were only NCr\$28.7 million. Thus, EPE funding will have to increase by NCr\$3.5 million, or more than 12% to meet the projected 1968 level. An increase of this magnitude, measured in either numerical or percentage terms, has not been achieved in the past. The closest EPE came to a shift of this size was in 1966, when funds were cut by NCr\$2.9 million, or 9.1%, from the 1965 level. On the basis, however, of the investment per researcher in Brazil as compared to the U.S. (\$33,000 for the U.S. as compared to \$17,500 for Brazil) and considering that the EPE budget has remained constant over the past years, while the number of researchers has grown, it is clear that the increased funds can be utilized. This opinion is reinforced by the knowledge that EPE's research in the past has been limited by an irregular flow of funds which prevented expenditure of funds during a significant period of each year. Further on the investment side, a substantially larger amount of funds could be effectively utilized.

The third observation is that EPE has stated that Administration expenses will average 35% of total expenses in the future, while they have run considerably higher than this in the past. As pointed out earlier, Administration accounted for 66.9% of total budgeted expenses in 1967 and had been as high as 72.6% previously. In view of this, EPE's assumption of 35% in the future is probably not realistic.

SECTION VII - GOALS OF THE PROGRAM AND PROCEDURES FOR EVALUATION OF ACHIEVEMENT

The procedures for the implementation of the various sub-projects are set forth in the descriptions of the sub-project. To be explained here are the objectives of the program and the methods to be utilized in achieving these objectives.

A. Operating Principles

The overall objectives of the program are to increase EPE (and cooperating state and university research centers) capacity to plan and execute a national research program, and to upgrade the research staffs' professional competence and knowledge through a comprehensive professional training program. As a basis for the achievement of these objectives, EPE and USAID have agreed on the following statement of operating principles or guidelines which also incorporate certain specific objectives to be achieved.

"Brazil requires technical assistance of senior scientists well acquainted with the world's research findings and materials, in plant and animal science to help: (1) in the proper identification of problems, and (2) in the planning and execution of effective research programs. Additionally, it requires a training program to train research scientists. The following general guidelines will be observed to insure that the assistance is effectively used and the institutional development objectives achieved:

1. Young graduates of the agricultural colleges and existing researchers will be assigned to research projects and receive in-service training under the guidance of senior scientists, both Brazilian and foreign. Each researcher-trainee must become familiar with all aspects (and their practical application) of the management and production of the various plants and animals with which he works. Similarly the other specialists must acquire a full

knowledge of this subject and its practical application in problem solutions. Each senior scientists will lead a team working on a specifically defined project or program. In general, a team will consist of a senior scientist and at least five junior scientists and/or trainees. Provisions will be made for five or more Brazilian scientists and or trainees to work with each technician assigned under a project. This may be done by bringing together Brazilian personnel from other locations to work at a particular location on a temporary basis or by permanent assignment of personnel at one location.

2. Outstanding young researchers must be provided the opportunity for advanced training abroad.
3. Clear goals must be established to increase the national production; success of each program must be measured by improvement to average yields in the nation. Attention must be focused on the solution of problems limiting production increases.
4. Data and analysis will be provided to top policy makers on input/output cost relationships and other conditions required to stimulate farmers to adopt yield increasing practices at rates required to meet national output goals.
5. Projects will be clearly defined, and responsibility for each placed in the hands of a capable scientist. There should be no uncertainty about the responsibility for the success or failure of the technical phases of the projects.
6. Specific publications plans and schedules will be established for each project at the time it is initiated, defining the ultimate consumers of research findings. Plans should indicate specific data to be released to the public at the end of the

second year or sooner and each year thereafter. Provisions should be made for periodic evaluation of the degree to which expected research consumers are, in fact, reached.

7. Provision should be made to assure continuity for both leadership and resources and other conditions both for Brazilians and foreign technicians assigned to the project.

8. For all types of research, adequate provision should be made for economic interpretation of facts to provide farmers with specific information on potential benefits relative to costs.

9. Continuing data should be collected and evaluation made of all costs of research and results obtained therefrom with the view to making necessary changes to increase research output relative to cost.

10. Crop and livestock research and production priority must be observed within a nationally coordinated program taking into consideration the differing regional needs and priorities and utilizing the entire national capacity.

11. For each crop, attention must be given to problems of fertilizer, disease, insect, and weed control, crop rotation, and other management problems.

12. The world germ plasm for each crop must be assembled and systematically screened for utility to the nation. Selection and breeding programs must be carried out to develop the varieties for each of Brazil's important cropping areas.

13. For each type of livestock, priority should be given to management, nutrition, feeding, disease, and pest control.

B. Institutional Objectives

The general objectives of the program were described in the first paragraph of this section. Below are described: (1) some specific sub-objectives, which are important to the accomplishment of many of the general objectives, and which will be accomplished under the program, and (2) specific changes which EPE and the Government of Brazil are to affect if the results of this program are to be lasting.

Program Sub-Objectives

1. To conduct by the end of 1970 a complete inventory of all agricultural research carried on in Brazil and to establish a program for such inventory to be up-dated and published annually;

2. The assignment of EPE economists by 1972 with at least MA degrees in each region to assist in integrating agricultural economics into research design and interpretation, to insure that research results will be interpreted to farmers in economically meaningful terms. (Economists with PhDs should be assigned to principal regions).

3. The establishment of an accounting system which can provide up to date accounting of costs of research by project and by program.

4. The training of the following approximate number of researchers publication and diffusion specialist during the 5-year period:

- a) MS and PhD training in the U.S. for 120 researchers;
- b) MS training in Brazil for 156 researchers;
- c) MS training for 89 professional workers in diffusion of research results (23 in the U.S. and 66 in Brazil);
- d) shortcourse training for 470 professional workers;
- e) shortcourse training for 200 technical level and supervisory level personnel.

5. The assignment of one EPE farm machinery engineer to each regional institute.

6. The establishment of a machinery and laboratory equipment maintenance program including trained mechanics and spare parts at each of the regional institutes.

7. The establishment of a modern system of identifying, recording and filing of research data. (partially accomplished)

8. The establishment of a national agricultural research library and a series of regional and university agricultural research libraries, and a systematic program of translating selected research literature into Portuguese.

9. Development of guidelines and procedures for estimating costs of research experiments, projects and programs, in order to improve the programming and budgeting procedures.

10. The establishment of a system of fixed asset and inventory control and accounting.

11. The establishment of a sound procurement system.

12. A system requiring establishment of publication schedules for research papers will also be incorporated into each research project. Likewise targets on diffusion of research results will be quantified for each year.

13. Institutionalization of a system to program agricultural research priorities (to the extent possible) on the basis of economic forecasts of relative supply and demand conditions for agricultural products (see discussion on planning in Section II A. EPE organization).

14. Establishment of a formal system for the annual development of a national research plan and research budget by the national division teams of Crop Sciences, Soil Science, Animal Husbandry, and Agricultural Engineering.

15. Establishment of clear regional responsibilities for the fulfillment of national goals.

16. Develop for the national agricultural research program: (a) the long term manpower requirements by discipline, and by levels of academic training and experience in the various research disciplines and, (b) a long term recruitment and training program to meet these requirements.

17. The assignment by 1972 of three EPE economists at the PhD level or with MS and at least two years experience, to the EPE headquarters to integrate agricultural economics into the process for the establishment of research priorities and planning, and into the design and interpretation of research programs and projects, and to provide accurate information to national policy makers on costs, cost and price relationships and other conditions necessary to achieve orderly adoption of modern productivity increasing practices.

18. Implement a cooperative program with state and university research institutions to ensure coordination and concentration on national and regional priorities. EPE will use part of the funds provided in this project to help finance such cooperative research with qualified institutions. It is anticipated that initially such cooperative programs will be concentrated largely in the states of Sao Paulo, Minas Gerais, Rio Grande do Sul, Pernambuco and Ceara.

19. Establishment of a system of continuous evaluation and re-programming of national programs and projects on the basis of experienced successes and failures.

20. Establishment of a program to assure prompt technical and economic interpretation and publication of research results and the prompt flow of research information to the farmers through the extension service and other media.

Required Changes to be Effected by EPE and the Government of Brazil

1. More delegation of the management responsibilities by the Directors of the Regional Institutes to subordinates in such a manner as to free directors from the day-to-day personnel and management problems, and allow them to focus their attention on research administration.

2. Establishment of salary levels and incentives to encourage research to obtain MS and PhD degrees.

3. The commitment by the Government of Brazil to provide funding for research to EPE on a systematic basis throughout the year in accordance with research requirements.

4. The establishment of a training school in research methodology and techniques, such as the course now being conducted by IRI at the Matao training school either directly or in cooperation with similar research or teaching institution, such school to be available for the training of researchers from non-federal research institutions. In the interim such researchers should be invited to attend the Matao training school.

5. The commitment by the Government of Brazil to increase the research budget in real terms annually for the next five years.

C. Procedures for Implementation and Evaluation of the above Objectives

The above objectives will be made a part of the various implementing documents for the loan in such a manner as to commit the Government of Brazil and EPE to certain objectives in accordance with a pre-determined time schedule, and to establish IRI's responsibilities for assisting in their achievement. Then on an annual basis there will be an evaluation of the progress or status of each objective, and the proposed program in the coming year to achieve the objectives. This evaluation will be conducted jointly by EPE, IAI and USAID. The occasion for this

review will be the presentation to USAID of the proposed annual PL 480 budget which will be presented in integrated form with the EPE annual budget, prior to October 31 of each year. At the review, the adequacy of the budgetary performance of the Brazilian Government will be examined. For purposes of this review, IRI and EPE will prepare a joint annual report and projected program setting forth the year's program for accomplishing objectives. Current thinking is to obtain assistance in this evaluation from an outside institution such as the National Science Foundation or the Rockefeller Foundation, or the Association of Land Grant Colleges.

The above list of objectives is long, and in many cases, an objective is a simple statement of a complex problem, and it is not clear that all objectives will be completely achieved during the life of this program. Further, some objectives will need to be modified to adjust to Brazilian conditions. However, it is reasonable to expect that most objectives will be accomplished in their entirety and that substantial progress will be made on all others.

D. Research Goals

1. The Brazilian Plan - Summary of Research Priorities by Region

Due to local and regional diversity in resource capability, in present land use, and in access to markets within the country, research programs differ in nature and intensity from one region of Brazil to another. The economic objectives to be served by the agricultural research program will require special geographic concentration of research efforts roughly corresponding to the zonal opportunities for increasing agricultural production shown in the Map (Annex VII Exhibit 1)

The general research priorities assigned to each region are summarized below. The research assistance to be provided under the loan will in general support these priorities with which USAID is in general agreement.

The present economic activity of Region I is largely extractive and consists of collections of

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products of the Amazon forest. It is expected that Region I will expand its contributions to national production during the next 10 years, principally in the form of livestock production. By the end of the century, Region I could be the principal zone of active agricultural expansion in the country, if the basic problems limiting production are solved. Priorities of the national research program for Region I are designed to support expansion of beef production through replacement of forest with planted pastures, to provide technologies and genetic materials to meet intra-zonal food needs, and to develop soil management information that will be pre-requisite to the eventual occupation of the Amazon basin with high-productivity agriculture.

The agricultural resources of Region II are largely committed to use by traditional agriculture. Hence, Region II has relatively little opportunity for increasing its contribution to the national economy by significant increase in quantity sold off the farm. The research program for this region is designed primarily to improve the level of consumption on its present largely subsistence farms. Efforts will be aimed at significant increases in the present levels of commercialized agriculture within the region, but these do not make up a large part of total Brazilian agriculture production. The principal exception to this regional generality is Zone II-B south (in Bahia) which has flexibility for rapid expansion of high-productivity agriculture if proper technology is applied. The research program places a priority on Zone II-B south to provide technologies and genetic materials necessary to develop the agricultural potential of this zone.

Region III has a relatively dense rural population and little physical opportunity for increasing its present level of contribution to the national economy, that is, through commercial agriculture production and sale. The research priorities for Region III are designed to increase levels of rural consumption through production for home use of subsistence crops, and to raise present

levels of commercialized agriculture production, but this increase will inevitably be slow. Some work will be carried out in introducing more intensive crops for nearby markets.

Region IV presently produces nationally-significant agricultural surpluses over and above intra-zonal needs. These regional surpluses serve the national economy through exports of beef and rice, soybeans and other legumes and through providing tropical regions of Brazil with temperate-climate products. The research program for Region IV is designed to strengthen and expand both these functions and to increase and develop new products such as temperate-climate fruits and wheat which make up a major part of the imports of agriculture products. Although Region IV makes an important contribution to the national economy through its commercialized agricultural production, this region also contains important areas of small subsistence farmers. The research program for Region IV also will seek to provide these small farmers with technologies and genetic materials required for increasing rural consumption and raising these small farmers to the status of commercial producers.

Region V includes the principal center of commercialized agricultural production in Brazil. Surplus production from Region V furnishes most of the agricultural production consumed by the major urban populations and industries of the country and also provides major exports. Region V also contains very large reserves of hitherto-unused land that is physically suited to practices and technologies of high-productivity agriculture. The performance of the agricultural sector of the country in the near future depends primarily upon the rate of expansion of commercialized agriculture within Region V. Hence, a very high priority in the national research program is placed upon development of high-productivity technologies required for agricultural expansion within this region. This region produces a very wide range of agricultural products.

2. Research Priorities by Science

Research to be given priority attention under loan financing is primarily applied research in the general subject matter areas of animal sciences, plant sciences, soils sciences, and agricultural engineering.

This assignment of priority coincides generally with the Brazilian three-year program which allocates funds to these types of research in the following percentages of the total research budget in 1968, 1969 and 1970:

	<u>1968</u>	<u>1969</u>	<u>1970</u>
Crops	49%	42%	41%
Livestock	28	28	28
Soils	14	21	22
Agriculture Engineering	3	4	5

3. Research Priorities by Crops

By specific crop, by region, the loan program will be directed, within the above sciences, to specific areas of research on specific crops. Listed below are the priority crops and their respective research requirements for which technical assistance and support will be provided.

a) Field Crops

(1) Principal Crops by Regions

Region I - Rice, cowpeas, corn, mandioca, fibers

Region II- Corn, beans, cowpeas, mandioca and castor-beans, fibers

Region III-Corn, beans, rice and mandioca

Region IV -Corn, rice, wheat, beans, soybeans

Region V - Corn, beans, rice, soybeans and peanuts, fibers

(2) Type of Research Required

For each crop, research is required to screen and select the varieties which have potential adaptability to each region to select the best varieties for each region and sub-region. Where genetic improvement is clearly indicated, research will be initiated utilizing available germ plasm to produce superior new varieties. Wheat is the only crop for which a major effort of this kind is now foreseen within the program.

Fertility trails need to be carried out on each of the crops to arrive at the best combinations of soil additives for the selected varieties on different soils, regions and sub-regions where the crops are important.

Other management practices must be tested on a smaller scale for applicability in the area, including planting rates, chemical and biological pest control, crop rotations where these are indicated by the nature of the soil, climate, and particular crop requirements.

Economic interpretations and analyses will be conducted to provide information on the most economic practices under varying conditions.

