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

CAPITAL ASSISTANCE PAPER

Proposals and Recommendations
For the Review of the
Development Loan Committee

BRAZIL - SCIENCE & TECHNOLOGY FOR DEVELOPMENT

AID-DLC/P-1072

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February 12, 1973

MEMORANDUM FOR THE DEVELOPMENT LOAN COMMITTEE

SUBJECT: Brazil - Science & Technology for Development

Attached for your review are the recommendations for authorization of a loan in an amount not to exceed \$15,000,000 to the State of Sao Paulo to finance the dollar costs of a program of technical assistance and training in the industrial and agro-industrial sectors in the State of Sao Paulo.

This loan proposal is scheduled for consideration by the Development Loan Staff Committee at a meeting on Friday, February 16, 1973.

Rachel R. Agee
Secretary
Development Loan Committee

Attachments:

Summary and Recommendations
Project Analysis
ANNEXES I-XII

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BRAZIL - SCIENCE AND TECHNOLOGY FOR DEVELOPMENT

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SUMMARY AND RECOMMENDATIONS

1. Borrower and Executing Agent

The State of São Paulo will be the borrower. The State Council of Technology (CET) will be responsible for the execution of the program. The loan will be guaranteed by the Government of Brazil (GOB).

2. Proposed Amount and Terms of Loan

a. Amount: Not to exceed \$15 million. Two-step.

b. Terms: Two-step. The borrower will repay the loan in Cruzeiros to the Government of Brazil (GOB): 30 years, 10 years grace, 2% during the grace period, 4% thereafter. A guarantee and repayment agreement will provide for a dollar repayment of the loan by the GOB to the United States: 40 years, 10 years grace, 2% during the grace period, 3% thereafter.

c. Local Cost Financing: None

3. Purpose and Goal.

This loan, through the provision of American expertise, will assist Brazil in a program to increase and broaden the use of technological services by the industrial and agro-industrial communities; to extend the scope of technological services available, and to improve the capabilities of organizations that provide such services.

In the broadest sense, the goal of the program is to assist Brazil to maintain an average growth rate of at least 9%. The specific purpose of the loan is to increase Brazilian capacity to select, adapt, and generate technology; and to promote the increased use of this technology by industry. Despite São Paulo's large industrial base, and strong technological capability, industry is not using this capability to the degree potentially possible. Nor are the technological institutes & the universities oriented or equipped to provide services to industry. Stronger linkages need to be forged among the universities, the research institutes, and the private sector through engineering, development and research contracts to help industrial firms reduce costs, improve quality, diversify products, and promote exports. Export promotion will receive particular emphasis, since a 12% annual increase in exports is essential for a continued 9% increase in GNP.

4. Description of the Project

The fundamental proposition of the São Paulo Program is that resources should be allocated to science and technology on the basis of known needs and opportunities in the market place. From this it follows that the government should develop a system to identify these basic problems and opportunities and assist the industrial and agricultural sectors meet their needs through contracts with competent research institutes or university research departments.

The São Paulo program involves the development of a system designed to: (1) orient universities and technological research institutions toward the needs of the market for industrial and agro-industrial goods; (2) provide technological extension services and financial incentives to encourage the use of Brazil's technological facilities by industrial and agro-industrial firms; (3) establish additional technological services particularly in the areas of standards and quality assurance; (4) improve the capacity of the universities and research institutions to provide services required by the private sector and (5) develop the technical competence to plan and coordinate technological activities financed or supported with public funds. The locus of the program is São Paulo, however, the services will be available and used Brazil-wide.

The São Paulo Council of Technology (CET) is the hub upon which the program turns. The CET, in close cooperation with national authorities involved in technological matters, has a wide mandate and authority. Substantial resources are available for the purposes listed in the preceding paragraph.

As the coordinating and controlling agency of the program, the CET will be responsible for implementing the A.I.D. loan. The São Paulo program is, of course, much broader than the loan, which will be designed to facilitate and strengthen the program at a few points where the availability of American expertise is either a sine qua non or can make an especially significant contribution.

The loan will finance four contracts between the CET and American entities which will provide (a) technological consultants and (b) training. The specific training will be decided and scheduled by the CET and the contractor(s) as the program progresses. The specifics of the technological consultancies will be similarly determined. However, the prime original need has already been established: advice on the organizational structure and the planning of a technology program. The initiation of certain services essential to the progress of the program are also now known to require outside help. These include: reference information centers, marketing services, quality control services, and technological extension services. The latter, initially, will have more the character of a technology sales and promotion department, since the progress of the program hinges in the final analysis upon increased use by industry of technological services. Finally, rapid progress of the program requires a certain number of early instances which unmistakably demonstrate to the business community that investments in technology pay dividends. For this reason, among others, it has been decided to undertake immediate activities in two promising fields: metallurgy and food technology.

The AID loan project will finance technical assistance and training for

selected elements of the system. The AID project will principally involve four major state supported institutions: CET, IPT (Institute of Technological Research), ITAL (Institute of Food Technology) and through the CET to the University of São Paulo. (Other institutions will receive limited technical assistance and training grants.)

5. Rationale for A.I.D. Involvement

This project involves the first A.I.D. loan that attempts to deal with the establishment of a comprehensive market oriented system for providing technological services to the industrial and agricultural sectors in a developing country. Also it enters this process at a stage when these services are susceptible of being influenced not merely in detail, but in their fundamental structure.

In simplest terms, the project will influence the establishment of a new organizational structure, new functions, and new relationships in the industrial and agro-industrial sectors which will, for a long time to come, continue to be the cutting edge of Brazilian national development.

At the time when they are most susceptible to influence, i.e. in their formative stages, the project will deal with the Brazilian systems for managing technological transfer and technological progress by involving U.S. planning, organization, and technical advisors at the center of Brazilian technological growth, where patterns are being set for research planning, expansion of research facilities, structuring of industry-related technological functions, and industry-research relationships.

Starts have been made in ways which promise successful evolution of the system. As demonstrated in the various sections of this paper: (1) Brazil has a declared firm intention to adopt means for technological development. The Brazilian Government and Brazilians generally recognize not only the importance, but also the urgency of progress in this field if they are to continue rapid general development; (2) Brazilian competence exists to utilize external advice; and (3) Brazilian resources are available to follow through with the practical implementation of the advice.

Once established, processes, structures, relationships and involvements tend to be perpetuated. U.S. influence exercised now can make contributions of a sort not possible later. Moreover, the U.S., from the point of view of its own interest, will reap advantages that over the long run will be considerable, i.e., the adoption by Brazil of U.S. methods and processes, a tendency to use and prefer U.S. technological equipment, and an established exchange of information.

Finally, this project conforms to the rationale for any bilateral assistance activity in a country like Brazil, which has attained a favorable macro-economic situation, but yet remains, in many essential aspects, an under-developed country; (a) it provides a competence not available on the ordinary market;

(b) it provides assistance in an area where U.S. competence is the best in the world; (c) it works in an area where a bilateral relationship is unmistakably superior to multilateral management and (d) it embodies a mutuality of long-term national interests.

6. Summary Cost Estimate and Financial Plan

The proposed program will include four A.I.D. loan financed contracts which will provide services to three major recipient organizations: CET, IPT, and ITAL. These contracts between the State of São Paulo and U.S. institutions will include loan-financed dollar costs for field consultants, institutional backstopping, training, and materials required in the conduct of research and system implantation. Local support costs of consultants and all other local costs in support of the program will be borne by the Borrower. Equipment purchased outside of Brazil in support of the program will be financed through foreign lines of credit currently available to the São Paulo State Development Bank (BADESP)

Summary of Financing (In US\$'000s)

<u>Dollar Costs (AID)</u>	<u>CET</u>	<u>IPT</u>	<u>ITAL</u>	<u>TOTAL</u>
Consultants	3,700	2,040	3,600	9,340
Participants	2,600	870	1,000	4,470
Other Direct Costs	50	40	75	165
Scientific & Technical Materials	650	250	125	1,025
Total Dollar Costs	<u>7,000</u>	<u>3,200</u>	<u>4,800</u>	<u>15,000</u>

Local Costs (São Paulo)

Consultant Support	480	430	760	1,670
Personnel - Technical	1,420	3,930	4,160	9,510
Personnel - Administrative	330	800	310	1,440
Raw Materials, Supplies	-	890	240	1,130
Training	710	-	490	1,200
Equipment	250	-	1,150	1,400
New Construction	1,400	1,750	1,330	4,480
Other	510	1,660	2,920	5,090
Total Costs (Local)	<u>5,100</u>	<u>9,460</u>	<u>11,360</u>	<u>25,920</u>

7. Other Sources of Financing.

The EXIMBANK has indicated that it might consider a loan for procurement of equipment. Both the IBRD and IDB have stated that they have no interest. Given the nature of this project, no other U.S. or free world financing is believed to be available.

8. Statutory Criteria

All statutory criteria have been met. The Statutory Criteria Check List is provided in Annex III.

9. Resolution of Issues

I The USAID strongly recommends loan funding for five years instead of three as suggested in the IRR approval cable.

First, the project is highly complex, probably as complex as any in the USAID portfolio. It involves development of the CET-MG staff required to plan and coordinate the entire program. It involves design and implantation of complex components such as a technical information system, technological extension services, and international and domestic market research. These will take time, in many cases far more than five years. When it is known in advance that the institutional change will require more than three years, it would not seem prudent to undertake them without assurance of longer-term approval.

Second, the program must have a long-term commitment on the part of both the State and Federal Governments if it is to succeed. Quality assurance, which was stressed in the first IRR review cable, is a good example. To create an overall ambience of quality control will require the upgrading and collaboration of a variety of State and Federal organizations. It will require the establishment of rational technical standards. It will require technical extension services to generate an awareness of the importance of quality control and to provide necessary technical assistance. A three-year program does not seem compatible with the degree of commitment we would expect on the Brazilian side. By analogy, we would not recommend to a Brazilian organization that it undertake the first three years of construction of a five year power project without assured support during the fourth and fifth years.

Third, there will be a considerable lead-time in the selection and arrival of long-term consultants, and the selection, training, and subsequent placement of participants in the various organizations. With a three year program most of the planning for the major

components would have to be done in less than one year. This does not seem desirable in the case of a highly innovative flexible project.

Fourth, as explained elsewhere, the program involves a mixture of institutional development and "demonstration" projects. These are not entirely separate elements; frequently the best way to achieve institutional change will be in a real situation of efficient technological transfer. In general, it will take much longer to consolidate the institution changes desired than it will to achieve concrete results on the demonstration projects. It is probable that a three year project will create a tendency to stress projects which yield immediate returns to the detriment of long-term institutional development.

Lastly, as the USAID understands the IRR position, a three year loan would be approved with an understanding that if it were successful it would be extended for an additional period. USAID is hardly in a position to give any plausible assurances of follow-on funding in view of the rapid reduction in its lending levels (and the real possibility that further lending will soon be terminated completely). Even if a way were found to extend the USAID loan, there would almost certainly be a disruptive discontinuity in planning and staffing. Moreover, the prospects for showing progress within three years, particularly in the institutional areas and especially in extending the program to the northeast would be seriously compromised.

II The IRR approval cable expressed DAEC concern about the ability of the institutes to retain staff after they had received training under the program. The Mission has been advised by representatives of the Borrower that current state of São Paulo legislation provides that the recipient of long-term state funded training must agree to return to his previous employment for a period of time at least double the period of training.

It is anticipated that the loan agreement will require evidence that provision has been made for the retention of trainees who receive long-term training under the loan.

Further the Borrower has agreed to include a covenant in the loan agreement to provide for the training of their planners and technical personnel in income distribution, employment and labor intensity considerations.

III The USAID has considered the feasibility of allocating a specific portion of the loan to the Northeast. The only NE institution with any short-run potential, to our knowledge, is

the Foundation for Scientific Development of the State of Bahia. In our judgment, this newly founded institution does not yet have the professional depth and experience to participate effectively in a separate overall systems approach such as that envisaged for São Paulo.

Nevertheless, there are several other ways in which the Bahia Foundation and other NE institutions will receive assistance under the program. The State of São Paulo has a formal cooperative agreement with the State of Bahia in two areas: technology and urban problems. São Paulo institutions such as IPT are already actively collaborating with the Bahia Foundation. Other São Paulo agreements have recently been signed with Rio de Janeiro and Minas Gerais. Others in process include Rio Grande do Norte, Pernambuco, and Ceará. These will soon become operative.

IPT and ITAL regularly give short-term courses which are available to technicians from other states. No charge is made for technicians from the public sector. For example, two seminars in research management were recently given by four Paulista scientists who had recently returned from study in the United States.

São Paulo officials have agreed to include technicians from collaborating institutions in other states as candidates for participant training in the United States under the loan.

The Fund for Scientific and Technological Development of the Development Bank of São Paulo (FUNDO) is open to applicants, private and public, in all states. No preference will be given to São Paulo applications. This policy is consistent with the fact that 50% of the FUNDO's capital comes from federal sources.

The services of the São Paulo institutions are open to any client, public or private. The São Paulo officials intend to expand their technological extension service to provide maximum feasible coverage in other states. They recognize a national obligation accruing from the industrial-financial-technological leadership of the state. Moreover, it is good business for the participating São Paulo institutions.

Lastly, it may be relevant to mention the many fiscal mechanisms for transferring resources from São Paulo to poorer areas. São Paulo generates about 50% of federal revenues and receives only about 20% of federal allocations. The Article 34-18 tax incentive program for initiating industry in the NE is mostly utilized by São Paulo firms; this program results in a transfer not only of capital but also of management and technology; the numerous NE subsidiaries of São Paulo firms will be amongst the normal clientele of the São Paulo system.

(See also Annex XI, EXHIBIT A)

10. Loan Administration

Loan financing will be restricted to dollar costs. It is expected that all loan funds will be disbursed in accordance with A.I.D.'s standard Letter of Commitment, Letter of Credit procedure. Loan funds will finance contracts between the Borrower, represented by CET, and U.S. institutions providing technical assistance and training of participants (including international travel cost of participants) as well as U.S. procurement of commodities included in the contracts. Cruzeiro costs of the program will be financed by the State of São Paulo.

11. Recommendations

It is recommended that a loan to the State of São Paulo in an amount not to exceed \$15 million be authorized subject to the following terms and conditions:

A) Interest and Repayment Terms

The loan would contain the two-step procedure under which terms to the Borrower would be:

Repayment	30 years
Grace Period	10 years
Interest	2% during grace period 4% thereafter

The terms granted to the Government of Brazil would be:

Repayment	40 years
Grace Period	10 years
Interest	2% during grace period 3% thereafter

There will be no local cost financing.

B) Other Terms and Conditions

1. Prior to committing or disbursing funds the Borrower shall:

a) Submit to A.I.D. in form and substance satisfactory to A.I.D. evidence that funds will be provided to cover allocated currency costs of the first year of the program;

b) Submit to A.I.D. in form and substance satisfactory to A.I.D. a time-phased implementation plan for the execution of the technical assistance. Such plan to include:

(1) a plan for the overall administration and coordination of the program.

- (ii) a description of each major element of the program;
- (iii) a description of the agency or entity responsible for the execution of each major element of the program;
- (iv) evidence of the organizational and technical capability of such agency or entity to carry-out its responsibilities and functions under the program, and
- (v) a financial plan showing breakdown of dollar and local currency costs.

2. The Borrower shall covenant:

- a. To establish ways and means to provide higher salaries for research personnel in the state institutions and for allowing professors at the state universities involved to receive fees for private consulting.
- b. Prior to the end of the first year of implementation of the program, and annually thereafter, the Borrower shall provide a revised financial plan for the dollar and local costs of the program for the following year. This revised financial plan shall be accompanied by evidence satisfactory to A.I.D. that funds are available to finance the local costs as shown in the revised plan.
- c. That the assistance under the loan will be used, to the extent feasible, to foster the development of industrial technology institutions in the Northeast. A.I.D. and the CET will review annually the amount of loan assistance to the Northeast, and the CET further covenants to maximize efforts to reach and to maintain the maximum feasible amount.
- d. That no demonstration projects shall be initiated beyond thirty (30) months following the date of the first disbursement of loan funds.
- e. To provide for the training of certain of the Borrower's personnel in income distribution, employment and labor intensity considerations.
- f. That provision will be made that recipients of loan financed long term training shall return to their previous employment for a period of time at least equal to the period of the training received.
- g. That the proposed four basic CET contracts and contractors and contractor personnel financed under the loan shall be approved by A.I.D. prior to the execution of said contracts.

h. That within thirty (30) months from the date of execution of the loan agreement the Borrower, the CET and A.I.D. shall review, in depth, all aspects of the program.

i. To establish a principle of residual State rights to any innovation developed under the program if such innovation is not introduced within a reasonable period of time.

j. To take all necessary measures to maximize the participation of small and medium firms in the BADESP Fund, and also agrees to the establishment of mutually acceptable target levels of small and medium firm project approvals by CET.

It is the intention of the Mission to negotiate with the Borrower a target level for the first year that would fall in a range of 40-60% of project approvals by financial magnitudes.

A condition precedent to first disbursement shall be the agreement on the target level for the first year. Annually, the actual performance in this regard shall be compared to the target, and if major deviation is found, a satisfactory plan shall be agreed upon by A.I.D. and the CET for promoting the increased participation of the small and medium firms in the program.

3. The loan will be guaranteed by the GOB.

4. The loan shall be subject to such other terms and conditions as A.I.D. may deem advisable.

Capital Assistance Committee

Chairman:	O.J.Lustig
Program Officer:	J.M.Miller
Economists:	J.Braga Costa, J.G.Thomsen
Financial Analysts:	T.J.McMahon, A.Mulholland
Legal Advisor:	D.D.Robertson
Project Coordinator:	D.J. Mackell
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	W.F. Gelabert
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SECTION I - BACKGROUND

A. Brazilian Science and Technology Plan

The Brazilian Development Plan 1972/74, Chapter II, "Expansion Factors: Scientific and Technological Policy", spells out the goals of Brazil's strategy. These include:

1. Attention to the Brazilian competitive position in priority sectors, including industries with high technological content; the need to adapt imported technology; and the development of domestic technology.
2. "Internal technological elaboration", i.e., product and process engineering; solution of technological problems peculiar to Brazil, especially in the industrial, agricultural and mining sectors.
3. The rational allocation of resources to technological priorities, including those sectors with rapidly changing technological content and prospective high growth rates.

To accomplish the above goals, the GOB has articulated the following program for 1972/74:

a. Accelerating GOB action by:

- (1) Orientation of the financial system towards technological development. The National Fund for Science and Technology (FNDCT), the Development Fund for Science and Technology (FUNTEC) of the National Economic Development Bank (BNDE), the National Research Council (CNPq), and the Fund for Technological Assistance (FUNAT) of the National Institute of Technology (INT) will invest approximately Cr\$1.100 million in technology over the period 1972/74.
- (2) Modernization and coordination of Government research institutes in the execution of the Scientific and Technological Development Basic Plan (PBDCT), with an investment of about Cr\$1.750 million in the 1972/74 period.
- (3) The mobilization of foreign resources to reinforce selected federal, state and private research on industrial technological problems.
- (4) Strengthening and updating the organizational structure of the CNPq which is responsible for promoting and coordinating the PBDCT as well as for strengthening organs of ministries involved in the program.
- (5) Reformulation of policy so as to allow adequate working conditions, full-time employment, satisfactory wages, and improved career prospects for researchers.

(6) Establishment of a national scientific and technological information system, under the guidance of the CNPq but designed for decentralized operation. Components of this system will include:

- (a) Industrial technological information;
- (b) Patent information;
- (c) Agriculture information; and
- (d) Domestic and foreign information, including data on organizations and services available.

b. Developing priority technological areas by:

(1) Development of high technological-content industries (e.g., iron and steel, electronics) while at the same time expanding Brazilian research capacity.

(2) Intensive agricultural research (especially with respect to acid-soil areas, cerrados), to irrigation techniques, and to tropical foods technology.

c. Strengthening the public and private technological infrastructure:

(1) Creation of domestic and multinational Brazilian enterprises to promote exports in technologically sophisticated sectors.

(2) Modernization of technological and administrative functions of private and governmental enterprises.

(3) Provision of fiscal incentives for innovation in enterprises by:

- (a) Governmental financial assistance to private research institutions;
- (b) A policy to stimulate foreign firms to provide research funds to their Brazilian subsidiaries;
- (c) Tax exemptions for the purchase of foreign or domestic laboratory equipment; and
- (d) Tax exemptions for designated expenditures made by enterprises for research purposes.

d. Accelerating technological transfer through a domestic and foreign patents policy:

(1) Technological transfer contracts submitted for patent registration will be examined in light of the following factors:

- (a) The necessity for importing technology;
- (b) The cost of such technology; and
- (c) The importance to Brazil of the technology being transferred.

(2) The federal entity responsible for regulating industrial property norms is being reorganized to enable the patent service to advise the industrial and research sectors of available knowledge in the public domain.

e. Integrating Industry, Research Centers, and Universities by:

(1) Establishment of university-industry integration centers where training programs can be conducted for the business community, and where the needs of the private sector can be conveyed to the university system, facilitating the joint implementation of research projects.

(2) A program of coordination between research institutes, industry, and agriculture, especially as regards dissemination of research results.

(3) Governmental contracts to universities to carry out regional development studies or applied research of interest to planners.

B. Other Donor Assistance in Science and Technology (IDB and UNDP)

1. IDB: The Bank is presently negotiating with the Ministry of Planning, BNDE, and the CNPq a \$30 to \$35 million capital investment loan for science and technology. It is expected that the loan will be signed in April 1973. The program consists of strengthening nine research and development institutions in Brazil. Approximately 75% of the Bank's loan would be used for the purchase of equipment and materials; 15% for construction; 10% for technical assistance, salary support for additional researchers and miscellaneous program costs. The program would be controlled and coordinated through an office in the Ministry of Planning by representatives from Ministry, BNDE and the CNPq.

One of the nine research institutions, IPT in Sao Paulo will benefit from both the IDB and the USAID projects. Through the IDB loan IPT will receive new equipment for its force measurements and physical metallurgy laboratories. The technical assistance and training provided by the AID loan in quality assurance and in assisting IPT develop demonstration projects in metallurgy will complement the IDB program. Representatives from the IDB and USAID have met on several occasions to exchange information during the development of these programs. Although no other institution is directly involved in both the IDB and the AID loan projects, the creation of Center of Research and Development in Bahia through the IDB loan would complement the Sao Paulo technological extension program in the northeast.

through the World Industrial Property Organization to develop more modern patent searching and analysis techniques and to create a data bank of technical patent information. This project has been delayed until facilities are constructed in Rio.

The second, a \$800,000 UNIDO project, involves technical assistance and training for technicians from the National Institute of Weights and Measures in standards, administration, enforcement, and metrology for agriculture, industry, commerce, education, public health, and safety. The project has been developed and approved by the UN. The GOB, however, has not signed the project agreement. The delay apparently stems from the reluctance of the GOB to assign responsibility for quality control to the National Institute for Weights and Measures. The Federal Republic of Germany has agreed to provide supplementary technical assistance and training to the project.

C. Related USAID Programs in Science & Technology

Since 1966 the USAID has financed a cooperative relationship between the U.S. National Academy of Sciences and its Brazilian counterpart, the National Research Council (CNPq). The São Paulo program had its origins in this joint relationship.

The goals of the CNPq-NAS project included: 1) the identification of those areas of research most vital for the development of Brazil, including recommendation of the types of research and kinds of training personnel and equipment required; 2) strengthening of CNPq as the national scientific institution; 3) development of a national science policy, especially with regard to the training and retention of scientists and scientific research; 4) stimulation of greater investment in Brazilian research; and 5) furtherance of scientific exchange between the U.S. and Brazil.

Four joint US-Brazilian workshops have been held and joint work groups formed to study more intensively the following areas: 1) industrial research; 2) norms, standards, and measurements; 3) agricultural research; 4) agricultural economics; 5) earth sciences; 6) computer sciences; and 7) postgraduate chemistry research and education.

Upon the recommendation of the chemistry work group, USAID has since 1969 financed a project to strengthen Brazil's teaching and research capacity in chemistry. Research projects in ten advanced fields of chemistry, relevant to Brazil's development, were selected by a joint committee and established at the University of São Paulo and the Federal University of Rio de Janeiro.

Many of the concepts and problem analyzes underlying the São Paulo program came out of the joint work group in industrial research.

D. Planning the São Paulo System

Since July 1971 USAID has been assisting the State of São Paulo in designing a system to forge stronger links between industry and the research institutions. Numerous encounters between industry and representatives of industrial associations, financial community, government planners and directors of research institutions were arranged to discuss the basic problems and assist in planning the program.

In the meetings it was recognized that industry and to a large extent government have been indifferent to or unaware of the contributions that research and experimental technology could make to industrial growth. The government planning agencies usually budget on the basis of requests formulated by the research institutions, and the institutions rely upon government subsidies. There has been little incentive for research institutes to seek contracts for research.

Multi-national companies seldom use Brazilian research, preferring to send such problems to home-base laboratories. They do, however, utilize a variety of local suppliers of materials, parts, etc., which are potential users of technical assistance.

Brazilian large and medium industries need EDR and could use the institutes. Small scale firms on the other hand do not seem to have the management know-how to recognize technical problems nor to seek assistance when problems are recognized. The attitude of those firms toward applied research institutes can be generalized as follows: Lack of confidence in the ability of research institutes to serve them in a reasonable time and at a realistic cost; wariness of the research institute government relationship which could result in disclosure to government agencies or competitors of potential patent possibilities, technical secrets, or management information; lack of interest in research results until these have been carried through a pilot or demonstration plant phase, and the production, economic, and marketing problems have been resolved.

As a result of those meetings the basic formula for a new system was developed, and stronger relations between industry, government, the financial community and research institution began to emerge.

The basic idea is to begin with specific problems or opportunities in industry and agriculture and to organize a system of resource allocations to assist the private sector to resolve the problems. At the time of the initial USAID involvement, the state had had a decree on its books for 4-1/2 years authorizing the establishment of a State Council of Technology. In August 1971, the state invested this council with a combination of highly qualified representatives from industry, government, the state development bank, research institutions, and the university.

Relying heavily on contacts with industry and on market studies in several fields, a preliminary model of the new system was developed, and in September 1971 the State Secretary of Economy and Planning and the USAID Program Evaluation Officer travelled to Washington to discuss the details of the system with the staff of the National Academy of Sciences.

In December 1971 USAID received an official request from Governor Laudo Natel for financial support for the new program. In responding, the Mission offered the state two groups of experts to assist in planning, programming, and

evaluating the proposed project.

The first group, selected with the assistance of the National Academy of Science in Washington arrived in February 1972. The group of six experts and two NAS staff visited all the major installations involved in the project and met with over 60 Brazilian scientists and engineers and with the Federation of Industry in São Paulo. This group endorsed the overall program.

Both US and Brazilian experts also endorsed the creation of a fund to finance contracts between industry and the research institutions. One month later the State of São Paulo established the Fund for Science and Technology within the Development Bank of the State of São Paulo, and shortly thereafter the GOB authorized use of approximately \$15 million of joint state and federal government monies to capitalize the fund. A federal/state government agreement permits firms outside the State of São Paulo to contract EDR projects with research institutions in São Paulo.

In the meantime, the State Council of Technology began to employ a technical and administrative staff, and the research institutions began to develop projects for some of the system's components such as information terminals, quality control programs, marketing projects, etc. The institutes also developed proposed demonstration projects in food technology and metallurgy.

Most of these proposals were complete when the second group of U.S. experts arrived to evaluate the program in May 1972. This group recommended that the project be oriented more toward the market, that salary structures of researchers be improved, and that the management capabilities of the CET be improved by experts from outside the civil service system. As a result of these recommendations, the state has programmed the development of a contracted Management Group. This group would assist in the early implementation of the program and in the training of the CET staff to execute their assignments, but it would fade out as the CET staff competencies improve. Additionally, a Market Division will be established in the CET and the two major research institutions will set up marketing departments in both food technology and metallurgy.

The CET has also undertaken a study of the salary structures for researchers, and the University of São Paulo has already moved to liberalize the restrictions on private consulting and research by full-time professors. Legislation improving the salaries of researchers was promulgated by the São Paulo State Legislature prior to the end of 1972.

As a result of these efforts, a new set of relationships is emerging between industry, government, and research institutions. Institutes are becoming more conscious of the needs of industry and are becoming more aggressive in pursuing contract research. Industry on its side is cautiously but assuredly vesting new confidence in both the government and the research institutions as manifested by their project proposals which are beginning to flow into the CET for approval of financing. The technical assistance and training proposed in the AID loan project should accelerate this process.

SECTION II - PARTICIPATING SÃO PAULO INSTITUTIONS

The State of São Paulo has the largest and probably the most advanced professional manpower base and technological infrastructure in Latin America.

The major state institutions involved in the program are:

- The State Council of Technology (CET)
- The Institute of Technological Research (IPT)
- The Institute of Food Technology (ITAL)
- The University of São Paulo (USP)
- The State Development Bank of São Paulo (BADESP)

To provide the background necessary to understand the proposed program, each of these institutions is described below.

A. State Council of Technology (CET): The CET was established in August 1971, with responsibility for setting state policies in industrial, agricultural and bio-medical technologies and coordinating the research activities of all public research institutions as well as of private institutions receiving state financial assistance. The CET, assisted by a Management Group, will be the control and coordination center for the proposed program.

The CET is chaired by the State Secretary of Economy and Planning (SEP), Prof. Miguel Colassuone, a former professor of economics and university administrator. The Secretary is responsible for the development and implementation of programs designed to assist industry to increase productivity and reduce costs, increase exports, develop new or improved products, and improve the quality of production. The CET was established to help the Secretary perform these functions.

The Secretary also controls the entire state budget. As a result, he and the CET can apply considerable leverage on the institutions receiving state funds. In total, the state spends nearly \$90 million annually on science and technology.

In addition to the chairman, the CET has ten members, representatives from the Secretariats of Agriculture, Health, and Education, the University

of São Paulo and six members named by the Governor who come from the industrial and financial sectors. 1/

The CET has a permanent staff of 17, consisting of 9 professional and 8 administrative/clerical personnel. The CET also contracts specialized personnel on an ad hoc basis.

The CET budget for 1973 is \$230,000.

Specific functions of the CET are to:

- identify priority economic and social development goals to be promoted by technological research;
- evaluate the industrial, agricultural and bio-medical research institutions, and design programs to further develop those institutions;
- coordinate the programs and activities of state research institutions, state firms and autarchies, state foundations, etc.;
- develop programs to encourage technological research in both the public and private sectors;
- develop programs to encourage the training of researchers, technicians and scientists;
- counsel the state government on subsidies for private research institutions;
- collaborate and exchange information with other public or private, foreign or national entities concerned with technological development;
- raise money from private or public, national or foreign entities to finance technological research for the private sector;

The Secretary and the Council recognize that they lack the experience, systems, and trained staff to perform this list of functions. This is one of the primary motivations for the proposed program. The proposals for developing CET's capability are discussed in Section VI.