Yields of these crops in Brazil are in generally about one-third of that in more developed areas. It is considered that research in each crop program over the next five years will provide varieties, fertilizer and management methods for each crop and each area which will demonstrate at least double present average yields for the area.

b) Forages, Grasses, Legumes

(1) Crops for the following regions:

- Region I - Tropical grasses and legumes
- Region II - Sub-tropical grasses and legumes
- Region III - Sub-tropical grasses and legumes
- Region IV - Temperate climate grasses and legumes
- Region V - same as region III.

(2) Type of Research Required

Variety and fertilizer trials need to be conducted on all the different types of grasses and legumes in the different regions to determine what is the best variety and most economical level of application of the nutrients applied. The time of application needs to be studied since it is related to the rain-fall pattern in the different areas.

Phodes grass scale is a serious problem on Pangola grass. Research must be continued to determine if biological control can be used to solve this problem. A small wasp has been imported for this study. This wasp feeds on scale thus affording an economical means of control. This is the only serious pest on Pangola grass at the present time.

Research information is needed on planting techniques, seed harvesting and seed storage. Grass legume mixtures need to be established and studied in all areas.

Research studies are being carried on to determine nitrogen fixation by legumes. This type of research must be increased to determine the correct rizobium to be used for the most promising legumes species.

c) Livestock

(1) Beef cattle for all regions with:

Buffalo in the Amazon region.
Dairy cattle near major consumption centers.
Sheep in the south, especially Rio Grande do Sul.
Swine in most of Brazil with major emphasis in the Central and Southern Regions.
Poultry near major consumption centers.

(2) Type of Research Required

The forage and legume and feed program are integrally linked to livestock. Research is required to develop adequate nutritional information on concentrate feeding of cattle, hogs, sheep, and poultry using local concentrates. Research is required to develop combinations of forage grasses and forage legumes with fertilizer and lime applications, disease and pest control methods, and feeding of concentrates and mineral supplements, and livestock management, which in each major region will show how to:

- i) increase calf crop to 70/80% from 40% or less now obtained in most regions.
- ii) reduce time to slaughter for cattle from 5 to 3 years.
- iii) raise production per acre of beef, milk, mutton and wool, by at least 100% over present regional averages.
- iv) increase hog production by at least 100% above herd average.

d) Vegetables

(1) Principal crops by regions:

Region I - Watermelon, Cantaloupe, Cucumber, Yams, Cassava, Tomato, Eggplant, Taro Pigeon Pea and Dasheen.

Region II - Same as Region I.

Region III - Watermelon, Cantaloupe, Cucumber, Cassava, Tomato, Eggplant, Sweet Potato, Beans, Cabbage, Carrot, Beets, Lettuce and Okra.

Region IV - Onion, Cabbage, Peppers, Watermelon, Cantaloupe, Cucumber, Sweet Potato, Tomato, Beans, Eggplant, Celery, Cauliflower, Broccoli, Lettuce,

Lima Beans, Peas, Irish Potato,
Leeks, Beets, Brussels sprouts,
Squash, Carrots, Okra, Radish,
Spinach and Asparagus.

Region V - Same as Region III

(2) Type of Research Required

Fertilizer trials are needed in all regions to determine the most economical kind of fertilizer to be applied for each crop and to determine the time and methods of application.

Fungicide trials are needed on most of the vegetable crops to determine which fungicides are desirable to control each disease. The time of application and concentration of the fungicide requires a great deal of research.

Similar information is needed for insect and weed control.

It is necessary to rotate other crops with vegetables to reduce the nematode population and build up organic matter in the soil. Rotation experiments are needed to determine what type of rotation crops are desirable under the different climatic conditions.

In order to obtain maximum yields, research information is also needed on plant spacing, variety trials, irrigation and drainage.

e) Temperate, Tropical Climate Fruit

(1) Temperate climate fruit is largely restricted to the high altitude parts of the Southern Region of Brazil because of dormancy requirements.

(2) Types of Research Required

Efforts will be concentrated on apples and pears in these areas. Peaches will receive

some attention but progress already is being made on peach programs. Brazil presently produces only a negligible amount of its apples and pears and imports about \$15 million worth per year. Tropical fruits will receive less attention than apples and pears.

Experiments need to be started on variety testing and selection and to develop the best combination of pest control, fertilization and management practices under different conditions. Research also will cover harvesting and local storage.

f) Agriculture Technology and Engineering

(1) Principal problems

A considerable amount of feed grain is exported during certain times of the year and imported at other times of the year due to a lack of efficient storage techniques. Many root crops such as potatoes, carrots, manioca, beets, etc. spoil before they are marketed due to improper storage.

There is a wheat shortage in Brazil at the present time so it is necessary to find methods of substituting manioca flour, corn and soybean meal in place of part of the wheat for bread and cakes.

There is a complete lack of mechanical equipment for plot size experimental trials. Belt-type plot size fertilizer applicators are needed as well as belt-type planters to increase the efficiency and uniformity in applying fertilizers and planting seeds on small plots. A small machine is needed that combines a cutter bar and suction mechanism to cut forage crops and bag the material for weighing. A machine needs to be developed to harvest and clean large quantities of Stytosanthes seed which is a very promising legume for Brazil since it grows on low Ph soils. The lack of this machine has made it difficult in the past to produce large quantities of this seed for distribution.

New areas of land are coming under irrigation in the Sao Francisco Valley area but there is a lack of research information on irrigation practices, drainage and soil tillage.

(2) Type of Research Required

Research work on grain and root storage need to be conducted to determine how to dry the seeds of different crops before they go into storage. Studies need to be made to determine what insecticides should be used to control weevils and other storage insects. Information is needed on handling bulk seed and the use of different types of storage bins for all types of grain.

Research is needed on the use of sprout inhibiting hormones for root crops in order to store them for a longer period of time and maintain good quality. Different types of storage rooms must be studied using varying levels of temperature and humidity to determine the correct environmental conditions for each of the root crops.

Research work on wheat substitutes might be contracted out to commercial firms in the U.S. that have proper laboratories for this type of research. Part of the work could be conducted in Brazil. Analysis of cereals to determine what varieties are high in aminoacid might also be made in the U.S.

The development of special types of plot size experimental machinery could be developed by firms in the U.S. and tested under Brazilian conditions.

Research on irrigation techniques need to be tested in Brazil to determine the most efficient means of irrigating crops and providing proper drainage.

4. Objectives of the Loan Program

The above section defines the priority research requirements for which assistance will be provided under the program. Due to the nature of research, the absence at this time of a comprehensive national research program and a central file on research data, and due to the fact that research assistance will only be provided for those research institutes which specifically request it, it is not possible at this juncture to establish specific objectives by crop. In spite of this difficulty, the overall objective of the total assistance is established as follows: To conduct research to select and recommend the best varieties, rates of fertilizer and lime application, pest control, and other management priorities for the major crops (including livestock) for each region and each major sub-region correlated with soil analysis, with the objective of developing materials and methods capable of raising present yields per acre by 100% above present area averages. In agricultural engineering the goal will be to find answers and make significant progress toward solution to all the problems stated in this section. A complementary goal will be to develop a system which will assure diffusion of research results and recommendations to farmers at a rate which will result in adoption by 2-5% of the farmers in a sub-region within 12 months, after results are approved for dissemination.

To assure achievement of this overall goal, the annual evaluation procedure discussed previously will also be applied to this goal, and an annual evaluation will be held to determine research priorities by crops and evaluate progress to date for each major crop by region and major sub-region and to evaluate the proposed program and goals for the coming years. It is in this phase of the evaluation that the assistance of an outside institution will be most valuable, and it is the intention of the USAID to arrange for such outside assistance in this evaluation.

To implement the overall evaluation system, and the acceptance of these goals, the USAID will negotiate with the Ministry of Agriculture the overall objectives of the program as stated herein and the evaluation procedures simultaneously with the negotiation of the loan agreement.

5. Specific Research Goals

For the specific research technical assistance to be provided, specific objectives in research, in-service training, and publication of results will be established as follows:

Technical assistance will only be provided to those research institutes which request it, and under project conditions which guarantee: (1) a team of at least five researchers to work with the technician, and (2) that sufficient resources, (seed, fertilizer, etc.) will be made available for research. (Because of this operating arrangement, it is not anticipated that assistance will be provided in all regions for all problems, and research being what it is, an achievement of a goal is not guaranteed by the application of technical assistance.)

The objectives discussed above will be considered as areas of priority in which technical assistance and other support will be provided. Specific objectives will be assigned to the work of each research technician and his program. The operating procedure for the approval of technical assistance project and the establishment of its objectives will be as follows:

- (1) Technical assistance must be requested by a research institution for the resolution of a specific research or diffusion problem (or problems) which are within the priorities listed in this section.

(2) The requesting institution must give assurances that at least five researchers will be available on a full-time basis to assist the research and that adequate resources will be made available to support the research.

(3) The overall request put forward will be reviewed by EPE, IRI and USAID and if approved, recruitment will commence.

(4) Upon arrival of the technician, the research and training program will be developed and research goals and publications schedules will be established and approved by the requesting institution, IRI and USAID.

(5) Annually each such project will be reviewed for progress in the achievement of objectives.

Other assistance (i.e., equipment, commodities and services--both dollar and cruzeiro) will be provided in accordance with the priorities discussed above, and in large part will accompany and be tied to technical assistance.

COMPARATIVE YIELD OF A FEW COMMODITIES PRODUCED IN BRAZIL
AND UNITED STATES

COMMODITY	<u>FIVE YEAR AVERAGE</u> 1962 - 1966 Yield expressed in Pounds per Acre	
	<u>Brazil</u>	<u>United States</u>
Beans, dry	585	1,285
Corn, field	1,164	3,824
Cotton, lint	269	500
Peanuts	1,196	1,496
Rice	1,407	4,093
Soybeans	957	1,458
Sugarcane	35,091	80,400
Tobacco	763	1,958
Wheat	709	1,608

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EVALUATION OF THE RESEARCH PROJECT

I. BACKGROUND

A. History of the Project

The MinAg-USAID Project of today is a direct continuation and expansion of the original grant funded project signed in September 1963 and the objectives and activities of the project have shifted significantly. In evaluating progress it is important to recognize that the objectives have changed and to understand the basis for such changes.

The original project was signed during a period when federal level cooperation with the U.S. was not encouraged by the GOB. The project was designed to stimulate applied research and increased cooperation among various research organizations but was aimed more at state and university levels. Research results, per se, were given important emphasis. For this reason, the original project was set up at the state agricultural research center in Campinas, São Paulo, at that time (as today) probably the most outstanding agricultural research institution in Brazil. The orientation of this original project was toward studies in applied agricultural research working with both Federal, state and university research institutions. Consideration was given at that time to simply signing with the Federal Coordinating Office, not including the MinAg except in sub-projects in a manner similar to state and university institutions. In general the U.S. policy during this latter part of the Goulart Government was to work more with the states which had capacity to utilize our assistance. The USAID relations with the Ministry of Agriculture had been fairly good during this otherwise difficult period. Thus, after considerable study and evaluation, it was decided that it would be worthwhile to be in a position to assist the federal research agencies in their coordinating functions should the situation become more favorable for national assistance. The negotiations for the project were long, but an acceptable agreement was finally achieved providing for technicians to work with the various types of research organizations including the Ministry of Agriculture.

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The original project visualized provision of local currency, some commodity and training as well as technical assistance to cooperating institutions. The original project covered South and Central Brazil. The central location in São Paulo became a place from which programs of assistance to many institutions were developed and administered.

A contract was signed by AID with IRI Research Institute in late 1963 to provide technical assistance and carry out other functions in implementing the project.

This project was first getting started by the time the government changed in March 1964. The change of government brought significant shifts in the Ministry of Agriculture at all levels making close and effective U.S. cooperative programs much easier. The new Director General of Agricultural Research, who had been U.S.-trained in agricultural research, saw the value of developing a close relationship with USAID as a means to strengthening his organization and Brazil's capability for such activities. As a result of his efforts and with the support of the Minister of Agriculture, a shift was then made in the orientation of the project. The project was expanded in geographical scope to include the North and Northeast and the orientation was shifted to concentrate on development of the Ministry of Agriculture capacity to coordinate and develop national research programs, with reduced emphasis on immediate research results, and direct project assistance to state and University research institutions. Plans were made to move IRI personnel from their research-based orientation in Campinas to the task of improving the research capacity of the EPE and other agricultural organizations, such as ABCAR. While IRI personnel had previously been working in the field on individual research efforts, they were now to move into largely senior scientists positions and concentrated on training and research planning. The process of bringing about the shift of personnel and orientation of the project was more difficult than expected due to delays of EPE in obtaining office space in Rio de Janeiro, and difficulties in relocating researchers, personnel and their families

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without interfering with on-going research. It was not until 1966 that the relocation and reorientation was completed and the program was operating on the new basis.

The present objectives have evolved through several Project-Agreement amendments. These were summarized in 1967 as follows:

"In order to (raise agricultural output), Brazil needs to establish a nation-wide, institutionalized system of agricultural research and extension. It has already begun to make this effort. It is the purpose of this project to provide technical assistance to those Brazilian institutions essential to research and extension. More specifically, the objective of this project is to develop the Brazilian institutions in agricultural research and extension, in particular the Departamento de Pesquisas e Experimentação Agropecuária (DPEA - now called EPE) and the Associação Brasileira de Crédito e Assistência Rural (ABCAR), into efficient and effective institutions able to play key leadership roles in solving the problems of Brazilian agriculture.

Specific sub-objectives of this project included the following:

1. Develop and implement 5-year plans for the development of EPE regional institutes.
2. Increase the capabilities of Brazilian agricultural institutions to select, plan, implement, administer and generally supervise projects relating to research and extension.
3. Train a corps of Brazilian specialists in the soil, plant, animal, and related sciences.
4. Secure and make available to Brazilian farmers research data needed to increase agricultural production.

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5. Improve and expand cooperation and coordination between the Ministry of Agriculture and State Secretariats of Agriculture, agricultural colleges and other agricultural research institutions.

b. Strengthen Federal, State, and private extension organizations to more effectively disseminate research results to farmers.

Under the original project, provisions were made for AID to contract with the research institute to carry out the major part of its responsibilities in assisting Brazilian institutes in the defined priority research programs. AID contracted with IRI Research Institute to carry out these responsibilities. Thus, the major part of the subsequent review centers about the performance of the contractor under the project.

B. History of IRI

IRI is a non-profit organization dedicated to increasing the agricultural productivity of developing countries. It was founded as IBEC Research Institute in 1950 by Messrs. Nelson and David Rockefeller and Associates. The name was changed in 1963 to IRI Research Institute, Inc. to avoid confusion with a number of other organizations which had similar names. Headquarters are at 1 Rockefeller Plaza, New York City. All major activities, however, are presently in Brazil and conducted through an affiliated organization, Instituto de Pesquisas IRI. New York headquarters are staffed by the president, several vice-presidents, financial people, and a supporting staff of secretaries, etc. Their main function appears to be one of coordinating the over-all IRI program, providing back-up to overseas operations, i.e., recruiting, procurement, university training arrangements, etc., providing liaison and public relations with the United States, and acquiring new business.

During the 12-year period previous to the USAID contract, assistance was extended to state institutions and farmers primarily in the Brazilian states of São Paulo and the South-Central region. The field headquarters of IRI was established in 1952 on Fazenda Combuy, adjacent to the town of Matão in the State of São Paulo. The 600-acre experimental farm and training center at Matão has been IRI's local point for applied research and training in soil fertility, soil management, pasture management and improvement, livestock nutrition, and field crops production. The collection of tropical grasses and legumes found at the Matão Center (over 2,300 varieties of legumes alone) is the largest in Latin America.