1/ Current members include Norman Puggina, Vice-President of BADESP; Affonso Pastore, Executive Secretary of the Economic Research Institute at the University of São Paulo; Alberto Pereira de Castro, Superintendent of IPT; Eduardo Celestino Rodrigues, President of CETEMCO Engenharia S.A. and Director of Cia. Industrial e Agro-Pastoril Vale do Campo Alegre; Jorge de Souza Resende, ex-Secretary of Economic and Planning of State of São Paulo and President of Maquinas Piratininga; and Ruy Agular da Silva Leme, ex-President of the Central Bank of Brazil.

B. Institute for Technological Research (IPT)

IPT was initiated in 1928 as a laboratory of the University of São Paulo. In 1934, as a semi-autonomous institute. It is the leading industrial research institute in Brazil.

1. Role: IPT has the responsibility to provide research and technical assistance to private industry and government enterprise in the State of São Paulo. IPT also provides assistance in other regions of Brazil. IPT performs testing and analyses; develops standards; operates pilot plants for demonstration purposes; and it conducts trouble shooting, consulting, and process or product research.

2. Organization: (See Annex IV-A) IPT is a state entity, reporting to the Governor through the President of the Administrative Council. The IPT Administrative Council consists of representatives of the: Escola Politécnica Faculty (2); Council of Science and Technology (2); Federation of Industries; Institute of Engineering; Secretary of Finance (observer); Superintendent of IPT (ex officio). Members of the Council are appointed for staggered terms by the Governor of São Paulo from nominees submitted by the above organizations. The Council President is elected by the Council.

The IPT Superintendent is selected by the Governor from a list of candidates nominated by the Administrative Council. The Superintendent is assisted by a Vice-President for Administration and is authorized a support staff of seven assistants. Alberto Pereira de Castro is the Superintendent of IPT. From 1952-68, Castro was a Director of COBRASMA S.A. Industria e Comércio. He has served on technological committees and councils at both the federal and state levels and is widely respected for his professional competence and abilities as an administrator. An assistant who deserves mention is José Luiz de Almeida N. Junqueira Filho, who holds a Ph.D. in Engineering. He is a recognized leader in his field, and in 1969-70 was invited to the University of Texas as a visiting professor of aerospace engineering. He is Director of the Information Research Center and Scientific Documentation Division of IPT.

IPT has several operating divisions (Civil Engineering, Mechanical Engineering, Metallurgical Engineering, Chemistry and Chemical Engineering, Mining and Geology, Mineral Processing, Wood and Paper, an Administrative Division, and an Information Research Center. The Division directors constitute an Advisory Committee to the Superintendent.

IPT is planning to establish a Technical Economics Division as soon as staff, now in training, have returned. Groups on Planning and Control, Internal Projects Evaluation, New Area Development, and Quality

Assurance are also being created to work on an interdisciplinary basis with the operating divisions. Those groups will receive assistance from the CET as needed in developing their capabilities and will, in turn, develop the capacity to train individuals from other institutes in São Paulo and throughout Brazil.

3. Financial Resources: The 1971 IPT budget was \$5.3 million, seventy percent of this amount came from the state budget, thirty percent from contracts, grants, and services for industry and government enterprise. Earned income from contracts has increased from \$500,000 in 1969 to an estimated \$1.7 million in 1972. Legally, such earned income must revert to the State Treasury. By permission, however, the IPT Superintendent is able to spend the income on pre-arranged services or equipment. He is not able to accumulate or carry over a surplus. Thus, he has limited opportunity to manage earned income to build up the institution. But IPT is preparing a proposal to the Governor requesting changes in the IPT charter which will exempt IPT from civil servant status and permit full management control of earned income.

4. Staff and Qualifications: IPT's staff and their qualifications are indicated in the following tables:

Personnel as of December 1971

<u>Departments</u>	<u>Professional</u>	<u>Non-Professional</u>	<u>Admin.</u>	<u>Total</u>
Superintendence	11	-	14	25
Civil Engineering	35	103	25	163
Mechanical Engineering	29	41	7	77
Forest and Wood	22	48	4	74
Metallurgy	38	79	11	128
Mining and Geology	41	59	43	153
Chemical Engineering	40	61	9	110
Mineral Treatment	7	17	4	28
Administration	<u>11</u>	<u>142</u>	<u>54</u>	<u>207</u>
TOTAL	234*	550	171	955

* 250 Professional in 1972

Academic Background of Professional
Personnel

<u>Departments</u>	<u>With Academ. Experi.</u>	<u>Ph.D. Degrees</u>	<u>Master Degrees</u>	<u>Studying for Ph.D.</u>	<u>Studying for Master</u>
Superintendence	3	2	0	0	4
Civil Engineering	2	2	4	1	18
Mechanical Eng'g.	2	1	1	0	11
Forest and Wood	1	0	6	1	4
Metallurgy	3	4	5	2	10
Mining and Geology	4	4	3	2	11
Chemical Eng'g.	3	2	4	3	14
Mineral Treatment	1	1	0	1	5
TOTAL	19	16*+	23**	10	77

* 6 received Ph.D. degree abroad

** 3 received Master degree abroad

*+ Increased to 25 Ph.D.s in 1972.

IPT's work has included: (1) Analyses, tests, and certification for industry in areas such as Civil and Mechanical Engineering and Chemistry. 17,000 certificates were issued in 1970; 25,300 in 1971; and a projected 30,000 will be issued in 1972. (2) Reports requested by industry on the solution of problems such as: identification of causes and remedies for failures of parts and components; erosion protection; problems of surface coating and painting; problems related to vibration, buildings, and machines, etc. Reports totaled 411 in 1970 and 484 in 1971.

Additional activities undertaken by IPT include contracts for research and technical assistance with government agencies, government enterprises, and industry. These activities totalled 85 in 1971/72. Consultation, opinions, and information provided to industry amounted to 221 in the same period. Lastly, research publications completed equalled 86 in 1971.

IPT's general fields of competence include applied chemistry; applied physics, engineering, operations research, productivity studies. Specialized fields of competence are Civil Engineering; Metallurgy including sintering and pelletizing of iron ores, ferrous and non-ferrous foundry development, and physical metallurgy; non-metallic minerals; elastomers; forest products; wood preservation, pulping studies, Mechanical Engineering and Naval Engineering.

IPT staff participate in committees organized by both industrial associations and government entities. They participate also in government councils such as the National Research Council (CNPq), the National Industrial Development Council (CDI), the State Council of Technology (CET), and the State Forestry Council.

Aside from doing much of the ground work for testing methods and materials, the IPT proposes some specifications. On the assumption that the establishment of technical societies would improve industry, IPT has helped in the organization of the Brazilian Society for Metals (ABN), the Brazilian Society of Ceramics (ABC), the Brazilian Society for Soil Mechanics (ABMS), the São Paulo Society for Applied Geology (ABGA), and the Brazilian Society for Wood Preservation (ASP). The staff of IPT participates in the seminars and congresses of these societies.

C. Institute of Food Technology (ITAL)

ITAL was started in 1963 as a Laboratory of Food Technology in the Agronomic Institute of Campinas. In 1969, it became an independent organization.

1. Role:

ITAL plays the following roles in the São Paulo system of research institutes:

- Promotes research and application of new techniques in preparation, storage, processing, packing, distribution, and utilization of foodstuffs.
- Cooperates with universities in the training of food technology specialists.
- Cooperates in the training of middle level technicians.
- Trains industry personnel, students, and graduates.
- Advises official credit institutions on food industry projects.

2. Organization: (See Annex IV-B)

ITAL is a state entity reporting to the Secretary of Agriculture of the State of São Paulo. Annual budget support is received from the Secretary of Agriculture. In addition, the Federal Government supports development of such things as pilot or demonstration plants and new buildings.

UN/FAO provides a consultant in marketing under an agreement scheduled to expire in 1973.

The ITAL Director-General is appointed by the Secretary of Agriculture. He is assisted by a FAO/ITAL Project Director, two Programming and Evaluation assistants, and an Administration and Maintenance chief. In addition, ITAL has three technical divisions: Research, Processing, and Engineering and Planning. The division heads constitute an advisory technical council. ITAL established a Marketing and Economics section in 1970 to collaborate with the technical divisions as well as with industry. Besides, ITAL has recently hired a Ph.D. in Communications who will head a Technological Extension Unit to be established.

3. Financial Resources: ITAL's 1972 budget amounted to \$1.54 million, of which \$1.04 million was operational support, \$167,000 was for facilities and buildings, and \$334,000 (21 percent) was derived from contracts with industry and government agencies.

During the period 1973-76, the ITAL budget is expected to double, with 65-70 percent annual support from the Secretary of Agriculture and 30-35 percent support from private industrial and government contracts. Most of the increase in governmental support will go to technical assistance to other states in Brazil to establish food science projects. The GOB has provided \$100,000 for the buildings to house a meat processing pilot plant and associated laboratories. GOB funds in the amount of \$167,000 are being provided to initiate a pilot fish processing plant. The Federal Research Council is providing equipment for a packaging testing laboratory.

The quality of leadership at ITAL is exemplified by the Director-General, Mr. Agido Gorgatti Neto. From 1963/65 he studied at the University of California, where he received his M.S. degree. He is a young and aggressive leader who has made significant improvements in the ITAL organization since his appointment. He has set up marketing and economics sections to support the technical divisions. He also has planned the technological extension unit which will be responsible for "selling" the services of ITAL to the private sector.

ITAL has conducted analyses and testing in food chemistry, microbiology, and biochemistry. It has done research in such areas as processing of tropical fruits and vegetables; edible oils and fats; technology of bread and flours; industrial fermentation processes; industrial enzymes, and microbiology.

Since 1969 it has had contracts with government enterprise, government agencies, and industry.

Studies have been completed for Brazilian industry in process development, engineering design, economic and marketing analysis.

Technical services and research being offered by ITAL to industry include:

- Chemical, biochemical, and microbiological analysis of agricultural and animal-origin raw materials and their industrialized products;
- Sensorial evaluation of processed foods;
- Quality control of processed products and establishment of standards;
- Research on development of canned food, cold preservation, freezing, fermentation, food dehydration, breadmaking, and noodles;
- Advice on ripening of fruits under controlled temperature and humidity conditions;
- Studies on the feasibility of new production processes;
- Improvement of methods for food products;
- Formulation of high-protein, low-cost foods;
- Improvement of traditional food products;
- Processing of significant lots of processed food product for market trial purposes;
- Specification of equipment, drawing of plans for the establishment of new food industries;
- Short intensive courses for food industry personnel;
- Longer intensive courses for specialized technical personnel, and
- In-training service for professional and industrial personnel.

ITAL has modern facilities and equipment valued at \$10 million in 13 semi-commercial food pilot plants and 13 specialized laboratories.

4. Staff and Qualifications:Personnel as of 1971

<u>Locality</u>	<u>Professional</u>	<u>Tech-Assistant</u>	<u>Administrative</u>	<u>Various Services</u>	<u>Total</u>
Campinas	48	31	40	106	225
Santos	1	1	2	1	5
Nova Odessa	-	-	-	2	2
TOTAL	49*	32	42	109	232**

* 60 professionals in 1972, projected to increase to 75 in 1973.

** 300 total staff in 1972.

Academic Background of Professional Personnel

<u>Speciality</u>	<u>MS</u>	<u>PhD</u>	<u>Post-graduate in country</u>	<u>Training abroad</u>
Agronomic Engineer	9	2	8	13
Chemical	1	-	3	1
Engineer	1	-	1	-
Pharmaceutical	1	-	1	-
Biochemistry-pharmaceutical	1	-	-	-
Biochemist	1	2	-	-
Statistician	1	-	2	-
Librarian	-	-	-	-
Veterinary Doctor	-	-	-	-
TOTAL	15*	4*	15	14

* MS abroad 13

** PhD abroad 3

ITAL conducts 8-12 courses and several seminars each year for the benefit of industry, offering special techniques. This training serves to test the relevance of ITAL capabilities to industry needs, so that these can be incorporated into the ITAL planning process. In fact, plans for the construction of pilot plants for meat and fish processing have evolved from such seminars. Representatives of the meat and fish processing industries have expressed interest in utilizing these facilities when completed.

D. University of São Paulo (USP)

The University of São Paulo was established as an "autarchy" of the State of São Paulo in January 1934. Since then the University has expanded into one of the best all around universities in Brazil. The university has campuses in São Paulo, Piracicaba, Santos, Ribeirão Preto, and San Carlos.

1. Organization: Apart from its administrative structure, the University of São Paulo is decentralized into 11 basic institutes; 10 faculties; 8 schools; 2 hospitals; 4 museums; and 6 associated institutions. The institutes train in basic subject areas; faculties and schools are for specialization in the humanities and professions such as engineering, education, economics.

A number of research institutions are also associated with the University. IPT, for example, is located on the campus. A faculty member of the Polytechnical School serves as a member of the IPT Administrative Board. (However, the budget for IPT is not administered by the University).

USAID has worked with three activities of the University of São Paulo in the past several years. These included the Institute of Economic Research (IPE), the Institute of Chemistry, and the School of Agriculture at Piracicaba. All three have become leaders in their respective fields.

2. Financial Resources: The state spent approximately \$34 million in 1971 to support USP (exclusive of budgets for hospitals and associated institutions).

3. Enrollment: In 1968, the number of undergraduate students from all USP campuses was 15,249; there were 1,487 graduate students. In 1969, total enrollment increased to 20,136 and to 24,061 in 1970.

4. Staff: The full and part-time staff teaching in undergraduate courses in 1968 amounted to:

<u>Subject Areas</u>	<u>Number</u>
Medicine	382
Dentistry	230
Agriculture	176
Engineering	1591
Nutrition	39
Nursing	91
Bio-Medicine	160
Law	70
Philosophy, Science & Letters	577
Library Science	10
Pharmacy	90
Art	65
Architecture & Urban Planning	76
Home Economics	80
Physical & Mental Therapy	60
Journalism	9
Veterinary Medicine	68
Public Relations	6
TOTAL	3780

There are, however, weak spots within some of the major departments. These include business administration (especially in marketing and market analysis), computer sciences and information, quality control techniques, and other specialties in engineering. The university also suffers, as do most universities in Brazil, from lack of involvement in market oriented research. In fact, most of their research efforts are classified as pure or basic. The São Paulo program, with the assistance of the leadership in the university, is determined to eliminate the weak areas and to concentrate more on the needs of the market.

In order to direct the university toward the needs of the industrial and agricultural sectors, the state recently authorized full-time professors to accept consultantships with the private sector or the research institutes. This move should strengthen the university and the links between the professional staff and the market economy. In the Mission's experience with the IPE program at USP, for example, only about 20% of the professors in the program are on a full-time basis. The remaining 80%, although officially paid as part-time staffers, actually spend more time than the full-time staff in the university. The reason is that these part-time employees are involved in contract research for the government and the private sector. This

factor has been crucial in the growth of the institution and its ability to attract high quality students.

E. Development Bank of São Paulo (BADESP)

BADESP began operations early in 1971. Its capital stock of about \$23 million is 98% owned by the State of São Paulo. Its operations are divided into three broad areas:

1. Rural Credit, including reforestation, fisheries, and agro-industry. Industrialization of farm produce for export, with particular emphasis on fruits and tomatoes, is an important objective. Another priority production facility is for orange concentrate.
2. Industrial Financing, providing long and medium-term credit for investment in new plant and in working capital.
3. Financing of Services, including surveys and feasibility studies, research.

In March 1972, a Fund for Technological Development was established within BADESP. The Fund has an availability of about \$15 million to be used over the next three years. Half this amount came from the Federal Government and half from the state.

Eligible projects as defined by the National Development Plan include:

- Research leading to more rapid development of industries with a high technological density such as chemicals, electronics, steel and aircraft,
- Research conducive to the strengthening of Brazilian industrial competitiveness,
- Research to increase the technological and managerial ability of Brazilian business,
- Investment favoring the use of São Paulo research capacity to benefit other parts of the country;
- Research in agro-industry,
- Market research to disclose new market opportunities, especially potential export markets for Brazilian products,
- Programs and projects linking state and federal research work;

- Research and studies for the improvement of quality control and technical standards.

The financial status and lending procedures of BADESP and the Fund will be described in Section V.

F. Other Participating Institutions

Other state institutions will collaborate with the 5 major organizations listed above. Many of the CET functions will be subcontracted; ITAL will work with the Institute of Agronomy, Zoology, and Biology in food research; IPT may collaborate with smaller industrial research facilities.

SECTION III - DESCRIPTION OF SAO PAULO PROGRAM

A. Introduction

São Paulo officials recognize that the state is not receiving anywhere near the potential benefits from its technological plant and research budget. In the words of the Secretary of Economy and Planning, "something must be done to cross the demand and supply curves for technology." In other words, the suppliers of technology must become responsive to the needs of the private sector; in turn, the private sector must use the available technological services. With too few exceptions, the private sector either buys expensive foreign technology (often poorly selected and inadequately adapted) or it drifts into technological obsolescence. On the other hand, the universities and technological institutes go on performing research for its own sake, unaware of or indifferent to the needs of industry.

This problem is not unique to São Paulo. What may be unique is the opportunity to do something about it. São Paulo has a high quality technological base, a dynamic private sector, and an aggressive leadership that is acutely aware of the problems of technological change.

The fundamental proposition of the São Paulo program is that resources should be allocated to science and technology on the basis of known needs and opportunities in the market place. From this it follows that the government should develop a system to identify these basic problems and opportunities, and assist the industrial and agricultural sectors meet their needs through contracts with competent research institutes or university research departments.

As Dr. Harrison Brown, Foreign Secretary of the NAS stated in a letter dated August 7, 1972 forwarding the NAS report to Director Ellis:

"That science and technology have a critical role to play in development process is now part of the conventional wisdom; however, I fear that much too often it is expressed in institutional forms that remain detached from the economy they are ostensibly designed to serve. The central issue is to link the wealth-producing sectors of the economy with the supporting technical services that can contribute to their higher productivity; hence, strengthening supporting technical institutions should be closely related to recognized needs for such services. The alternative course, which has long been the norm, is to create institutional capacity to respond if and when called upon, with the attendant risk of wasting resources and orienting institutional capabilities to useless or irrelevant fields."

The São Paulo program involves the development of a system designed to: (1) orient universities and technological research institutions toward the needs of the market for industrial and agro-industrial goods; (2) provide technological extension services and financial incentives to encourage the use of Brazil's technological facilities by industrial and agro-industrial firms; (3) establish additional technological services particularly in the areas of standards and quality assurance; (4) improve the capacity of the universities and research institutions to provide services required by the private sector and (5) develop the technical competence to plan and coordinate technological activities financed or supported with public funds. The locus of the program is São Paulo, however, the services will be available and used Brazil-wide.

The focus of the program is a combination of institutional and systems development - staff training, improved management systems, new technological services, better overall planning and coordination. At the same time, wide spread private sector involvement in the program will require some "success stories" which demonstrate to the business community that investments in technology pay dividends. For this reason, among others, "demonstration" projects will be undertaken immediately in two priority sectors: Food technology and metallurgy.

In other words, the process of managed technological change will be addressed from both ends: at one end modern systems of planning and coordination will be installed; these generic systems will have applicability to all fields of technology including those outside the scope of the current program; at the other end, the technological facilities will respond to known market needs in priority areas. The São Paulo program, is of course, much broader than the loan which would be designed to strengthen critical sectors where the availability of U.S. expertise could make especially significant contributions.

The remainder of this section will attempt to show what changes are to be made in the participating institutions and how the AID loan will assist in the process. Four AID contracts are foreseen in the areas of research management and planning, food technology, metallurgy and quality assurance. Contracts would be signed with the CET, but the contractors in food technology and metallurgy would be physically located in ITAI and IPT respectively. Some technicians and training programs furnished by these contracts would involve the University of São Paulo and other technological research centers.

B. State Council of Technology

The CET is the hub upon which the entire program depends. Although the Council members themselves are qualified in their respective fields, the staff lacks the experience and training needed to carry out the CET's legal responsibilities, including activities to be undertaken in the new program.

A sine qua non of the program -- and a key task of the AID loan -- will be the organization and training of a first rate staff. The CET plans to establish a separate Management Group (MG) to coordinate the new program. A director and five professionals have recently been designated. See following page for organization chart for CET Management Group.

PROJECTED ORGANIZATION CHART FOR THE CET/MANAGEMENT GROUP

CET

DIRECTOR (Brazilian)
Coordinator (US)

ADMINISTRATIVE SERVICES
Staff: 1 Chief (Brazilian)
1 Administrative (Brazilian)

MONITORING AND EVALUATION
Staff: 1 Chief (Brazilian)

<u>RESEARCH PLANNING AND PROGRAMMING</u>	<u>TECHNICAL ASSISTANCE AND TRAINING</u>	<u>MARKET SERVICES</u>	<u>MANAGEMENT EXTENSION SERVICE</u>	<u>INFORMATION SYSTEM</u>
<u>Functions:</u>	<u>Functions:</u>	<u>Functions:</u>	<u>Functions:</u>	<u>Functions:</u>
<ol style="list-style-type: none"> Identify and Analysis needs. Establish & review research priorities and policies. Advise on allocation of resources. Establish & review criteria for project selection & evaluation. Develop fiscal incentives. Establish & maintain coordination between system components. Establish & maintain contact with foreign sources of technology. Develop decentralized standards reference service. Design & program resources for installation of certification system & reference & testing laboratories. 	<ol style="list-style-type: none"> Develop & review research management training programs. Develop and review formal and on-the-job training programs. Develop and review courses in areas such as quality control, market analysis, info. services, etc. Develop & review seminar, workshop, intern programs in subject areas of concern. Develop & review nonconventional training programs. Program and coordinate international training. 	<ol style="list-style-type: none"> Determine sources to provide market research & analysis serv. Organize & coordinate data collection system Contract Market analysis and forecasts. Develop services for metallurgy & food technology sectors & maintain price and demand data for these sectors. Provide market tend information to planners. 	<ol style="list-style-type: none"> Develop & Coordinate system to analyze management function & contract management consulting services, to institutes and industry Assist in evaluating commercial & economic viability of research proposals. 	<ol style="list-style-type: none"> Develop & coordinate simplified system to provide commercial, econ. & scientific & tech. information. Develop & coordinate system to provide market trend info and research results to users. Develop & coordinate system to store and retrieve standard references & patents for metal and food sectors. Design a general info. network.
Staff: 1 Chief (Braz.) 1 Assistant (Braz.) 1 Ind. Economist (US) 2 Administrative (Braz.)	Staff: 1 Chief (Braz.) 1 Assistant (Braz.) 2 Administrative (Braz.)	Staff: 1 Chief (Braz.) 2 Market Spec. (US) 2 Admin. (Braz.)	Staff: 1 Chief (Braz.) 1 Research Mgt. Spec. (US) 1 Administrative (Braz.)	Staff: 1 Chief (Braz.) 3 Info Spec. (US) 1 Administrative (Braz.)

Total Staffing Requirements: 10 Brazilian Professional; 8 U.S. Professional; 9 Brazilian Administrative = 27
Short-term consultants will be used in areas such as management, standards, markets, patents, evaluation, systems, etc.

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Although the Management Group will have a separate identity, it will work closely with other staff officers of the CET. 1/

It is important to understand that the duties of the CET and its Management Group are policy making, planning, and coordination. They will not have operational responsibilities. They will design systems (e.g. information and quality control) but they will not operate the systems. The Management Group will be relatively small and highly trained. When special expertise is required the CET-MG will use short-term consultants or subcontractors.

Although not operational itself, the CET Management Group must have the authority necessary to implant, regulate, and evaluate the operational programs and systems. In addition to its normative role, the CET will function as a "technological gatekeeper", using its persuasive powers with the federal government to improve fiscal management of the technological transfer process, and with industry to adapt more modern technology. As explained earlier the state budget process is controlled by the Secretary of Planning who is also President of the CET and is responsible for coordinating state programs with the federal government.

The CET must approve all loans made by the Technology Fund of the BADESP. Lastly, the CET will approve all technical assistance provided under the proposed AID loan (or any other sources of assistance). 1/

The contract for research management would cover the following areas:

1. Research planning and programming: Technological forecasting, technological criteria for resource allocations and project evaluation, and coordination with federal planning agencies.
2. Information System: Designing systems to provide to the private sector, to pertinent research institutions, and to planners data on market trends and research results. CET would, however, not operate the system.
3. Quality Assurance: Designing and programming resources to install a certification system and reference and testing laboratories in the major state supported research institutions. The CET would coordinate this program with the Federal Government.

1/ Much of the technical assistance participant training, for example, included in the AID-financed contract with the CET-MG would not be used by the MG, but would be programmed by the MG.

4. Market Research: The CET MG would insure that reliable market data and analysis were available for private sector clients and for research planners. The actual market research and analysis would be contracted with the GVF or other qualified institutions or would be decentralized on a sectorial basis to the relevant institutes. CET would also insure that the technical institutes developed or strengthened their ability to assist industry in certain marketing functions, e.g., product evaluation, design, packaging, etc.

5. Management Extension Services: Designing a system to detect management defects and to provide appropriate management consulting services to private firms where it is apparent that their problems are not solely technological in nature. For example, in reviewing Fund loan applications for private clients, the CET-MG would look at the management as well as technical aspects of the borrower. The service itself would be performed by qualified contractors.

6. Training Programs: CET-MG in collaboration with the University of São Paulo and other participating institutions, will develop special courses in research management, quality control, information sciences, etc. Some of the courses would be for academic credit and others would be short-term workshops and seminars designed for private sector managers and technologists. CET will also program international training.

These functions, like technology itself, are highly dynamic. Designing the various systems is not a one-time job. They must be constantly modernized and adapted as technology evolves and market conditions change. Staff would need frequent "refresher" training. After the 5-year project life, it is expected that the CET-MG would maintain the rejuvenation process without large-scale external assistance.

The AID loan is expected to finance a contract between CET-MG and a competent U.S. research facility or university. The Chief of Party should have high level executive experience in research management with both industry and university affiliated research institutions. Other full-time people would be required in specialized fields such as research management, information systems, and market research.

Short-term consultants would be provided under this contract as required. They would be employed in the analysis and design of systems and in the training of the CET staff. Training would be provided under the contract for promising members or potential members of the CET staff and the Management Group.

The research management contract with the CET will also include assistance to university departments in areas which not only complement

but assure the program's longer range development. This assistance would be provided in the form of individual post-doctoral fellows from U.S. universities to the USP system for developing new specialized fields, modernizing curricula, and strengthening the departments involved.

C. Institute for Technological Research (IPT) and Institute of Food Technology (ITAL)

These two research institutes can be discussed together since the functions are virtually identical even though the sectors are different. Contracts with the CET would assist each institute both in the overall process of institutional development and to work directly on specific engineering, development and research demonstration projects.

There are five general functions which must be strengthened or installed in each institution:

1. Management and Research Planning: The Chief of Party for each contract will assist the superintendent of IPT and ITAL to establish modern research management and planning procedures, including flexible project management systems, planning and evaluation procedures, contracting procedures, cost accounting methods. One of the most important functions of the Chief of Party is to assist the institute in integrating new systems components planned and designed by the CET into the organizational structure of the research institutions.

2. Reference and Testing Laboratories: Although CET will establish the certification system, the actual reference laboratories in the food technology and metallurgy areas would be at ITAL and IPT respectively. The institute staffs would also be trained in testing methodologies and quality control procedures. These services would be made available to industry through the Technological Extension Units (see below) and would also be used to assist other research institutes to develop their testing and analysis capabilities.

3. Technological Extension Units: These units will be basically concerned with selling the services of the research institutes to industry and agro-industry and demonstrating their capability to service industrial needs. The service should substantially increase the amount of contract research for industry performed by the research institutes.

4. Marketing: The Marketing Units in IPT and ITAL will be trained to analyze markets, determine the reasons for acceptability or non-acceptability of products, analyze product usage, etc. For potential new product developments, emerging from laboratory investigations, staffs would be trained in conducting market evaluations before significant investments in pilot plants or prototypes are made.

5. Information Terminals: The collection, storage and retrieval of specific information for the extension, marketing and reference services will ultimately become part of the state technological information network. In the early stages of the project, the terminals would be organized to function on a simple postal, telegraphic and telephone basis, using and organizing knowledge readily available to the users. As the number of terminals grow and users' requirements increase, the terminals will operate with better equipment and ultimately become part of the state technological network. In at least one research institute, staff will be trained to organize and develop information systems for industry, as well as to provide technical services to the state in the development of new information facilities.

As mentioned above, CET, and especially IPT and ITAL, are determined to demonstrate rapid and impressive results in solving specific technical problems of interest to the private sector. In addition, many of the general functions listed above can best be "learned by doing" rather than through the design of abstract systems. For example, the design of a workable information system, capable of delivering technical and market data relevant to a specific problem or a specific client, can best be derived from practical cases.

Some of the demonstration projects, now in the planning stage, all of which are of interest to the São Paulo industrial community, are the following: 1/

(IPT) Explosive Cladding, Forming and Welding processes have been used in the United States for a variety of needs including metal laminates for U.S. coinage, seamless unwelded tank ends, welding of oil pipelines, etc. The process utilizes the force effects of small quantities of commercially available industrial explosives to reform metal plates or sheets into controlled shapes, to laminate dissimilar metals such as titanium or stainless steel on steel or bonding of lead to steel, and in welding large cross-country oil and gas pipelines. The potential users in Brazil include manufacturers of fuel and processing tanks and vessels for the chemical, petro-chemical, petroleum and food industries, and for cross-country oil and gas pipelines. The process is relatively simple and its use by industry would not require extensive capitalization.

(IPT) Weathering Steels: Weathering steels contain additives which result in formation of a rust-resistant coating which reduces costs of maintenance and improves mechanical properties which make possible the use of lighter steel segments for architectural and construction applications. Unlike galvanized steels, the weathering steels are weldable. The potential uses in Brazil include power transmission lines, building exteriors and construction, highway guard rails and bridges. At present, there is no capability for producing weathering steels in Brazil nor elsewhere in Latin America.

1/ See Annex V for more complete summary of demonstration projects.

It is necessary to evaluate the effect of Brazilian atmospheric conditions on the properties of weathering steels; to investigate process adaptations of available foreign technology which are necessary for utilization of Brazilian raw materials and for modification of existing steel industry production operations; and to develop weathering steels peculiar to Brazilian raw materials and needs.

(IPT) Surface Quality Steels: The physical and mechanical properties of thin-gauge steel sheets, particularly surface conditions, are crucial to utilization of these materials in fabrication processes. The sheet surface condition may be influenced by contaminants in the molten metal or in the cast ingot, from the process of transformation of ingot to plate or sheet, or during forming into a finished shape. This surface quality influences the corrosion resistance of the fabricated items. The ability to form such components efficiently, for example, auto bus bodies, appliances, etc., with a high degree of quality is also largely influenced by surface conditions.

The Brazilian steel industry cannot produce good quality draw and deep draw steel sheet. Properties are erratic. For some unknown reason, Brazilian sheet steel surfaces corrode more rapidly than do equivalent sheets from the U.S. and Europe. The price of such sheet is frequently higher than better quality sheet imported from Japan. While Brazil exports some sheet (approximately 10% of the 1970 export volume of steel products), the quality imposes constraints on potential exports of automobile bodies, etc.

(ITAL) Processed and Fresh Meat Products. Fresh meat processing involves carcass classification and codification, tenderizing, aging, and refrigeration. Industrial meat processing involves increase in use of blood and glands in processed meats and the utilization of other animal protein (fish or fowl) or vegetable protein in order to decrease cost without decreasing nutritive value. Processed meat must be boned, cooked and canned, frozen or packed. In order to improve the quality of meat and increase growth rate, the quality and quantity of pasturage feeds and silage must be improved. Further standards, control measures, and techniques for the preparation of cooked and frozen meat products are required. The project will be a cooperative endeavor involving ITAL, the Agronomic Institute, the Biological Institute, and the Zoological Institute.

(ITAL) Industrialization of Fishery and Marine Resources: Industrialization of marine products requires application of technologies for freezing, salting, drying, dehydration, canning and other forms of preservation, to meet the needs of both the domestic and export markets. Techniques for use of by-products as well as techniques to use fishery residue and other marine resources in agriculture can be developed. The industry also needs better understanding of marine species of commercial value, improved methods of harvest and handling and storage capability.

(IPT and ITAL) Packaging Materials and Containers: There are no facilities in Brazil to determine packaging properties or the interaction of these with food products. Thus, IPT and ITAL will develop a collaborative program on packaging. The former will be concerned with materials, and the development of special packaging processes for producing packages; ITAL will be responsible for testing and evaluation of the package materials for the food industry.

Two of the expected four major contracts with the CET, financed by the AID loan will involve IPT and ITAL. The U.S. contractors would be universities or research facilities with special competence in the sectors of metallurgy and food technology respectively. Each U.S. contract would have a core-staff of research managers, supplemented by both long and short-term expertise in specialized areas. The U.S. contracts would also include funds for staff development, i.e., conventional and non-conventional participant training in the U.S.

Whenever U.S. technicians worked on projects for specific clients, the costs of their services (or a reasonable share thereof) would be billed to the client, exactly as in the case of the Brazilian staff.

Although the prime U.S. contractors would be principally located in IPT and ITAI, individual technicians could be assigned to other technical institutes or to university facilities whenever this is required for the solution of specific research problems, e.g. Zoological Institute in the case of meat products, Univ. of São Paulo engineering and physics departments in the case of metallurgy.

D. The University of São Paulo (USP)

The professional and laboratory facilities of USP are indispensable to the success of the program. Also, although USP would not be party to an AID-financed contract, it would indirectly benefit in a variety of ways. At least five of these ways can be listed:

1. Specific Technological Research Projects, usually but not necessarily in collaboration with an institute such as IPT or ITAL. This collaboration might involve only individual professors or entire departments. University regulations have recently been liberalized to permit professors to accept outside contracts with remuneration.

2. Development of Courses in research management, quality control, market research, etc. Some of the courses would be for academic credit; others would be short-term workshops. Course development would be done in collaboration with the CET-MG.

3. Market Studies and Economic Analyses of concern to CET-MG would frequently be done by the USP's Institute of Economic Research. On occasion such studies might also be done for private sector clients.

4. The Information Systems would involve the University's School of Communications and Computer Center. In designing the systems, CET-MG would draw heavily on these facilities.

5. Faculty Up Grading. The foundation of the entire program, in a certain sense, is the various university departments - engineering, physics, chemistry, biology, economics, administration, communications, etc. - which produce the needed professional manpower. CET-MG, which will have a substantial amount for participant training in its AID-financed contract, will be alert for strategic opportunities to upgrade faculties through participant seminars, visiting professors, special seminars, etc.

The University would draw upon the CET contract for post-doctoral fellows to assist in faculty upgrading and curriculum development. The Mission has tried this innovative technique in institution building in the NAS/CNPq chemistry program where it has proven usually effective. This program enjoys great prestige among professors and students alike and bears replicating under this proposed program. An innovation in the present proposal is that the post-doctoral fellows may spend part time doing research in the research institutions with promising Brazilian graduate students.

E. São Paulo Development Bank (BADESP)

Although the proposed AID loan has no direct role in BADESP, the indirect effects are worth mentioning. (BADESP's role in the program is described in Section V and VI). As indicated earlier, the revolving science and technology fund administered by the Bank is essentially a risk venture operation which finances research contracts for industry and research institutions. Contracts may be for marketing research or engineering, development and technological research. Although this fund is risk oriented, it is expected that as the volume of risk contracts increase, the demand for funds available in other lines of credit such as equipment, including imported equipment, would increase and at the same time the risks associated with these loans would decrease. This effect would occur because the AID loan would provide better market facilities as well as improving capabilities in the overall selection and adoption of new technology for Brazilian industry and agriculture.

F. Functional Analysis of Program:

The Government of São Paulo has already made a preliminary "test run" of the system which produced two research projects between agro-industrial firms and a research institution. In the two cases, the CET obtained information on potential export market opportunities for tomato paste and canned pineapples. How could Brazil exploit these opportunities? The CET contacted a research institution to analyse the

problems and identify potential solutions. Then CET brought together representatives from agro-industrial firms and the appropriate state institutions. Two firms were interested and worked with the technicians from the research institution in developing project proposals which were subsequently submitted to the CET.

The Council is in the process of reviewing and approving these proposals. The proposals will then be forwarded to BADESP where an evaluation of the financial integrity of the firms will be made, loan documents prepared and disbursements made to the research institutions to implement the projects. It is interesting to note that these two projects will be the first private sector contracts ever made by the Agronomic Research Institute of Campinas.

Under this system, proposals could also originate directly from the firms or other research institutions. The sequence described above would remain basically the same; the major difference being in who repays the fund. A Chart showing how the components fit together to identify projects, analyze proposals, search and find potential solutions, develop concurrence of the participating firms, research institutions and financial entities, implement the EDR project, classify results, transfer technology to firms and follow up with subsequent evaluations and audit is attached in Annex VI.

SECTION IV - PROBLEM ANALYSIS AND ASSISTANCE STRATEGYA. Role of Exports and Technology1. Introduction

The permanent goal of the Brazilian Government is to maintain the rate of economic growth achieved in recent years when GDP increased by an average of 10% in the 1968-72 period. On the basis of this rate, and assuming a 3% population growth rate, a country can double its per-capita income in about 10 years. The First National Development Plan, 1972-74, calls for a doubling of Brazil's 1969 per capita income of \$445 by 1980. The Government is also concerned with the participation of the population in the growth process through productive employment and a more equitable distribution of income. In Annex XI, Exhibit A the aspects of income distribution and employment are discussed in regard to this project.

2. The Importance of Export Growth

The projected rates of growth for the Brazilian economy will require exports to grow very rapidly in the future. This will be necessary in order to maintain the economy's capacity to import and to service the foreign debt. Notwithstanding the implementation of strong import substitution policies the proportion of imports to gross domestic product has not declined since the early fifties. The composition of imports has shifted sharply from non-durable consumer goods and intermediate goods to durable consumer goods and capital goods, but the relative importance of imports in the total supply of goods has not changed. In absolute terms imports have recently risen very rapidly, by 26% in 1970 and 30% in 1971. This growth helped to convert a commercial account surplus of \$232 million in 1970 into a deficit of \$346 million in 1971. Despite current account deficit of \$1.3 billion in 1971, Brazil increased its foreign reserves in that year by \$.5 billion, on account of a net inflow of capital of \$1.8 billion, which raised Brazil's foreign indebtedness up to \$6.6 billion at the end of 1971. The inflow of capital increased substantially in 1972 and the foreign debt is estimated to be very close to \$10 billion at year-end.

1/ Ministry of Planning, 'First National Development Plan', Brasilia, September, 1971, pp. X, XI, 16, 53.

2/ Non-durable consumer goods and intermediate goods declined as a percentage of total imports from an average of 72.4% in 1955-60 to 59.1% in 1965-70 while durable consumer goods and capital goods increased from 27.6% to 40.8%. The import coefficient (ratio of imports to GDP), however, has fluctuated within one or two points of .07 ever since the early fifties.

Projections by the World Bank illustrate the sensitivity of import growth to a small acceleration in an already rapid GDP growth. ^{3/} If exports are to continue to grow at 10.8% annually (as they did from 1966-70) and GDP is to grow at 7.5 percent annually, from 1971-77, imports are projected by the Bank to grow at 9.3 percent a year. But if GDP is to grow one percentage point faster, at 8.5 percent, the Bank projects a much higher import growth rate of 11.6 percent.

If the World Bank's analysis is reasonably accurate, maintenance of GDP growth in the 9-10% range called for in the Plan could lead to a serious deterioration in external liquidity unless total exports increase at a rate close to 15% a year rather than 10.8%, a boost of 2-3 percentage points.

A key element in Brazil's export strategy is to increase the exports of manufactures. ^{4/} In view of the required growth in total exports, manufactured exports will have to play an important role in making possible that 2 to 3 percentage points boost in total export growth. The Development Plan posits a continuation of total and manufactured export growth at rates over 10 and 20%, respectively. But since manufactures still account for only 15% of total exports, they will have to grow considerably faster than the 20% growth rate called for by the Plan in order to boost total export growth by one or two percentage points.

Exports of manufactures have been stimulated by a wide range of fiscal and financial incentives to exporters of manufactured products. Fiscal incentives include exemption from Federal manufacturers' excise tax (applied since 1965), deduction from taxable income of profits earned on export sales (applied since 1966), and duty "drawbacks" providing for exemption from (or tax credit for) duties paid on specified imported inputs used in manufactured exports. Special lines of long short-term credit have been provided through the Bank of Brazil, the commercial banks, and the Government's Export Financing Fund (FENEX) for financing both production and sale of manufactured exports of consumer, intermediate, and capital goods. According to the most recent World Bank Report on Brazil (Volume I, November 30, 1971, p. 104), this credit is extended "frequently at heavily subsidized rates". Recent additional incentives include exemption from value-added taxes levied by state governments, and

^{3/} World Bank, Current Economic Position and Prospects for Brazil, Vol. 1, November, 1971, pg. 122

^{4/} Annex VII, Exhibit A contains data on the structure of Brazilian export growth.

a credit (payable in cash) against taxes on domestic production equal to a maximum of 15% of the FOB value of manufactured export sales.

3. Brazilian Exports and Constraints on Future Growth

a. Export Performance

Manufactures have grown phenomenally from a very low proportion of total exports (about 2% in the early 60's) to almost 15% in 1971. From 1965 to 1971, manufactured exports have grown at an annual compound rate of 25%. The rise in Brazilian exports was induced in part by the incentives mentioned above, which greatly increased the profitability of producing for exports, and in part by the steady increase in international demand. The Brazilian authorities are eager to maintain this expansion into external markets since until very recently the Brazilian position has worsened in this respect. For example, Brazil's share among its 18 largest importers dropped from 3% in 1953 to 2% in 1967. During 1964-67 total imports by those countries rose by 7.7% per year, whereas in 1964-68 Brazilian export to the same countries rose by only 5.0% per year. 5/ This decline reflects Brazil's record as an exporter of primary products, whose demand has a low income elasticity; that is, the consumption of these products tend to increase proportionately less than the income of their consumers. This indicates the need for export diversification towards products with a higher income elasticity of demand, namely, manufactured products.

Until quite recently most of Brazilian exports of manufactures were produced with existing production capacity owing to the contraction of the internal market caused by price stabilization policies. This fall of internal demand and growth of exports was examined by IPEA economists through econometric analysis and interviews with exporters. Using quarterly data on the exchange rate, industrial production, and an index of capacity utilization, the elasticity of manufactured exports with respect to capacity utilization was found to be -2.3. 6/ This variable had a larger explanatory power than total production or the rate of exchange. For 1965-68 data in the table on the next page help to illustrate the point.

5/ Doellinger, C. V., et. al., "Exportações Dinâmicas Brasileiras, Ministry of Planning, IPEA, Rio de Janeiro, 1971, p. 37.

6/ Doellinger, op. cit., p. 31. The meaning of this elasticity is that a one-percent decline in capacity utilization was associated with a 2.3 percent increase in manufactured exports.

Annual Rates of Growth of Industrial
Output and Manufactured Exports

	<u>Industry</u>	<u>Exports</u>	7/
1965	4.7	68.8	
1966	11.7	- 1.2	
1967	3.0	35.8	
1968	15.5	- 2.4	
1969	10.8	41.0	
1970	11.1	52.2	
1971	11.2	40.1	

Source: GVF and CACEX

In the post-1968 period the Government intensified substantially its export promotion policies. Consequently, the profitability of exports relative to production for the domestic market must have increased significantly. According to the IPEA study, exporters in this period indicated they were more inclined than in the preceding period to consider exports as a permanent activity. The data above for 1969-71 tend to confirm this view.

That incentives have made production for exports at least as profitable as producing for the domestic market is illustrated by data in the following table. The calculation and data are from IPEA ^{8/} and refer to selected products for which costs and prices were available in 1970. The first column presents

7/ The products included here are those classified by CACEX in the NEM classes 5, 6, 7, 8 and part of 2 and 4. They include chemicals, pharmaceuticals and similar products; machinery, vehicles and accessories; products classified by the main raw-material input; sundry manufactured products; some prepared raw materials and some food-stuff and beverages.

8/ Doellinger, op. cit.

the ratios with no export incentives and the second column with fiscal incentives (exemption and tax credits for the IPI - industrialized products tax, and ICM - the tax on the circulation of merchandise). A ratio equal or greater than one indicates that external trade is more attractive than internal trade.

Rates of Comparative Return

(Export Profit/Profit from Sales in the Internal Market)

1970

(Ratios)

	<u>No Incentives</u>	<u>Incentives</u>
Menthol (crystalized)	- .78	.76
Steel Plates	- 1.22	- .31
Jute Textiles	.13	1.36
Orange Juice	- 2.26	1.23
Sewing Machines	- 2.88	.33
Radio Tubes	- 5.85	.92
T.V. Tubes	- .52	1.41
Wood Boards (compensated)	- 1.80	1.04
Dry Batteries	- 2.00	- .12
Tires	- 2.08	.70
Typewriters	- 5.34	- .21
Food Blenders	- 5.76	1.34

The sample of products presented above is obviously too small to permit definite conclusions on the profitability effects of current incentives beyond what can be inferred from the actual results of export performance. The data indicate that for some products the profitability of producing for exports largely exceeded that of producing for the domestic market. In some cases, however, the relative export profitability is still low (less than one) or negative.

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b. Constraints on Further Growth

While Government incentives to exports in Brazil may be considered to have been greatly responsible for the remarkable growth of Brazilian manufactured exports, there may be doubts about the extent to which exports of manufactures can reach a stage of self sustained growth solely on the basis of fiscal incentives. On the one hand there are clear limitations on the Government's capacity to further increase its incentives to exports. On the other hand, while export incentives can be justified on the basis of the infant industry argument, they clearly represent a missallocation of resources if they have to be perpetuated in order to maintain a certain level of exports.

Thus, constraints on the supply side of Brazilian manufactured exports may be expected to become significant as the effects of Government incentives level off and Brazilian exports meet increasingly difficult test for prices, quality control, design, packaging, etc., in the highly competitive markets of abroad. Constraints may also appear in the form of entrepreneurship, certain raw-materials, and knowledge about foreign markets. Some of these constraints are reviewed in the following paragraphs. 9/

1) Entrepreneurship - One striking characteristic of manufactured exports in Brazil is the concentration of the export business in a few firms. Eleven firms export about 50% of the total; 3 state-owned steel companies, account for 25% of total exports; 3 international firms producing data processing equipment, electronic data processing equipment, electronic tubes, and typewriters, for 13% of total; and 5 national firms, including a steel company, and alcohol and menthol producers account for another 13%. About 25% of the foreign companies in Brazil, which are concentrated in the most dynamic sectors of manufacturing, 10/ are exporters, but only half of them have annual export values of more than \$25,000.

The concentration of the export business and the large participation of the foreign companies highlights the shortage of entrepreneurs in the export business, the importance of which was stressed in a report by the World Bank. 11/

9/ Based on information in Doellinger, et. al., op. cit. and Exportações de Manufaturados, Ministry of Planning, IPEA, Rio de Janeiro, 1971.

10/ Such as metallurgy, mechanics, chemicals, among others.

11/ Current Economic Position and Prospect of Brazil, Vol. III: Brazil's Exports of Manufactures, November 1971

... "exporting requires more such skill than does production and sale for the domestic market, it requires experience in selling different products in widely different countries, knowledge of foreign consumer tastes, familiarity with trade regulations, flexibility, ability to modify production lines, effect representation in different world centers, etc."

2) Technology and Markets - The most dynamic Brazilian manufactured products (largest recent growth) have been menthol, mint oil, and tanning and dyeing extracts; food products; certain data processing equipment; typewriters; machine tools; electronic tubes; graders; elevators; road rollers; certain vehicles; principally buses; steel products; and textiles. The principal problems affecting the exports of these products are briefly reviewed in what follows:

In regard to chemicals, the supply of raw materials constitutes the major difficulty. This applies also in part to food products, among which there is a great export potential in tropical food and meats. For some types of tropical food, the product technology has been studied at some length, and results could be applied if the marketing problems were properly analyzed and resolved. Thus market research will be of great importance in this area in the near future. The development of the meat industry on the other hand requires considerable more additional research, aimed in part at increasing the supply of cattle. As to data processing equipment technology and exports are entirely dependent upon one international company's technology and marketing capabilities. Similar conditions apply to typewriters. Perhaps the most interesting export case among machines is that of machine tools, in which lathes predominate. Of \$2.9 million dollars exports in 1969, lathes accounted for \$2 million. The principal exporter (88% of total export value) is a private national company using national technology and patents. Latin America and the U.S. are the principal importers. The Brazilian lathe is the conventional type, falling in the lowest technological brackets (export value of US\$1.5 per kg., compared to imported lathes valued at US\$4./kg.). The principal competitor in this bracket is Spain, but competition from other developing countries is expected. Thus the future of Brazilian exports for lathes is conditioned upon technological advances to reduce production costs of the traditional types and/or incorporate automatic, copying, and control devices. With respect to electronic tubes, their principal market is the market for spare parts and as such the export prospects for those are not very bright. In regard to other machinery and equipment, the principal problems are technological. Exports of steel

products, which account for 90% of Brazilian exports of metallurgical products, have fluctuated considerably as function of internal demand. Brazil has comparative advantages in steel in terms of iron and labor inputs, but faces considerable problems in regard to quality and standardization.

The preceding paragraphs indicate the close association of the technological problems affecting Brazilian exports and the market for these exports. Thus marketing and market research emerge as important components of the technological constraints upon future export growth. In regard to existing export markets, problems of quality, costs, and standards clearly have greater relevance. In regard to new markets, particularly in industrialized countries, considerable effort in upgrading the technological content of Brazilian products may also be essential. As recognized in the IPEA study^{12/} this effort must be concentrated in certain strategic areas in view of the size of the present technological gap, the rapid advance of technology in the developed world, and the scarcity of resources. The principal sectors identified by IPEA include: food products, wood products, agricultural machinery, machine tools, and steel products.

The foregoing analysis indicates therefore the need for Brazil to pay serious attention to the technological aspects of its manufacturing industry if exports of manufactures are to become a steady source of economic dynamism. Improved technology means higher productivity, which if passed on to the consumers in the form of relative price decreases will widen internal market as well, thus enlarging the base for further product cost reductions; it also means better quality products capable of meeting world market standards.

^{12/} Doellinger, op.cit.

4. The Supply of Technology: Internal Production vs. Importation

Nearly all the technological advances noted in the Brazilian growth process are of foreign origin. Confined to the most readily available and easily applicable technologies, these advances have been incorporated into the productive system with little adaptation. Little progress has been made in the Brazilian production of new techniques required for industrial growth.

Thus the process of technological change in the Brazilian economy has not been paralleled by development of an internal capacity for generating technical knowledge. Otherwise stated, Brazilian industry has been dependent for technical change upon the results of research developed abroad. In terms of its capacity to meet the research needs of its production establishment, Brazil is backward, despite the dimensions of its industry and the many institutions dedicated to scientific and technical activities. For 1969/70 it is estimated that Brazil's expenditure for science and technology were between .2 and .3% of GNP as compared to 3.4% in the U.S., 1.5% in Europe and 1.4% in Japan (these figures are for 1963/64). The latter country, an export oriented economy, applies in R & D about \$4. for each \$1. spent on the importation of technology. In Brazil the ratio of R & D expenditures to imported know-how is less than one.

Brazilians have become increasingly concerned about dependence on the technologies developed abroad. A lagging technological structure has come to be viewed in Brazil as a critical developmental bottleneck. First because it impedes the improvement of the competitive capacity of the Brazilian industry and deters export growth. Second, it reduces the economic benefits of exports, since the Brazilian producer is not able to incorporate into his product technical advances that could increase the unit value of the product shipped abroad. Third, lagging indigenous technology results in misallocation of resources. For example, most of the technology that has been imported by Brazil came from the U.S. and western Europe which have a tradition of labor-saving technological advances. But Brazil has a fast growing labor force.

These concerns have been expressed by various Brazilian Government officials in the recent past and are reflected in the assessment and design of an strategy for scientific and technological development as spelled out in the more recent Brazilian economic and social development plans.

The Brazilian dependence on foreign scientific and technological research and the weakness of Brazilian research institutions may be viewed as a result of the intensive process of import substitution industrialization, which greatly neglected the development of an indigenous ability to select, generate and adapt technology.

Until early this century industry was not an important activity; the dynamic sector was the export of primary goods. After World War II there was a spurt of industrialization and around the mid-fifties rapid and diversified industrialization became an important government goal. The import substitution industrialization that was underway was further promoted through very strong protective policies, complemented by favorable treatment of both domestic and foreign direct private investment. Under these circumstances the typical firm simply took advantage of an existing market for a particular product, for which purpose it was far more profitable to import than to develop technology. The opportunities to improve local technological competencies were missed, because inflation weakened internal competition and firms were unaffected by international competition (a more detailed description of the development of Brazilian industry and technology is provided in Annex VII Exhibit B).

The question now, given Brazil's new strategy of development via export growth, is to know the extent to which there should be an increasing substitution of internal production of technology for the importation of know-how. The economic criterion for answering this question is the rate of return from each dollar invested in internal R & D as compared to that invested in the purchase of foreign technology.

Since a country tend to export along the lines of its comparative advantages, which are greatly influenced by the country's internal price structure, investment in R & D would have a higher pay-off than the importation of know-how whenever the domestic research project is aimed at economizing the country's most scarce or maximizing the use of its most abundant resources. This would not be the case if the country faced resources price distortions, making its price structure approaching that of the seller of technology. Insofar as the price distortions introduced in the Brazilian economy by the past development along the lines of import substitutions still persist, the case for local production of technology could not be made.

Regarding the current situation in Brazil with respect to the structure of factor and other prices, it may be observed that although some distortions still prevail, there has been considerable progress in correcting them so that investment for the internal production of technology tends to become considerably more profitable than the importation of know-how. One of the principal distortions was the level of protection. Joel Bergsman has estimated the average level of protection on manufactured products to have been 99% in June 1966, 48% in April 1967, and 36% in July 1970. Levels of effective protection were respectively 254%, 117%, and 121%, thus, a small increase in 1970 relatively to 1967. ^{12/} Another distortion was in relation to the price of capital. Capital continues to be subsidized in relation to industrial investment in the Northeast (34/18), import-substitution projects and certain lines of export financing. Recent legislation, however, has shifted part of 34/18 funds to agriculture and land reform projects under the PROTERRA and import-substitution projects benefiting from import exemptions tend to decline relatively to total private investment as the opportunities for import substitution have been substantially reduced in the last 10 years. On the other hand, current rates of interest in Brazil today are considerably high in real terms relatively to rates in other countries and by and large are fairly close to the opportunity cost of capital, which has been estimated to be somewhere between 15 and 18% in 1970. ^{13/} Rates of interest on loans to non-agricultural business in Brazil, in real terms, which were negative until 1966, have risen sharply since then. In 1969 real rates varied from 8.4 to 19.3% (the lower rates apply to short-term commercial credit and the higher to personal borrowing and medium-long term private financing). ^{14/} In order to prevent these rates to reach unacceptable levels Brazilian authorities have been reducing the nominal rates in correspondence with reductions in inflation. Recent Central Bank resolution set nominal rates between 16 and 29%. ^{15/} If the government target of keeping inflation down to 12% in 1973 is achieved, real rates would fall between 4 and 15%. Rates to asset holders have become very attractive for both the national and foreign savers, as reflected in the substantial rise in the domestic savings and in the inflow of foreign capital in the recent past.

^{12/} Bergsman, J. Malan, P., "A Estrutural de Proteção Industrial no Brasil", Revista Brasileira de Economia, April/June 1970 and Bergsman, J. "Foreign Trade Policy in Brazil", AID/W February 1971.

^{13/} Bacha, E.L., et. al., Análise Governamental de Projetos de Investimentos no Brasil, Ministry of Planning, IPEA/INPES, Rio, 1971.

^{14/} Donald Syvrud, "Interest Rate Structure and Policies in Brazil, 1960-70", USAID/Rio de Janeiro, July 1970.

Thus, on the basis of these rates, it is not unreasonable to conclude that the private cost of capital in Brazil, with a few exceptions as in export production and agricultural financing, is approaching its social cost.

In regard to labor it is estimated that labor costs to the firm are about 40% higher than the wage rate due to the use of payroll taxes as a form of financing social security.

The prospects for further adjustments of the price structure can be expected in regard to labor costs through substituting value-added tax for payroll tax as a form of financing social security. In the case of protection there will be marginal reductions on a case-by-case basis. ^{16/}

Thus, to the extent that Brazil's price structure is improved to better reflect the country's resource endowment the private return of R & D will approach its social return. This is to say that while in the past the importation of know-how was clearly more profitable than the local development of technology, from the private standpoint, the indiscriminated importation of foreign technology represented a high cost for the national economy, in terms of the misallocation of resources that it gave room to. As the private sector can be expected to be guided by better price signals, which in large part result from Brazil's new strategy for development, its need to embark on a technological effort of its own will be increasingly greater. If this effort is to succeed, the capability of Brazilian institutions of science and technology to work with the private sector for the local production of technology has to be improved.

The Government of Brazil has explicitly stated the importance for continued growth of developing an improved Brazilian capability to select, adapt, and generate technology for domestic as well as export production (Development Plan, 1972/74, pp. X. 53-60).

^{16/} These expectations are based on conversation with Brazilian economists working both at federal and state levels, who indicated that the Government is increasingly aware and sensitive to the issue following the conclusions and recommendations of studies done in field. See f.ex., Bacha, E.L. and others, "Análise Governamental de Projetos de Investimentos no Brasil" and "Encargos Trabalhsitas e Absorção de mão de Obra", IPEA/INPES, Research Report - Series, Rio de Janeiro, 1971.

The Plan sketches the main components of a National Technology. The policy envisions three major funds, the National Fund for Science and Technology (FNDCT), the Development Fund for Science and Technology (FUNTEC), and the Fund for Technological Assistance (FUNAT), as well as the Scientific and Technological Development Basic Plan (PBDCT). The National Development Plan adds that the "mobilization of foreign resources (through the PBDCT) will permit reinforcement of the program for strengthening selected groups of institutions and research centers - federal, state and private - dedicated to the solutions of technological problem in industry" (p.55). A national system of Scientific and Technological Information is proposed, as well a system of incentives for the private sector, including government assistance to industrial research institutions for certain private enterprise research expenditures, including the purchase of research equipment.

B. The Brazilian S&T System

The difficulties of an overall evaluation of the S&T system in Brazil are enormous. S&T activities are not included in the regular statistics of the country. There are no consistent statistics on public or private expenditures on research and development. Studies so far made of scientific and technological activities do not give an assured view of the system as a whole. There follows a brief account of technological activities by firms and research institutions and the major problems faced by the latter in producing technology. 1/

1. Industrial Firms

Foreign companies have been largely uninterested in performing R&D in the country or in utilizing existing local research capabilities for that purpose. Available evidence indicates that industrial research is usually limited to the large Brazilian firms. The firms that do research or contract for research are concentrated in the most dynamic sectors (machinery, metallurgy, electricity, transportation, equipment, and chemicals). These are the firms that account for most of the contracts for technology transfers including technical assistance. They also account for most of the growth of manufactured exports in the recent years. These are also the firms which participate in the more complex stratum of the import substitution process. They represent less than 2% of all manufacturing concerns, although they account for about 33% of total industrial employment and 40% of total production. Nevertheless, probably only slightly more than a third of the firms in these sectors utilize the services of the institutional network of S&T in Brazil.

2. Research Institutions

Among the limitations and deficiencies that currently affect research institutions, the lack of financial resources is usually identified as the most crucial problem. In institutions of higher education, the prevailing professional orientation largely accounts for their small research budgets. The dearth of research funds prevents institutions from reaching the critical mass of activities required for efficiency. Lack of funds also means lack of equipment and of research personnel. Researchers are badly paid

1/ The basic sources of the information presented are IPEA's "Potencial Tecnológico no Brasil," Rio, 1971, and "A Pesquisa Científica e Tecnológica no Estado de São Paulo," a survey done by the Faculty of Philosophy, Sciences and Letters of the University of Rio Claro, São Paulo, 1971.

and do not make research their principal source of income for more than an average of seven years. Thus careers in research are fairly unattractive to talented students. This contributes to the low qualification of the personnel engaged in research. The proportion of researchers with an M.S. or a Ph.D. is small. Data for 1971 indicate that in São Paulo research institutions, not more than 12% of the employees classified as technologists or scientists had any post-graduate training.

Another problem commonly mentioned regarding research institutions is the lack of research planning. Research priorities are not linked to the needs of the productive system. Decisions as to the research to be performed are largely left to the individual investigator, or group of investigators, normally working in isolation within the same institution. This reduces the possibility of interdisciplinary work which is fundamental for an effective response to the EDR needs of the productive sectors.

The lack of a planning system reflects the lack of such a system at the governmental level. The Federal Government and the State of São Paulo have only recently incorporated science and technology into their development planning. Other states in Brazil have as yet taken little initiative in this regard. The lack of research planning and of a science policy has led to a concentration of scarce research resources on basic research rather than on applied research. It is estimated that about 80% of past research activities in São Paulo refer to basic research. Also, data for 523 institutions (including agriculture experimental stations), show a small proportion of research completed in the area of technology.