Over the years, and especially since the signing of the USAID - IRI contract in 1963, the emphasis on the various activities conducted at the Matão Center has shifted. Basically, the primary focus of the Center has shifted from one of an agricultural research center to one of a training center for agricultural research personnel. While research efforts are still found in abundance and while an emphasis on publishing research results and putting them into application still exists, it is now strongly coupled with an effort to train research personnel in modern methods of agricultural research. Under the USAID - IRI contract, IRI's efforts to improve and strengthen the Federal Department of Agriculture Research Center (Departamento de Experimentação - DEPE) and the National Agricultural Extension Service (SEMAR) have required practically the full-time efforts of the Matão Center. Training of personnel from these and other agricultural research institutions is accomplished through specially-designed intensive subject matter courses in such areas as shop mechanics, animal nutrition, farm mechanization, soil fertility, and pasture management.

II. IRI CONTRACT

A. STAFF AND ADMINISTRATION

Number and Qualifications

The number of IRI personnel carried under their contract with USAID has varied over the years, but averages out at about 30 full-time technicians plus the assistance of a supporting staff and numerous short-term consultants trained in particular fields.

The 1967 contract calls for a total of 29 full-time personnel resident in Brazil, of whom 24 are research technicians, 4 are extension specialists, and one is the Chief of Party. This is down from 35 in the 1966 contract, with the major cut coming as a reduction of extension specialists from 10 to 4. The 1967 IRI contract ammendment also calls for use of approximately up to 50 agronomists, veterinarians, and senior supervisory personnel to be recruited locally and a Brazilian supporting staff of up to 150. Provision is made for up to 30 man-months per year of short-term consultants. It is anticipated that next year the total number of technicians will rise to 34, of whom 14 will be grant funded and the remaining 20 will be carried under the proposed loan.

IRI specialists presently on-board cover a wide range of disciplines including agricultural economics, crops, soil fertility, animal sciences, animal nutrition, entomology, plant pathology, horticulture, and extension. All research technicians have a Ph.D. degree and an average of 10 years of practical experience in their areas of specialization. In addition, many of them also have substantial overseas experience. At the time of the Checchi Report, the 32 American technicians on-board had a total of 125 year of overseas experience. Extension specialists have a minimum of an M.S. degree, and several have a P.H.D degree.

Virtually all the U.S. technicians are under contract to serve two years in Brazil. Of these, a good number have

either signed on for a second tour or have indicated a desire to remain in Brazil longer than this minimum period. It is reported that 90% of those who have been at post 4 months or more speak fair to good Portuguese. All the others are studying the language 3-4 hours a day.

For an evaluation of the IRI personnel, Checchi and Company has this to say:

"The quality of IRI/US personnel appears to be quite good, indeed one may say superior. In general, they are technically well qualified, are dedicated and well motivated, and are adaptable and "simpatico"... the almost universal comment by Brazilians was of satisfaction with IRI technicians' language ability".

There is no evidence that this high evaluation of the IRI personnel is not as valid today as it was when the Checchi Report was made in 1967. In fact the average, technical qualifications, research management experience and ability, experience and capacity to work effectively within this type of program, has increased during the period.

Locations and Functions

The 1967 USAID-IRI contract suggests that of the 24 research technicians 6 should be stationed in Rio de Janeiro, 5 in Recife, 5 in Salvador, 3 each in Brasilia and Belem, and 1 each in Nova Odessa and Pelotas. Experts in Salvador, Belem, and Pelotas are working with the EPE regional institutes in these cities, while those in Brasilia are assigned to the EPE research station there. IRI personnel in Recife spread their formal activities between the EPE regional institutes and the state's agricultural research center, which is one of the most active in the country. The man in Nova Odessa is stationed at the Sao Paulo state agricultural research center, which maintains contact with the EPE system. The 5 IRI technicians stationed in Rio de Janeiro, plus the Chief of Party, are all working directly with EPE headquarters.

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Of the 4 extension specialists, 1 is stationed in ABCAR headquarters in Rio de Janeiro and another is attached to the ABCAR operation in Recife. The other 2 are assigned to the state of Sao Paulo center in Campinas and to the Federal Agricultural Information Service (SIA) in Campinas, Sao Paulo.

In the EPE regional institutes, they are generally responsible for assisting in the planning and implementation of priority research projects. Additionally, they supervise research and promote in-service training of Brazilian researchers.

IRI personnel in Rio de Janeiro are assigned directly to EPE headquarters. One each is assigned to the EPE departments responsible for research programs on soils, crops and livestock. Such personnel make recommendations to the department heads in the formulation of research policy, the evaluation of existing programs, and the preparation of new ones. Another man is attached to SERPA, the newly-created office within EPE responsible for improving Federal-State communication and coordination on agricultural research. A fifth works directly with the Director-General of EPE on the planning, implementation, and evaluation of priority agricultural research programs.

Extension specialists work directly with ABCAR, both in its Rio de Janeiro headquarters and in state field offices, on the overall program of extension services and on the training and up-grading of personnel. The Chief of Party assists in all of these activities as needed and coordinates the complete IRI project.

The general decision to give primary attention to the strengthening and development of the Federal agricultural research institution, EPE, appears to be sound. It is the only such organization with a national scope and with a realistic opportunity to secure funding adequate to tackle effectively the enormous problems of Brazilian agricultural development. While a number of state-owned organizations are conducting effective programs, of agricultural research, the decision to work primarily with EPE does not appear to have seriously reduced opportunities to work effectively with such groups also.

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On the contrary, in most states where such state-owned institutions function (Pernambuco, Rio Grande do Sul, and Sao Paulo), IRI technicians have established close working relations and have done much to improve cooperation between the Federal and State bodies. It is not certain that such cooperation could have been achieved had IRI decided to work, instead, primarily with the state groups and then tried to establish working relationships with the Federal network. Likewise, when good opportunities have presented themselves for working with the several agricultural universities, IRI personnel have been able to take advantage of them.

Similarly, the decision to locate IRI personnel in EPE headquarters and the regional institutes and put them in largely management-level positions seem to have been the correct one especially in the transitional period. In doing this, IRI has been able to achieve a maximum institution-building impact while at the same time operating with a tight budget and limited personnel. Experts stationed in the regional institutes have helped the resident manager in the formulation and implementation of research programs. In doing so, they have trained Brazilian researchers in research programming and planning techniques. Similarly, at the EPE headquarter level, IRI personnel have been able to utilize their talents at high levels, thus helping to strengthen EPE in its organizational structure and overall research program.

B. ADMINISTRATION AND FACILITIES

At the initiation of the project, IRI had offices in three locations. The headquarters office was in New York,; the affiliate "Instituto de Pesquisas IRI", later the headquarters, had a business office in Sao Paulo, and the research headquarters was located in Matao. Some research was carried out from Matao at Fazenda Jangada, Sao Paulo, some research previously had been carried on in Northern Parana. With the signing of the contract with AID, IRI established an office in Campinas where most of the American technicians were located. From this office, assistance was provided initially to develop projects in many federal, state and university locations. This office all was used as a center for

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communication, information, and publication of research results.

With the re-orientation of the project, substantial changes have been made. The main office was moved and located with EPE headquarters in Rio, the Campinas office has been closed out, the Sao Paulo office is scheduled to be closed out very shortly, the responsibilities and activities carried on in the Campinas and Sao Paulo offices will be joined with and largely assumed by the EPE headquarters staff. The Matao operation has assumed substantial training responsibilities under the project and will now concentrate primarily on this role. The research and related activities are being transferred to the various Ministry institutions.

The dollar financing has been adequate and has been received in a timely way throughout the project but the local funds often have been late or inadequate. This is in part due to the build-up of local staff and increase in resulting costs by the contractor substantially beyond what was anticipated under the project. This was complicated by shifts in sources of local currency from PL-480 to program loan (TONTAP) controlled by the Brazilian government. These latter funds were subject to more stringent accounting and reporting requirements. Releases were held up until accounting for prior releases had essentially been completed. This was further complicated by the difficulty of the contractor in meeting the stringent Brazilian reporting requirements and consequently not being able to supply the data required to obtain releases as programmed.

Thus there were substantial periods when the contractor was without funds and used its own funds, borrow, and at times was given authorization to convert project dollars. The solution of these problems required a great deal of cooperative effort of USAID and Brazilian government personnel. To some extent the problems were complicated by the contractors tendency to operate independently and its reluctance to expeditiously make the changes necessary to integrate its operations with EPE even after the projects and contracts had provided sufficient time to achieve this.

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Changes were made in local IRI administration, since then operations have been and are being integrated in a manner satisfactory to both the Ministry of Agriculture and USAID. In general the contractor has done an above average job of meeting AID reporting requirements. It has maintained equipment in an outstanding manner, maintained identification in accordance with requirements and maintained equipment records properly.

IRI also has established small offices in Recife, Salvador, Brasilia, Belem and Pelotas. In Belem and Pelotas the offices are fully integrated.

However, in Recife, Salvador and Brasilia there is only partial integration at present. This is partly due to the lack of office space and locational problems. Steps are being taken to fully integrate offices as well as operations.

Early the contractor created some problems for itself by attempting to maintain a strong identification with the research results, publications, rather than giving the Ministry of Agriculture or other institutions the senior credit. This too has been subject of discussion and policies have been changed to satisfy the Ministry of Agriculture and USAID. Thus, in total the contractor's performance as a research organization has been well above normal. In the early phase of the project its cooperativeness and institutional development efforts were below average but in the last year or two with the new leadership the contractor has shown superior results in this respect. Its technical assistance and training aspects have been superior throughout.

The New York headquarters backstopping costs have been somewhat higher than the costs with similar university projects. This is due to several conditions:

- a) Contract personnel generally are given more generous retirement and other fringe benefits than is true of agriculture university contracts.
- b) Salaries in New York are higher in general than salaries of similar technical administrative personnel at university headquarters.

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- c) IRI increased its headquarters and backstopping staff in anticipation of other contracts which are only now being initiated. Thus, while the contractor overhead was accepted by AID contracting office, the costs were somewhat less favorable.

C. RELATIONS WITH BRAZILIANS

In any institution-building project gaining the confidence of key personnel and maintaining close working relationships are major ingredients necessary for success. They are even more necessary in the IRI project, where U.S. technical assistance is called upon to assist in the restructure and development of the major Brazilian government organization involved in the complex field of agricultural research. In addition to differences in nationality and educational background, there are often also ideological differences in politics and economics which must be lived with if cooperation is to be achieved.

By all accounts, however, IRI personnel have been generally effective in maintaining close, effective working relationships with the pertinent individuals and organizations. The Checchi Report summarizes their findings as follows:

"In most places, IRI staff appear to have earned the confidence of the Brazilian counterparts with which they have worked directly, of an ever widening circle of other Brazilian technicians, and of a majority of the directors of the federal and state research institutions at which they work... To win the confidence of Brazilian technicians and other personnel takes time, particularly in the case of directors ... but is essential to the achievement of the objectives to which IRI activities are now directed ... All in all ... IRI performance to date must be rated as more than adequate".

The major problem, as noted under Administration, has been the establishment of separate offices, in some locations which has reduced the extent to which IRI technicians have fully integrate their effort with the Brazilian agencies in the area.

III. PROJECT PERFORMANCE

The quality of the IRI staff and the soundness of the project's basic approach to the problem of strengthening and expanding Brazil's system of agricultural research do not necessarily assure that the project will effectively and efficiently achieve its intended results. An indication of whether or not the project has actually been successful can only be obtained by analyzing some of the changes that have been made in the system which have reasonably resulted to some extent from the project. This analysis is presented briefly below.

A. Institutional Growth

A key element in the success of the project is the institutional growth needed to support an expanded program of agricultural research. Such growth must include such things as improving the selection process for agricultural research projects, expanding relations between the Federal EPE and other Federal, state, and private agricultural research organizations, strengthening the link between research efforts and extension work, and improving the mechanisms for planning, coordination, and control. Some idea of the success and progress that has been achieved in this area can be gained from recent innovations that EPE has initiated, many resulting from IRI recommendations:

1. All regional institutes are now preparing five-year plans covering their entire program. These plans will be reviewed and approved by the Central Planning Group in the Ministry of Agriculture. Preliminary plans for 3 of the institutes have been prepared and those from the remaining institutes will be ready shortly.

2. Decisions reached by EPE and other central agencies that affect the regional institutes must be cleared by the regional institutes before they become

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effective. Each regional institute must accept responsibility for all projects it implements.

3. Each regional institute has been authorized to study its Experiment Station network and add to or subtract from that network as its findings indicate.

4. Each regional institute has been delegated authority to handle its own material, supply and personnel needs.

5. The system of National Crop Research Committees for the formulation and evaluation of over-all programs of agricultural research is being continued and strengthened. Use of these groups will allow effective control of the national program being carried out in each area of strategic importance.

6. The relationship between agricultural research and statistical methods of analysis is being improved.

7. A new agency within EPE, SERPA, has been set up and staffed to improve cooperation between the Federal government and the states on programs of agricultural research. Attempts are being made to provide this agency with funds which will be used to finance joint projects of agricultural research.

8. Cooperation between EPE and state programs has recently been improved in at least the states of Para, Pernambuco, Bahia, and São Paulo through the undertaking of joint projects. Efforts are being made to establish additional joint projects with these and other states.

In general, it is felt that during the period in which the project has been in effect there has been significant institutional development and growth within EPE and that to a considerable extent these changes have resulted from the advice, assistance, and support of the IRI staff. While EPE

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still has a long way to go, there can be no question but that much progress has been made and that key personnel are now aware of the need for additional change and strengthening.

B. Research Results

Programs of tropical research by IBEC, the original parent agency, were first started during 1951 in Venezuela and Brazil. In Venezuela, the research program concentrated on cultural methods for tropical crops and especially on production of rice and of corn. In Brazil, the initial research program included development of improved cultural methods, determination of soil fertility of tropical soils, crops processing and weed control (Bulletin no. 6). From this early work in Brazil it was found that tropical latosols lose most of their soil moisture by Capillary movement upwards and surface evaporation rather than internal drainage downwards. The research showed that over 70% increases in crop yields could be obtained by eliminating this evaporation loss through the use of mulches, cultivation, etc. in the areas studied.

The early research with control of brush in pasture showed that forage could be doubled through elimination of brush and that this could be accomplished inexpensively with chemicals. If this practice were adopted to the extent of its economic feasibility the benefit to Brazilian livestock production would amount to US\$50,000,000.00 per year according to estimates.

The institute did pioneering work in Brazil on determination of fertilizer requirements by means of foliar analyses. This direct method of determining fertilizer needs was especially useful in Brazil where soils have not yet been mapped in details (which would permit fertility recommendations according to soil classification). Chemical tests of the soil itself have not yet been correlated with crop response in a manner to provide a confident basis for predicting fertilizer needs.

In 1955 the IRI research program was reoriented to serve two key areas of Brazilian agriculture that were being neglected by other research agencies in the country, namely,

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management of beef cattle and crop production on the "Campos Cerrados" soils that occupy most of the central plains region of Brazil.

In November 1963 IRI and AID signed a contract under which IRI agreed to carry out certain responsibilities in furtherance of Ministry of Agriculture - USAID Project agreement to develop agricultural research capacity in Brazil.

Prior to this IRI Research Institute had operated as an independent research agency in São Paulo and Northern Paraná. Most of its research capability was concentrated on improvement of agriculture in these more advanced regions and in resolving problems of the "campos cerrados" soils so as to permit the northward and westward geographic expansion of intensive agriculture.

Thereafter, the main thrust of the IRI program was altered to accommodate fulfillment of a contract with USAID to provide technical assistance in research to government research agencies. IRI continues a few of its former research activities outside the USAID contract through funds from the Ford Foundation and from private industries. However, the main IRI activity in Brazil consist of assisting in development of research projects at Brazilian research institutions, training Brazilian researchers, and otherwise assisting on-going research programs of Brazilian research agencies rather than carrying out research on IRI's own account.

Under this Ministry of Agriculture -USAID project IRI has assisted in many fields with material results. For example it has assisted in the installation of five laboratories for foliar analyses in the southern half of Brazil which now serve as the best means available for predicting fertilizer needs in the more important agricultural centers of the country. Through increased efficiency of fertilizer use made possible with the development of this technology, it is estimated that current benefits to the agriculture of the country amount to conservatively US\$20 million dollars per year.

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The research on beef cattle management and pasture improvement was singled out for particular attention under the project. Brazil has the world's third largest cattle population (90 million head) but annual slaughter is only 12% (vs 30% in US). The principal feed for this cattle herd is derived from 125 million hectares of native range land and 15 million hectares of planted pasture. This low extraction rate reflects poor feed and other poor management. The average range land is so poor that animals only reach market weights at the age of 4 to 5 years. Some of the critical production problems have been attacked.

Pioneering work has been done on the use of mineral supplements for beef cattle on range in the tropical latosols of southern and central Brazil. This work showed that by the use of minerals animals gained 50% more weight per year on range than occurred without minerals. This findings was accepted and put into practice by Brazilian ranchers within a remarkably short time. The cost of the minerals required to attain this 50% gain in weight is negligible. Of equal importance, the use of minerals on range has in some areas, (e.g. the Pantanal of Mato Grosso) increased the annual calf crop by 25%.

As part of the research program with cattle, the collection of over 1,700 forage species and strains has been assembled. The better entires in this collection (maintained at Matão, S.P.) have been distributed to 12 locations within the country. Nine of the best forages in this collection have been evaluated in replicated grazing experiments. The best grasses so far evaluated have been strains of Guineagrass (Panicum maximum) and Jaragua (Hyparrhenia rufa). On the average, without fertilizers, these better grasses produced an average of about 200 kilos liveweight per hectare as compared with 30 kilos for commonly planted Molasses grass (melini minutiflora) and with 60 kilos/ha. from native range. With fertilization, the better species (Guinea and Jaragua) produce an average of 400 kilos/ha. of livesweight gain as compared with 120 kilos/ha. from fertilized Molasses grass. The planting materials of these pasture grasses have been distributed by IRI to 3,000 Brazilian farmers, who, in turn, have served as sources of further distribution of these improved species through important beef and dairy centers of Brazil.

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The redistribution of improved grasses has been in progress only a short time; best benefit to Brazil from this distribution is estimated to be about several million dollars. This effect on the economy is expected to grow geometrically with further anticipated distribution among farmers.

Note: On unfertilized soils, Pangola resists weed invasion longer than Guinea grass. The two grasses initially produced about the same animal gain per hectare. On the basis of better longevity under use, Pangola would be recommended except that it is susceptible to a scale insect (cochonills) that now occurs throughout Brazil. Under the project IRI has already introduced a parasite to control this scale insect. Assuming success in this biological control, Pangola thereafter will be recommended. Superior strains of Pangola are held in reserve for this purpose.

Further selections of superior legumes and grasses, among which are Stylosanthes gracilis and Brachiaria have been made. These are now in advanced stages of evaluation and the first releases to farmers are expected in the near future.

The early start on developing technology of crop production on the campos cerrados soils of central Brazil is of major importance to growth of agricultural economy during the next decade inasmuch as the "Campos" areas of Central Brazil represents the main opportunity for future agriculture expansion. The already established centers of agricultural production in Brazil have flexibility to increase national production by approximately 45% above present levels. On the other hand, if Brazil maintains its goal of 5% annual increase in national agricultural product, the present level of production will have to be doubled by 1980. To do so will require bringing substantial areas of the "campos cerrados" soils into crop production. The research on these soils has developed management technologies through which crop yields in experiments of 6 Ton/ha (100 bushels per acre) of corn, 3 ton/ha (50 bushels per acre) of soybeans and

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similarly high levels of other field crops are obtained in the areas tested so far. This research has by no means reached the stage where all practical management problems of crop production on the cerrado soils have been solved. The research has shown that intensive agriculture can be developed on the "campos cerrados" soils and that it will be economical to do so, provided that cost of inputs (fertilizer, machinery, etc.) are in line with those paid by farmers in developed economies and prices for agricultural products are equal to those prevailing in international markets. The research on the "campos cerrados" soils has not yet advanced to the point as to have a significant effect upon the national economy. However, some farmers in the areas where research has been carried out, have already adopted many of the recommended practices. The effect of research on the "campos cerrados" soils is expected to have a major effect on performance of the agricultural sector of the national economy within the next decade as experimental work is widely expanded.

Under the contract with USAID the IRI program of technical assistance was expanded to provide national coverage by 1965. The original IRI headquarters at Matão, S.P., has been converted from its original function as a research station to include a strong training program for Brazilian researchers.

In carrying out this training function under the contract with USAID, the IRI has arranged for 50 Brazilian technicians to go to the United States for advanced training in American graduate schools. It has provided advanced training courses in Brazil for 60 Brazilian technicians at Matão. Sub-professional training (shop foremen, field foremen, laboratory assistance, etc.) has been provided at Matão for about 50 employees of the Brazilian research agencies. IRI has provided in-service training to approximately 200 researchers who have worked in the upgrading of on-going programs of Brazilian research agencies. As a by-product of this later in-service training program, 25 professional papers have been prepared of which have already appeared in scientific journals of Brazil. American technicians regularly participate in seminars and scientific meetings of researchers in Brazil.

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Under the USAID contract the IRI has also provided assistance in dissemination of research information to farmers by Brazilian information services and extension services.

Research under the USAID contract IRI's efforts have directed toward the dual purpose of achieving research results and training. IRI has cooperated with Brazilian researchers in over 200 cooperative research projects. Some of these projects have involved cooperative work with University research when AID has U. S. University professor also assisting. Some of the results carried out under these research projects are indicated below:

1. Crop Improvement and Management

- The average yield of wheat in commercial field ranges between 600 and 700 kg/ha due to the low level of production of Brazilian varieties. Research studies being carried out in Rio Grande do Sul have indicated new varieties and cultivation methods yielding with yield over 3 to 4 times as high.
- Study of over 700 varieties of forage legumes has indicates 10 which give good prospects for widespread adaptation to Brazil.
- Selected cowpea seed is being distributed to farmers in Bahia to raise production in the state by 50%.

2. Soil Fertility and Management

- Soil fertility studies have been made in Paraná, Minas Gerais, and Rio de Janeiro. Results will be published shortly.
- Additional soil fertility studies are being conducted in the Amazon region.
- Tests are being conducted in the Northeast to determine proper soil balance for particular crops.

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3. Livestock and Poultry Feeding and Management

- Tests are continuing on various grasses to determine their yield characteristics in tropical climates and their acceptability to livestock.
 - Programs are being developed for economical use of unutilized cane tops, now unused as an energy feed for livestock. Promising results have been obtained to date.
 - A variety of projects are attacking such problems as low producing milk cows, low milk quality, and the price instability of dairy products.
 - Comparison studies of broiler and layer stock are being made on poultry in the Northeast.
- Nutrition studies are being carried out on a variety of local feeds for swine and poultry.

C. Extension Application

Research results in themselves are of little value, until they are put into practical application on the farms. The importance of this link between research efforts and extension activities has been recognized for some time by EPE, and the project has had significant success obtained in improving the communication and cooperation between the two stages. Some measure of this success has been obtained from these facts:

1. Regional institutes will soon begin to hold "research and extension" meetings with the regional ABCAR branches and state agricultural organizations.

2. Field days at regional institutes and experimental stations are being encouraged. Extension personnel and local farmers will attend these meetings and explore the applicability of the institutes' research results to their practical problems.

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3. An information Section will be created at each regional Institute to assist the local ABCAR branch and others in obtaining research results and the assistance of the institute. ABCAR is placing extension specialists at research institutes to help move research results to farmers.

4. The managers of the regional institutes are seeking to improve their relationships with state agricultural organizations and the agricultural section of universities.

5. Efforts will be made to increase the number of cooperative projects involving EPE, ABCAR, and other agricultural research and extension groups. Experience gained from such projects already completed indicates this is a most effective way to improve the flow of research results to practical application.

6. Regional institutes are exploring the possibility of using a monthly newsletter to bring pertinent information to the attention of extension specialists.

Fast efforts to improve the relationship between EPE's research activity and the extension process are considered to be satisfactory. It is expected that steps recently taken will improve this network substantially.

D. Personnel Building

Another key element in the construction of an expanded and strengthened system of agricultural research is the upgrading of personnel. Substantial attention to this question has been given by the project. The EPE has recognized the need for upgrading its staff in terms of both quality and quantity and has taken steps to accomplish this. The following facts indicate the steps that are being taken in this area:

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1. The EPE has adopted a scholarship system for experienced staff members.

2. A new office, SAIT, has been set-up by EPE to handle training being provided to its staff both in Brazil and in other countries.

3. EPE has recognized the importance of adequate salary levels and is consulting with ministry officials and others to determine what can be done in this area.

4. ABCAR has developed a national plan to send 15 state and Federal extension directors to the U. S. and Mexico to study research and extension cooperation in these countries.

5. Under the project, 45 Brazilians are now studying in the U. S., Puerto Rico, and Costa Rica for advanced degrees. An additional 2 have completed graduate study and returned to Brazil. Of the 47, 40 are research technicians and 7 are extension specialists.

6. About 30 research and extension personnel are studying English at the bi-national centers throughout Brazil. If they qualify, up to 70 of these may be sent to the U. S. to study for an M. S. or PhD degree.

7. IRI personnel are providing on-the-job training for approximately 200 Brazilians each year.

8. The Matão Center completed one 6-month course in research methods and a 6-week course in farm mechanics during the last half of 1967. Capacity is being expanded to 40 students for the research methods course by early 1968.

E. Publications

The publication of research results helps to a considerable extent in making findings available to others and in speeding the practical application of new developments. In this regard, it should be pointed out that the results of a number of projects have been published. Among these are

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the following:

1. "Estudos sôbre a inoculação de leguminosas - Influência de nitratos do solo e modo de inoculação das sementes na nodulação da alfafa (Medicago Sativa) , Ali Sydney Lopes, D. O. Norris, and W. F. Weber - (BRAGANTIA).
2. "Investigação preliminar de introdução de Cicer arietinum L sob o ponto de vista da época de plantio e adaptação, etc. (Chickpea Paper)", by P. Nuti, M. Mascarenhas, and T. Mymowits. (BOLETIM DA INDUSTRIA ANIMAL).
3. "Informações iniciais sôbre Stylosanthes gracilis (IRI 1022) Alfafa do Nordeste", by H. Hymowitz, H. Steenmaijer, A. Cardoso, and P. Nuti (ZOOTECNIA).
4. "The Brazilian National Soybean Program" by T. Hymowitz, P.J. Verneti, H. L. Shands (AGRISUL).
- "Competição entre cinco variedades de soja cujas sementes foram inoculadas, ou não, com diferentes misturas de estirpes de Rhizobium, by H. A. Mascarenhas e Shiro Miyaseka, W. Weber, E. S. Freire, Guido di Scordi, Ruter Hirace, J.S. Tango (BRAGANTIA).
5. "Experimentos de adubação e calagem em cultura de cebola por meio de bulbinho", T. Tanaka, T.Nishikawa and S. Kawasaki (SOCIEDADE OLERICULTURA DO BRASIL).
6. "The influence of creep feeding, castration, diethylstilbestrol and supplementation of calves on Colonial Guinea grass pasture", by L. R. Quinn, G. O. Mott, and W.V.A. Bisschoff. (PESQUISA AGROPECUARIA BRASILEIRA - PAB).
7. "Cation-exchange characteristics of some soils of São Paulo, Brazil", by P. F. Pratt and R. Alvahydo. (PESQUISA AGROPECUARIA BRASILEIRA - PAB).

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In all cases, both the research and the finished write-up have involved the active participation of Brazilian and American personnel. This is considered particularly important, as it provides good training and encouragement and helps in promoting the names of Brazilian research personnel in the scientific fields.

Additionally, a number of other papers have been approved for publication in the future and even more are still under review. In many cases, the original Portuguese piece will later be translated into English for publication elsewhere.

Perhaps even more significant than the publication of the individual papers is the establishment of EPE's research publication, Pesquisa Agropecuaria Brasileira, on a regular basis. The first volume of this publication is already out and the second is due shortly. It is expected that this will provide an important vehicle in the future for the transmission of research projects and results. Additional methods of rapid publication of research results are being planned.

IV PROBLEMS

While the overall effect of the effort can be rated as a success at this time, and while IRI is on excellent terms with EPE, as is evidenced by EPE's desire to continue working with IRI, there have been problems in the implementation of the program.

Initially, under the grant program, IRI had great difficulty in moving from the concept of an IRI research program to a program of EPE research under which IRI helped in the execution of the EPE program and at the same time trained EPE personnel. The urge for independent research was strong. The changeover was slow, and not always smooth, and the program as a result was not as effective as it should have been. At this time, however, the changeover has been essentially completed.

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ANNEX I

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A further problem is that IRI has, both under the contract, and under their other operations in Brazil, built an overly large local support staff to perform work that, in the case of the AID contract, should in most cases have been undertaken by EPE. This has had two adverse effects: (1) EPE was not assisted to develop its capacity to perform these functions, and (2) IRI professionals wasted valuable professional time in the management of the local IRI staff and its functions.

This orientation has been changed under the grant project and the approach under the loan will be for IRI to assist EPE to assume many of the functions preformed by the IRI local staff in the post.

Further in creating its local staff, IRI unknowingly created substantial financial liabilities under the Brazilian labor law, and has created a situation from which it is having great difficulty extricating itself. While this problem is legally an IRI problem and not an AID problem, it has from time to time affected the efficiency of IRI and consequently caused some USAID involvement in the problem. It appears that this problem will be resolved before the loan program begins. In any event, it will not affect the efficiency of the proposed program.

V. CONCLUSION

In view of the above-mentioned factors, it is felt that the project has been successful to date in assisting EPE to create a base for more rapid institutional and research growth. Quality of personnel appears to be high, and the strategy upon which the project is based appears to be sound. Analysis of actual changes occurring in Brazil's system of agricultural research during the time of the project indicates that considerable growth has been achieved in important areas. Additionally there is awareness on the part of key Brazilian personnel of the need for additional moves to strengthen and expand their system. To a considerable extent, this progress appears to be the result of the IRI technicians who, occupying positions of management level assistants, have counseled and supported top administrators in EPE and ABCAR in planning, implementing, controlling and evaluating their programs of agricultural research and extension.