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C. Strategy and Rationale for AID Loan Emphasis

The Proposed loan will finance the services of high level U.S. technicians who will provide assistance in carrying out a program in science and technology centered in the State of São Paulo. The program is designed to increase local capability for adapting, selecting and generating technology and to foster increased utilization of this capability by industry and agriculture within and outside the State. The proposed loan includes certain demonstration projects which should produce tangible research benefits rapidly. The demonstration projects will be performed in the sectors of metallurgy, food technology and possibly in mechanics in conjunction with IDB project.

1. São Paulo

In terms of Brazilian development priorities, São Paulo is the logical initial location for a program which seeks to integrate research capability with industrial use of Science and Technology. Most of Brazil's industry and the best of Brazil's S&T infrastructure is located in São Paulo, and improving the efficiency of the SP infrastructure can only be beneficial to all Brazil. Efforts have been made to extend the benefits of research to other states. For example, the São Paulo Secretariat of Planning has already entered into agreements with the SEP's of Pernambuco, Minas Gerais, Bahia, Rio de Janeiro and Paraná to encourage firms in those states to request assistance from CET and BAIESP through the federal portion of the S&T fund. ^{1/} IPT and ITAL will work with similar institutes in other states through agreements for (1) exchange of personnel, research projects, and research results, and (2) joint research ventures. Most promising in this area and of particular interest for the northeastern and northern states is research in tropical fruits technology. One of the end products of this project will be an improved capability of São Paulo research and technical institutes to provide technical assistance directly to other states or indirectly through the federal government. This will set the basis for a process of regional technological transfer within the country, with advantages to poorest states in terms of cost and adequacy over the transfer from abroad.

2. Sector Emphasis

The AID financed technical assistance will be oriented to the greatest extent toward activities in the sectors of metallurgy and food technology. These, together with mechanics, are strategic.

^{1/} The institutions involved in the program are described in Section II.

from the standpoint of export promotion. They also show a great degree of interdependence with other sectors, so that technological advances in each of them will greatly benefit other sectors of the economy. On the other hand the São Paulo institutes of industrial technology, IPT, for metallurgy and mechanics, and ITAL, for food technology, are currently the best institutions in these fields in Brazil. They will be able to more quickly respond to an increased utilization of research and development that the São Paulo program is designed to promote.

a) Export Potential

In 1969 and 1970 exports of machinery, metallurgy and food products accounted for 59.0 and 61.2% respectively, of total Brazilian manufactured exports. (Annex VII, Exhibit C). Exports of chemical products which also represented a significant portion of total manufactured exports in those two years (10.9 and 9.0% respectively) have been declining in relation to total manufactured exports (Annex VII, Exhibit D). Exports of metallurgical products increased their share of total manufactured exports from 3.4% in 1962 to 25% in 1970. In the case of machinery the rise was from 5.9% to 14.0% in the same period, while food products declined from 26 to 19%. In addition to this shift in the composition of exports, there have been some strong fluctuations within the period for the relative importance of each export component. This structural shift in manufactured exports reflects a gradual definition of Brazil's comparative advantage in foreign trade along the line of basic metallurgy and certain types of machinery. The fluctuations reflect the fact that until 1968, Brazilian manufactured exports were highly sensitive to the level of economic activity and the size of the internal demand for industrial goods, as discussed earlier.

Data in the following table show the growth of manufactured exports in the 1968-70 period. During this period the Government implemented a program of export promotion, which led to a 131% increase in the exports of manufactured goods, or a gain of US\$251 million. About one third of this gain came from exports of metallurgical products. Machinery exports and exports of food products accounted each for 14% of the total increase. The three sectors, combined, produced 60% of the total increase in manufactured exports.

Brazil: Growth in Manufactured Exports
1968-70 - By Principal Export Sectors

	Amounts US\$ Million	Percent of Total
Metallurgy	81.0	32.2
Machinery	33.8	13.5
Chemicals, Class 5	12.3	4.9
Food Products	33.1	14.0
Sub-Total	162.2	64.6
All Other	89.0	35.4
Total Manufacturing	251.2	100.0
Mach., Met., Food Prod.	150.0	59.7

Source: USAID/PREP; Raw Data: CACEX.

b) Industrial Interdependence

Another way of being selective in applying limited resources to science and technology is to look at the interdependence of the industrial sectors in terms of backward and forward linkages. Here, the rationale recommends an initial concentration of scarce investment resources in those sectors with the strongest linkages, and therefore, with the greatest likelihood of inducing investment in other sectors. This applies not only to research but also, and perhaps principally, to research benefits accruing to other sectors (and therefore instrumental to technological progress in these sectors).

From 1959 data, the magnitudes of the backward (purchases of inputs from other sectors) and forward (sales of output to other sectors) effects were derived and are presented in Annex VII, Exhibit E. Data in this table are percentages of each sector's purchases or sales to the sector's total output or demand. They are indicative of the relative importance of each sector as a purchaser of inputs or as a seller of output and thus, roughly speaking, of the extent to which activities in one sector may be expected to influence activities in other sectors. It may be seen from data in the table that the food products industry ranks first as a purchaser of inputs with an index of 63.3. Metallurgy has poor backward linkages, with an index of 22.4. But its forward linkages are important, with an index of 72.6, ranking third among all sectors. As could be expected, the food industry has weak forward linkages. In the case of machinery, the low forward index, 29.4, is only apparently indicative of weak forward linkages because most machines sales are counted as investment and therefore appear in the input-output table as final demand and not as intersectoral transactions.

D. Analysis of Firms Benefiting From the São Paulo Program

1. The Small and Medium-Scale Firms

Small and medium firms are the most likely ones to benefit by and large from this program. In what follows there is a brief discussion of the economics of these firms. Industrial statistics for Brazil suggests the following definitions: small - up to 100 employees per firm; medium - from 100 to 500 employees per firm and large from 500 and more employees per firm. ^{1/} The capital-labor ratios (installed horsepower capacity per worker) as shown in Annex VII, Exhibit F tend to increase significantly at the 100 employee levels, both for São Paulo industry and for Brazil as a whole. These data tend to confirm the generally accepted belief that smaller firms are more labor-intensive than large firms. They also confirm, for firms in the 20 to 500 employee range, the relative capital intensiveness in the food products sector (owing to the very capital-intensive sugar and grain milling sub-sectors), and an intermediate position for metallurgy.

The table in Annex VII, Exhibit G, shows the distribution of establishments, employees, and value added, by size of establishment, for Brazil and for the State of São Paulo in 1969. The data indicate that substantially greater proportions of both employment and value added are contributed by medium scale establishments. In fact, in many cases, medium-scale firms contribute as much or more to employment and value added as do large establishments.

One of the components of the AID loan is, as mentioned before, the demonstration projects. In order to assess the industry's interest for these projects, C.E.T. did a small survey of São Paulo firms in the food products and the metallurgic sectors and identified, through direct contact, 340 firms as interested in the demonstration projects or in their results. In view of the similarity of the problems experienced by these firms, herewith called responsive firms, CET identified over 200 other firms, which could be expected to become interested in the demonstration projects, specially when those 340 firms start experiencing the benefits of these projects.

^{1/} These definitions have been confirmed in conversations with São Paulo industrialists. The statistics are defined in terms of establishment rather than firm. It seems reasonable to assume that large multi-establishment firms in manufacturing tend also to be composed of relatively large individual establishments.

A tentative distribution, by volume of capital and number of employees of the responsive firms suggests that : small firms are the ones with capital up to Cr\$499 thousand, and employing up to 100 employees; medium - from Cr\$500 to Cr\$9.999 thousand of capital and from 100 to 999 employees; and large - those with capital of Cr\$10,000 thousand or more and 1000 or more employees (Annex VII, Exhibit H).

It may be observed that these contrast sharply with US notions of size; by US standards there are relative few large Brazilian firms. On the other hand very few small firms, under the Brazilian definitions, would be in a position to mount a significant EDR effort.

The information collected by CET shows that 52% of the responsive firms in the food product sector fell in the medium-sized category, followed by small firms, 31%; and large firms, 17%. In the metallurgic sector, 49% of the responsive firms were small; 34%, medium, and 17% large. For the two sectors together, of the 340 responsive firms, 44% were medium; 39% small, and 17% large. These percentages seem to indicate that the most likely beneficiaries of the demonstration projects will be the medium-scale firms, followed closely by small ones and lastly by large firms. In spite of the limitedness of C.E.T's survey it seems to indicate the existence of a probable ample demand for the services to be rendered by this program, as large firms represent less than 1% of all firms in food products and less than 4% in metallurgy.

2. Large Firms

As to the role of large firms, including multi-national corporations, the relative low percentage of responsiveness of these firms (17%), as indicated in table (AnnVII, Ex.I), seems to confirm the notion, as stated in the National Academy of Sciences report on the São Paulo program, that financially strong companies will rarely be interested in undertaking development work merely because money is available on favorable terms. With respect to their participation in the BADESP Fund for Technological Development it is the opinion of São Paulo officials that it is neither technically desirable nor politically feasible to exclude them. They feel that the Fund should be available largely to small and medium sized companies except in those cases when larger companies can demonstrate that use of the fund is essential to their decision to undertake significant projects. Moreover, the larger firms have an interest in inducing their small and medium suppliers to adopt research and quality control practices. Finally, the larger firms can be an important source of information regarding the kinds of problems the smaller firms are having in meeting standards and specifications.

E. Expected Benefits

1. Increased Volume of Research Activity

An increased volume of technological research activity of a great relevance to industry, agriculture and government may be viewed as the primary benefit to be expected from the implementation of the program supported by this loan. This should result from increased State and Federal budget allocations to science and technology, from increased interest by industry in embarking on research and from increased efficiency of the system in allocating and administering resources for science and technology.

Increased research interest by firms shall emerge in large part from the availability of concessionary long-term financing for technological research, which reduces significantly the cost of financial resources required for research investment. A built-in capability both at the government level and at the level of research institutions for technical and economic evaluation of research projects and the operation of an improved information system and a technological extension service will contribute to facilitate identification by the firm of its technological needs and decision to explore new possibilities in the market in terms of new or improved products and processes.

Government allocations to S & T in the coming 5 or 6 years are expected to increase considerably. Immediately the State of São Paulo is programming at least \$25. million more in support of local cost associated with the AID loan. The Federal government has planned to increase its expenditures with S&T from some \$42 million in 1970 to over \$100. in 1974. Part of this money will finance research to be undertaken by research institutions in São Paulo.

2. Increased Research Efficiency

The program emphasizes the absorption by the system of modern management and planning capabilities, for the purpose of allocating and administering resources for science and technology and training for both research and research management. The contribution of these elements to increase the efficiency of the system should be significant. The capabilities the AID loan will help to develop at CNE, IPT and ITAL should exert considerable influence in upgrading the level of other research institutions within and outside São Paulo. Not only research productivity (output per investigator and number of successful projects) should increase, but research quality should also improve. Moreover, stronger links between the producers and users of technology should originate, resulting in a considerable

shift in research priorities, favoring the undertaking of technological activities. This in turn should determine a stream of research results of considerable more relevance to industry and agriculture than has been the case so far.

Research efficiency should also result from a broader and better quality information system in the case of science and technology. An improved information system will facilitate the interchange of technical knowledge, both within Brazil and internationally, thus contributing to reduce research efforts of the "invention of the wheel" type and to stimulate dissemination of research results throughout the São Paulo S&T system and to other areas of Brazil.

3. Benefits to the Economy

An increased volume of the type of research to be fostered by this program should make Brazilian technical progress less dependent upon the importation of technology. Moreover, that technology which will continue to be imported should find better conditions to be adapted to the local peculiarities of production and factor endowments. This is of extreme relevance in face of Brazil's move towards a development strategy that relies heavily upon the growth of exports as the principal source of economic dynamism.

Increased ability of the local S&T system to select, adapt and generate technology should increase considerably. Brazil's comparative advantages in existing export lines. This would emerge principally from research results leading to reduction in production cost, quality improvement and increase in the technological content of exported products. Parallel to this, a developed standard and quality control system should decisively contribute to increase the acceptability of Brazilian products in the international markets, thus reducing rejection rates, currently quite high for certain products, especially meat. But new export lines should also emerge from the adoption of results from research aimed at exploring new markets and uses for available materials, especially tropical fruits.

Benefits from this program in the form of research results leading to increased or new export should to a great extent also be beneficial to the internal market. On the one hand the adoption of research results represents new investment. On the other hand one may expect that investment for export by and large will be also investment for local consumption, so that the gains in quality and cost reduction, at least in part, will be transferred to the local

consumer. The internal market, particularly the rural sector, should benefit considerably from research aimed, for example, at the industrialization of primary products for either export or domestic consumption. Industrialization of food products may represent several fold increase in the outlet of agriculture production as compared to consumption of the product in nature. For example, Brazilian exports of oranges have been at the level of 3 million boxes a year for more than 10 years. Exports of orange juice, however, which is started being produced some 7 years ago, amounts to the equivalent of 21 million boxes of the fruit in nature.

The list of potential benefits from the research to be fostered by this program can certainly be made a long one, the economic value of which will depend on the actual adoption of results. Judging from international experience, technological research has a high pay-off. Thus it suffices perhaps to say that, aiming at increasing the Brazilian capability for undertaking technological activities which will be strongly oriented toward the needs of the productive system, the program should have made a significant contribution for the growth of Brazilian exports and expansion of Brazil's domestic market, as research results are generated in the form of new or improved products and processes and are incorporated into production at one time, or are subsequently diffused throughout the economy.

SECTION V - FINANCIAL ANALYSISA. Projected Financing Requirements

It is anticipated that the proposed program will include four AID loan-financed contracts which will provide services to three major recipient organizations: CET, IPT, and ITAL. These contracts between the State of São Paulo and U.S. institutions will include loan-financed dollar costs for field technicians, institutional backstopping, participant training and materials required in the conduct of research and system implantation. Local support costs of field technicians and all other local costs in support of the program will be borne by the Borrower. Equipment purchased outside of Brazil in support of the program will be financed through foreign lines of credit currently available to the São Paulo State Development Bank (BADESP).

Technicians provided under these contracts will assist in the development of the system components of the program and in research management for demonstration projects. The following tables of costs are based upon estimated requirements for the financing of all components of the program. The costs were developed by constructing probable contract budgets based upon manpower requirements and participant training projections.^{1/}

SUMMARY OF FINANCING (In US\$ 000s)

<u>DOLLAR COSTS (AID)</u>	<u>CET</u>	<u>IPT</u>	<u>ITAL</u>	<u>TOTAL</u>
Consultants	3,700	2,040	3,600	9,340
Participants	2,600	870	1,000	4,470
Other Direct Costs	50	40	75	165
Scientific & Tech Materials	<u>650</u>	<u>250</u>	<u>125</u>	<u>1,025</u>
TOTAL DOLLAR COSTS	7,000	3,200	4,800	15,000
<u>LOCAL COSTS (SÃO PAULO)</u>				
Consultant Support	480	430	760	1,670
Personnel - Technical	1,420	3,930	4,160	9,510
Personnel - Administrative	350	800	310	1,440
Raw Material, Supplies	-	890	240	1,130
Training	710	-	490	1,200
Equipment	250	-	1,150	1,400
New Construction	1,400	1,750	1,330	4,480
Other	<u>510</u>	<u>1,660</u>	<u>2,920</u>	<u>5,090</u>
TOTAL COSTS (LOCAL)	5,100	9,460	11,360	25,920

^{1/} See Annex VIII, Exhibit H.

SUMMARY OF FINANCING

(Cash Flow)

(In US\$ 000s)

	<u>FY'74</u>	<u>FY'75</u>	<u>FY'76</u>	<u>FY'77</u>	<u>FY'78</u>	<u>TOTAL</u>
DOLLAR COSTS (AID)						
CET	1,300	1,300	1,600	1,400	1,400	7,000
IPT	700	700	750	650	400	3,200
ITAL	<u>1,000</u>	<u>1,450</u>	<u>1,100</u>	<u>700</u>	<u>550</u>	<u>4,800</u>
	3,000	3,450	3,450	2,750	2,350	15,000
LOCAL COSTS						
CET	510	840	1,270	1,300	1,180	5,100
IPT	1,120	1,810	2,330	2,070	2,130	9,460
ITAL	<u>2,750</u>	<u>2,770</u>	<u>2,110</u>	<u>1,890</u>	<u>1,840</u>	<u>11,360</u>
	4,380	5,420	5,710	5,260	5,150	25,920

A portion of the dollar and local costs attributable to research projects will be recovered and made available for similar projects. It is not possible to estimate the extent of these recoveries because they will be entirely dependent upon the anticipated charges to industry by the research institutes for the benefits accruing from individual research projects. For example, if an industrial client has entered into a research contract with ITAL at the time that a program-financed research project is undertaken, the CET will charge ITAL for the cost of technicians assigned to the project and the related local costs. Conversely, program-financed research undertaken by an institute without benefit of a current contract with an industrial client will not obligate the institute to repay the CET. Recoveries will be administered by BADESP.

All local costs included in the summary above are expected to be financed through the São Paulo State budget. Industrial users who enter into contracts with the research institutes may obtain financing for such contract costs from the BADESP Science and Technology Fund. BADESP and the Cr\$80 million Science and Technology Fund are discussed below.

B. Development Bank of São Paulo

1. Operation and organization

The Banco de Desenvolvimento do Estado de São Paulo (BADESP), the State Development Bank of São Paulo, was created by a state law in May 1970, and began operations early in 1971. BADESP's capital stock, amounting to Cr\$140 million or about US\$23 million, is 98% owned by the State of São Paulo. The Bank is regarded as being the financial instrument of São Paulo's development policies.

As a state development bank, BADESP's activities are legally limited to the State of São Paulo. Its operations are divided into three broad areas:

a) Rural Credit - covering a wide range of activities including reforestation, fisheries, and agroindustry. Industrialization of farm produce for export, with particular emphasis on fruits and tomatoes, is an important objective of the State's development program. A special rural credit program provides financing for orange concentrate production facilities.

b) Industrial Financing - providing long and medium-term credit for investment in new plant and working capital.

c) Financing of Services - including surveys and feasibility studies, technological research, warehouses, etc.

As of June 30, 1972 BADESP's net worth amounted to Cr\$179 million or about \$30 million. In addition to its own capital, BADESP has access to a number of funds for which it acts as financial agent. Some of the more important of these funds and the related organization for which BADESP acts as financial agent are listed below:

<u>Entity</u>	<u>Fund</u>
BNDE (National Bank for Economic Development)	FIPEME - Loans to small and medium size firms
	FINAME - Industrial plant financing
	FINEP - Financing of Survey and Feasibility studies
BNH (National Housing Bank)	REGIR - Working capital loans to producers of construction materials
	REINVEST - Fixed asset financing for producers of construction materials
Central Bank of Brazil	FUNDEPE - National Livestock Development Fund
	FUNAGRI - Working capital loan to agriculture
Secretariat of Agriculture, São Paulo	FEAP - Agricultural Expansion Fund
Caixa Econômica Federal	PIS - Working capital and fixed asset financing.

In 1971, in its first year of operations, BADESP made 123 loans totalling Cr\$61 million. The following table provides an indication of loan activity by department together with a comparison of lending levels from BADESP's own funds and those for which BADESP acts as agent.

LOANS BY SOURCE OF FUNDS AND DEPARTMENT - 1971

(In thousands of cruzeiros)

<u>Department</u>	<u>No. of Loans</u>	<u>BADESP Funds</u>	<u>Other Funds</u>	<u>TOTAL</u>
Rural	45	3,888	9,805	13,693
Industrial	65	10,574	13,990	24,564
Service	13	22,670	238	22,908
TOTAL	123	37,132	24,033	61,165

BADESP is organized into departments which are managed by directors of the Bank. The administrative activities, i.e., the Administrative, Financial and Legal Departments are under a single director. There are three operating activities one for each broad area of loan activity: the Rural Operations Department, Industrial Operations Department, and Special Operations (i.e., service financing) Department. Each of these operating departments has 3 divisions: Analysis, Monitoring and Technical Assistance, and Operations.

In addition to the administrative and operating activities there is also the Funds Department which concerns itself with foreign and domestic sources of funds and the Bank's budget. BADESP's capital market activities are supervised by the same bank director who is responsible for Funds and Special Operations.

As of October 31, 1972, BADESP's staff totalled 227 including 102 professionals and 125 administrative personnel. The Bank is considered to be fully staffed and no additional personnel will be required for the continuing activity within the Fund for Technological Development discussed below. BADESP's organization chart and staffing table are shown in Annex VIII Exhibits A and B.

2. Fund for Technological Development

The Fund for Technological Development was set up as a result of an agreement signed between the State of São Paulo and FINEP in March 1972. (*) Under this agreement, FINEP is to lend to the State a total of Cr\$40 million over a period of 3 years in roughly equal annual amounts (Cr\$10 million the first year and Cr\$15 million during each of the two subsequent years), this amount to be matched by another Cr\$40 million to be contributed by the State of São Paulo. The source of the FINEP funds is the National Fund for Scientific and Technological Development.

As stated in the agreement, eligible projects are those in the areas defined by the National Development Plan and are the following:

(*) See Annex VIII, Exhibit C.

- a) Research leading to a speedier development of industries with a high technological density, such as: chemicals, electronics, steel and airplanes;
- b) Research conducive to the strengthening of Brazilian industry's competitiveness;
- c) Research which will increase the technological and managerial ability of Brazilian business;
- d) Investments favoring the use of São Paulo's research capacity to the benefit of other parts of the country;
- e) Research in the area of agroindustry;
- f) Market research to disclose new market opportunities, especially potential export markets for Brazilian products;
- g) Programs and projects permitting a linkage between State and Federal research work;
- h) Research and studies for the improvement of quality control and technical standards.

Another agreement signed in April 1972 between the Secretariat of Economics and Planning of São Paulo and BADESP defines the various functions and responsibilities of the Secretariat, C.E.T. and BADESP under the Technological Development Program. ^{1/} The Secretariat represents the State of São Paulo and has overall policy-making responsibility for the program. Implementation responsibility is shared by C.E.T., which is responsible for the technical side, and BADESP which handles the financial side. BADESP is the financial agent for the program and is responsible for managing program funds, performing an analysis of the borrowers, making loan disbursements, and collecting interest, monetary correction and principal payments.

The Fund for Technological Development is separate and distinct from BADESP which merely manages the Fund. In return for this management service, BADESP receives a 2% commission on all loans made. Since the Fund is an independent entity, one can consider the São Paulo State's Cr\$40 million as being in the nature of corporate capital, while the Cr\$40 million FINEP loan can be regarded as debt capital. Loan disbursements and repayments, and payments of interest and monetary correction are all made from and to the Fund, and even the payments related to the FINEP loan will be made from the Fund's own resources and not by BADESP or the State of São Paulo. This FINEP loan, made to the State of São Paulo, is to be repaid over a period of 10 years following a grace period of 3 years, with 2% interest and 10% monetary correction. Neither the Cr\$40 million FINEP loan nor the Cr\$40 million State government contribution have been transferred in block to BADESP; funds for the program are to be drawdown as required for making disbursements to borrowers. The FINEP loan terms apply individually to each drawdown, i.e., each drawdown has a 3-year grace period and a 10-year repayment period. The

^{1/} See Annex VIII, Exhibit D

State's Cr\$40 million, since they are in the nature of equity capital, will only return to the State when the Fund is eventually closed. No interest is due to the State for the use of the funds.

It is intended that, as a general principle, the State's funds will be used for financing governmental borrowers, i.e., government agencies or corporations and research institutes, while the FINEP loan funds will be reserved for private borrowers, and public institutions such as ITAL and IPT which have independent sources of revenue. However, should there be a temporary lack of funds from one source, the other source can be used.

Loans are normally made for periods of up to 5 years including a grace period of up to 2 years. These limits may be exceeded in special cases. The grace period is based primarily on the project's implementation period, but may exceed the project's completion date if warranted by the borrower's financial condition.

All loans are subject to 10% monetary correction and 2% commission. However, the interest charged may be either 2% or 10% depending on whether the risk of the research project's failure is shared with the borrower or not:

<u>Type of Loan</u>	<u>%</u>	<u>Loan Charges %</u>			
		<u>Financed</u>	<u>Interest</u>	<u>M. Correct. & Commission</u>	<u>Total</u>
At Borrower's Risk	100		2	12	14
Risk Shared	80		10	12	22

Failure of a project occurs when research objectives have not been attained. Such objectives are defined at the beginning and the lack of success, if any, will be certified in the final report prepared by the CET - appointed monitoring research institute. When the risk of failure is shared between the borrower and BADESP, if the research project is unsuccessful, the borrower is relieved of the obligation to repay the loan and his loss is limited to the 20% of the project costs which is not financed by BADESP plus the interest and monetary correction paid during the life of the project.

Loan applications are reviewed first by the C.E.T. which evaluates the proposed project from a technical and economic point of view. Once approved by C.E.T., projects are forwarded to BADESP which investigates the borrower. Approved loans are negotiated and executed by BADESP. Although BADESP is equipped to evaluate projects, the C.E.T. is in a better position to evaluate research proposals. For instance, C.E.T. is aware of what research has been done or is underway in Brazil and can prevent duplication. It can also identify proposed research projects which, although not identical, are related to research done or underway elsewhere in Brazil. Furthermore, the C.E.T. is able to evaluate the ability and capacity of whoever is to conduct the research, and also to advise as to which institution is best qualified to perform a specific type of research project.

Monitoring of project implementation is done by the C.E.T. through a technological institute assigned to the project by C.E.T. Projects are broken down into stages and loan funds are released as each stage is completed. The C.E.T. must certify the completion of a stage before BADESCP will disburse additional funds. Disbursements are made to the borrower.

One loan has already been approved, five are under review either at C.E.T. or BADESCP, and another three have been discussed. These projects total over Cr\$8 million and are listed with a brief description in Annex VIII, Exhibit E. The approved loan in the amount of Cr\$ 1 million is to be made to ITAL - Instituto de Tecnologia de Alimentos (Food Technology Institute) of Campinas, State of São Paulo. This loan will finance part of a two-year food research program which includes 35 individual research projects plus a training program for technicians from private industry. These research projects are listed in Annex VIII, Exhibit F. The borrower is to finance 50% of the cost of the total program which amounts to Cr\$16 million or \$2.5 million.

3. Financial Statements

BADESCP's last three semi-annual financial statements are given in Annex VIII, Exhibit G. Each of these statements has been audited by a major public accounting firm in Brazil. As required by the Central Bank, a different firm has been used for each audit.

The Negotiable State Bonds and Time Deposits shown in Current Assets are temporary investments of cash in excess of current requirements. Capital Subscriptions Receivable at 6/30/71 of Cr\$70 million were fully paid in July, 1971 which accounts for the increase in negotiable state bonds and time deposits at 12.31.71. These temporary cash investments may appear to be unduly high, particularly at 6.30.72 when BADESCP had been operating for 18 months. However, there are substantial commitments under loans signed for future disbursements to borrowers. Thus, in addition to the loan amounts disbursed and outstanding shown as long-term assets, BADESCP had the following cash commitments:

	<u>Cr\$ thousands</u>
6.30.71	3,845
12.31.71	21,298
6.30.72	46,286

The Market Activation Fund which makes its first appearance in the June 30, 1972 balance sheet, was established to provide market support to a stock issue underwritten by BADESP. BADESP is acting as the leader of a group of 17 underwriters and the total offering value of the issue was Cr\$220 million.

The Long-Term Assets section of the balance sheet lists loans made within the different operational categories described earlier. The investments shown as long term assets are stock participations using mainly FUNAC funds. Stock participation with BADESP's own funds are limited to Cr\$2 million. FUNAC is a São Paulo State fund which provides financing to industry in São Paulo. One form of financing is stock participation of up to 30% in a company's capital. The FUNAC Fund also appears as a long-term liability. The differences between the amounts on the liability side and those shown as Investments on the assets side are the stock participations made with the Bank's own funds.

The substantial increase in fixed assets at 6.30.72 is due to real estate purchased in the amount of Cr\$7.7 million for the Bank's own use.

The Long-Term Liabilities are a list of the different funds for which BADESP is financial agent. Although the Bank simply repasses these funds in exchange for a commission, the amounts repassed are liabilities because BADESP is the guarantor.

BADESP's Income Statements show that the Bank's operating income has grown faster than its other income, which is derived mostly from the temporary case investments. In fact, it appears that other income has begun to decline as the Bank's loan volume expands. BADESP's operating income has grown sufficiently to match its operating expenses. It is expected that the Bank's operating income will continue to grow rapidly, as it has done, and that other income will decline significantly as short-term cash investments are reduced. It is also expected that operating expenses will now level off as the Bank has become fully operational.

C. Prospects for Loan Repayment

The proposed program is expected to produce long-term economic benefits to São Paulo and to Brazil. The nature of the program precludes any expectation of short-term significant benefits to the Borrower. It is for this reason that a ten-year grace period with a 30-year repayment obligation and concessional interest rates have been proposed. There is also no apparent justification for recommending a spread of significance between interest charged to the borrower and that charged to the federal government under the payment agreement.

The State of São Paulo leads Brazil in economic progress. Repayment of this loan by the Borrower is a virtual certainty. As additional security, the loan will be guaranteed by the Government of Brazil.

D. Adequacy of Financial Plan

As noted earlier in this section, the local costs will be financed by the Borrower. Representatives of the borrowers in the Secretariat of Planning have stated unequivocally that the proposed program is of high priority and will be financed from State budgeted resources. AID will include a condition precedent to disbursement requiring that the State furnish evidence that the program has been included in the State budget for 1973 in an amount adequate to meet first year requirements. The loan agreement will further require that the Borrower provide all funds necessary for the completion of the program.

SECTION VI - PROJECT IMPLEMENTATIONA. Preliminary Execution Plan

The following plan indicates the sequence of actions which must occur to meet initial Conditions Precedent and other covenants of the Loan and in order to proceed with the implementation of the project in a timely manner.