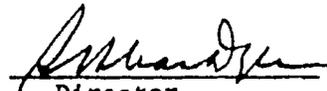
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CERTIFICATION PURSUANT TO SECTION 611(a)
OF THE FOREIGN ASSISTANCE ACT OF 1961,
AS AMENDED

Re: BRAZIL - Capital Assistance - Agricultural Research Loan

Having taken into account, among other things, the maintenance and utilization of projects in Brazil previously financed or assisted by the United States, I certify that in my judgment Brazil has the financial capability and the human resources capability to effectively utilize the proposed Agricultural Research Loan.

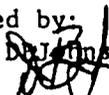
This judgment is based primarily on the facts developed in the Capital Assistance Paper for the proposed loan of \$12.6 million which discusses in detail the capabilities of the executing agencies for the loan and finds they possess adequate financial and human resources capability to effectively maintain and utilize the project. The relationship between this proposed loan and other projects financed by the United States is reviewed in a memorandum from the Deputy Assistant Director for Capital Development attached hereto.



Director

JUN 23 1962

Date

Drafted by:
ADCD:  Johnson

Clearances:
LGS: FHDeRosa 
ARDO: RRNewberg 

MEMORANDUM

TO: Mr. Stuart H. Van Dyke, DOM

FROM: Dwight H. Johnson, ADCD

SUBJECT: Brazil - Agriculture Research Loan.
Recommendation Concerning 611(e)
Certification Under F.A.A.

The proposed loan will be made to the Government of Brazil. The recent certification under the 1968 Program Loan of compliance with the F.A.A. appears to satisfy the certification requirements of the general question of lending to Brazil.

There will be two executing agencies under the proposed loan: The Escritorio de Pesquisas e Experimentacao (EPE), the research agency of the Ministry of Agriculture; and the Conselho Nacional de Pesquisas (CNPq), an autonomous government agency reporting directly to the President of the Republic and charged with the responsibility of stimulating and promoting the scientific and technological development of Brazil. The capabilities of these two organizations are discussed at length in the Capital Assistance Paper describing this program. In the case of CNPq, our analysis has indicated that their staff is competent, and that the CNPq will be able to effectively utilize that portion of the loan funds allocated to it. As noted in the Capital Assistance Paper, the organization and staff of EPE is deficient in a number of significant respects. However, the primary purpose of this loan is to finance technical assistance to EPE to overcome these weaknesses. It is the judgment of the Project Committee that EPE has both the understanding of its deficiencies and the interest in technical assistance which create the conditions for a successful technical assistance program to be carried out, and that, with the technical assistance to be provided under the loan, EPE will have the necessary human resources to effectively utilize this loan.

With respect to funding, we expect no problems with the CNPq whose budget has more than doubled in the past four years. Funding, however, particularly the failure to receive budget resources in an orderly and timely manner throughout the calendar year has caused severe difficulties for EPE in the past. While this problem was substantially corrected this year, we feel this problem to be sufficiently important to require a special covenant, on the part of the government, to guarantee timely availability of budget resources. Accordingly such a covenant will be included in the loan agreement. With respect to the level of funding, the Ministry of Planning, has given its assurance that budget resources allocated to EPE research programs will be increased annually over the life of this loan program to assure adequate resources for EPE research programs. The amount of increase will need to be established during loan negotiations in terms of research requirements and the absorptive capacity of EPE. In view of this assurance, and the covenant on funding regularity, it is the opinion of both ARDO and ADCD that EPE will have the financial capability, as will CNPq, to effectively utilize this loan.

The certification requirement of section 611(e) specifically requires that account be taken of the maintenance and utilization of projects in Brazil previously financed or assisted by the United States. In my opinion there are no problems with any loans in Brazil which would indicate that Brazil does not have the financial and human resource capacity to effectively utilize the proposed loan.

I recommend that you sign the attached certification.

Attachment: a/s

Clearance:

LGS:Mr. De Rosa 
ARDO:Dr. Newberg 

Summary of Local Support Costs of IRI Contract

	<u>1969</u>	<u>1970</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>Total</u>
	(thousands of dollars equivalent in Cruzeiros)					
Support Personnel ^{1/}	130.7	137.2	144.1	151.3	158.9	722.2
Vehicle Purchase	60.0	60.0	60.0			180.0
Vehicle Maintenance	36.0	36.0	36.0	36.0	36.0	180.0
Gasoline, oil, etc.	32.0	32.0	32.0	32.0	32.0	160.0
Travel	48.0	48.0	48.0	48.0	48.0	240.0
Travel per diem	36.0	36.0	36.0	36.0	36.0	180.0
Office Equipment & Supplies	20.0	20.0	20.0	20.0	20.0	100.0
Total	<u>362.7</u>	<u>369.2</u>	<u>376.1</u>	<u>323.3</u>	<u>330.9</u>	<u>1,762.2</u>
(15% Contingency (included))	417.1	424.6	432.5	371.8	380.5	2,026.5

(1) Includes 5% pay increase per year.

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Research Loan PL 480 Local Support Costs Per Year^{1/}

	<u>Aver. Salary/Yr.</u> US\$	<u>Number</u>	<u>Total/Yr</u> US\$
<u>Support Personnel</u>			
Secretaries	3,250	18	58,500
Technicians	5,000	3	15,000
Asst. Accountants	3,250	6	19,500
Drivers	1,625	12	19,500
Mechanics	2,500	4	10,000
Messengers	815	10	<u>8,150</u>
			130,650
<u>Travel and Transportation</u>			
Per diem - aver. 60 days each 60 x 40 x \$15 (per day)			36,000
Travel - aver. 12 trips per person 12 x 40 x \$100 (per trip)			48,000
Vehicle purchase 40 x \$4,500 (cost/vehicle)			180,000
Vehicle maintenance (20%)			36,000
Gasoline and Operations			32,000
<u>Material and Supplies</u>			
Office equip., materials and supplies - \$2,000/location(10)			<u>20,000</u>
Total:-			\$482,650

^{1/} Calculated on basis of 40 personnel per year -

NOTE: Vehicle purchase over first three year -
 5% salary increases should be added each year on
 dollar basis. Also 15% for contingencies on total
 each year.

REVISED ANNUAL DOLLAR COSTS FOR ONE U.S. TECHNICIAN

	<u>U.S. Dollars</u>	<u>Cruzeiro (Dollar Equivalent)</u>
Basic Salary	\$ 18,750	
Quarters Allowance		3,500
Temporary Lodging		1,000
Education		2,500
Transportation, Intern.Travel, etc.	4,000	
Language Training		150
Personnel Benefits		
Pension Plan (10% of basic salary)	1,875	
Life Insurance	300	
Social Security	400	
Disability Insurance	100	
Major Medical Insurance	300	
Workman's Compensation	300	
Physical Examination, Passports, etc.	<u>300</u>	<u> </u>
	26,325	7,150
Overhead (20% of above costs)	<u>5,275</u>	
	31,600	
Plus Dollar Equivalent Costs	<u>7,150</u>	
	<u>\$ 38,750</u>	Total cost per technician per year

SALARY ANALYSIS

Current Salary	\$ 17,150	(Base average of 14 core technicians presently on board)
average 3% Post Differential	<u>550</u>	
Total	\$ 17,700	1st year
3% Annual Escalation (Salary Increase)	18,200	2nd year
	18,700	3rd year
	19,300	4th year
	<u>19,900</u>	5th year
	<u>\$ 93,800</u>	5 years = <u>\$18,750 per year (average)</u>

SUMMARY OF CONTRACT MAN YEARS

	<u>Long Term</u>	<u>Consultants</u>
EPE Headquarters	29	2 1/2
Scientists on projects & part of team	110	15
Diffusion of Practices	12	2 1/2
Total loan funded man years	151	20

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SUMMARY OF THE PROPOSED MASTER OF SCIENCE RESEARCH
TRAINING AT BRAZILIAN UNIVERSITIES

(No. of M. S. Degrees by Starting Year)

	<u>5 year Program</u>					<u>MS Level</u>	
	69	70	71	72	73	74	TOTAL
Field crops	5	5	5	5	5		25
Horticulture -vegetable crops	1	2	2	5	5		15
Biometrics and experimental design	1	1	1	1	1		5
Forage crops	1	2	2	5	5		15
Plant Pathology	1	1	1	2	2		7
Soil Fertility	2	3	5	5	5		20
Soil Chemistry	2	2	2	2	2		10
Soils Physics	1	1	1	1	1		5
Animal Husbandry							
Beef	1	1	1	1	1		5
Swine	0	0	1	1	0		2
Poultry	0	1	1	0	0		2
Dairy	0	0	1	1	0		2
Animal Nutrition	2	2	2	2	2		10
Animal Parasitology	1	1	1	1	1		5
Agriculture Economics							
Farm Management	1	1	2	2	2		8
Production Economics	1	1	1	1	1		5
Aggregative Economics	1	1	1	1	1		5
Agriculture Engineering	2	2	2	2	2		10
	<u>23</u>	<u>27</u>	<u>32</u>	<u>38</u>	<u>36</u>	—	<u>156</u>
Man Year of Training	23	38.5	45.5	54	55	18	234

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SUMMARY OF PROPOSED MASTER OF SCIENCE TRAINING IN BRAZIL PROPOSED
INFORMATION AND SUBJECT MATTERS SPECIALISTS WORKING ON INFORMATION
PUBLICATION, COMMUNICATION AND DISSEMINATION OF RESEARCH RESULTS.
(No. of M. S. degrees - by starting year)

	<u>5 year program</u>						<u>MS Level</u>	<u>Total</u>
	<u>69</u>	<u>70</u>	<u>71</u>	<u>72</u>	<u>73</u>	<u>74</u>		
Agricultural Engineering	1	1	1	2	2		7	
Animal Sciences	2	2	2	2	2		10	
Plant Sciences	3	3	3	3	3		15	
Rural Economics, Farm Management and Sociology	2	2	2	2	2		10	
Soil Science	1	1	2	2	1		7	
Pasture and Forages	1	2	2	1	1		7	
Methodology in Dissemination of Research Results	2	2	2	2	2		10	
Total	12	13	14	14	13		66	
Man years of training	12	19	20.5	21	20	6.5	93	

SUMMARY OF GRADUATE LEVEL TRAINING IN THE U.S.
PROPOSED FOR RESEARCH SCIENTISTS

<u>DISCIPLINE</u>	<u>Master of Science Training</u>	<u>PhD Training.</u>
	<u>(1) N^o of Parti- cipants.</u>	<u>(2) N^o of Parti- cipants.</u>
Field Crops	5./8.5	6/18
Horticulture	4/6.8	4/12
Biometrics & Experimental Design	2/3.4	1/3
Crop Processing, Preservation & Storage	2/3.4	1/3
Forage Crops & Pasture	4/6.8	3/9
Plant Pathology (Economic)	3/5.1	2/6
Economic Entomology	2/3.4	2/6
Weed Control	3/5.1	1/3
Nematology	2/3.4	1/3
Soil Microbiology	2/3.4	2/6
Soil Fertility (MS Soil chemistry in Brazil)	2/6.8	4/12
Soil Chemistry & Plant Nutrition (MS in Brazil)	2/3.4	3/9
Soil Physics (PhD's in structure, tillage, drainage)	4/6.8	1/3
Soil Conservation (cropping systems)	3/5.1	0/0
Animal Husbandry (MS in Brazil):		
2 beef, 2 swine, 2 dairy	4/1.8	4/12
Animal Nutrition (MS in Brazil)	4/6.8	2/6
Animal Parasitology	10/17	5/15
Agriculture Economics:		
(2 aggregate economists, 2 farm management, 2 production economists PhD's in U.S.)	3/5.1	6/18
Food Processing	2/3.4	1/3
Agr. Engineer-Farm Machinery	3/5.1	
Irrigation	3/5.1	
Farm Structures(tropical)	2/3.4	
T O T A L:-	71 participants 120.7 years	40 participants 147 years

- (1) - 1.7 years per participant
(2) - 3.0 years to cover PhD requirements.

SUMMARY OF GRADUATE LEVEL TRAINING IN THE U.S. PROPOSED FOR
SPECIALISTS IN INFORMATION, PUBLICATION AND METHODOLOGY IN
DIFFUSION OF RESEARCH RESULTS

	Master of Science
	<u>No. of Participants</u>
<u>DISCIPLINE</u>	
Farm Management	3
Dissemination of results -weed control	2
Information and Publication Specialists	8
Administration of Research and Extension Coop. Program	4
Rural Sociology - Extension Research	3
Dissemination of Soil Conservation & Tillage results	3
	<hr/>
Total Number of Participants	23
Total man years	39.1

RESEARCH LOAN
PL-480
IN-COUNTRY TRAINING

COSTS/TRAINEE

<u>EPE/IRI Training Center- Matão (Agronomists & Vets)</u>	<u>Ave. Cost per trainees/yr. 1,000 US\$</u>
Technical personnel (supervisors & special contracted personnel	.600
Assistants and field labor	.125
Clerical	.050
Travel (staff only)	.150
Room and Board	.850
Supplies and equipment	.175
Miscellaneous	<u>.050</u>
Total	2.000
<u>EPE/IRI Matão Training Center - Sub-Professional</u>	
Technical personnel	.250
Assistants	.050
Clerical	.025
Travel (staff only)	.100
Room and Board	.700
Supplies and equipment	.100
Miscellaneous	.025
	<u>1.250</u>
TOTAL	1.250
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<u>Graduate School (M.S.)</u>	<u>Ave. Cost per trainee/yr</u> <u>1,000 US</u>
Resident and visiting professors	1.500
Administration	.300
Thesis research (equipment, materials, supplies)	1.300
Travel	.400
	<hr/>
TOTAL	3.500
<u>Specialized Short Courses (non-degree)</u>	
Technical personnel	.700
Administration	.100
Special problems (equipment, materials, supplies)	.300
Travel	.600
	<hr/>
Total	1.700

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COST FOR TRAINING IN THE UNITED STATES BY
TYPE AND LENGTH OF TRAINING BASED ON USAID
RECOMMENDED BUDGETING DATA PLUS ALLOWANCE
FOR FAMILY.

	Basic	Est. Increase 10%	Family	Overhead 5%	Int'l Travel	Inter- preters <u>/1</u>	Tech. Leader <u>/2</u>	Total
5 weeks	\$ 1,375	\$ 140.	\$ -	\$ 70	\$ 650	\$ 425	\$ 250	\$ 2,910
3 months	3,573	350	-	200	650	1,105	650	6,538
6 months	4,500	450	-	225	650	-	-	5,825
12 months	6,000	600	1,200	360	1,300	-	-	9,460 ^{/3}
MS (1.7 year)	9,200	920	2,000	600	1,300	-	-	14,020 ^{/3}
PhD 30 months	13,200	1,320	3,000	810	1,300	-	-	19,630
PhD 36 months	15,600	1,560	3,600	1,040	1,300	-	-	23,100 ^{/3}

/1 \$425 week with about one interpreter for 5 people = \$85/week/person

/2 \$400 week with average of 1 per 8 people = \$50/week/person

/3 Includes Family costs.

Total costs for M.S. are slightly over \$8,000 per man year with family; for PhD slightly below \$8,000 per man year. For trainees without family, the cost will be slightly over \$6,000 per year but relatively few are expected to go without their families. For calculation of total training costs, an average of \$8,000 per year was used and an average of 1.7 year on M.S. and 3 years for a PhD.

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SUMMARY TABLE RESEARCH EQUIPMENT AND SUPPLIES	Unit Cost US\$ 1000s	CALENDAR YEAR										
		1969		1970		1971		1972		1973		TOTAL
		Qt'y	Amt	Qt'y	Amt	Qt'y	Amt	Qt'y	Amt	Qt'y	Amt	
Special Nursery & Field Research Equipment	40	5	200	4	160	4	160	3	120	1	40	680
Greenhouse and Equipment	9	3	27	2	18	2	18			2	18	61
Soils Lab	8	2	16	4	32	2	16	2	16	2	16	96
Pathology and Entomology Lab	18	2	36	4	72	2	36					144
Foliar Analysis Lab	8	2	16	1	8	1	8	1	8	1	8	48
Animal Nutrition Lab	16	3	48	2	32	1	16	1	16	1	16	128
Veterinary Lab (Diagnostic)	40	2	80	2	80	2	80	1	40	1	40	320
Soils Physics Lab	5	1	5	2	10	2	10	2	10	1	5	40
Statistics and Economics Lab	3	4	12	2	6	2	6					24
English Language Lab	5	4	20	1	5	1	5	1	5	1	5	40
Seed Lab, Processing and Storage	30	2	60	1	30					1	30	120
Meteorological Equipment	2.5	4	10	2	5	1	2.5	1	2.5			20
Photographic and Visual Aid Eq't & Supplies	15.5	5	77.5	2	31	1	15.5					124
Publication Equipment and Supplies	12	2	60	2	24	1	12					96
Radio Communications	2	8	16	2	4	2	4					24
Agricultural Chemicals	5	2	10	1	5	1	5	1	5	1	5	30
Seeds	1	2	2	1	1	1	1	1	1	1	1	6
Replacement Parts			2		1		2		2		2	9
Machinery, Specialized combine, plot thresher seed harvester, forage chopper	5		25	6	30	6	30	3	15	-	-	100,
SUB-TOTAL A			722.5		554.0		427.0		240.5		166.0	2,130
Plus 3% per year price increase			21.7		33.2		38.4		28.9		27.9	150.1
Sub-Total B			744.2		587.2		465.4		269.4		213.9	2,280.1
Handling and Freight (20%)			148.8		117.4		93.1		53.9		42.8	456.0
GRAND TOTAL			893.0		704.6		558.5		323.3		256.7	2,736.1

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ANNEX III C
Exhibit 1
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Research Loan PL 480 Commodities

	<u>Millions US\$</u>					
	<u>1969</u>	<u>1970</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>Total</u>
Vehicles	.280	.280	.280	.140	.140	1.120
Farm Machinery	.150	.300	.397	.253	.180	1.280
Repair Parts & Replacements	.050	.100	.125	.100	.045	.420
Maintenance & Machine Shop	.040	.064	.128	.040	.032	.304
Publications & Library Equip.	.005	.025	.020	.034	.020	.104
Pilot Lime Plant	-	.020	-	-	-	.020
Fertilizers	.025	.025	.025	.025	.020	.120
Seeds	.005	.005	.005	.005	.005	.025
Livestock for Experiments	.005	.005	.005	.005	.005	.025
Livestock Feed & Concent.	.005	.010	.010	.010	.005	.040
Seed Storage Facilities	-	.041	.010	.020	.009	.080
Greenhouse Facilities	-	.035	.020	.025	.020	.100
Livestock Facilities	-	.010	.010	.010	.010	.040
Special Lab Facilities	-	.040	.020	.010	.010	.080
Lab Supplies and Materials	.005	.010	.010	.010	.005	.040
Office Equip. & Supplies	.005	.030	.030	.030	.005	.100
Miscellaneous Field Supplies & Laboratory Supplies	.075	.100	.125	.075	.075	.450
Sub-						
Totals:-	.650	1.100	1,220	.792	.586	4,348
Contingencies 10%	65	110	122	79	59	435
Totals:-	.715	1,210	1,342	.871	.645	4,783

Research Loan PL-480 Commodities

		US\$
<u>Vehicles</u>		
All types - average cost \$7,000/vehicle		
5 per Regional Institute (8)	\$280,000	
1 per Sub-Station (60)	<u>\$840,000</u>	1,120,000
<u>Farm Machinery</u>		
Tractor w/plow and harrow - average cost - \$6,000/unit		
4 per Regional Institute (8)	\$200,000	
1 per Sub-Station (60)	<u>\$360,000</u>	560,000
Other implements as graders, combines, mowers, rakes, etc.		720,000
		1,280,000
<u>Repair Parts and Replacements</u>		
25% of 1,680,000		420,000
<u>Maintenance and Machine Shop</u>		
\$8,000 per unit		
1 per Regional Institute (8)	\$ 64,000	
1 per Sub-Station (30)	<u>\$240,000</u>	304,000
<u>Publications & Library Equipment</u>		
\$8,000 per unit for main libraries (8)	\$ 64,000	
\$4,000 per unit for secondary libraries (D)	<u>\$ 40,000</u>	104,000
<u>Pilot Lime Plant</u>		
1 unit with motor driven crusher and screens		20,000
<u>Fertilizers</u>		
Average cost - \$60/ton		
5 ton/Regional Institute/yr.		
8x30x5 years = 2,000 at \$60		120,000
<u>Seeds</u>		
\$5,000/Regional Institute/Year		25,000

Research Loan PL-480 - Commodities

(Cont'd).

<u>Livestock for Experiments</u>	\$ 25,000
<u>\$5,000/Regional Institute/year</u>	
<u>Livestock Feed & Concentrates</u>	40,000
<u>\$1,000/Regional Institute/year</u>	
<u>Seed Storage Facilities</u>	80,000
<u>\$4,000/Unit - Total 20 Units</u>	
<u>Greenhouse Facilities</u>	100,000
<u>\$5,000/Unit - Total 20 Units</u>	
<u>Livestock Facilities</u>	40,000
<u>\$4,000/Unit - Total 10 Units</u>	
<u>Special Laboratory Facilities</u>	80,000
<u>\$8,000/Unit - Total 10 Units</u>	
<u>Laboratory Supplies and Materials</u>	40,000
<u>\$1,000/Unit - Total 40 Units</u>	
<u>Office Equipment and Supplies</u>	100,000
<u>\$5,000/Unit - Total 20 Units</u>	
<u>Miscellaneous Field Supply</u>	<u>450,000</u>
Sub-Total	\$ 4,323,000
Contingencies & Reserves - 10%	<u>435,000</u>
Total	\$4,783,000

CHECK LIST of STATUTORY CRITERIA

(Alliance for Progress)

In the space provided under each item, summarize for each item the information or conclusion requested or make reference to the section(s) of the Capital Assistance Paper, or other clearly identified and available document, in which the matter is clearly discussed.

The following abbreviations are used:

FAA - Foreign Assistance Act of 1961, as amended by the Foreign Assistance Act of 1967.

App.- Foreign Assistance and Related Agencies Appropriations Act, 1968.

NA - Not Applicable.

Country Performance

Progress Towards Country Goal

1. FAA Sec. 208; Sec. 251(b)(1), Sec. 251(b)(5), Sec. 251(b)(6).
Extent to which country is:
 - (a) making appropriate efforts to increase food production and improve means for food storage and distribution;
 - (b) creating a favorable climate for foreign and domestic private enterprise and investments;
 - (c) increasing the public's role in the development process;
 - (d) allocating expenditures to development rather than to unnecessary military purpose or intervention in other free countries' affairs;

- (e) willing to contribute funds to the project or program;
- (f) making economic, social and political reforms such as tax collection improvements and changes in land tenure arrangement, and making progress toward respect for the rule of law, freedom of expression and of the press, and recognizing the importance of individual freedom, initiative and private enterprise.

Borrower is making appropriate efforts to:

- (a) increase food production and improve means for food storage and distribution; to further increase the objective of this loan is ultimately agricultural productivity and improve the quality of the product; (b) encouragement of private enterprise and investment is clearly evidenced by the present Administration's policies; (c) increase the public's role in the development process; (d) allocate expenditures for development rather than for unnecessary military purposes and is not intervening in other free countries' affairs; (e) contribute funds to this program; (f) make economic, social and political reforms. (These include improvements in tax collection, changes in land tenure arrangements, progress toward respect for law, increased recognition of the importance of individual initiative, and private enterprise. And (g) adhere to the principles of the Act of Bogotá and Charter of Punta del Este and respond to the vital economic, political and social concerns of its people, and demonstrate a clear determination to take effective self-help measures.

For specifics see comments in AID-DLC/P-668 of January 23, 1968, containing Negotiating Instructions for Proposed Program Loan 1968. For: (a) page 6.11; (b) page 2.11; (c) page 2.11; and (d) page 7.1; (f) page 1.2B; (g) page 1.2B. For (e) see page iii item 8 of this loan paper.

2. FAA Sec. 251(b). Information and conclusion on country's efforts to repatriate capital invested in other countries by its own citizens.

Brazil's efforts to stabilize the value of the cruzeiro

through measures to counter inflation, including the last devaluation and recent measures to control the parallel market, contribute to the return of capital invested in other countries by its citizens.

Relations with United States and Other Nations

3. FAA Sec. 620(e). If assistance to a government, existence of indebtedness to a U.S. citizen for goods or services furnished or ordered where such citizen has exhausted available legal remedies, debt is not denied or contested by such government or indebtedness arises under an unconditional government guaranty.

Brazil is not known to be indebted to any U.S. citizen for goods or services furnished or ordered where such a citizen has exhausted available legal remedies or where the debt is not denied or contested by the Borrower or the indebtedness arises under an unconditional guaranty of payment by the Borrower.

4. FAA Sec. 620(d). If assistance for any productive enterprise which will compete in the United States with U.S. enterprise, existence of agreement by the recipient country to prevent export to the United States of more than 20% of the enterprise's annual production during the life of the loan.

Not applicable.

5. FAA Sec. 620(e)(1). If assistance to a government, extent to which it (including government agencies or subdivisions) has, taken any action which has the effect of nationalizing, expropriating, or otherwise seizing ownership or control of property of U.S. citizens or entities beneficially owned by them without taking steps to discharge its obligations.

Neither the Government of Brazil nor any governmental agency or subdivision thereof, has on or after January 1, 1962, nationalized, expropriated, or seized ownership or control of property of any U.S. citizen or firm, taken steps to repudiate or nullify contracts with such citizens or firms,

or impose or enforce discriminatory taxation or other exactions of restrictive conditions, or taken other actions having the effect of nationalizing, expropriating or other wise seizing ownership or control of property owned by U.S. citizens or firms, as specified in this section of the Act, without taking appropriate steps to discharge its obligations, as specified in this section of the Act.

6. FAA Sec. 620(i). Information whether the country permits, or fails to take adequate measures to prevent, the damage or destruction by mob action of U.S. property.
7. FAA Sec. 620(l). Consideration which has been given to denying assistance to a government which after December 31, 1966, has failed to institute the investment guaranty program for the specific risks of inconvertibility and expropriation or confiscation.

Brazil has signed such an agreement and instituted an active program.

8. FAA Sec. 620(o). If country has seized, or imposed any penalty or sanction against, any U.S. fishing vessel on account of its fishing activities in international waters, which has been given to denying assistance.

Brazil has not seized or imposed any penalty or sanction against any U.S. fishing vessel in international waters.

9. FAA Sec. 620(q). Existence of default under any FAA loan to the country.

No such default exists.

10. FAA Sec. 620(t). Prohibition on aid if country has severed diplomatic relations with United States, unless agreements have been negotiated after resumption of relations.

Brazil maintains satisfactory diplomatic relations with the U.S.

11. FAA Sec. 620(u). Status of the country on delinquent U.N. obligations.

Brazil is not delinquent with respect to dues, assessments or other obligations to the U.N.

12. FAA Sec. 209. Information about multilateral assistance being furnished to the country.

A.I.D. assistance is being closely coordinated with that of the International agencies. (For specifics see comments AID-DLC/P-663 of January 23, 1968, containing Negotiating Instructions for the 1968 Program Loan, pages 3.1-3.3)

13. FAA Sec. 620 (a); app. Sec. 107(a) and (b). Compliance with prohibitions against assistance to Cuba and any country (a) which furnishes assistance to Cuba or failed to take appropriate steps by February 14, 1964, to prevent ships or aircraft under its registry from carrying equipment, materials, or supplies from or to Cuba; or (b) which sells, furnishes, or permits any ships under its registry from carrying items of primary strategic significance, or items of economic assistance to Cuba.

No assistance will be furnished under this loan to the present Government of Cuba, nor does Brazil furnish assistance to the present Government of Cuba. Brazil has taken appropriate steps to prevent ships or aircraft under its registry from engaging in any Cuban trade.

14. FAA Sec. 620(b). If assistance to a government, existence of determination it is not controlled by the international Communist movement.

The Secretary of State has determined that Brazil is not controlled by the international Communist movement.

15. FAA Sec. 620 (i). Information on representation of the country at any international conference when that representation includes the planning of activities involving insurrection or subversion against the United States or countries receiving U.S. assistance.

There has been no Brazilian Government representation nor any private Brazilian representation with Brazilian Government sanction at any international conference in which that representation includes the planning of activities involving insurrection or subversion against the U.S. or countries receiving U.S. assistance.

16. FAA Sec. 620 (n); App. 107(b) and 116. Compliance with prohibition against assistance to countries which traffic or permit trafficking with North Viet-Nam.

Brazil does not traffic or knowingly permit trafficking with North Viet-Nam.

Military Expenditures

17. FAA Sec. 620(i). Existence of determination that the country is engaging in or preparing for aggressive military efforts.

The President has not determined that Brazil is engaging in or preparing for aggressive military efforts.

18. FAA Sec. 620(s). Information and conclusion whether country is devoting unnecessary percentage of budget for military purposes and using foreign exchange for military equipment.

Reference: Airgram A-414 - Brazilian Military Expenditures December 18, 1967. Brazil is not so devoting resources.

19. App. Sec. 119. Information on reduction in assistance by amounts spent by country for the purchase of sophisticated military equipment.

As of the date hereof, Brazil has not spent any amounts on the purchase of sophisticated weapons systems as described in this Section. See also Airgram A-414, Brazilian Military Expenditures of December 18, 1967.

Conditions of the Loan

General Soundness

20. FAA Sec. 201(d). Information and conclusion on legality (under laws of country and United States) and reasonableness of lending and relending terms of the loan.

The proposed loan is consistent with the laws of Brazil and the United States and the terms are considered reasonable by both the Borrower and A.I.D.

21. FAA Sec. 251(b)(2); Sec. 251(e). Information and conclusion on activity's economic and technical soundness, including information on availability of an application together with assurances to indicate that funds will be used in an economically and technically sound manner.

The project has received the endorsement of the Ministry of Agriculture and the Ministry of Planning. Sufficient information and assurances have been provided by the Brazilian Government to indicate that the funds will be used in an economically and technically sound manner.

This activity has been found economically and technically sound. See the respective Sections of this Loan Paper.

22. FAA Sec. 251(b). Information and conclusion on capacity of the country to repay the loan, including reasonableness of repayment prospects.

The concessional terms of the proposed loan (40 years, including: 10 years grace period (2%) 30 (2 1/2%)) are within the country's debt servicing capacity.

23. FAA Sec. 611(a) (1). Information and conclusion on availability of engineering, financial, and other plans necessary to carry out the assistance and of a reasonably firm estimate of the cost to the United States of the assistance.