<u>ACTION</u>	<u>TARGET DATE</u>
1. Formal and Non-Formal Training of CET, Institute and Industry personnel	Sept.1972-Dec.1977
2. Appointment of Brazilian Management Group Director	January 1973
3. Preliminary Implementation Plan (See Logical Frameworks Annex IX for preliminary implementation schedule of U.S. loan financed and Brazilian inputs).	January 1973
4. USAID/GOB Loan negotiations	Jan.-March 1973
5. Sign Loan Agreement	March 1973
6. Selection of U.S. Co-Director of Management Group	April 1973
7. Recruitment, selection & organization of Management Group	June 1973
8. Planning and organizational activities related to meeting initial set of conditions precedent, e.g. legal opinion, implementation plan, criteria for project selection, etc.	June-August 1973
9. Establish CET/Management Group Program Activity Capabilities	June-October 1973
10. Re-assessment and evaluation of demonstration project plans	June-August 1973
11. Implementation of demonstration projects	October 1973
12. Joint project evaluation	Dec.1973/74/75/76/77

<u>ACTION</u>	<u>TARGET DATE</u>
13. Identification, assessment and evaluation of new projects	July-Sept. 1974/75
14. Implementation of new projects	November 1974/75
15. Termination of Management Group	December 1976
16. Science and Technology System Self-Sustained	January 1977
17. CET assumes responsibility for Science & Technology System	January 1977
18. Training 90% completed	
CET	May 1977
Institute	July 1977
Industry	Continuing

B. Contracting and Procurement Procedures

As presently envisaged there will be basic contracts between the São Paulo State Council of Technology (CET) and US institutes or institutions. The scope of work of these contracts shall be approved by A.I.D. in writing prior to their execution. A.I.D. shall also approve in writing the contractors and contractor's personnel prior to the execution of such contracts.

Initially, four contracts are planned. As the project proceeds, it is anticipated that another institutional contractor may replace one of the contractors for the demonstration projects. It is also anticipated that sub-contracts may be executed by the four major contractors for the provision of specialized services. A summary scope of work of each contract

1. General Research Management and general qualifications of the contractors follows.

The contractor would work with the CET-MG on the following functions:

a. Overall Management - The American Chief of Party would serve in effect as a coordinator of the project. He should have the widest possible experience in the management of sizeable and varied research facilities, with background in staff development, research promotion, work scheduling, and technological forecasting.

b. Staff Development - The contractor would work on a personal basis with the staff of the newly created Management Group. Initially, this would be the most critical task: to assist in organizing the group, setting priorities and work schedules, counselling individuals, etc.

c) Training - In addition to the CET-MG group, the

contractor would assist in selecting participants in key areas such as science management, marketing, communications who would eventually return to positions in the various participating institutions. In addition, the contractor would assist in the development of academic and short-term courses, seminars etc., relevant to the program.

d. Technical Information System - The contractor, through consultants would assist in the design of a system, initially relatively simple, and addressed to the priority sectors of the project. This would involve CET-MG, IPT, ITAL, and the U.S.P. (Faculty of Communications and Computer Center).

e. Technological Extension Service - A closely related function is the development of a skilled staff which can analyze EDR and management problems of prospective clients.

f. Other Technical Assistance - The contractor would work closely with other contractors to insure that systems and priorities were compatible, that training requirements were coordinated etc.

Initially this contract would be relatively small. It would involve two full time Americans resident in Brazil, plus funds for short-term consultants and participant training. The primary task, for at least the first two years, would be the development of CET-MG as functioning institution.

2. Metallurgy

A second U.S. contractor would work with IPT (although the contract would be with CET) on both specific research projects and broad institutional improvements. The research projects already identified are:

a. Weathering Steels - Field tests of weathering steels under different Brazilian weather conditions.

Data correlation for setting accelerated tests.

Development of new grades of weathering steels, most suitable for local conditions, taking into account their mechanical properties, weldability and weathering performance.

Development of techniques for the use of weathering steels in specific structures, such as transmission line towers, bridges and buildings. Economic analysis.

b. Surface quality of steels for deep drawing

Measurement of surface quality of steels sheets for deep drawing.

Correlation of the surface quality with drawing performance, drawing processes and lubrication problems.

Correlation of the surface quality with processing parameters.

c. Explosive forming, cladding, bonding, and welding of metals, e.g. production of dished heads of aluminum and steel for fuel tanks and chemical processing tanks; cladding of steel with aluminum, lead.

In addition, the contractor would work on the following general institutional improvements:

a) Better capacity for problem identification and choice of priority fields for technological research.

b) Introduction of marketing and of economic analyses besides technological research, in a multidisciplinary approach.

c) Improvement of the methods of liaison with other sectors interested in the economic development - Government agencies, investment banks, industrial enterprises, etc.

d) Better methods of research administration.

e) Better forecast of technological innovations and appraisal of their impact upon the Brazilian economic and industrial development.

(There follows a more detailed description of the simultaneous process of technological transfer and institution building using explosive forming as an example:

1. Three-four IPT professionals will receive 3 months of intensive training in the technology of explosive forming, cladding, bonding, welding, to include facilities design for an IPT laboratory, as well as economic and marketing aspects of the process.
2. Following this, three U.S. staff members, who are actively involved in application of the technology, will spend 3-4 months in residence in IPT, for continued training of IPT staff, to assist in installation of the demonstration explosive forming facility, and jointly with IPT staff, to initiate discussions with potential users of the technology in the São Paulo area.
3. The U.S. personnel will present lectures and seminars on the technology before interested industrial groups and the Engineering students of the Escola Politecnica, and will consult with Brazilian industry as representatives of IPT.

4. As the transfer of technology progress under this linkage, it will be important to continue the flow of personnel between Brazil and the U.S. at periodic intervals, for further training in newly developed techniques, to solve unique problems presented by a potential user industry, to develop improved strategies for selling the technology to Brazilian industry, etc.
5. A two year program is contemplated in order to fully integrate the technology into IPT and to gain contract research support on a measurable basis from Brazilian industry.

There is an important additional aspect of the linkage, namely training opportunities at the MS or PHD level for IPT staff with research concentration in areas related to forming, cladding, bonding of metals.)

3. Food Technology

A third contract would be negotiated with a broadly based U.S. institution or combination thereof (probably a university consortium). Although the contract would be with CET, the primary Brazilian counterpart would be ITAL. Initial emphasis would be given to meats, fish, and tropical fruits. Packaging (i.e. development of materials, establishment of performance standards, packaging design, market testing) would also be stressed; this field might require a separate sub-contractor with more industrial experience. (Or possibly the contractor discussed under 2 above). See program description for further detail on these sub-projects.

As in the case of IPT, the contractor would also address the broad institutions changes listed above.

4. Quality Assurance

CET and IPT hope to obtain the services of the U.S. National Bureau of Standards under a loan-funded PASA.

One of the most important components of the Program is to establish a system for Standardization and Quality Assurance in which IPT, through the Council of Science and Technology (CET) should be heavily involved.

CET and IPT would see that the necessary linkages with Associação Brasileira de Normas Técnicas (ABNT) and other federal agencies be established within the Program.

IPT would participate in collaborative reference programs of the NBS. NBS would assist in the development of joint research and development projects to establish testing methods and specifications and would provide technical assistance to the development and production of standard reference materials in IPT.

CET and IPT recognize that a preliminary survey by the NBS would be required to develop a complete scope of work. Such a survey will be arranged as soon as possible.

Second Phase

After a period of around two years required for staff recruitment, training and organization, it is expected that the CET-MG will have the capacity to assume broader and more sophisticated responsibilities. One or more of the contractors discussed above may be suitable for these expanded functions. Alternately, it may seem appropriate to seek a new contractor(s) with the specialized background required. For example, the CET-MG and other participating entities ^{may} be ready to design and utilize more complex technical information systems, international market research and analyses, management analysis services, etc.

Procurement of goods and services under the loan shall, where required, follow the procedures of the Capital Project Guidelines and the A.I.D. procurement regulations. These have been discussed with representatives of the Borrower and Borrower has agreed. Pertinent parts of the Capital Project Guidelines have been made available to Borrower's representative for reference.

C. Role of U.S.A.I.D. and Plan for Evaluation

Members of the project committee will periodically review selected activities financed under the loan. Detailed, close monitoring by USAID is not intended.

The Mission's approach to monitoring the program will be to use the basic AID system of an implementation plan plus periodic progress reports. The Borrower will be required to submit a detailed implementation plan, including a financial plan and disbursement schedule, as a condition precedent to disbursement. Subsequent progress reports, submitted periodically by the Borrower, will show actual progress achieved as compared to the planned progress spelled out in the Implementation Plan, with appropriate comments including local cost expenditures in support of the program.

The Implementation Plan, in view of the wide scope of the program, will have to be divided up into parts addressing specific areas such as the demonstration projects, training, research management, the information system, and so on. The Borrower will also be required to include in the Implementation Plan the overall and sectorial objectives of the program and relevant benchmarks which can be used to determine the progress toward achievement of the program purpose.

The progress reports to be submitted on a quarterly basis will be so structured as to permit direct comparison with the Implementation Plan. These reports will also include the following information for firms receiving project approval by the CET: name, location, nature of the activities, number of employees, installed capacity (horsepower) and capitalization. For research institutes receiving CET project approval only the name, location and nature of the activity need be included.

Although these progress reports will provide much information

will provide an opportunity for evaluating the achievement of program objectives, the adequacy of the implementation plan and the program's progress. It is anticipated that these reviews will be conducted at least quarterly during the first year of implementation when the various program components will be pulled together and a research management system will be developed. This will be a critical period, requiring many divisions and frequent meetings will be essential. At the end of the first year of implementation, and every year thereafter, an annual review of the program will be made jointly with the Borrower. Annual review will be more formal and concentrate on the overall picture and the program's outputs. It is expected that outside expert assistance will be required, and if so the Mission will use the services of technicians sponsored by U.S. institutions or Universities.

D. Disbursement Procedures

Inasmuch as loan financing will be restricted to dollar costs, it is expected that all loan funds will be disbursed in accordance with AID's standard Letter of Commitment, Letter of Credit procedures. Loan funds will finance contracts between the Borrower, represented by the CET, and U.S. institutions capable of providing the required technical assistance and training for participants. Cruzeiro costs of the program will be financed by the State of São Paulo. As noted earlier in Section V of this paper, a portion of the dollar and local cost financing made available to research institutions, which in turn charge industrial clients for the benefits of the research, will be recovered and utilized for financing of similar projects.

E. Major Conditions and Covenants

1. Prior to committing or disbursing funds the Borrower shall:

a. submit to A.I.D. in form and substance satisfactory to A.I.D. evidence that funds will be provided to cover local currency costs of the first year of the program;

b. submit to A.I.D. in form and substance satisfactory to A.I.D. a time phased implementation plan for the execution of the technical assistance. Such plan to include:

1) a plan for the overall administration and coordination of the program;

2) a description of each major element of the program;

3) a description of the agency or entity responsible for the execution of each major element of the program;

4) evidence of the organizational and technical capability of such agency or entity to carry-out its responsibilities and functions under the program, and

- (ii) a description of each major element of the program;
- (iii) a description of the agency or entity responsible for the execution of each major element of the program;
- (iv) evidence of the organizational and technical capability of such agency or entity to carry-out its responsibilities and functions under the program, and
- (v) a financial plan showing breakdown of dollar and local currency costs.

2. The Borrower shall covenant:

- a. To establish ways and means to provide higher salaries for research personnel in the state institutions and for allowing professors at the state universities involved to receive fees for private consulting.
- b. Prior to the end of the first year of implementation of the program, and annually thereafter, the Borrower shall provide a revised financial plan for the dollar and local costs of the program for the following year. This revised financial plan shall be accompanied by evidence satisfactory to A.I.D. that funds are available to finance the local costs as shown in the revised plan.
- c. That the assistance under the loan will be used, to the extent feasible, to foster the development of industrial technology institutions in the Northeast. A.I.D. and the CET will review annually the amount of loan assistance to the Northeast, and the CET further covenants to maximize efforts to reach and to maintain the maximum feasible amount.
- d. That no demonstration projects shall be initiated beyond thirty (30) months following the date of the first disbursement of loan funds.
- e. To provide for the training of certain of the Borrower's personnel in income distribution, employment and labor intensity considerations.
- f. That provision will be made that recipients of loan financed long term training shall return to their previous employment for a period of time at least equal to the period of the training received.
- g. That the proposed four basic CET contracts and contractors and contractor personnel financed under the loan shall be approved by A.I.D. prior to the execution of said contracts.

h. That within thirty (30) months from the date of execution of the loan agreement the Borrower, the CET and A.I.D. shall review, in depth, all aspects of the program.

i. To establish a principle of residual State rights to any innovation developed under the program if such innovation is not introduced within a reasonable period of time.

j. To take all necessary measures to maximize the participation of small and medium firms in the BADESP Fund, and also agrees to the establishment of mutually acceptable target levels of small and medium firm project approvals by CET.

It is the intention of the Mission to negotiate with the Borrower a target level for the first year that would fall in a range of 40-60% of project approvals by financial magnitudes.

A condition precedent to first disbursement shall be the agreement on the target level for the first year. Annually, the actual performance in this regard shall be compared to the target, and if major deviation is found, a satisfactory plan shall be agreed upon by A.I.D. and the CET for promoting the increased participation of the small and medium firms in the program.

3. The loan will be guaranteed by the GOB.

4. The loan shall be subject to such other terms and conditions as A.I.D. may deem advisable.

GLOSSARY

Associação Brasileira de Cerâmica	(ABC)	Brazilian Society for Ceramics
Associação Brasileira de Metais	(ABM)	Brazilian Society for Metals
Associação Brasileira de Normas Técnicas	(ABNT)	Brazilian Society for Soil Mechanics
Fundação Brasileira para a Preservação da Natureza	(ABP)	Brazilian Society for Wood Preservation
Associação Paulista de Geologia Aplicada	(APGA)	São Paulo Society for Applied Geology
Banco de Desenvolvimento do Estado de São Paulo	(BADESP)	Development Bank of the State of São Paulo
Banco Nacional do Desenvolvimento Econômico	(BNDE)	National Economic Development Bank
Carteira de Comércio Exterior	(CACEX)	Department of Foreign Trades
Conselho de Desenvolvimento Industrial	(CDI)	National Industrial Development Council
Comissão Econômica para a América Latina	(CEPAL)	Economic Commission for Latin America
Conselho Estadual de Tecnologia, São Paulo	(CET)	São Paulo Council of Technology
Centro Nacional de Pesquisa	(CNPq)	National Research Council
	(EDR)	Engineering Development and Research
Escola de Engenharia, USP	(EP)	Engineering School
Eximbank	(EXIMBANK)	Import and Export Bank
Organização de Alimentação e Agricultura	(FAO)	Foreign Agriculture Organization
Fundação Getulio Vargas	(FGV)	Getulio Vargas Foundation

Federação das Indústrias do Estado de São Paulo (FIESP)	São Paulo Federation of Industries
Fundo de Financiamento de Estudos, Projetos e Programas (FINEP)	Financing Survey and Feasibility Studies
Fundo de Financiamento para Exportação (FINEX)	Export Financing Fund
Fundo Nacional de Ciência e Tecnologia (FNDCT)	National Fund for Science and Technology
Fundo para Assistência Tecnológica (FUNAT)	Fund for Technological Assistance
Fundo para Desenvolvimento da Ciência e Tecnologia (FUNTEC)	Development Fund for Science and Technology
Instituto de Agricultura de Campinas (IAC)	Agriculture Institute of Campinas
Instituto de Biologia (IB)	Biological Institute
Instituto Brasileiro de Geografia e Estatística (IBGE)	Brazilian Institute for Geography and Statistics
Imposto sobre Circulação de Mercadorias (ICM)	Tax on the Circulation of Merchandise
Instituto Nacional de Tecnologia (INT)	National Institute of Technology
Instituto da Pesca (IP)	Fishery Institute
Instituto de Pesquisas Econômicas (IPE)	Economic Research Institute
Instituto de Pesquisa Econômica Aplicada (IPEA)	Economics Planning Institute
Imposto sobre Produtos Industrializados (IPI)	Industrialized Products Tax
Instituto de Pesquisa Tecnológica (IPT)	Technological Research Institute
Instituto Tecnológico da Aeronáutica (ITA)	Institute for Aeronautic Technology
Instituto de Tecnologia de Alimentação (ITAL)	Food Technology Institute

Ministério da Indústria e Comércio	(MIC)	Ministry of Industry and Commerce
	(NAS)	National Academy of Science
Plano Básico para o Desen- volvimento da Ciência e Tecnologia	(PBDCT)	Scientific & Technological Development Basic Plan
Programa de Integração Nacional	(PIN)	National Integration Program
Programa de Redistribui- ção de Terra e do Estímulo a Agro- Industria	(PROTERRA)	Program for Land Redistribution
Pontifícia Universidade Católica	(PUC)	Pontifice Catholic University
Secretaria de Economia e Planejamento	(SEP)	Secretariat of Economy and Planning

MINISTRY OF PLANNING AND GENERAL COORDINATION

Brasilia, D.F.

GM/C/24/72

Rio de Janeiro, December 19, 1972

To His Excellency
Minister William A. Ellis
Director USAID/Brazil

Excellency:

1. Please refer to the Government of São Paulo State request for the granting of a loan to help finance the Science and Technology Project, which was drafted by the Technology State Council, an office of the Secretary of Economics and Planning of the State of São Paulo.

2. The basic strategy will be for the enterprises to absorb technology by transferring scientific know-how to the productive level, in the industrial as well as agricultural areas. The said project will involve both local and foreign sources of funding, and USAID's share is estimated in US\$15,000,000.00 (fifteen million dollars), as a loan to be specifically applied to financing technical assistance.

3. I take this opportunity to express to Your Excellency the interest of the Brazilian Government in having USAID consider the investigation of this request, so as to finally have it approved.

Sincerely,

João Paulo dos Reis Velloso
Minister

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

Subject: BRAZIL - Capital Assistance

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 judgement Brazil has the financial capability and the human resources to maintain and utilize effectively the proposed Loan to the State of São Paulo for science and technology development.

This judgement is based primarily on the facts developed in the Capital Assistance Paper for the proposed loan of US\$15 million (fifteen million dollars), which discusses in detail the capabilities of the State of São Paulo and finds that it possesses adequate financial and human resource capability to maintain and utilize the project effectively. The relationship between the proposed loan and prior U.S. assistance to science and technology development in Brazil is discussed in detail in the Capital Assistance Paper.

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CHECKLIST OF STATUTORY CRITERIA

(Alliance for Progress)

The following abbreviations are used:

FAA - Foreign Assistance Act of 1961, as amended.

App. - Foreign Assistance and Related Agencies Appropriations Act, 1972.

MMA - Merchant Marine Act of 1936, as amended.

COUNTRY PERFORMANCE

Progress Towards Country Goals

1. FAA §. 208; §. 251 (b)

A. Describe extent to which country is:

1. Making appropriate efforts to increase food production and improve means for food storage and distribution.

Expanding food production and improving the means for food storage and distribution is one of the major goals of Brazil and a great many steps have been taken to achieve this goal. For further details see CIAP/377, especially pages 124-142.

2. Creating a favorable climate for foreign and domestic private enterprise and investments.

Brazil has done a great deal to encourage private enterprise, both domestic and foreign and has not in general placed any special obstacles in the way of foreign investors except in a few "national security" areas. However, on October 20, 1972, the National Monetary Council passed a resolution requiring a deposit of 25% of the face amount of all foreign loans with the Central Bank. This is called a temporary measure aimed at, for the time being, restricting the inflow of foreign investment.

3. Increasing the public's role in the developmental process.

Brazil has encouraged an increased public role in the developmental process by its very successful tax incentive programs to encourage private savings and investment.

4. a. Allocating available budget resources to development.

Brazil is allocating large amounts of budget resources to development.

b. Diverting such resources for unnecessary military expenditure and intervention in affairs of other free independent nations. (See also Item no. 17.)

Brazil is spending about 2.3 percent of its GNP for defense. In 1971 this was about US\$1.05 billion. This is a substantial amount but not excessive in view of the special defense burdens created by long borders (4,600 miles coast and 8,700 miles of land frontier) and a vast sparsely populated interior. Defense Agency budgets include expenditures of a non-military nature for such things as subsidies to civilian airlines, civilian airport construction, maintenance of flight control and communications and mail delivery to remote areas. Identifiable items of this kind approach 10 percent of Defense Agency budgets. Brazil is not intervening in the affairs of other nations.

5. Willing to contribute funds to the project or program.

See the Financial Analysis section of the paper for a discussion of Brazil's contribution.

6. Making economic, social, and political reforms such as tax collection improvements and changes in land tenure arrangements, 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.

Although progress toward a return to democratic government still is hindered by the military's determination to hold on to Revolutionary leadership, state legislatures elected Governors from among the candidates either selected or approved by the President. Elections for the national Congress and Senate were held in November 1970 after preliminary screening process. Cassations, the stripping of political rights for ten years and the firing from government jobs or deprivation of elected office, continue sporadically. All the State legislatures have been reopened, membership altered, of course, by cassations. Municipal elections continue to be held. In October 1969 the Federal Congress reopened after having been closed by former President Costa e Silva for ten months. At the same time the Constitution was amended, with Congressional ratification, to strengthen the President's powers. Although censorship still exists and new laws precensoring for pornography have been issued, a certain latitude in the press and in expression is allowed insofar as fundamental concepts of the Revolution are not challenged nor articles published which lend support to subversives. On the other hand, there have been incidences of police intimidation of individual journalists.

The GOB appears convinced that private enterprise with government assistance will keep the economy growing at the same rapid rate of the past several years. Outside the government there is some concern expressed at the extent of U.S. investment in certain sectors and at amount of foreign profit remittances.

7. Adhering to the principles of the Act of Bogota and Charter of Punta del Este.

Brazil is adhering to these principles.

8. Attempting to repatriate capital invested in other countries by its own citizens.

Brazil's efforts to encourage investment, promote rapid economic growth and reduce the rate of inflation contribute to the return of capital invested in other countries by its citizens.

9. Otherwise responding to the vital economic, political, and social concerns of its people, and demonstrating a clear determination to take effective self-help measures.

Since assuming power President Medici has voiced concern for the desequilibrium in standards of living among Brazilians of different regions and classes. GOB has embarked on significantly needed land reform projects.

- B. Are above factors taken into account in the furnishing of the subject assistance?

The above factors have been taken into account in recommending approval of this loan.

Treatment of U.S. Citizens

2. FAA §. 620 (c). If assistance is to a government, is the government liable as debtor or unconditional guarantor on any debt to a U.S. citizen for goods or services furnished or ordered where (a) such citizen has exhausted available legal remedies and (b) debt is not denied or contested by such government?

Brazil is not known to be so indebted.

3. FAA §. 620 (c) (1). If assistance is to a government, has it (including government agencies or subdivisions) 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 toward such citizens or entities?

No such action has been taken.

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4. FAA §. 620 (o); Fishermen's Protective Act. §. 5. If a country has seized, or imposed any penalty or sanction against, any U.S. fishing vessel on account of its fishing activities in international waters.

No case of seizure, penalty or sanction against U.S. fishing vessel is known to exist.

- a. has any deduction required by Fisherman's Protective Act been made?

Not applicable.

- b. has complete denial of assistance been considered by AID Administrator?

Not applicable.

Relations with U.S. Government and Other Nations

5. FAA §. 620 (d). If assistance is for any productive enterprise which will compete in the U.S. with U.S. enterprise, is there an agreement by the recipient country to prevent export to the U.S. of more than 20% of the enterprise's annual production during the life of the loan?

Not applicable. While export promotion will receive particular emphasis in the broad program, it is not known which kinds of clients will avail themselves of which specific kinds of technical assistance provided by the loan.

6. FAA §. 620 (j). Has the country permitted, or failed to take adequate measures to prevent, the damage or destruction by mob action, of U.S. property?

Brazil has not permitted such acts.

7. FAA §. 620 (l). If the country has failed to institute the investment guaranty program for the specific risks of expropriations, in convertibility or confiscation, has the AID administration within the past year considered denying assistance to such government for this reason?

Brazil has actively instituted a guaranty program.

8. FAA § 620 (q). Is the government of the recipient country in default on interest or principal of any AID loan to the country?

No such default exists.

9. FAA §. 620 (t). Has the country severed diplomatic relations with the U.S.? If so, have they been resumed and have new bilateral assistance agreements been negotiated and entered into since such resumption?

Brazil has not severed relations with the U.S.

10. FAA §. 620 (u). What is the payment status of the country's U.N. obligations? If the country is in arrears, were such arrearage taken into account by the AID Administrator in determining the current AID Operating Year Budget?

Brazil is meeting its U.N. obligations.

11. FAA §. 620 (a). Does recipient country furnish assistance to Cuba or fail to take appropriate steps to prevent ships or aircraft under its flag from carrying cargoes to or from Cuba?

Brazil does not 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.

12. FAA §. 620 (b). If assistance is to a government, has Secretary of State determined that 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.

13. FAA §. 620 (f). Is recipient country a Communist country?

No.

14. FAA §. 620 (t). Is recipient country in any way involved in (a) subversion of, or military aggression against, the U.S. or any country receiving U.S. assistance, or (b) the planning of such subversion or aggression.

No.

15. FAA §. 620 (n). Does recipient country furnish goods to North Viet-Nam or permit ships or aircraft under its flag to carry cargoes to or from North Viet-Nam?

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

16. FAA §. 481. Has the government of recipient country failed to take adequate steps to prevent narcotic drugs and other controlled substances (as defined by the Comprehensive Drug Abuse Prevention and Control Act of 1970) produced or processed, in whole or in part, in

such country, or transported through such country, from being sold illegally within the jurisdiction of such country to U.S. Government personnel or their dependents, or from entering the U.S. unlawfully?

The Government of Brazil is taking adequate steps to prevent narcotic drugs and other controlled substances from being sold illegally.

Military Expenditures

17. FAA §. 620 (s). What percentage of country budget is for military expenditures? How much of foreign exchange resources spent on military equipment? How much spent for the purchase of sophisticated weapons systems? (Consideration of these points to be coordinated with PPC/RC.)

Expenditures for military purposes are about 17 percent of total central government expenditures, or about 7.0 percent of total public sector expenditures including states and municipal governments, (estimates for 1971).

Brazil's foreign exchange disbursements for military equipment are projected to increase from \$20 million in 1967 to \$58 million in 1973. These expenditures would range from 1.19% of total imports (defined as goods plus net services) in 1967 to 1.85% in 1973. Brazil's foreign exchange reserves were at about 3.5 billion at the end of October 1972. For about 10 years (1955-1965) Brazil bought little military equipment. A re-equipment and modernization program now underway to improve efficiency in the defense establishment by replacing aged and obsolete equipment will increase expenditures for equipment, but will increase overall military expenditures only slightly.

CONDITIONS OF THE LOAN

General Soundness

18. FAA §. 201 (d). Information and conclusion on reasonableness and legality (under laws of country and U.S.) of lending and relending terms of the loan.

The terms of the proposed loan are legal under both U.S. and Brazilian laws, and are considered reasonable.

19. FAA §. 251 (b) (2); §. 251 (e). Information and conclusion on activity's economic and technical soundness. If loan is not made pursuant to a multi-lateral plan, and the amount of the loan exceeds \$100,000, has country submitted to AID an application for such funds together with assurances to indicate that funds will be used in an economically and technically sound manner.

This project is considered to be economically and technically sound. Application has been submitted by the Government of the State of São Paulo which includes assurances that the funds will be used in an economically and technically sound manner.

20. FAA §. 251 (b). Information and conclusion on capacity of the country to repay the loan, including reasonableness of repayment prospects.

Brazil is considered able to repay the proposed loan.

21. FAA §. 611 (a) (1). Prior to signing of loan will there be (a) engineering, financial, and other plans necessary to carry out the assistance and (b) a reasonably firm estimate of the cost to the U.S. of the assistance?

Necessary technical and financial planning has been completed. A reasonable firm estimate of the costs of the loan is presented in Section V.

22. FAA §. 611 (a) (2). If further legislative action is required within recipient country what is basis for reasonable expectation that such action will be completed in time to permit orderly accomplishment of purposes of loan?

No legislation is required. State budgetary action will be required prior to implementation.

23. FAA §. 611 (e). If loan is for capital assistance, and all U.S. assistance to project now exceeds \$1 million, has Mission Director certified the country's capability effectively to maintain and utilize the project?

Yes. See the Director's Certification in Annex 2.

24. FAA §. 251 (b). Information and conclusion on availability of financing from other free-world sources, including private source within the United States.

See Summary and Recommendations Section.

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Loan's Relationship to Achievement of Country and Regional Goals

25. FAA §. 207; §. 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 of trained manpower in the country; (d) programs designed to meet the country's health needs; or (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) (a) The specific purpose of the project is to increase the Brazilian institutional capacity to select, adopt and generate technology. Institutions to be directly assisted include the São Paulo Council of Technology, research institutions, and the University of São Paulo.

(b) Not applicable.

(c) This project includes a substantial training component which aims to increase the availability of trained scientific and technological manpower in Brazil.

(d) Not applicable.

(e) The contribution of this project to the economic development of Brazil is discussed in Section IV.

26. FAA §. 209. Is project susceptible of execution as part of regional project? If so why is project so executed?

Project is not a regional project. In the long run it is planned that project will be source of country-wide use.

27. FAA §. 251 (b) (3). Information and conclusion on activity's relationship to, and consistent with, other development activities, and its contribution to realizable long-range objectives.

See Section I, Background.

28. FAA §. 251 (b) (7). Information and conclusion on whether or not the activity to be financed will contribute to the achievement of self-sustaining growth.

This project is responding to the creation of self-sustaining growth through developing Brazilian institutions which are designed to carry on activities after the U.S. portion of this program has been completed.

29. FAA §. 281 (a). Describe 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 country, through the encouragement of democratic, private, and local governmental institutions.

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The objectives of this program are coincidental with those set forth in FAA Section 281 (a) in that this program will strengthen both private and governmental institutions and facilitate the flow of information coming therefrom which is essential to sustained economic development in Brazil.

30. FAA §. 281 (b). Describe extent to which program recognizes the particular needs, desires, and capabilities of the people of the country; utilizes the country's intellectual resources to encourage institutional development; and supports civic education and training in skills required for effective participation in governmental and political processes essential to self-government.

The program recognizes the great need of utilizing the country's scientific and technological resources to encourage both private and public institutional development for the continued economic development of the country.

31. FAA §. 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.

This loan specifically responds to the above concerns and the loan paper describes in detail how the loan will encourage efforts in Brazil to:

- (a) increase international trade;
- (b) foster private initiative and competition;
- (c) not applicable;
- (d) discourage monopolistic practices;
- (e) improve technical efficiency of industry;
- (f) not applicable.

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32. FAA §. 619. If assistance is for newly independent country; is it furnished through multilateral organizations or plans to the maximum extent appropriate?

Not applicable.

33. FAA §. 251 (b). 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 annual 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 latest annual review. The project will help Brazil to improve through the transfer of technology and the strengthening of indigenous capabilities to transfer technical skills.

34. FAA §. 251 (g). Information and conclusion on use of loan to assist in promoting the cooperative movement in Latin America.

Not applicable.

35. FAA §. 209; §. 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 U.S. and A.I.D. Program

36. FAA §. 251 (b) (4); §. 102. Information and conclusion on possible effects of loan 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.

One of the goals of this program is to promote international trade, however, there should be no adverse effects on the U.S. economy as a result of the program. In fact, substantial services will be procured from the U.S. under this program.

37. FAA §. 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 over a period of time should encourage further U.S. private investment in Brazil. Further, it is anticipated that most if not all of the technical services provided by the U.S. will be private.

38. FAA §. 601 (d). If a capital project, are engineering and professional services of U.S. firms and their affiliates used to the maximum extent consistent with the national interest?

Not applicable.

39. FAA §. 602. Information and conclusion whether U.S. small business will participate equitably in the furnishing of goods and services financed by the loan.

Not applicable.

40. FAA §. 620 (h). Will the loan promote or assist the foreign aid projects or activities of the Communist-Bloc countries?

No.

41. FAA §. 621. If Technical Assistance is financed by the loan, information and conclusion whether such assistance will be furnished to the fullest extent practicable as 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.

The technical assistance to be financed under this loan will be, for all practical purposes, furnished from private enterprise.

42. FAA §. 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 procurements from private sources.

None of the loan money will be going directly to private enterprise. For a description of the program and the use of loan funds see Section IV, Analysis of Program and AID Project and Section V, Financial Analysis.

Loan's Compliance with Specific Requirements

43. FAA §. 201 (d). Is interest rate of loan at least 2% per annum during grace period and at least 3% per annum thereafter?

Yes.

44. FAA §. 608 (a). Information on measures to be taken to utilize U.S. Government excess personal property in lieu of the procurement of new items.

Not applicable.

45. FAA §. 604 (a). Will all commodity procurement financed under the loan be from the United States except as otherwise determined by the President?

Not applicable.

46. FAA §. 604 (b). What provision is made to prevent financing commodity procurement in bulk at prices higher than adjusted U.S. market prices?

Not applicable.

47. FAA §. 604 (d). If the cooperating country discriminates against U.S. marine insurance companies, will loan agreement require that marine insurance be placed in the United States on commodities financed by the loan?

Yes.

48. FAA §. 604 (e). If offshore procurement of agricultural commodity or product is to be financed, is there provision against such procurement when the domestic price of such commodity is less than parity?

Not applicable.

49. FAA §. 611 (b); App. §. 101. If loan finances water or water-related land resource construction project or program, is there a benefit-cost computation made, insofar as practicable, in accordance with the procedures set forth in the Memorandum of the President dated May 15, 1962?

Not applicable.

50. FAA §. 611 (c). If contracts for construction are to be financed, what provision will be made that they be let on a competitive basis to maximum extent practicable?

Not applicable.

51. FAA §. 620 (g). What provision is there against use of subject assistance to compensate owners for expropriated or nationalized property?

The loan agreement will not permit such use.

52. FAA §. 612 (b); §. 636 (h). Describe steps 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 borrower is providing all local currency costs of the project. The financial analysis section lists local currency contributions.

53. App. §. 104. Will any loan funds be used to pay pensions, etc., for military personnel?

No.

54. App. §. 105. If loan is for capital project, is there provision for AID approval for all contractors and contract terms?

The loan is not for a capital project.

55. App. §. 108. Will any loan funds be used to pay U.N. assessments?

No.

56. App. §. 109. Compliance with regulations on employment of U.S. and local personnel for funds obligated after April 30, 1964 (AID Regulation 7).

Not applicable.

57. FAA §. 636 (1). Will any loan funds be used to finance purchase, long-term lease, or exchange of motor vehicle manufactured outside the United States, or any guaranty of such a transaction?

No.

58. App. §. 501. Will any loan funds be used for publicity or propaganda purposes within the United States not authorized by the Congress?

No.

59. FAA §. 620 (k). If construction of productive enterprise, will aggregate value of assistance to be furnished by the United States exceed \$100 million?

Not applicable.

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60. FAA §. 612 (d). Does the United States own excess foreign currency and, if so, what arrangements have been made for its release?

Not applicable.

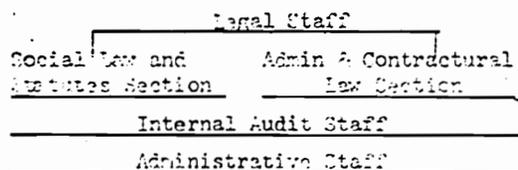
61. MMA §. 901 (b). Compliance with requirements that at least 50 per centum of the gross tonnage of commodities (computed separately for dry bulk carriers, dry cargo liners, and tankers) financed with funds made available under this loan shall be transported on privately owned U.S. flag commercial vessels to the extent that such vessels are available at fair and reasonable rates.

Not applicable.

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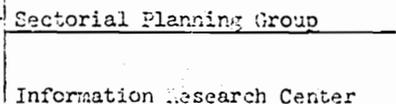
ADMINISTRATIVE COUNCIL

Tech-Cultural Assistance & Support Staff



SUPERINTENDENT

Technical Administrative Group



CIVIL ENGINEERING DIV

- Materials Group
- Structures Group
- Geotechnical Group
- Environmental Tech Gr

MECHANICAL ENGINEERING DIV

- Machine Tool Group
- Material & Equipment Assessment Group
- Instrumentation & Automation Group
- Naval Engineering Group
- Thermal Engineering Group

MINES AND APPLIED GEOLOGY DIV

- Petroleum Section
- General Geology Section
- Geophysics Section
- Applied Geology Section
- Rock Mechanics Section
- Hydrogeology Section
- Mines Section

CHEMISTRY AND CHEMICAL ENGINEERING DIV

- Inorganic Analyses Group
- Instrument Analyses Group
- Organic Analyses Group
- Inorganic Technology Group
- Organic Technology Group

WOOD DIVISION

- Forestry Inventory Group
- Anatomy Group
- Utilization Group
- Wood Chemistry Group

METALLURGY DIVISION

- Experimental Metal Plant
- Metal Chemistry Group
- Metal Physics Group

MINERAL PROCESSING DIVISION

- Apini Reg Experimental Station
- Mineral & Min Products Lab
- Experimental Mineral Processing Plant

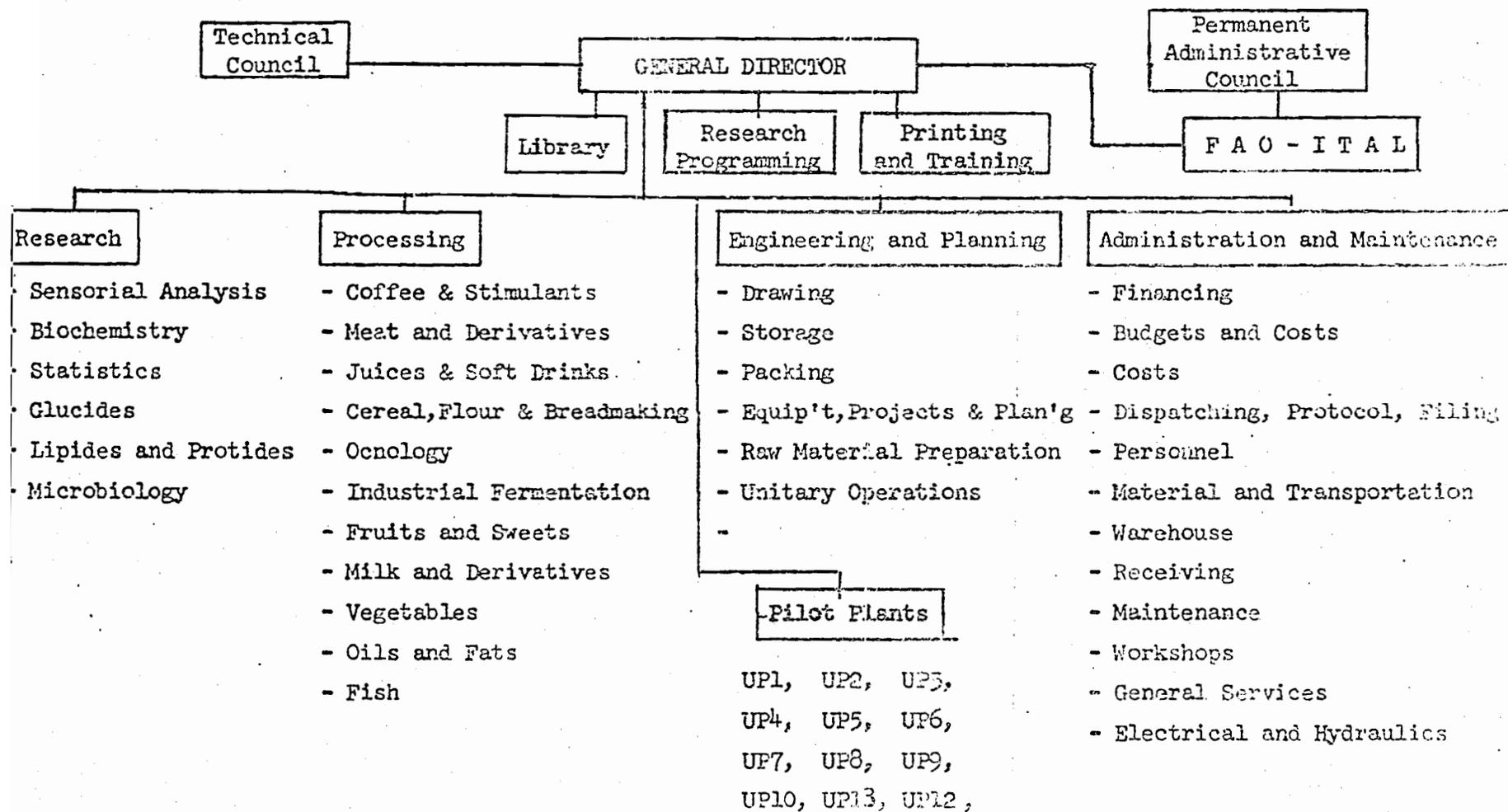
ADMINISTRATION DIVISION

- Scientific Documentation Service
- Accounting & Finance Service
- Personnel and Auxiliary Activities Service

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 INSTITUTE OF FOOD TECHNOLOGY

- ITAL -



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ANEX 11
 INSTITUTUL DE
 CERCETARE SI
 DEZVOLTARE
 IN ALIMENTARIE
 SI NUTRITIE

SYSTEM DEVELOPMENT AND DEMONSTRATION PROJECTS

AT IPT AND ITAL

(1) Coordinating Institution	(2) Implementing Institution	(3) Project	(4) Objective	(5) Estimated Cost (US\$)
IPT	IPT	Explosive cladding, forming, and welding.	Develop staff capability in technology and practical utilization of this process. Identify specific industrial problems which can be solved by this process.	\$1,729,000
	IPT	Weathering steels	Develop capability of providing technical assistance to and conduct research for steel producers and fabricators.	\$1,438,000
	IPT	Surface quality of steels.	Establish competence necessary to analyse processing inputs from the ingot to the transformation process and through the fabrication of finished components.	\$2,165,000
	IPT and ITAL	Packing materials and containers	Provide technical information about packaging and new materials for packaging to food processing and package manufacturers. Provide trouble shooting and technical assistance, especially to small and medium firms. IPT will be concerned with materials and processes for producing packages and ITAL will be responsible for testing and evaluation of the packages. ITAL will also request IPT assistance in developing specialized packaging materials.	\$6,909,000

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(1)	(2)	(3)	(4)	(5)
IPT	IPT	Standardization and quality control. <u>1/</u>	Define, with federal and state authorities, the role of IPT as a reference laboratory for metallurgical products, prepare long range plan for establishment of laboratory and implement this plan.	\$14,402,000
ITAL	ITAL	Marketing Management Services. <u>1/</u>	Develop an institutional capability to provide agro-industry and government with marketing management services to assist in creating and expanding markets for processed food products.	\$2,169,000
	ITAL	Quality Control Laboratory. <u>1/</u>	Develop analysis methods and establish standards and reference for processed foods and furnish quality certificates for export product lots according to buyers specifications.	\$1,252,000
	ITAL	Industrialization of fishery and marine resources.	Develop a technical information center for use by fishery and fish processing industries and distribute information to these and other organizations. Conduct training, apprenticeship programs. Provide technical assistance, evaluate and design new process lines and contract with industry for research.	\$1,415,000

(1)	(2)	(3)	(4)	(5)
ITAL	ITAL	Processed and fresh meat products.	Conduct seminars for the meat industry as means to identify their needs and disseminate information. Also conduct workshops and training programs for meat industry. Provide technical assistance including technical and economic feasibility and marketing analyses.	\$2,179,000
Instituto de Zootecnia	Dry season feeding	Strengthen capability in and conduct research on dry season feeding of cattle including utilization of silage, hay-products and agricultural and industrial by-products. Study dairy and cattle production techniques under feed lot conditions.	\$1,523,000	
Instituto de Zootecnia	*Grass-legume pastures	Strengthen capability in and conduct studies on grass-legume pastures. Includes grazing experiments with improves tropical pastures in various ecological regions.	\$1,323,000	
Instituto de Zootecnia	Improvement of cattle through selection and crossbreeding.	Strengthen capability in and conduct research on cattle selection and crossbreeding with objective being increased production through use of special breeds, artificial insemination and other techniques.	\$1,785,000	

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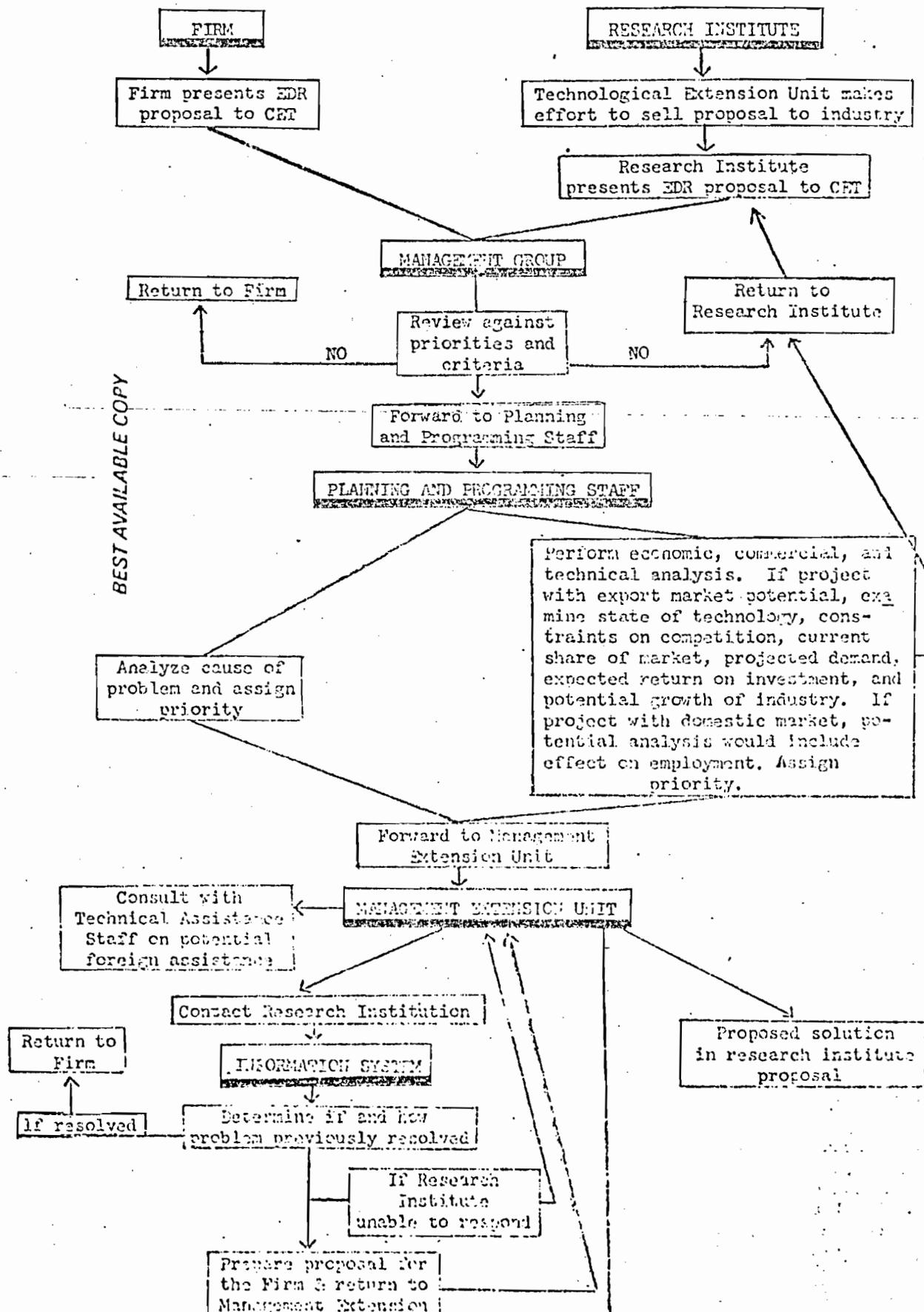
(1)	(2)	(3)	(4)	(5)
ITAL	Instituto de Zootecnia	Cattle management	Strengthen capability in and conduct studies on cattle management with emphasis on breeding seasons, ages of calving and slaughtering as well as studies on economic viability of dairy cattle production.	\$1,097,000
	Instituto de Zootecnia	Poultry, pork, rabbits and sheep.	Strengthen capability in and conduct research on the use of agricultural and industrial residues to increase pasture profitability. Study and evaluate genetic potentials, management systems, and carcass classification.	\$1,006,000
	Instituto Biológico	Sanitary control of domestic slaughter animals.	Strengthen capability in and study production methods for vaccines to central disease. Conduct research on principal parasitic illness and mineral deficiencies of domestic slaughter animals.	\$6,824,000
	Instituto Biológico	Poisoning of domestic slaughter animals.	Strengthen capability in and conduct studies on the toxic effects of pesticides on domestic slaughter animals.	\$3,580,000
	Instituto Biológico	*Diseases and illness of industrialized food crops.	Strengthen capability in and supply support to other institutions in preserving the high quality of agro-industrial crops and provide information concerning resistant varieties and product protection.	\$ 549,000

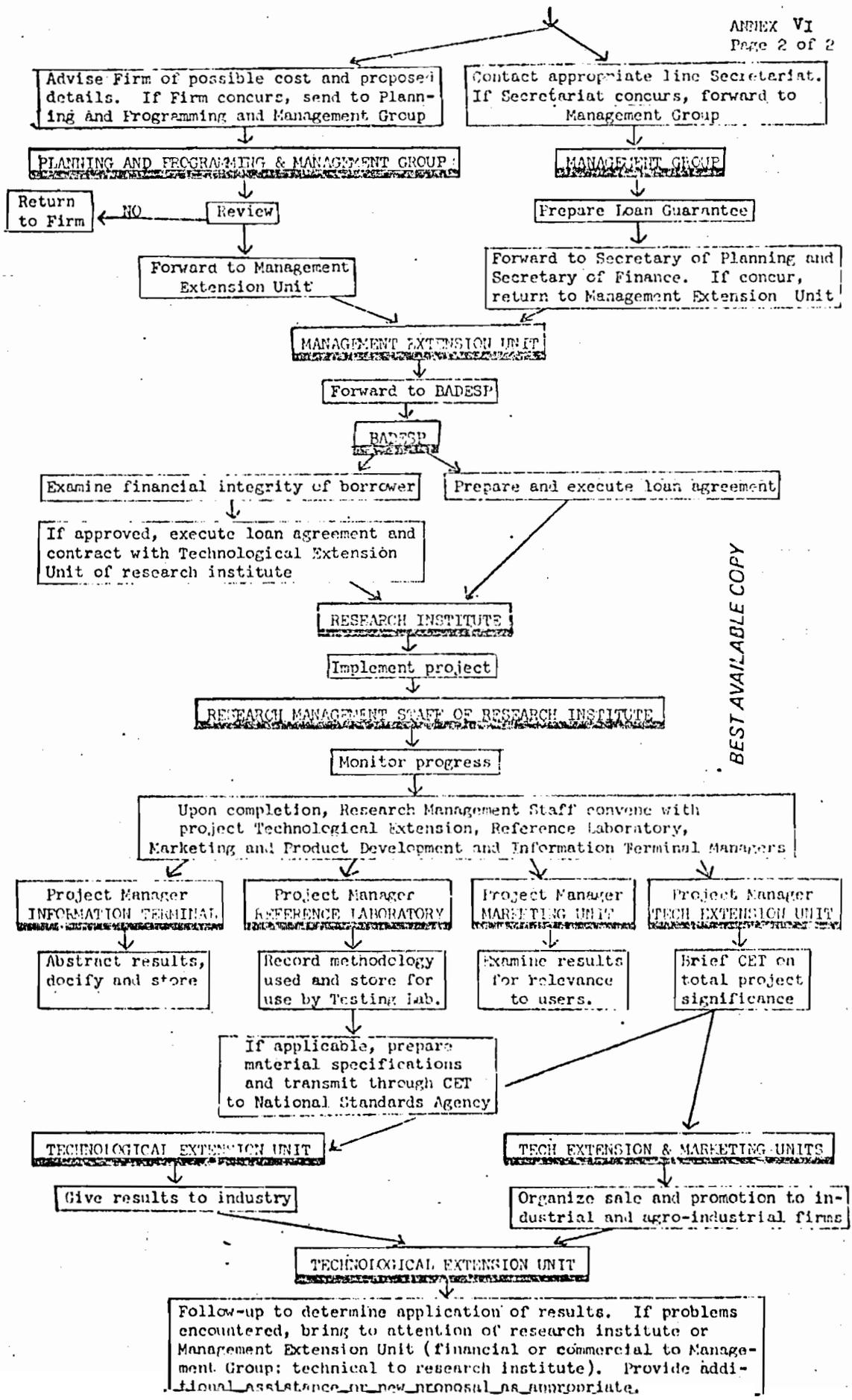
(1)	(2)	(3)	(4)	(5)
TOTAL	Instituto Biológico	Fruit diseases	Supply support to other institutions in preserving the high quality of agro-industrial fruits. Increase staff capabilities through training.	\$885,000
	Instituto Agrônômico	Improvement of fruits for industrial ends.	Strengthen capacity in and conduct research in varieties and strains of citrus, tropical fruits, grapes and fruits of temperate climate with objectives being increased production and improved quality.	\$2,531,000
	Instituto Biológico	*Diseases and illnesses of horticultural crops.	Strengthen capacity in and supply support to other institutions in preserving the high quality of agro-industrial crops.	\$1,859,000
	Instituto Agrônômico	*Horticultural crops.	Study horticultural seeds with objectives being improvement and increased production.	\$1,147,000
	Instituto Agrônômico	*Genetic support and improvement of products.	Strengthen capability and develop techniques for the efficient selection and identification of high production, drought and pest resistant and nutritive food crops for industrial and non-industrial use.	\$7,487,000

(1)	(2)	(3)	(4)	(5)
ITAL	Instituto Agronômico	*Support research and physical support of activities.	Strengthen capability in and conduct research on crop improvement and the chemical and physical characteristics of plants. Also provide support to insure execution of field experiments, equipment installation and human resource training.	\$10,901,000
TOTAL				\$76,155,000

1/ System development project to be undertaken at research institute and coordinated by the CET/Management Group.

* These projects were not considered in arriving at estimated costs of technical assistance contracts to be financed under the proposed AID loan.





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STRUCTURE OF BRAZILIAN EXPORT GROWTHA. Annual Compound Ct. Rate

<u>Year</u>	<u>Total Exports</u>	<u>Coffee</u>	<u>Primary Excl. Coffee</u>	<u>Manufactures</u> *
1960	100.0	56.2	42.1	1.7
1961	"	50.6	46.9	2.5
1962	"	52.9	44.4	2.7
1963	"	53.2	44.1	2.7
1964	"	53.1	42.0	4.9
1965	"	44.3	48.6	6.9
1966	"	44.4	50.0	5.6
1967	"	44.3	47.1	8.6
1968	"	42.4	50.7	6.9
1969	"	36.6	55.5	7.9
1970	"	35.8	53.0	11.2
1971	"	28.3	57.1	14.6

B. Growth of Exports (per cent)

1960-61	10.6	-0.3	22.8	67.9
1961-62	-13.5	-9.5	-18.1	-7.0
1962-63	15.8	16.5	15.3	13.0
1963-64	1.7	1.5	-3.3	85.9
1964-65	11.6	-6.9	29.8	56.7
1965-66	9.1	9.3	11.9	-11.6
1966-67	-5.0	-5.2	-10.7	47.4
1967-68	13.7	8.8	22.6	-8.9
1968-69	22.9	6.1	34.6	39.7
1969-70	18.5	16.1	13.0	69.0
1970-71	6.0	-16.3	14.3	33.2
1965-71	10.5	2.5	13.4	25

(Calculated from Banco Central do Brasil, Boletim, Março 1972 pp-102-3).

* Classes 5, 6, 7 and 8 of Brazilian Nomenclature of Products.

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TECHNOLOGY IN BRAZIL

Around the 1850's the nascent Brazilian industrial system was concentrated on the production of goods requiring simple know-how. Technologies used were either of general knowledge associated with imports of the machinery and equipment for the production of specific goods, or were brought in by skilled immigrant workers. Public utilities, transportation, and communications were entirely explored by foreign companies. There was no demand to stimulate scientific and technological activities in the local community or in the emerging universities.

The universities were established according to European tradition with emphasis on the preparation of liberal professionals, especially lawyers. In the medical and engineering schools, which had a lower status than the law schools, the teaching of science involved little research. A few research institutes concerned with specific problems appeared at the turn of the century; e.g., the Butantan Institute (epidemic poisoning), the Oswaldo Cruz Institute (yellow fever and small pox), and the São Paulo Biologic Institute (coffee tree diseases). These were established as independent units and remained restricted to their original areas of concern.

Until early in the century industry progressed slowly. The dynamic sector was the export of primary goods. But the recurring crisis in the market for traditional exports (the First World War, most of the 1930's, the Second World War) and their consequences on Brazil's balance of payments, the production of manufactured goods for the internal market became profitable. This provided the basis for the industrialization that followed. Further, the industrialization process was stimulated by a protective system that was gradually established in response to continued balance of payments difficulties. Around the mid-fifties, rapid and diversified industrialization was made a primary goal of the government. High levels of protection were complemented by incentives to both domestic and foreign private investment in the form of loans at negative real interest rates, tariff exemption, and lower exchange rates to encourage imports of capital goods in a number of categories. Foreign direct investment was viewed as an important source of both savings and know-how. Liberal profit remittance regulations were set to stimulate this investment.

Under these conditions, the typical firm simply took advantage of an existing market for a particular product. For this purpose it was far more profitable to import than to develop technology. Foreign technology was readily available through licensing agreements and other arrangements at costs easily transferrable to the consumer through the higher prices protected by tariff barriers. The foreign company had easy access to the parent company's research facilities and know-how. For them, the alternative of developing local technological capacity was clearly unattractive.

This was also the case for the national firms for at least the following reasons: (1) The cost of a technological project, in the absence of long-term financing, is concentrated in the initial period, whereas the cost of the imported technology can be distributed over time and generally varies with the level of activities. (2) The risk associated with research is usually larger than that associated with the importation of technology. (3) The opportunity cost of research investment was high in view of the subsidies to capital investment. (4) The establishment of even a minimal capacity for research was too costly for the average Brazilian firm. Even the largest firms, however, were discouraged by the aforementioned constraints and disincentives. Thus, after deciding on a new product or process, the Brazilian entrepreneur was simply maximizing profits by importing technology.

The problem of adapting the imported techniques to the various local peculiarities, however, is inevitably followed by a new generation of technological problems. These place the firm in the position of once again having to weigh the alternatives of further importations of technology or of procuring it domestically when available, or drifting into technological obsolescence.

Among this generation of problems are those associated with modernization, or keeping abreast with the technological advances taking place abroad in the firm's field of specialization, and the need to search for less costly, better quality products in order to keep the share of the market or to gain other markets. These are the kinds of problems that give inducement for the local S&T system to improve its capacity to produce technology. The problems are more complex in a dynamic perspective than those associated with the launching of a new product, and they can hardly be solved by the simple importation of know-how.

However, in Brazil, this stage has been continuously postponed in the development process. Inflation eased domestic competition. Protection encouraged firms to be inward-looking, disregarding internationally competitive prices and external markets, while continuing to maximize profits, by producing high cost and low quality goods for the domestic markets.

Furthermore, in view of factor prices favoring capital, a considerable part of the modernization problem tended to be solved through the importation of new equipment.

Thus, the need to adapt foreign technology to the local peculiarities of the market or of the local resources endowments, could have been the driving force in the development of a local capacity in science and technology. In the case of Brazil, however, this did not happen. Available evidence indicates that except perhaps at a later stage, the foreign know-how that came to Brazil was largely unadapted, thus contributing very little to induce the development of an indigenous capability in S&T. Recent

data on research activities in Brazil suggest adaptive research as the predominant type of technological research undertaken whether by research institutions or by firms. The same set of data indicates that the proportion of firms embarked on research is considerably larger among those which have contracts for technological transfer than among those that do not have this sort of contract. These observations seem to indicate that the process of technological transfer should be a major determinant of technological research activities in Brazil. In view of the intensity of the Brazilian ISI process, the volume of technological transfer that the Brazilian industry must have experienced, should have generated considerable adaptive research activity, which seems not to have occurred. We lack data on past technological activities to illustrate the point, but current data suggest a volume of technological activities in Brazil that is too small to warrant much adaptation of foreign technologies in the past.

The data cited are from an IPEA survey covering the 1967-69 period, and carried out among Brazil's 500 largest domestic and foreign companies, in terms of net worth. The IPEA survey assumes that technological research undertaken by industry in Brazil would be concentrated among the largest companies. The production of technology by these firms is assumed to be nearly the total volume of technological activities by the manufacturing sector in Brazil. The survey covers 46 out of 132 research institutions supposedly representing the universe of institutional technological activities for industry in the country. Among the firms surveyed, more than 292 undertook research at some time during 1967-69; 100 firms which did not themselves undertake research resorted at least once during the period to the facilities of a local institute. If the IPEA assumption is correct, then the volume of research currently done in Brazil is considerably smaller than is required to support intense process of technological transfer to the country.

The demand for technology posed by the primary and the non-industrial export sectors in Brazil, also offered in the past little incentive for the development of the internal production of technology. Brazilian agriculture has been predominantly extensive, with little incorporation of new techniques. The same is true of the extractive industries. On the export side, Brazil has traditionally been an exporter of primary products, involving few technological requirements in production or processing. Manufactured exports only recently have begun to assume significance in the Brazilian export schedule so that they have represented little or no challenge to the indigenous scientific and technological system.

If the productive system in Brazil has not stimulated the growth of a scientific and technological capacity, the evolution of the Brazilian institutions of science and technology, and the previous lack of government policy have also contributed to the weakness of this capacity. Most of the Brazilian capability in S&T has been dependent upon institutions of higher education and government agencies. Yet S&T education has until recently received little governmental attention and institutions of higher education have been giving little attention to research or to the training of researchers. Moreover, resources allocations for research have been small and erratic.