Necessary technical and financial planning has been completed. (See Section II Pages 10-34 and pages 35-48). American technicians, many of whom have spent several years in Brazil, will work closely with both government and cooperating institutions.

24. FAA Sec. 611(a) (2). Necessary legislative action required within recipient country and basis for reasonable anticipation such action will be completed in time to permit orderly accomplishment of purposes of loan.

No legislative action is required.

25. FAA Sec. 611(e). Compliance with requirement that Mission Director certify, with respect to projects estimate to cost over \$1 million, as to the country's capability effectively to maintain and utilize the project.

The required certification is made in the letter of transmittal.

26. FAA Sec. 251(b). Information and conclusion on availability of financing from other free-world sources, including private sources within the United States.

Other free world financial lenders have been approached and have indicated that they are not interested in the project. See Loan Paper's Summary and Recommendations. Private lending on terms required are not available for non revenue producing projects of this type.

Loan's Contribution Toward Achievement of Country and Regional Goals

27. FAA Sec. 207; Sec. 251 (a). Extent to which assistance reflects appropriate emphasis on:
- (a) encouraging development of democratic, economic, political and social institutions;
 - (b) self-help in meeting the country's food needs;
 - (c) improving availability in the country of trained manpower;

- (d) Programs designed to meet the country's health needs;
 - (e) other important areas of economic, political and social development, including industry; free labor unions, cooperatives and voluntary agencies; transportation and communication; planning and public administration; urban development; and modernization of existing laws.
- (a) Not applicable.
 - (b) There is excellent evidence of self help. The purpose of this loan is to further increase the effectiveness of those efforts so that Brazil may become self sufficient in meeting its food needs.
 - (c) The loan will have a direct effect in increasing the trained manpower and the capacity to train others.
 - (d) The loan will encourage both increases in the quantity and quality of food supplies and thus help to ameliorate Brazil's health problems through improved diets.
 - (e) Improvements in Brazilian agriculture encouraged by this loan will have long run effects on economic, political and social development in Brazil.
28. FAA Sec. 251(b)(3). Information and conclusion on activity's relationship to and consistency with other development activities, and its contribution to realizable long-range objectives.

Increasing agricultural production and the quality of food produced through research on seeds, soils, fertilizers, and agricultural techniques is consistent with and complementary to achieving long range objectives in Brazil.

29. FAA Sec. 251(b)(7). Information and conclusion on whether or not the activity to be financed will contribute to the achievement of self-sustaining growth.

The activities carried out under this loan will contribute to self sustaining growth because they will stimulate increased production of improved seed varieties, wider use of better tools and equipment, increased production and utilization of fertilizer, and growth of storage, processing, and farm service centers.

30. FAA Sec. 281(a). Extent to which the loan will contribute to the objective of assuring maximum participation in the task of economic development on the part of the people of the developing countries, through the encouragement of democratic private and local governmental institutions.

The loan will contribute to assuring maximum participation by the people for increased production is keyed to better seeds and plant varieties, improved agricultural practices and increased fertilizer usage. The position of governmental institutions in the program encourages the participation of farmers on a national basis.

31. FAA Sec. 281(b). Extent to which program recognizes the particular needs, desires, and capacities of the people of the country; utilizes the country's intellectual resources to encourage institutional development; and is supportive of civic education and training in governmental skills.

The objectives of this program are coincidental with those outlined in FAA Sec. 281(b) in so far as they refer to the agricultural sector of Brazil.

32. FAA Sec. 601(a). Information and conclusions whether loan will encourage efforts of the country to: (a) increase the flow of international trade; (b) foster private initiative and competition; (c) encourage development and use of cooperatives, credit unions, and savings and loan associations; (d) discourage monopolistic practices; (e) improve technical efficiency of industry, agriculture, and commerce; and (f) strengthen free labor unions.

- (a) Increased production will normally lead in the long run to greater international trade.
- (b) Encouragement of private initiative is inherent in the growth of seed production, farm implement production and increased supplies of fertilizers that must result.
- (c) Indirect cooperative activity is expected to grow.
- (d) If the Government of Brazil continues its present trend in agricultural policies, monopolistic practices will be discouraged.
- (e) Improved technical efficiency in agriculture, industry, and commerce can be concomitant results of this project.
- (f) It is not anticipated that the project will have any adverse effects on labor unions nor it will stimulate union growth.

33. FAA Sec. 619. Compliance with requirement that assistance to newly independent countries be furnished through multilateral organizations or plans to maximum extent appropriate.

Not applicable. Brazil is not a newly independent country.

34. FAA Sec. 251(h). Information and conclusion on whether the activity is consistent with the findings and recommendations of the Inter-American Committee for the Alliance for Progress in its review of national development activities.

The loan is consistent with the findings and recommendations of the Inter-American Committee for the Alliance for Progress in its review of national development activities.

35. FAA Sec. 251(g). Information and conclusion on use of loan to assist in promoting the cooperative movement in Latin America.

Not applicable to this loan.

36. FAA Sec. 209, Sec. 251(b)(8). Information and conclusion whether assistance will encourage regional development programs, and contribute to the economic and political integration of Latin America.

Not applicable.

Loan's Effect on United States and A.I.D. Program

37. FAA Sec.251(b)(4),Sec.102. Information and conclusion on possible effects on U.S. economy, with special reference to areas of substantial labor surplus and extent to which U.S. commodities and assistance are furnished in a manner consistent with improving the U.S. balance of payments position.

There will be no adverse effect on the U.S. economy as a result of this project; in fact, it will benefit the U.S. economy through purchases of U.S. products.

38. FAA Sec. 601(b). Information and conclusion on how the loan will encourage U.S. private trade and investment abroad and how it will encourage private U.S. participation in foreign assistance programs (including use of private trade channels and the services of U.S. private enterprise).

The loan will over time encourage U.S. private trade and investment for the very simple reason that the U.S. is a world leader in seed production, agricultural implements, fertilizer manufacture and food processing, all of which will receive a stimulus in Brazil from this project in the long run.

39. FAA Sec. 601(d). Conclusion and supporting information on compliance with the Congressional policy that engineering and professional services of U.S. firms and their affiliates are to be used in connection with capital projects to the maximum extent consistent with the national interest.

U.S. professional research technicians have been employed in formulating the proposed program. Their services will be continued under the loan to the maximum extent consistent with the volume of funds available and with the national interest.

40. FAA Sec. 602. Information and conclusions whether loan will permit U.S. small business to participate equitably in the furnishing of goods and services financed by it.

U.S. small business will have an equitable opportunity to furnish goods financed by the loan. Services, however, in the form of technical assistance will come very largely from foundations and universities.

41. FAA Sec. 620 (h). Compliance with regulations and procedures adopted to insure against use of assistance in a manner which, contrary to the best interests of the United States, promotes or assists the foreign aid projects or activities of the Communist-bloc countries.

Assistance provided by this loan will not be used in a manner which, contrary to the best interests of the U.S., promotes or assists the foreign aid projects or activities of the communist-bloc countries.

42. FAA Sec. 621. Information and conclusion on how the loan in providing technical assistance will utilize to the fullest extent practicable goods and professional and other services from private enterprise on a contract basis. If the facilities of other Federal Agencies will be utilized, information and conclusion on whether they are particularly suitable, are not competitive with private enterprise, and can be made available without undue interference with domestic programs.

Technical assistance in the field of agriculture will be contracted from U.S. universities and foundations with probably very limited participation by Federal agencies because the latter do not have available in sufficient quantities at convenient periods the numbers and types of technicians required without undue interference with domestic programs.

43. FAA Sec. 252 (a). Total amount of money under loan which is going directly to private enterprise, is going to intermediate credit institutions or other borrowers for use by private enterprise, is being used to finance imports from private sources, or is otherwise being used to finance procurement from private sources.
- (a) \$3.3 million for procurement of equipment and commodities.
- (b) \$11.9 million to contract private individuals.

Loan's Compliance with Specific Requirements

44. FAA Sec. 608 (a). Information on measures to be taken to utilize U.S. government excess personal property in lieu of the procurement of new items.

The Loan Agreement will provide that the Borrower will procure U.S. Government-owned excess property to the maximum extent practicable. However given the nature of the procurement, it is doubtful that this source will be utilized.

45. FAA Sec. 604 (a); App. Sec. 108. Compliance with restriction of commodity procurement to United States except as otherwise determined by the President and subject to statutory reporting requirements.

All goods and services purchased under this loan will be of United States origin.

46. FAA Sec. 604 (b). Compliance with bulk commodity procurement restriction to prices no higher than the market price prevailing in the United States at time of purchase.

This section will be enforced by application of Reg. 1.

47. FAA Sec. 604 (d). Compliance with requirements that marine insurance be purchased on commodities if the host country discriminates, and that such insurance be placed in the United States.

This section will be enforced by application of Reg. 1.

48. FAA Sec. 604 (e). Compliance with requirement that funds not be used for procurement of any agricultural commodity or product thereof outside the United States when the domestic price of such commodity is less than parity.

Most of the equipment required will be purchased for dollars in the United States. However, there are some items manufactured in Brazil which will be procured with cruzeiros from PL-480 counterpart funds.

49. FAA Sec. 611 (b); App. Sec. 101. If water or water-related land resource construction project or program, information and conclusion on benefit-cost computation.

Not applicable.

50. FAA Sec. 611 (c). Compliance with requirement that contracts for construction be let on competitive basis to maximum extent practicable.

Competitive bidding is required under Brazilian law for construction. The facilities so provided will be paid for with cruzeiro funds.

51. FAA Sec. 620 (f); App. Sec. 109. Compliance with prohibitions against assistance to any Communist country.

Assistance provided under this loan will not be furnished to any Communist country.

52. FAA Sec. 620 (g). Compliance with prohibition against use of assistance to compensate owners for expropriated or nationalized property.

Assistance provided by this loan will not be used to compensate for expropriated or nationalized property.

53. FAA Sec. 612 (b). Appropriate steps that have been taken to assure that, to the maximum extent possible, the country is contributing local currencies to meet the cost of contractual and other services and foreign currencies owned by the United States are utilized to meet the cost of contractual and other services.

The Brazilian Government and cooperating agencies and institutions are providing extensive facilities, personnel and equipment to carry out the project. This contribution is very substantial, if not readily computed in terms of total value. Moreover the total funds provided from PL-480 sources are equivalent to \$15.106 million.

The federal and state Brazilian contribution to the objective of this program will amount to approximately \$32 million. The proceeds of the A.I.D. loan will be spent entirely in the U.S.

54. App. Sec. 102. Compliance with requirement that payments in excess of \$25,000 for architectural and engineering services on any one project be reported to Congress.

Will be complied with when and if appropriate.

55. App. Sec. 104. Compliance with bar against funds to pay pensions, etc., for military personnel.

Funds obligated by the loan will not be used to pay pensions, annuities, etc.

56. App. Sec. 106. If country attempts to create distinctions because of their race or religion among Americans in granting personal or commercial access or other rights otherwise available to U.S. citizens generally, application which will be made in negotiations of contrary principles as expressed by Congress.

No attempts by Brazil to create distinctions because of race or religion among Americans in granting personal or commercial access or other rights otherwise available to U.S. citizens generally are known. If Brazil attempts to create such distinctions application will be made in negotiations of contrary principles as expressed by Congress.

57. App. Sec. 111. Compliance with requirements for security clearances of personnel.

Security clearance of U. S. funded personnel will be obtained to extent required by Manual Orders and U. S. policy.

58. App. Sec. 112. Compliance with requirement for approval of contractors and contract terms for capital projects.

Will be complied with as required.

59. App. Sec. 114. Compliance with bar against use of funds to pay U. S. assessments, etc.

Loan funds will not be used to make any payment to U.N. members.

60. App. Sec. 115. Compliance with regulations on employment of United States and local personnel for funds obligated after April 30, 1964 (Regulation 7).

Not applicable.

61. FAA Sec 636 9 (1). Prohibition on financing non/U.S. manufactured motor vehicles.

Not applicable.

62. App. Sec. 401. Compliance with bar against use of funds for publicity or propaganda purposes within United States not hretofore authorized by Congress.

Loan funds will not be used for publicity or propaganda purposes within the United States.

63. FAA Sec. 620(k). If construction of productive enterprise where aggregate value of assistance to be furnished by United States will exceed \$100 million, identification of statutory authority.

Not applicable.

(TRANSLATION)

Ministry of Planning and General Coordination

GM/C/133/1968

Rio de Janeiro, June 19, 1968

Minister Stuart H. Van Dyke
Director, USAID/Brazil
Rio de Janeiro, GB

Mr. Minister:

We are writing to you with respect to a program for the development of agricultural research in Brazil. As you know, representatives of the National Research Council (CNPq), and of the Office of Research and Experimentation (EPE) of the Ministry of Agriculture have been meeting with USAID to discuss the possibility of promoting assistance to agricultural research through a loan.

On the basis of an analysis of technical and financial requirements for expansion and intensification of research during a period of 5 years, and with a view to providing high level academic training for Brazilian researchers, the three agencies have prepared a Five-Year Agricultural Research Program. To carry out the program, we hereby request that you examine the possibility of providing a loan, under the Alliance for Progress, of an estimated amount of \$12.6 million which, together with funds from Wheat Agreements (PL-48), will constitute the financing scheme of the program.

Approximately \$11 million of the amount indicated will be used to finance the Five-Year Program of the Office of Research and Experimentation (EPE). The program will consist of (1) technical assistance for research and research development; (2) academic work of Brazilian researchers at the Master of Science (MS) level both in Brazil and in the United States, and at the Doctorate (PhD) level in the United States; (3) procurement of materials and equipment needed for the expansion and intensification of agricultural research during the period of five years. The estimates of both dollar and cruzeiro requirements for these three items are shown below.

UNCLASSIFIED

	<u>US\$ 1,000</u>	
	<u>Dollar Cost</u>	<u>Cruzeiro Cost</u>
Technical assistance and research program	5,084	5,106
Training	2,960	1,648
Material and equipment	<u>3,091</u>	<u>4,783</u>
	11,135	11,537 *

(*) Equivalent to US\$36,918,000 at the exchange rate of NCr\$3.20/US\$1.00

The dollar costs of these programs will be financed through the loan and the cruzeiro costs with PL-480 resources.

Regarding future commitments, it is planned that the cruzeiro costs during 1969 and 1970 will be covered with resources of the Amendment to the VII Wheat Agreement, and its continuation through counterpart funds from a subsequent Agreement. In the event that the resources of the future Agreement are not generated in time to finance the remaining costs, a part of the funds originating from the Amendment to the VII Agreement which have been allocated for agricultural credit will be transferred to this program.

US\$1.5 million of the US\$12.6 million will be added to NCr\$14,600,000 of PL-480 earmarked for the National Research Council (CNPq) to implement a program which includes a select number of Brazilian Universities and Research Centers, herein called "Centers of Excellence" in order to increase and expand post-graduate programs in subject-matters related to agricultural research. This program will finance a number of study grants intended for young meritorious researchers who will attend those Centers, and it will also make it possible to send researchers and instructors of the Centers to the U.S. for more advanced academic work in view of the impossibility of carrying this out in Brazil. Furthermore, resources will be supplied to the "Centers of Excellence" as financial assistance to expand and increase their graduate research programs, to secure the contracting of U.S. professors and to acquire essential imported laboratory equipment.

The Government of Brazil assigns a high priority to agricultural research and considers it a program of the highest importance. With the intention of improving the effectiveness of the program and of securing sufficient resources for the professional U.S. researchers and their Brazilian counterparts, as well as to guarantee future availability of resources needed to effectively train Brazilian researchers following this program, the GOB intends to increase from year to year, in real terms, the amount of budgetary resources earmarked for the program starting in 1968 through 1973.

One of the serious obstacles to agricultural-livestock research in Brazil is the shortage of specialized technicians of proven ability and dedication. The main reason for this situation has been the lack of a differential in compensation which would provide incentives for the technicians to become specialists and obtain post-graduate degrees, and which would keep them in active scientific production.

The National Research Council and the Ministry of Agriculture are making efforts to offer more attractive salaries to researchers, while the Federal Government is studying a system of compensation with a schedule based on merit and scientific output. The salary improvement which is under study will aim also at keeping the qualified researchers who will be trained under the program to be financed by the proposed loan.

We avail ourselves of this opportunity to renew to you the expression of our esteem and consideration.

(sgd.) Helio Beltrão
Minister of Planning and
General Coordination

(sgd.) Ivo Arzua
Minister of Agriculture

(sgd.) Antonio Moreira Couceiro
President of National
Research Council

Conselho Nacional de Pesquisas
Actual Expenditures (1960 - 1967)
In Thousand New Cruzeiros in 1967 Prices

	<u>1960</u>	<u>1961</u>	<u>1962</u>	<u>1963</u>	<u>1964</u>	<u>1965</u>	<u>1966</u>	<u>1967</u>
Personnel	464.4	560.0	579.0	427.4	387.9	508.7	514.2	786.0
Material	60.6	45.4	49.9	76.1	70.2	70.0	82.2	63.0
Others	<u>121.2</u>	<u>121.1</u>	<u>159.7</u>	<u>222.5</u>	<u>219.9</u>	<u>223.0</u>	<u>160.5</u>	<u>179.0</u>
Total Adm.	646.2	726.5	788.6	726.0	678.0	801.7	756.9	1,028.0
Subordinated Agencies	2,079.8	2,981.6	2,415.7	1,534.0	2,559.3	3,015.1	2,185.9	6,333.0
Others	20.1	30.3	39.9	93.7	42.8	108.7	110.9	128.0
Scholarships								
Biology	686.6	802.2	648.8	527.0	497.8	1,048.7	1,157.5	1,449.0
Physics	767.3	953.5	708.7	644.0	513.0	1,551.8	959.2	1,621.0
Technology	302.9	287.6	259.6	193.2	259.6	744.6	685.1	848.0
Geology	181.7	166.5	149.7	93.7	268.8	464.4	565.1	777.0
Chemistry	403.9	408.6	319.4	240.0	317.6	366.8	580.7	549.0
Agriculture	242.3	181.6	179.7	140.5	192.4	433.1	512.9	660.0
Mathematics	141.3	181.6	129.8	123.0	155.8	322.5	314.5	257.0
Sociology	-	-	-	-	-	-	45.7	53.0
Other	161.5	60.5	39.9	52.7	48.9	84.8	40.5	138.0
5 & 2 Year Plans				<u>134.7</u>	<u>61.0</u>	<u>289.4</u>	<u>26.0</u>	
Total	2,887.5	3,042.1	2,435.6	2,148.8	2,314.9	5,306.1	4,887.2	6,352.0
Investments	<u>-</u>	<u>15.1</u>	<u>49.9</u>	<u>58.5</u>	<u>27.4</u>	<u>27.6</u>	<u>358.9</u>	<u>88.0</u>
Total	5,633.6	6,795.6	5,729.7	4,561.0	5,622.4	9,259.2	8,299.8	13,929.0
Non-budgeted expenditures	-	-	-	-	726.9	193.5	1,384.6	-

Escritorio de Pesquisas e Experimentacao (EPE)
Past Budgets(1963 - 1967)
In thousands of 1967 NCr\$

	<u>1963</u>	<u>1964</u>	<u>1965</u>	<u>1966</u>	<u>1967</u>
<u>EPE Headquarters</u>					
Administration	4,128.0	1,472.0	2,720.0	1,506.0	1,433.0
Investment					
Construction	205.0	168.0	184.0	170.0	50.0
Equipment	509.0	147.0	170.0	120.0	105.0
Furniture & Fixtures	47.0	40.0	39.0	27.0	25.0
Research	<u>4,725.0</u>	<u>2,119.0</u>	<u>1,281.0</u>	<u>2,782.0</u>	<u>2,180.0</u>
Total Investment	<u>5,486.0</u>	<u>2,474.0</u>	<u>1,674.0</u>	<u>3,099.0</u>	<u>2,360.0</u>
Total EPE Headquarters	9,614.0	3,946.0	4,394.0	4,605.0	3,793.0
<u>Regional Research Institutes</u>					
Administration	12,477.0	14,580.0	20,599.0	16,980.0	17,780.0
Investment					
Construction	1,089.0	687.0	1,196.0	1,142.0	688.0
Equipment	638.0	623.0	669.0	521.0	369.0
Furniture & Fixtures	182.0	186.0	243.0	219.0	142.0
Research	<u>5,650.0</u>	<u>10,576.0</u>	<u>5,028.0</u>	<u>5,765.0</u>	<u>5,963.0</u>
Total Investment	<u>7,559.0</u>	<u>12,072.0</u>	<u>7,136.0</u>	<u>7,647.0</u>	<u>7,162.0</u>
Total Institutes	20,036.0	26,652.0	27,735.0	24,627.0	24,942.0
<u>Total EPE Expenditures (Budgeted)</u>					
Administration	16,605.0	16,052.0	23,319.0	18,486.0	19,213.0
Investment					
Construction	1,294.0	855.0	1,380.0	1,312.0	738.0
Equipment	1,147.0	770.0	839.0	641.0	474.0
Furniture & Fixtures	229.0	226.0	282.0	246.0	167.0
Research	<u>10,375.0</u>	<u>12,695.0</u>	<u>6,309.0</u>	<u>8,547.0</u>	<u>8,143.0</u>
Total Investment	<u>13,045.0</u>	<u>14,546.0</u>	<u>8,810.0</u>	<u>10,746.0</u>	<u>9,522.0</u>
Total	29,650.0	30,598.0	32,129.0	29,232.0	28,735.0

Escritorio de Pesquisas e Experimentacao (EPE)

Budget Projections (1968-1970)

In thousands of NCr\$

	<u>1968</u>	<u>1969</u>	<u>1970</u>
<u>Institute Programs</u>			
IPEAN	NCr\$ 1,100.0	NCr\$ 1,300.0	NCr\$ 1,500.0
IPEANE	900.0	1,100.0	1,250.0
IPEAL	1,000.0	1,200.0	1,300.0
IPEACO	870.0	1,260.0	1,250.0
IPEACS	925.0	1,000.0	1,100.0
IPEAS	940.0	1,100.0	1,250.0
IPEAO	-	<u>350.0</u>	<u>500.0</u>
Subtotal ^{1/}	5,735.0	7,310.0	8,150.0
National Programs	<u>4,176.0</u>	<u>5,870.0</u>	<u>7,050.0</u>
Total Operating Program	9,911.0	13,180.0	15,200.0
Construction, Equip., etc.	<u>1,365.0</u>	<u>2,150.0</u>	<u>2,100.0</u>
Total "Investment" Budget ^{2/}	<u>11,276.0</u>	<u>15,330.0</u>	<u>17,300.0</u>
Administrative Budget	20,941.1	28,410.0	32,128.6
Total Budget	NCr\$32,217.1	NCr\$43,800.0	NCr\$49,428.6

^{1/} Does not break out budget for IPEAME, which was not officially formed when this budget was prepared.

^{2/} According to Brazilian usage, this basically includes all expenses except permanent personnel costs.

CONSELHO NACIONAL DE PESQUISAS

BUDGETS - 1967/69

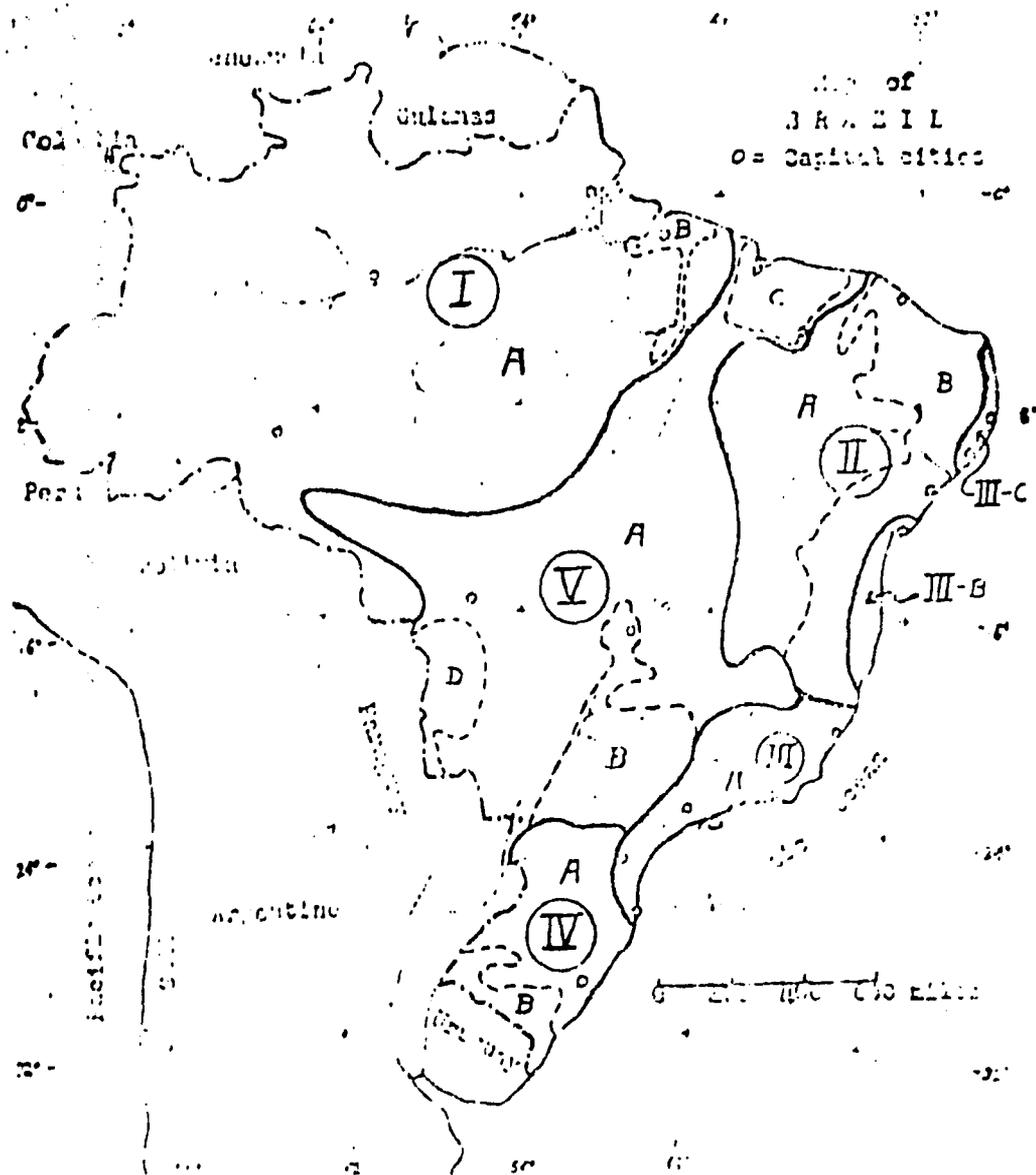
<u>Year</u>	<u>CNPq</u>	<u>Five-Year Plan</u>	<u>Subordinated Organs(6)</u>	<u>Total</u>
1967	8,573,750.17		5,993,150.00	14,566,900.17
	(*) <u>418,899.83</u>	-	-	<u>418,899.83</u>
	8,992,650.00			14,985,800.00
1968	9,648,193.00	7,600,000.00	6,425,885.00	23,674,078.00
	(*) <u>529,292.00</u>	-	-	(*) <u>529,292.00</u>
	10,177,485.00			24,203,370.00
1969	15,693,169.00	23,500,000.00	18,266,185.00	57,459,354.00
<u>Total</u>				
1967/9	<u>34,863,304.00</u>	<u>31,100,000.00</u>	<u>30,685,220.00</u>	<u>96,648,524.00</u>

(*) Supplementary credit for current expenditures.

(1) to begin in the second semester of 1968.

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ANNEX VI
Exhibit 4
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MAP No. 1. Agro-climatic regions of Brazil

Map Region	Climate	Rainfall		Natural vegetation type	Total area million ha.	Area* suited to mechanized agric. million ha.
		Annual inches	Duration months			
I	Humid-tropical	70 - 150	10 - 12	Equatorial forest	384	110.
II	Dry-tropical	5 - 40	1 - 4	Tropical thorn-brush	136	4.
III	Humid-tropical	40 - 70	6 - 10	Tropical forest	42	2.
IV	Humid-temperate	40 - 70	10 - 12	Deciduous & "pine" forest	51	15.
V	Humid-tropical	40 - 70	6 - 8	Grass to scrub forest	135	40.
National totals					551	171.

* Included are soils potentially capable of high production by use of modern technologies of capitalized agriculture. Areas of Region II for which no source of irrigation water can be developed are excluded.

DRAFT
LOAN AUTHORIZATION

Provided From: Alliance for Progress Funds
BRAZIL: Agriculture Research Loan

Pursuant to the authority vested in the Administrator, Agency for International Development (hereinafter "A.I.D.") by the Foreign Assistance Act of 1961, as amended, and the delegations of authority issued thereunder, I hereby authorize the establishment of a loan pursuant to Part I, Chapter 2, Title VI, Alliance for Progress, of said Act to the Government of Brazil ("Borrower"), of not to exceed twelve million six hundred thousand United States dollars (\$12,600,000) to assist in financing the United States dollar costs of the expansion and improvement of Agricultural Research in Brazil. The Loan shall be subject to the following terms and conditions:

1. Interest and Terms of Repayment:

- (a) Borrower shall repay the loan to A.I.D. in United States dollars within forty (40) years from the first disbursement under the loan, including a grace period of not to exceed ten (10) years.
- (b) Borrower shall pay to A.I.D. in United States dollars on the disbursed balance of the loan interest of two (2) percent per annum during the grace period, and two and one-half (2 1/2) percent per annum thereafter.

2. Other Terms and Conditions

- (a) The Government of Brazil shall covenant to increase the amount of budgetary resources allocated to the National Agricultural Research Program; the magnitude of increase to be established during loan negotiations on the basis of research requirements and the research capacity of EPE.
- (b) The Government of Brazil shall covenant that budgetary funds allocated to research will be made available on a timely and regular basis.
- (c) The Government of Brazil shall covenant to study ways and means of establishing salaries for researchers with

advanced academic training at such level as to provide proper incentive for researchers to undertake such training.

- (d) In the event that P.L. 480 funds are not available the Government of Brazil shall covenant to provide the necessary funds to cover the local currency costs of the Project from budgetary resources.
- (e) Equipment, material and services financed under the loan shall have their source and origin in the United States of America.
- (f) The Loan shall be subject to such other terms and conditions as A.I.D. may deem advisable.

Administrator

Date