Brazilian Exports of Manufactured Products

Percent Distribution by Manufacturing Sectors

	<u>1969^{2/}</u>	<u>1970^{3/}</u>
1. Non Metallic Minerals	2.7	2.2
2. Metallurgy	18.7	25.2
3. Machinery	15.4	14.0
4. Electric & Comm. Materials	3.1	4.3
5. Transportation Materials	2.4	3.2
6. Lumber & Wood Products	8.2	6.6
7. Furniture	.2	.3
8. Paper & Allied Products	.1	.1
9. Rubber	.4	.9
10. Leather	.1	.2
11. Chemicals	10.9	9.0
12. Textiles	7.0	6.3
13. Apparel & Shoes	.9	2.5
14. Food Products	24.9	22.0
15. Beverages	.3	.3
16. Tobacco	.4	.3
17. Printing & Publishing	.5	.5
18. Miscellaneous	3.7	2.1
19. Sub-total (2+3+14)	59.0	61.2
20. Total	100.0	100.0

(=\$452.6 million dollars)

2/ source of data: World Bank Report on Brazil, Nov. 1971

BRAZIL: Exports of Selected Manufactures as Percentage of Total Manufactured Exports

1962 - 1970

	<u>1962</u>	<u>1963</u>	<u>1964</u>	<u>1965</u>	<u>1966</u>	<u>1967</u>	<u>1968</u>	<u>1969</u>	<u>1970</u>
Chemicals									
Class 5 only	31.3	32.3	19.1	9.3	16.3	13.8	12.9	10.9	8.5
Metallurgy									
Iron & Steel	3.4	7.9	19.2	29.6	15.6	24.6	17.7	19.1	25.0
	2.7	6.4	18.6	28.7	13.0	23.1	15.9	16.8	22.7
Machinery	5.9	9.9	9.9	11.0	15.1	14.0	15.3	15.4	14.2
Electric & Comm. Mat.	1.2	1.0	1.8	2.8	3.2	2.4	2.9	3.1	3.8
Transp. Mat.	18.4	9.8	8.1	4.7	3.3	4.4	1.9	2.4	3.3
Food Products	26.1	19.3	16.8	19.4	22.1	23.2	26.8	24.9	19.2

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Interdependence in Brazilian Manufacturing

Backward and Forward Linkages

1959

(In Percentage of Totals)

	Purchase from Other Sectors <u>(Backw. Link)</u>	Sales to Other Sectors <u>(Forward Link.)</u>
	(Sector Output)	(Sector Demand)
	=100	=100
Metallurgy	22.4	72.6
Machinery	50.2	29.4
Food Products	63.3	2.2
Non-Met. Minerals	35.3	81.8
Electric Material	52.6	13.2
Transp. Material	41.4	15.4
Wood & Furniture	44.7	49.0
Paper	25.2	63.3
Rubber and Leather	41.4	58.0
Chemicals	45.6	76.7
Textiles & Apparel	38.8	13.8
Beverages	50.5	8.8
Other	43.5	24.6

Source of basic data: IPEA

Capital-Labor Ratios by Size of
Establishment, 1959 ^{1/}

<u>Employees per Establishment</u>	<u>Brazil</u>			<u>São Paulo Industry</u>
	<u>Industry</u>	<u>Metallurgy</u>	<u>Food Product</u>	
1-4	2.83	2.49	3.99	3.18
5-9	3.74	2.94	3.59	3.79
10-19	3.73	2.48	4.11	2.69
20-49	2.63	2.71	5.33	2.58
50-99	2.87	3.51	6.08	3.16
100-249	3.36	3.26	6.68	3.59
250-499	3.69	4.17	5.25	3.76
500-999	4.42	7.12	5.48	4.99
1,000+	4.21	4.05	3.27	5.19
TOTAL	3.40	3.97	4.85	3.31

^{1/} Installed horsepower capacity as of December 31, 1959, per average annual monthly employed operative. Data are calculated from IBGE Censo Industrial-1960. Industry includes mineral extraction as well as manufacturing.

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Percent Distribution of Establishments, Employees and Value Added, Size of Establishment, for Selected Industries in Brazil and in the State of S. Paulo, 1969 ^{1/}

	<u>Size Categories of Establishment</u> (Employees per Establishment)		
	<u>0-49</u>	<u>50-99</u>	<u>100 & above</u>
<u>BRAZIL</u>			
<u>Total Manufacturing</u>			
Establishments	80.6	17.6	1.8
Employees	19.1	44.1	36.8
Value Added	13.2	42.3	44.5
<u>Metallurgy</u>			
Establishments	63.6	32.6	3.8
Employees	10.5	38.1	51.5
Value Added	7.6	34.4	58.0
<u>Food Products</u>			
Establishments	89.0	10.3	0.7
Employees	29.8	52.6	17.6
Value Added	24.1	56.5	19.4
<u>SÃO PAULO</u>			
<u>Total Manufacturing</u>			
Establishments	66.0	30.4	3.6
Employees	11.7	44.9	43.4
Value Added	9.0	41.6	49.5
<u>Metallurgy</u>			
Establishments	56.5	39.2	4.4
Employees	10.8	44.4	44.7
Value Added	9.3	40.7	50.0
<u>Food Products</u>			
Establishments	71.9	25.6	2.5
Employees	14.8	54.3	30.9
Value Added	12.8	56.5	30.7

^{1/} Calculated from IBGE, Produção Industrial, 1969. "Value-added" is "Valor de Transformação Industrial", which, in turn, is "Value of Production" ("Valor da Produção") less certain expenditures for purchases of intermediate goods and services. Establishments sampled account for 20% of industrial production.

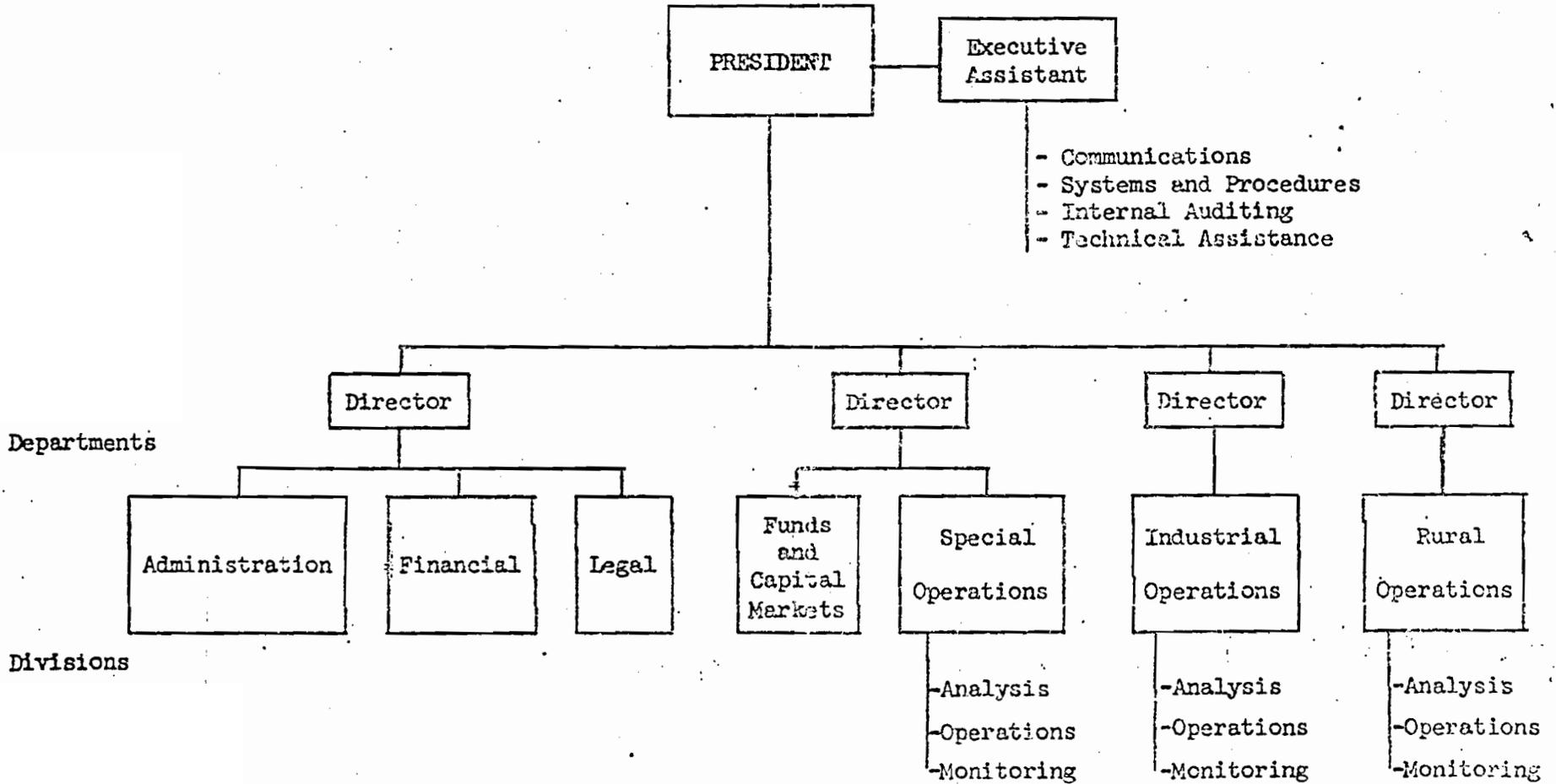
Distribution of Responsive Firms in the Food Products
and the Metallurgic Sectors by Employees, and by Volume of
Capital for the state of São Paulo, as of December 1971

<u>Category</u>	<u>Employees per Establishment</u>	<u>Volume of Capital per Establishment</u>	<u>Food Products Sector</u>		<u>Metallurgic Sector</u>		<u>Food Products and Metallurgic Sector</u>	
			<u>No. of Firms</u>	<u>%</u>	<u>No. of Firms</u>	<u>%</u>	<u>No. of Firms</u>	<u>%</u>
"small"	1 - 99	0 - 499	57	31	77	49	134	39
"medium"	100 - 999	500 - 9,999	96	52	52	34	148	44
"large"	1,000 - +	10,000 - +	<u>33</u>	<u>17</u>	<u>25</u>	<u>17</u>	<u>58</u>	<u>17</u>
			186	100	154	100	340	100

Source: Conselho Estadual de Tecnologia, São Paulo.

BANCO DE DESENVOLVIMENTO DE SÃO PAULO - BADESP

ORGANIZATION CHART



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AIID-DIC/P-1072
ANNEX VIII
Exhibit A

BANCO DE DESENVOLVIMENTO DE SÃO PAULO - BADESP

STAFFING

	<u>Professional</u>	<u>Administrative</u>	<u>Total</u>
President's Office	17	11	28
Directors' Offices	2	4	6
Departments:			
Funds and Capital Markets	9	7	16
Special Operations	15	9	24
Industrial Operations	13	17	30
Rural Operations	27	13	40
Administration, Finance, etc.	19	64	83
	<u> </u>	<u> </u>	<u> </u>
Total	102	125	227

BADESP



ANNEX VIII
Exhibit C
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AGREEMENT reached by FINANCIADORA DE ESTUDOS E PROJETOS S.A. - FINEP, and the GOVERNMENT OF THE STATE OF SÃO PAULO, with the intermediation of the BANCO DE DESENVOLVIMENTO DO ESTADO DE SÃO PAULO - BADESP and CONSELHO ESTADUAL DE TECNOLOGIA.

FINANCIADORA DE ESTUDOS E PROJETOS S.A. - FINEP, public enterprise created by Decree nº 61.056, of July 24, 1967, and constituted as Executive Secretaryship of National/^{the}Fund for Scientific and Technological Development by Decree nº 68.748, of June 15, 1971, established in this city at Rua Araujo Pôrto Alegre, 36 - 7º andar, represented in this deed by its President, Sr. José Pelúcio Ferreira, from now on referred to simply as FINEP, and the GOVERNMENT OF THE STATE OF SÃO PAULO, in this deed represented by the Economy and Planing Secretary, Sr. Miguel Colasuonno, from now on referred to as GOVERNMENT, with the intermediation of the BANCO DE DESENVOLVIMENTO DO ESTADO DE SÃO PAULO - BADESP, created by Decree - Law nº 228, of April 17, 1970, with headquarters in the city of São Paulo, on Avenida Paulista, 2064 - 1º andar, in this deed represented by its President, Sr. Américo Oswaldo Campiglia and its Vice-President, Sr. Norman Puggina, from now on referred to as BADESP, as well as the CONSELHO ESTADUAL DE TECNOLOGIA, from now on referred to as CONSELHO, in this deed represented by its President, Sr. Miguel Colasuonno, decide to perform the present agreement, in accordance with the following clauses and terms:

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ANNEX VIII
Exhibit C
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FIRST CLAUSE

1. This deed has as its goal to define the technical and financial sharing of the contracting and intermediating parties in the working up implantation of a series of specific project of technological research in the State of São Paulo, in accordance with the terms of the COOPERATION PROTOCOL signed by FINEP and the ECONOMY AND PLANNING SECRETARYSHIP OF THE STATE OF SÃO PAULO, later on referred to as SECRETARIA, on July 16, 1971, in which:
 - a. FINEP formally expressed its resolution of supporting the SECRETARIA and the CONSELHO in the identification of activities of applied research susceptible of being used on behalf of the national economy.
 - b. FINEP offered to financially cooperate in the working up and implantation of the studies or projects selected as deserving priority.
 - c. The identification and selection of the studies, projects or specific researches would be carried on through close cooperation by experts from FINEP, SECRETARIA and CONSELHO.



-
2. In the selection and accomplishment of this series of specific projects the following criteria, derived from the National Development Plan, regarding Science and Technology, must be followed:
- a. Researches leading to the fastest development of the industries of high technological density, such as: chemical, electronic, steel and airplane industries;
 - b. Researches which contribute to the strengthening of the national industry competitive power;
 - c. Researches which increase the technological and managerial capacity of Brazilian "entrepreneurs";
 - d. Investments which favor the use of São Paulo's research capacity to the benefit of other areas of the country;
 - e. Researches which improve the prospects of the farming industries;
 - f. Supplementary marketing researches which reveal opportunities for market broadening, especially concerning Brazilian export;



- g. Programs and projects which allow a linkage between State and Federal researches, paving the way for an efficient use of the human and material resources available at the two spheres of government;
- h. Research and studies aiming at the improvement of the authenticity of quality control and standardization of technical rules.

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SECOND CLAUSE

1. The necessary resources for the working up and implantation of the specific projects of technological research referred to in the First Clause are estimated at G\$ 80.000.000,00 (eighty million Cruzeiros).
2. From the amount established on Item I of this Clause, FINEP hereby assumes the obligation, in accordance with the authorization of His Excellency the President of the Republic, mentioned in " CONSIDERANDA " nº 16-B, March 9, 1972, to disburse resources valued at G\$ 40.000.000,00 (forty million Cruzeiros) deriving from the National Fund for Scientific and Technological Development, in the 1972/74 three years period, detached from the allocation recorded in the Investments Program-Budget, Item on "Special Projects for the Strengthening of the Priority Institutions



of Science and Technology " in accordance with the following scheme:

1972	Cr\$ 10.000.000,00
1973	Cr\$ 15.000.000,00
1974	Cr\$ 15.000.000,00

3. The resources foreseen in the previous Item will be placed, by FINEP, at the disposal of BADESP which, as a Financial Agent, will administer it through an specific agreement to be established between BADESP and SECRETARIA.

4. As a counterparty, GOVERNO pledges to contribute with supplementary resources to the amount fo Cr\$ 40.000.000,00 (forty million Cruzeiros) deriving from the State Budget, the Foundation for Support of Research in the State of São Paulo - FAPESP and from other sources which may share the program.

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THIRD CLAUSE

1. Through CONSELHO , SECRETARIA will establish a Committee for the examination and establishment of sectorial guiding lines, identification and fittings will follow the criteria determined in the National Developmen



- Plan relative to the Science and Technology sector.
2. The terms of the financial transfers to be granted to the entities which will carry on the specific projects will be established, on a case by case basis, by the Financial Agent, according to the criteria to be settled in the Agreement referred to on Second Clause, item 3.

FOURTH CLAUSE

1. BADESP will transfer to the institutions which will carry on the research the resources referred to in Item 3 of the Second Clause, being also incumbent of financial control in the investment of such resources..
2. CONSELHO will be in charge of the examination and technical control in the working up or implantation of the specific projects, as well as in the fitting of agreement with the principles which might be agreed upon with FINEP.
3. BADESP and CONSELHO will submit to FINEP, each six months period, reports and documents pertaining to the use of the resources and the follow-up of the specific projects, so as to certify the full performance of their duties, as established in the previous items of this



4. BADESP and CONSELHO will agreed upon the rates of payment for the per-
formed services, to be charged against the institutions which will carry
on the researches.

FIFTH CLAUSE

The dues hereon mentioned, or others which may be established by the NATIO-
NAL MONETARY COUNCIL, will be computed over the disbursed values starting
on the date of their respective disbursements, and must be collected by
FINEP, on each six months period, according to the calendar year, including
during the grace period:

- a. Interest 2% p/year
- b. Monetary correction up to 10% P/year.

SIXTH CLAUSE

The financing now being agreed upon will be paid off by GOVERNO, for each
disbursement, in 20 (twenty) six months installments, equal and successive,
the first falling due 36 (thirty six) months after the date
of the transfer of the resources to BADESP, according to what is stipula-
ted on Item 3. of the second clause.

SEVENTH CLAUSE

GOVERNO, through its own agencies, will pay the amounts relative to the obligations assumed in this deed, whether relative to amortization or to accessories, at FINEP's main office, in the city of Rio de Janeiro, or wherever FINEP determine by letter, and the payment must be made in currency, through payment orders or through certified checks, to the credit of FINEP, payable in Rio de Janeiro or at the place which may be determined.

EIGHT CLAUSE

As a guaranty of the obligations resulting from this Agreement, GOVERNO assumes the obligation to previously include in future annual and pluri annual budgets the necessary allocations for the payment of the principal and other charges.

NINTH CLAUSE

1. GOVERNO assumes the obligation to extend to FINEP, whenever requested all technical assistance necessary to research projects which may be prepared or carried on by institutions connected to technology in other States of the Union, so as to pave the way for the transfer, to such institutions, of the scientific accumulated knowledge of the State of São Paulo.
2. FINEP assumes the obligation of reimbursing GOVERNO of the expenses resulting from what was laid out in the previous item.

TENTH CLAUSE

1. In the accomplishment of the present agreement GOVERNO assumes the obligation of abiding by FINEP's usual operation rules, or others which may be established for the management of the National Fund

BADESP



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Exhibit C
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2. Additionally, GOVERNO assumes the obligation of maintaining the program established in this agreement all the way through its final settlement, also being under the obligation of reinvesting, in technological research projects, all and whichever reimbursement of resources of the program may be forthcoming.

ELEVENTH CLAUSE

The Court of the City of São Paulo has been selected to settle any point of contention resulting from the present agreement.

Achieved and signed on two original documents of equal content and form, in the presence of the witnesses below mentioned, so that legal effects may be taken.

Rio de Janeiro, March 17, 1972

On behalf of FINANCIADORA DE ESTUDOS E PROJETOS S.A. - FINEP

On behalf of the GOVERNMENT OF THE STATE OF SÃO PAULO

On behalf of the BANCO DE DESENVOLVIMENTO DO ESTADO DE S. PAULO - BADESP

On behalf of the CONSELHO ESTADUAL DE TECNOLOGIA

WITNESSES

AGREEMENT EXECUTED BETWEEN THE SECRETARIAT OF
ECONOMICS AND PLANNING OF THE STATE OF SÃO PAULO,
AND THE DEVELOPMENT BANK OF THE STATE OF SÃO PAULO.

The SECRETARIAT of Economics and Planning, an agency of the state administration created by State Decree No. 8208 of July 8, 1964 and located at the Bandeirantes Palace in this city, represented on this occasion by the State Secretary of Economics and Planning Mr. Miguel Colasuonno, hereinafter referred to as SECRETARIAT and the DEVELOPMENT BANK OF THE STATE of São Paulo, instituted by Decree-Law No. 228 of April 17, 1970 and located in the city of São Paulo at Avenida Paulista, 2064 - 1st floor, represented on this occasion by its President, Mr. Américo Oswaldo Campiglia and by its Vice-President, Mr. Norman Puggina, hereinafter referred to as BADESP with the intervention of the Conselho Estadual de Tecnologia (State Technology Council), an entity belonging to the Secretariat, instituted by State Decree No. 49066/67 and located at Avenida Brigadeiro Luiz Antonio 278 - 4th floor, in this city, on this occasion represented by its Chairman Mr. Miguel Colasuonno, hereinafter referred to as C.E.T., decide to execute the present Agreement in accordance with the following clauses and conditions:

CLAUSE ONE

1. It is the purpose of this Agreement to define the functions and responsibilities of each one of the parties hereto in the management of the specific science and technology projects referred to in the Agreement signed in Rio de Janeiro on March 17, 1972 between FINEP Financiadora de Estudos e Projetos S.A. and the State of São Paulo, with the intervention of BADESP and CET.

CLAUSE TWO

2. The conditions of the Agreement mentioned on Clause One are an integral part of this Agreement as if they had been herein transcribed.

CLAUSE THREE

3. The SECRETARIAT's functions are:

3.1 To represent the State of São Paulo in contacts with FINEP and coordinate the allocation of the required State Funds.

3.2 To establish general and specific guidelines for the State's participation in the field of Technology, particularly regarding the use of funds provided under the FINEP agreement, and approve the lines of credit and priority criteria to be applied in financing projects.

3.3 Has the prime responsibility for implementing the FINEP Agreement in the State of São Paulo coordinating the activities of BADESCP and CET and making final decisions concerning the activities developed within the framework of the Agreement.

3.4 To approve, for the State of São Paulo, and forwards to FINEP for its approval, the operational rules for the management of Agreement funds and any alterations of such rules as may be required for technical, administrative or policy reasons.

3.5 To institute in common agreement with FINEP and BADESCP a set of Repass Operation Regulations applicable to the disbursement and repayment of Federal Funds and which establish adequate financial procedures.

CLAUSE FOUR

4. The CET's functions are:

4.1 To establish sectorial priorities and guidelines for technology and review them periodically subject however to the Secretariat's approval.

4.2 To coordinate the activities of the several Institutes taking part in the research to be financed with FINEP Agreement Funds.

4.3 To evaluate technically the research projects submitted for financing under the Agreement subject to the operating rules to be established.

4.4 To prepare periodically surveys of the needs of the different sectors of economic activity as regards technological development.

4.5 To evaluate the final outcome of research projects carried out with the FINEP agreement funds and to manage the resulting technological know-how including the providing of technical assistance to other Brazilian States as provided for in Clause 9 of the Agreement.

CLAUSE FIVE

5. BADESCP's functions are:

5.1 To determine the eligibility of research projects in accordance with the sectorial and specific guidelines established by the C.E.T. and approved by the Secretariat for Financing with FINEP Agreement Funds.

5.2 To carry out the economic and financial analysis of the research projects and borrowing entities in accordance with the operational rules to be established.

5.3 On the basis of favorable technical, economic and financial evaluations to enter into loan agreement on behalf of the government as financial agent of the FINEP Agreement.

5.4 To manage the funds to be provided by FINEP, to request disbursements from FINEP, make disbursements to borrowers, receive interest and other charges when due, control and account for such funds and prepare such financial statements as may be necessary.

5.5 To negotiate with private sector borrowers the general conditions of the loans subject to the operational rules to be established.

5.6 To be responsible for whatever else may be necessary in the financial area for the orderly and efficient development of the research projects and to be paid a management fee for the services it renders which shall be established in the operational rules.

CLAUSE SIX

6. A Technical Commission is hereby created, on a permanent basis and for as long as the Agreement is in force, made up of representatives from C.E.T. and BADESP and under the general coordination of the Secretariat. The Commission will be responsible for:

6.1 Developing and submitting to the Secretariat and FINEP for approval, the operational rules for the management of research projects under the Agreement, as well as recommending any necessary changes in accordance with paragraph 3.4.

6.2 Submitting to FINEP and the Secretariat for approval, the Repass Operations Rules mentioned in paragraph 3.5 and recommending any changes that may become necessary in the future.

6.3 Preparing semi-annual technical and financial reports on the activities developed as a result of the Agreement for the Secretariat's and FINEP's control.

6.4 Evaluating the implementation of the research program against the established guidelines and derived objectives.

The frequency of the Commission's meetings will be established by the parties to this Agreement.

CLAUSE SEVEN

7. Any questions arising out of this Agreement will be resolved in the city of São Paulo.

Made out and signed in duplicate in the presence of the witnesses given below.

São Paulo, April 25, 1972

For the Secretariat of Economics and Planning of the State of São Paulo

For the Development Bank of the State of São Paulo

TECHNOLOGICAL DEVELOPMENT FUND
PROPOSED PROJECTS

APPROVED:

Cr\$

1. Borrower: Instituto de Tecnologia de Alimentos - ITAL 1,000,000
To finance part of a Food research program covering 35 subprojects.

UNDER REVIEW AT BADESP:

2. Borrower: Paulo Abib Andery, a professor and consultant 1,100,000
To finance the development of technology for processing a mineral to produce phosphate for use as fertilizer and cement.

3. Borrower: F. Nascimento 200,000
To develop a process for industrializing talc in the Ribeira Valley.

4. Borrower: BAM 200,000
A local industry specializing in the manufacture of microphones which wants to investigate the use of locally manufactured components.

UNDER REVIEW AT CET:

5. Borrower: CICA, a canning company 250,000
To develop a more productive tomato plant for use in making tomato paste for export.
6. Borrower: PAOLETTI, another canning company 200,000
To develop a type of pineapple suitable for canning and export.

UNDER PRELIMINARY DISCUSSION:

7. Borrower: Lacta S. A., a chocolate manufacturer 300,000
To develop enriched and other dietary foods.

8. Borrower: COMGAS - the São Paulo municipal
gas utility 3,000,000
To develop technologies for the use of gas as
a fuel in industry.
9. Borrower: ENGESA - a heavy truck manufacturer 2,000,000
To develop new transmission systems.

BANCO DE DESENVOLVIMENTO DO ESTADO DE SÃO PAULO S.A. - BADESP

BALANCE SHEETS 1971 - 1972

(Cr\$ thousands)

<u>CURRENT ASSETS</u>	<u>6.30.71</u>	<u>12.31.71</u>	<u>6.30.72</u>
Cash	18,363	14,617	15,209
Negotiable State Bonds	9,176	69,200	69,528
Time Deposits	55,196	49,602	28,657
Market Activation Fund	-	-	7,870
Loans Receivable	-	1,672	3,428
Operating Income Receivable	-	1,073	2,584
Investment Income Receivable	2,543	9,848	7,436
Capital Subscriptions Receivable	70,000	-	-
All Other	35	537	275
	<u>155,313</u>	<u>146,549</u>	<u>134,987</u>
 <u>LONG-TERM ASSETS</u>			
Rural Financing	763	9,071	21,056
Industrial Financing	3,103	11,298	45,005
Special Financing	-	17,826	29,332
Investments	2,000	7,000	27,003
All Other	-	24	7,748
	<u>5,866</u>	<u>45,219</u>	<u>130,194</u>
 <u>FIXED ASSETS</u>			
Fixed Assets	1,167	1,368	9,492
Depreciation	(63)	(124)	(192)
	<u>1,104</u>	<u>1,244</u>	<u>9,300</u>
 <u>TOTAL ASSETS</u>	<u>162,283</u>	<u>193,012</u>	<u>274,481</u>

BANCO DE DESENVOLVIMENTO DO ESTADO DE SÃO PAULO S.A. - BADESPBALANCE SHEETS 1971 - 1972

(Cr\$ thousands)

<u>LIABILITIES</u>	<u>6.30.71</u>	<u>12.31.71</u>	<u>6.30.72</u>
<u>CURRENT LIABILITIES</u>			
Commitments to be disbursed	1,905	405	405
Accounts Payable	137	2,382	4,758
Taxes Payable	113	331	477
Provision for Social Security	102	-	193
	<u>2,257</u>	<u>3,118</u>	<u>5,830</u>
<u>LONG-TERM LIABILITIES</u>			
FUNAC Investment Fund	-	5,000	25,000
FEAP Agro-Livestock Fund	10,348	13,952	21,306
PIFEME Small & Medium Industry Fund	-	3,170	17,073
FGRI Industrial Modernization Fund	-	-	9,218
Market Activation Fund	-	-	10,005
FUNDECE Capital Democratization Fund	-	-	1,000
National Housing Bank	-	-	908
FINAME Equipment Financing Fund	-	518	3,106
Brazilian Coffee Institute	-	-	1,000
All Other	-	523	852
	<u>10,348</u>	<u>23,163</u>	<u>89,468</u>
<u>STOCKHOLDERS' EQUITY</u>			
Capital Stock	140,000	140,000	140,000
Capital Increase	-	3,458	3,459
Reserves	1,466	1,678	2,415
Retained Earnings	8,212	21,595	33,309
	<u>149,678</u>	<u>166,731</u>	<u>179,183</u>
<u>TOTAL</u>	<u>162,285</u>	<u>193,012</u>	<u>274,481</u>

BANCO DE DESENVOLVIMENTO DO ESTADO DE SÃO PAULO S.A. - BADESP

INCOME STATEMENTS 1971/72

(Cr\$ thousands)

	<u>SIX MONTHS ENDED</u>		
	<u>6.30.71</u>	<u>12.31.71</u>	<u>6.30.72</u>
Operating Income	-	3,293	7,736
Operating Expense	<u>3,216</u>	<u>5,034</u>	<u>7,763</u>
Net Operating (Loss)	(3,216)	(1,741)	(27)
Other Income	7,890(a)	15,336	14,515
Other Expense	-	-	<u>2,158(b)</u>
Net Income	4,674	13,595	12,330
Required Addition to Legal Reserve	<u>234</u>	<u>680</u>	<u>616</u>
Income Transferred to Retained Earnings	<u>4,440</u>	<u>12,915</u>	<u>11,714</u>

(a) The June 30, 1971 published Income Statement includes operational and investment income as a single amount. For purposes of this summary and in view of the low level of operational lending (see balance sheet), all income for this six-month period has been considered as Other Income.

(b) Reevaluation of long-term investment.

SUMMARY OF FINANCING

As stated in Section V, FINANCIAL ANALYSIS, costs included in the SUMMARY OF FINANCING were developed by constructing probable contract budgets based upon manpower requirements and participant training projections. The following pages of this annex include the detailed costs so developed. No amounts have been included for contingencies, and it is recognized that overhead rates may be underestimated if the contractors selected are private institutions. It is understood that such additional costs may result in a reduction in the number of demonstration projects undertaken, the number of participants trained, or the extent of assistance provided in the form of consultants or materials. Inasmuch as these costs are based on an estimated, desirable level of programmed research management, training, and systems development, the total loan amount of \$15 million is considered sufficient to accomplish the objectives of the program as described in the body of this paper.

As a condition precedent to disbursement of loan funds, the Borrower will provide a time-phased implementation plan and a financial plan for the total program. Prior to the end of the first year of program implementation, and annually thereafter, the Borrower will provide a revised budget for the following year. The financial plans so required will identify dollar and local costs by program element, e.g. research planning and programming, information system, quality assurance, market research, management extension services, training programs, and demonstration projects. The Borrower will be required to justify any significant departure from these financial plans when submitting proposed contracts and contract budgets for AID approval. A significant departure may be interpreted as a variation of more than 15 percent in the amount previously shown for the program elements included in the financial plans.

SÃO PAULO SCIENCE AND TECHNOLOGY PROGRAM

SUMMARY OF FINANCING

(In US\$'000s)

<u>DOLLAR COSTS (AID)</u>	<u>CET</u>	<u>IPT</u>	<u>ITAL</u>	<u>TOTAL</u>
Consultants	3,700	2,040	3,600	9,340
Participants	2,600	870	1,000	4,470
Other Direct Costs	50	40	75	165
Scientific & Technological Information	650	250	125	1,025
TOTAL DOLLAR COSTS	7,000	3,200	4,800	15,000
<u>LOCAL COSTS</u>				
Consultant Support	482	435	764	1,681
Personnel - Technical	1,424	3,928	4,156	9,508
Personnel - Administrative	330	796	314	1,440
Raw Material, Supplies	-	895	236	1,131
Training	705	-	495	1,200
Equipment	250	-	1,145	1,395
New Construction	1,400	1,750	1,326	4,476
Other	511	1,658	2,920	5,089
TOTAL LOCAL COSTS	5,102	9,462	11,356	25,920

CET Research Management Contract
Estimate Based on System Development Requirements

Fiscal Year	<u>1974</u> \$	<u>1975</u> \$	<u>1976</u> \$	<u>1977</u> \$	<u>1978</u> \$	<u>Total</u> \$
<u>Salaries</u>						
<u>Field Staff Professionals long-term</u>						
1 US Co-Director	50,000	50,000	50,000	50,000	50,000	250,000
1 Research Mngt. Specialist	30,000	30,000	30,000	30,000	30,000	150,000
3 Information Specialists	-	-	90,000	90,000	90,000	270,000
2 Market Experts	-	-	60,000	60,000	60,000	180,000
1 Industrial Economist	-	-	30,000	30,000	30,000	90,000
	80,000	80,000	260,000	260,000	260,000	940,000
<u>Field Staff Professionals short-term</u>						
10 Market Experts	15,000	30,000	45,000	15,000	15,000	120,000
1 Patent Consultants	-	9,000	9,000	-	-	18,000
6 Project Evaluation Specialists	15,000	18,000	27,000	6,000	6,000	72,000
5 Standards Specialists	6,000	6,000	12,000	3,000	3,000	30,000
5 Systems Analysts	18,000	30,000	6,000	3,000	3,000	60,000
6 Systems Design Specialists	18,000	30,000	12,000	6,000	6,000	72,000
6 Systems Engineers	-	6,000	30,000	18,000	6,000	60,000
1 Communications Expert	3,000	6,000	-	-	-	9,000
3 Editorial Advisors	-	-	6,000	9,000	3,000	18,000
4 Information Specialists	30,000	30,000	-	-	-	60,000
	105,000	165,000	147,000	60,000	42,000	519,000
<u>US Based Support Staff</u>						
1 Professional Administrator	30,000	30,000	30,000	30,000	30,000	150,000
2 Assistant Administrators	30,000	30,000	15,000	15,000	15,000	105,000
2 Secretaries	12,000	12,000	6,000	6,000	6,000	42,000
	72,000	72,000	51,000	51,000	51,000	297,000

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Fiscal Year	1974	1975	1976	1977	1978	Total
<u>Post Doctoral Fellows (all inclusive)</u>						
5 Engineers per year	75,000	75,000	75,000	75,000	75,000	375,000
5 Agricultural Engineers per year	75,000	75,000	75,000	75,000	75,000	375,000
5 Management Specialists per year	75,000	75,000	75,000	75,000	75,000	375,000
	225,000	225,000	225,000	225,000	225,000	1,125,000
<u>Indirect Costs - (overhead)</u>						
U.S. Based personnel - at 55%	39,600	39,600	28,050	28,050	28,050	163,350
Field Staff Long and Short-Term at 35%	64,750	85,750	142,450	112,000	105,700	510,650
	104,350	125,350	170,500	140,050	133,750	674,000
<u>International Travel, Transportation and Storage</u>						
<u>Long-Term Staff:</u>						
Assumes 4 per family \$400 1-way fare	3,200	-	11,200	-	12,800	27,200
Airfreight at \$200 one way	800	-	6,400	-	6,400	13,600
Sea freight family at \$1,625 one way	3,250	-	9,750	-	13,000	26,000
Storage family at \$225/yr.	450	450	1,800	1,800	1,800	6,300
	7,700	450	29,150	1,800	34,000	73,100
Short-Term at \$800	16,600	21,100	11,500	2,900	1,500	53,600
Other Direct Costs (general)	10,000	10,000	10,000	10,000	10,000	50,000
Scientific and Technological Information	100,000	100,000	150,000	150,000	150,000	650,000
TOTAL TA COSTS	720,650	798,900	1,054,150	900,750	907,250	4,381,700

Fiscal Year	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>Total</u>
	\$	\$	\$	\$	\$	\$
<u>Participant Training:</u>						
(Assumes average \$9,000 per year for one or more years of training and \$1,500 per month for 6 months or less)						
Long-Term:						
126 participants enrolled in 2 year programs	453,600	453,600	453,600	453,600	453,600	2,268,000
Short-Term:						
77 participants enrolled in 3-month courses or 231 man-months	69,300	69,300	69,300	69,300	69,300	346,500
Total Participant Training	522,900	522,900	522,900	522,900	522,900	2,614,500
TOTAL TA AND PT DOLLAR COSTS	<u>1,243,550</u>	<u>1,321,800</u>	<u>1,577,050</u>	<u>1,423,650</u>	<u>1,430,150</u>	<u>6,996,200</u>

CET RESEARCH MANAGEMENT
CONTRACT

Fiscal Year	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>Total</u>
<u>LOCAL COSTS - US STAFF SUPPORT COSTS</u>						
Housing for Staff at \$720/month/family:						
9 Long-Term	\$17,280	\$17,280	\$69,120	\$69,120	\$69,120	\$241,920
Edu.Allowance at \$2,600/year/family	5,200	5,200	20,800	20,800	20,800	72,800
Per Diem Short-Term staff at \$32	34,000	53,200	47,040	19,200	13,440	166,880
TOTAL US STAFF SUPPORT COSTS	\$56,480	\$75,680	\$136,960	\$109,120	\$103,360	\$481,600
<u>LOCAL COSTS - OTHER</u>						
Long-Term Technicians	\$56,000	\$210,000	\$310,000	\$396,000	\$420,000	\$1,392,000
Short-Term Consultants	9,000	7,500	6,000	4,500	4,500	31,500
Administrative Personnel	20,000	50,000	80,000	90,000	90,000	330,000
Training	45,000	150,000	170,000	170,000	170,000	705,000
Equipment	30,000	60,000	60,000	50,000	50,000	250,000
New Construction	250,000	200,000	400,000	350,000	200,000	1,400,000
Other	38,000	90,000	105,000	133,000	145,000	511,000
TOTAL LOCAL COSTS OTHER	\$448,000	\$767,500	\$1,131,000	\$1,193,500	\$1,079,500	\$4,619,500
GRAND TOTAL LOCAL COSTS	\$504,480	\$843,180	\$1,267,960	\$1,302,620	\$1,182,860	\$5,101,100

IPT CONTRACT
Estimate Based on 5 Sub - Projects

Fiscal Year	1974	1975	1976	1977	1978	Total
Salaries						
Field Staff Professionals-Long Term						
1 Chief of Party	\$ 40,000	\$ 40,000	\$ 40,000	\$ 40,000	\$ 40,000	\$ 200,000
1 Export Production Specialist	30,000	-	-	-	-	30,000
1 Gov. Procurement Specialist	30,000	-	-	-	-	30,000
1 Reference Lab Specialist	30,000	30,000	30,000	30,000	30,000	150,000
1 Packaging Specialist	30,000	30,000	30,000	30,000	30,000	150,000
1 Metal Corrosion Specialist	-	30,000	30,000	30,000	-	90,000
1 Rolling Mill Operations Specialist	-	30,000	30,000	30,000	-	90,000
	<u>160,000</u>	<u>160,000</u>	<u>160,000</u>	<u>160,000</u>	<u>100,000</u>	<u>740,000</u>
Field Staff Professionals-Subr. Term						
14 Standards and quality control	18,000	27,000	27,000	27,000	27,000	126,000
14 Various materials (woods-plastics)	45,000	54,000	72,000	36,000	-	207,000
3 Corrosion - Marketing - Feasibility	18,000	9,000	-	-	9,000	36,000
1 Metallurgist	18,000	-	-	-	-	18,000
5 Explosive Cladding/Marketing	27,000	27,000	9,000	9,000	9,000	81,000
	<u>126,000</u>	<u>117,000</u>	<u>108,000</u>	<u>72,000</u>	<u>45,000</u>	<u>468,000</u>
U. S. Based Support Staff						
1 Professional Administrator	30,000	30,000	30,000	30,000	30,000	150,000
1 Non-professional Assistant	6,000	6,000	6,000	6,000	6,000	30,000
	<u>36,000</u>	<u>36,000</u>	<u>36,000</u>	<u>36,000</u>	<u>36,000</u>	<u>180,000</u>
Indirect Costs - (overhead)						
U. S. based personnel -at 55%	19,800	19,800	19,800	19,800	19,800	99,000
Field Staff -at 35%	100,100	96,950	93,800	81,200	50,750	422,800
	<u>119,900</u>	<u>116,750</u>	<u>113,600</u>	<u>101,000</u>	<u>70,550</u>	<u>521,800</u>

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	Fiscal Year <u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>Total</u>
International Travel, Transportation- Storage:						
Long term staff						
Assumes 4 per family \$400 one way fare	11,200	3,200	3,200	3,200	4,800	25,600
Air freight at \$200 one way	5,600	1,600	1,600	1,600	2,400	12,800
Sea freight family at \$1,625 one way	11,375	3,250	-	3,250	4,875	22,750
Storage family at \$225/yr.	1,125	1,125	1,125	1,125	675	5,175
	<u>29,300</u>	<u>9,175</u>	<u>5,925</u>	<u>9,175</u>	<u>12,750</u>	<u>66,325</u>
Short term at \$800	<u>8,000</u>	<u>6,400</u>	<u>6,400</u>	<u>4,800</u>	<u>4,000</u>	<u>29,600</u>
Other direct costs (general)	<u>7,500</u>	<u>7,500</u>	<u>7,500</u>	<u>7,500</u>	<u>7,500</u>	<u>37,500</u>
Scientific & Technological information	<u>50,000</u>	<u>50,000</u>	<u>50,000</u>	<u>50,000</u>	<u>50,000</u>	<u>250,000</u>
TOTAL TA COSTS	\$ 536,700	\$ 502,825	\$ 487,425	\$ 440,475	\$ 325,800	\$ 2,293,225

I P T C O N T R A C T

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ESTIMATE BASED ON 5 SUB - PROJECTS

	<u>Fiscal Year</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>TOTAL</u>
Participant Training							
(Assumes average \$10,000 per year for one or more years of training and \$2,000 per month for 6 months or less)							
Long term:							
26 Standardization and quality control*	\$50.000	\$ 90.000	\$ 30.000	\$ 40.000	\$ -		\$260.000
5 Packaging (3 years each)	5.000	27.500	50.000	45.000	22.500		150.000
1 Weathering Sheet (3 years)	-	2.500	10.000	10.000	7.500		30.000
1 Surface quality steel sheet (3 years)	-	-	10.000	10.000	10.000		30.000
2 Explosive cladding (3 years)	-	-	20.000	20.000	20.000		60.000
	55.000	120.000	170.000	125.000	60.000		530.000
Short term:							
13 Standardization (6 mos. each)	-	60.000	48.000	48.000	-		156.000
15 Packaging (3 mos. each)	30.000	18.000	12.000	18.000	12.000		90.000
3 Weathering Sheets (3 mos)	6.000	-	6.000	-	6.000		18.000
5 Surface quality Sheets (3 or 4 mos)	16.000	6.000	6.000	6.000	-		34.000
7 Explosive cladding (3 mos.)	24.000	-	18.000	-	-		42.000
	76.000	84.000	90.000	72.000	18.000		340.000
Total Participant Training	131.000	204.000	260.000	197.000	78.000		870.000
TOTAL TA AND PT DOLLAR COSTS	667.700	706.825	747.425	637.475	403.800		3,163.225

* 1 year training - no degree.

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IPT Contract
Estimates Based on 5 Sub-Projects

	<u>1974</u> \$	<u>1975</u> \$	<u>1976</u> \$	<u>1977</u> \$	<u>1978</u> \$	<u>Total</u> \$
<u>Local Costs-US Staff Support Costs</u>						
Housing for Staff at \$720/mo/person 7 long-term plus 1 short-term (9 mos.)	49.680	49.680	43.200	43.200	25.920	211.680
Per diem short-term staff at \$32 x 30 = \$960/month	28.800	31.680	34.560	23.040	14.400	132.480
Education Allowance	18.200	18.200	18.200	18.200	18.200	91.000
Total Support Costs	96.680	99.560	95.960	84.440	58.520	435.160
<u>Local Costs - Other</u>						
Personnel						
Technical	88.000	516.000	870.000	1.187.000	1.267.000	3.928.000
Administrative	94.000	138.000	173.000	188.000	203.000	796.000
Raw Materials	70.000	115.000	190.000	245.000	275.000	895.000
New Construction	515.000	585.000	570.000	40.000	40.000	1.750.000
Utilities, supplies, etc.	255.000	357.000	432.000	322.000	292.000	1.658.000
Total Other Local Costs	1.022.000	1.711.000	2.235.000	1.982.000	2.077.000	9.027.000
AND TOTAL LOCAL COSTS	1,118,680	1,810,560	2,330,960	2,066,440	2,135,520	9,462,160

ANNEX VIII
Exhibit II
Page 10 of 14

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ITAL CONTRACT
Estimate Based on 11 Sub-Projects

	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>TOTAL</u>
<u>Salaries</u>						
Field Staff Professionals - Long Term						
1 Chief of Party	\$40,000	\$40,000	\$40,000	\$40,000	\$40,000	\$200,000
1 Marketing Economist	30,000	30,000	30,000	30,000	30,000	150,000
1 Quality Control Technician	30,000	30,000	30,000	-	-	90,000
1 Refrigeration/Freezing Technician	-	30,000	-	-	-	30,000
1 Meat Processing Technician	-	30,000	-	-	-	30,000
1 Forage Evaluation Technician	-	30,000	-	-	-	30,000
1 Ruminants Nutrition Technician	-	-	30,000	-	-	30,000
1 Cattle Breeding Technician	-	30,000	-	-	-	30,000
1 Dairy Cattle Technician	-	-	30,000	-	-	30,000
1 Poultry Feeding Technician	-	30,000	-	-	-	30,000
1 Swine Feeding Technician	-	-	30,000	-	-	30,000
1 Cellular Biologist	30,000	30,000	-	-	-	60,000
1 Trush Technician	30,000	30,000	-	-	-	60,000
1 Disease Technician	30,000	30,000	-	-	-	60,000
1 Mineral/Metabolic Disease Tech.	30,000	30,000	-	-	-	60,000
1 Worm Disease Technician	30,000	30,000	-	-	-	60,000
1 Biostatistics Technician	30,000	30,000	-	-	-	60,000
1 Pesticides Technician	-	-	30,000	15,000	-	45,000
1 Biochemist	-	-	-	30,000	15,000	45,000
1 Refrigeration/Freezing Technician	30,000	30,000	30,000	30,000	-	120,000
1 Fish Processing Technician	-	30,000	30,000	30,000	-	90,000
1 Tropical Fruit Technician	30,000	30,000	30,000	30,000	30,000	150,000
2 Fruit Disease Technicians	-	60,000	-	-	-	60,000
	<u>340,000</u>	<u>580,000</u>	<u>310,000</u>	<u>205,000</u>	<u>115,000</u>	<u>1,550,000</u>

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ITAL CONTRACT
Estimate Based on 11 Sub-Projects

	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>TOTAL</u>
<u>Field Staff Professionals - Short Term</u>						
5 Marketing	18,000	18,000	18,000	18,000	18,000	90,000
5 Quality Control	9,000	9,000	9,000	9,000	9,000	45,000
1 Meat Refrigeration/Freezing	9,000	-	9,000	-	-	18,000
1 Meat Tenderizing	-	-	9,000	-	-	9,000
1 Meat Cuts	-	-	9,000	-	-	9,000
2 Zoological Technicians	-	9,000	9,000	-	-	18,000
1 Laboratory Technician	-	-	-	9,000	-	9,000
28 Various Diseases	72,000	72,000	72,000	36,000	-	252,000
12 Various	18,000	18,000	27,000	18,000	27,000	108,000
5 Various	15,000	15,000	15,000	15,000	12,000	72,000
	<u>141,000</u>	<u>141,000</u>	<u>177,000</u>	<u>105,000</u>	<u>66,000</u>	<u>630,000</u>

U.S. Based Support Staff

1 Development Administrator	30,000	30,000	30,000	30,000	30,000	150,000
1 Assistant Administrator	15,000	15,000	15,000	15,000	15,000	75,000
2 Secretaries	12,000	12,000	12,000	12,000	12,000	60,000
	<u>57,000</u>	<u>57,000</u>	<u>57,000</u>	<u>57,000</u>	<u>57,000</u>	<u>285,000</u>

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FINAL CONTRACT
Estimate Based on 11 Sub-Projects

	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>TOTAL</u>
<u>Indirect Costs (Overhead)</u>						
U.S. based personnel at 55%	31,350	31,350	31,350	31,350	31,350	156,750
Field Staff at 35%	168,350	252,350	170,450	108,500	63,350	763,000
	<u>200,700</u>	<u>283,700</u>	<u>201,800</u>	<u>139,850</u>	<u>94,700</u>	<u>919,750</u>
<u>International Travel, Transportation and Storage</u>						
Long Term Staff						
Assumes 4 per family \$400 1-way fare	4,400	3,200	10,400	2,000	2,400	22,400
Air freight at \$200 one way	2,200	1,600	5,200	1,000	1,200	11,200
Sea Freight family at \$1,625 one way	17,875	13,000	29,250	8,125	9,750	78,000
Storage Family \$225/year	2,475	4,275	2,250	1,460	735	11,195
	<u>26,950</u>	<u>22,075</u>	<u>47,100</u>	<u>12,585</u>	<u>14,085</u>	<u>122,795</u>
Short Term Staff at \$300 per person	11,200	11,200	14,400	8,000	4,800	49,600
Other Direct Costs	15,000	15,000	15,000	15,000	15,000	75,000
Other Miscellaneous Costs *	12,340	19,340	22,940	32,640	27,540	114,800
TOTAL TA COSTS	<u>803,190</u>	<u>1,129,315</u>	<u>845,240</u>	<u>575,075</u>	<u>394,125</u>	<u>3,746,945</u>

* Scientific and Technical Materials

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ITAL CONTRACT
Estimate Based on 11 Sub-Projects

	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>TOTAL</u>
<u>Participant Training</u>						
(Assumes average \$10,000 per year for one or more years of training and \$2,000 per month for 6 months or less).						
<u>LONG-TERM</u>						
7 Marketing Management	10,000	10,000	20,000	20,000	20,000	80,000
5 Quality Control	10,000	10,000	10,000	10,000	10,000	50,000
4 Meat Processing	10,000	20,000	10,000	-	-	40,000
2 M.S. Feeding	20,000	20,000	-	-	-	40,000
1 Ph.D. Feeding	-	10,000	10,000	10,000	10,000	40,000
2 M.S. Cattle Management	-	20,000	20,000	-	-	40,000
5 M.S. Poultry, etc.	20,000	50,000	30,000	-	-	100,000
1 Sanitary Control	10,000	-	-	-	-	10,000
5 M.S. Sanitary Management	50,000	50,000	-	-	-	100,000
4 Ph.D. Sanitary Management	40,000	40,000	40,000	40,000	-	160,000
3 Fishery	10,000	10,000	10,000	-	-	30,000
	<u>180,000</u>	<u>240,000</u>	<u>150,000</u>	<u>80,000</u>	<u>40,000</u>	<u>690,000</u>
<u>SHORT-TERM</u>						
5 Marketing Management	4,000	4,000	4,000	4,000	4,000	20,000
5 Quality Control	4,000	4,000	4,000	4,000	4,000	20,000
10 Meat Techniques	12,000	12,000	12,000	12,000	12,000	60,000
6 Dry Season Feeding	-	-	36,000	-	-	36,000
10 Cattle Management	-	-	-	30,000	30,000	60,000
5 Small Animals	-	-	-	-	54,000	54,000
12 Fishery	18,000	18,000	18,000	18,000	-	72,000
6 Fruit Improvement	-	18,000	18,000	-	-	36,000
6 Fruit Diseases	-	12,000	12,000	-	12,000	36,000
	<u>38,000</u>	<u>65,000</u>	<u>104,000</u>	<u>68,000</u>	<u>116,000</u>	<u>394,000</u>
Total Participant Training	<u>218,000</u>	<u>305,000</u>	<u>254,000</u>	<u>148,000</u>	<u>156,000</u>	<u>1,084,000</u>
TOTAL TA AND PT DOLLAR COSTS	<u>\$1,021,150</u>	<u>\$1,437,315</u>	<u>\$1,099,240</u>	<u>\$723,075</u>	<u>\$550,125</u>	<u>\$4,830,945</u>

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SCIENCE AND TECHNOLOGY LOAN
PRELIMINARY LOGICAL FRAMEWORK MATRIX

Summary	Objectively Verifiable Indicators	Important Assumptions
<p>A.1. Goal</p> <p>Maintain Brazil's annual economic growth rate of 9% to 12%.</p>	<p>A.2. Measurement of Goal Achievement</p> <ol style="list-style-type: none"> 1. GNP increase of from 9% to 11% per year. 2. Increase per capita income to \$800 by 1980. 	<p>A.3. (as related to goal)</p> <ol style="list-style-type: none"> 1. GOB and State of São Paulo maintain goal of economic growth and provide resources necessary to achieve such a goal.
<p>B.1. Purpose</p> <p>Increase the Brazilian capability for selecting, adapting, and generating technology and foster increased utilization of this capability by industry and agro-industry.</p>	<p>B.2. End of Project Status</p> <ol style="list-style-type: none"> 1. <u>Industry</u> <ul style="list-style-type: none"> - Firms in metallurgical and food technology industries using modern production technologies and developing and testing new or improved products. - Exports and domestic markets have expanded over life of project. 2. <u>State Development Bank (BANESE)</u> <ul style="list-style-type: none"> - BANESE engaged in financing risk venture industrial investments. - BANESE's fund for science and technology has committed substantial portion of its fund to finance industrial research contracts with research institutions. - BANESE promoting modernization of mgnt. and production technologies in the industrial community. 3. <u>Secretary of Economy and Planning (SEP)</u> <ul style="list-style-type: none"> - Agreements in effect with Federal government regarding patent information systems and national testing and standards development. - Salaries of researchers adequate to reduce turnover in research institutes. - Agreements with other states to assist in developing integrated science and economic planning systems are in effect. - An independent agency to certify industrial products has been established through assistance of state and Federation of Industries. 4. <u>Council of Technology (CET)</u> <ul style="list-style-type: none"> - Providing industry with assessments of research results emanating from research projects. 	<p>B.3. (as related to purpose)</p> <ol style="list-style-type: none"> 1. Demonstration projects will evidence ability of CET and research institutes to provide industry with means of selecting, adapting, and generating technology. <ul style="list-style-type: none"> - Necessary government incentives will be provided to Brazilian industry to increase exports.

ANNEX IX
 Exhibit A
 Page 1 of 4
 AD-DIC/P-1072

	<ul style="list-style-type: none"> - A model for projecting industrial process and product trends into forecasts in operation. - Capable of project evaluation meaningful to industry and research institutions. 5. <u>Research Institutes (IPT and ITIL)</u> <ul style="list-style-type: none"> - At least 50% of income deriving from research contracts with industry. - Reference and testing laboratories established in these research institutes. - University staff and students being employed in do research for industry and government. - Researchers teaching in graduate courses in universities. 6. <u>Universities (UP)</u> <ul style="list-style-type: none"> - Demonstrated capacity to support administrative and research extn. program and extn. extension service evidenced by requests for assistance from industry. - Professors able to consult with research institutes, industry and government. - Joint appointments of personnel to universities and research institutions being made. - Modern curricula in process engineering, product development and adaptive engineering are being used. 	
<p>C.1. Outputs</p> <ol style="list-style-type: none"> 1. <u>Industry</u> <ul style="list-style-type: none"> - Key personnel in metal and food technology industries have been trained in modern production technologies and management systems. - Quality control systems have been established and are operational in the above industries. - Marketing and market research facilities have been implanted or contracted for. 2. <u>State Development Bank (SDBSP)</u> <ul style="list-style-type: none"> - SDBSP has staff and administrative capability of effectively assessing financial feasibility of engineering, development and research proposals. 3. <u>Secretary of Economy & Planning (SEP)</u> <ul style="list-style-type: none"> - State budget for improving the scientific and technological capacity in universities and research institutes is adequate to meet needs. 	<p>C.2. Output Indicators (Note: See system component and demonstration project log forms for detailed magnitude of outputs.)</p> <ol style="list-style-type: none"> 1. Industrial firms in metal and food technology industries are effectively using the State's research capacity to solve problems and increase capacity to compete in world markets and expand domestic markets. 2. SDBSP staff performing sound financial analyses of proposals received by CEM, industry and research institutes. 3. State budget for science and technology increasing in real terms during life of the project. 	<p>C.3. (as related to outputs)</p> <ol style="list-style-type: none"> 1. Industrial demand for training, quality control systems and marketing and marketing services can be met by strengthened state infrastructure. 2. State financial and human resource support available to SDBSP. 3. Development of scientific and technological capacity continues to be state priority as evidenced by budget support.

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3. Quality of Technology (CMT)

- Has staff and administrative capability of providing evaluations of research results to industry.
- Operating a patent information service for industry.
- Diagnostic, commercial and scientific and technological information service in operation and under policy direction and coordination of CMT.
- Has capacity to locate foreign technical or managerial assistance for industry, research institutions and universities.
- Patent evaluation procedures developed and functioning.
- Technical assistance and extension service being provided to industry.
- Marketing research capacity developed and service being provided to industrial and government clients.
- Training conducted for CMT, institute and industrial staffs.

5. Research Institutes (IPI and IVAL)

- The research institutes have capability of providing technical extension service to industry.
- The research institutes have capacity to establish and operate reference and testing laboratories.
- Informational terminals tied to network established in food and metal/mechanics sectors.

6. University (USP)

- USP has staff and administrative capacity to assist in the administration and research management program and providing management extension services to industry.
- Capacity developed to process and store economic, commercial, scientific and technological information for research institutes and industry.
- Courses developed or strengthened in research management, quality control and market research.

4. CMT has qualified, contracted staff in management group of approximately twenty-eight people and administrative capability to carry out required functions.

5. Extension service providing assistance to industry and reference and testing laboratories in operation.

6. USP has provided qualified staff to assist management group.
- Data base of technological information established at university.

4. CMT continues to develop support from industry, research institutes and universities.

- Qualified personnel can be recruited, trained and motivated to remain with CMT program.

5. Research institutes continue to obtain state support, but develop capacity and ability to supplement budgets with contracted research.

6. USP has qualified staff to provide to management group.

D.1. Inputs

1. Federal investment and state budget allocations to the Ministry of Economy and

D.2. Budget/Schedule

1. Federal investment of \$5 billion during 1972-74 period.

D.3. (as related to inputs)

1. Federal and state support for science and technology program continues.

Planning, CN, universities, and research institutes.
Fiscal incentives to industry.

FINTEC fund for technological development.

Technical assistance to CN in development and implementation of a planning, programming, evaluation and information system with a wide analytical capability.
Technical assistance to the CN Admin. and research inst. program to assist in the development of training and extension programs and increased research capabilities.
Technical assistance to research institutes (IPT and ITAB) to develop product research and testing capability and increase capacity to provide technical extension and research services to industry.
Technical assistance to USP to develop or strengthen graduate courses in areas such as research management, quality control, and market research.

Development and statement of São Paulo objectives and policies relating to the federal/state standards program and certification system.

- State budget allocations of approximately \$90 million in 1972.
- Local costs to be provided for project amount to \$25.9 million.
2. Export incentives established and maintained for industrial firms.
3. CN\$40 million to be provided by federal government to FINESP.
- CN\$40 million to be provided by state of São Paulo to FINESP.
4. Approximately \$7.0 million during a 5-year period to finance a planning, programming, evaluation, information, training, extension, and administration research management contract, including U.S. postdoctoral program. This contract would provide approximately 550 man months of long and short-term service, 900 man months of services from doctoral fellows, and about 3,200 man months of participant training.
5. \$2.8 million to IPT and \$4.8 million to ITAB, for five year period to finance research institute contracts. The IPT contract would provide approximately 450 man months of long and short-term consultant services and about 800 man months of participant training. The ITAB contract would provide approximately 300 man months of long and short-term consultant services and 1,025 man months of participant training.
\$10 million from Ex-Im Bank to finance purchase of scientific and technical equipment.
6. U.S. postdoctoral program (Sec 4 above).
7. Review to be conducted and recommendations made by CEI to state government.

2. Continued governmental support.

3. Industrial firms and research institutes make appropriate use of available funds.

4, 5, & 6. Qualified personnel can be recruited for and provided to CEI, USP and research institutes.

7. Federal and State governments continue interest to integrate state program into federal system.

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Council of Technology (CET)
LOGICAL FRAMEWORK MATRIX - PRI

AID 1025-3 (7-71)

Summary	Objectively Verifiable Indicators	Important Assumptions
<p>A.1. Goal</p> <p>1. Maintain Brazil's annual economic growth rate at 7% to 11%.</p>	<p>A.2. Measurement of Goal Achievement</p> <p>1. GNP increase from 7% to 11% per year. 2. Increase per capita income to \$890 by 1980.</p>	<p>A.3. (as related to goal)</p> <p>1. GOB and State of São Paulo maintain goal of economic growth and provide resources necessary to achieve such a goal.</p>
<p>B.1. Purpose</p> <p>1. Increase the Brazilian capability for selecting, adopting, and generating technology and foster increased utilization of this capability by industry and agro-industry.</p>	<p>B.2. End of Project Status</p> <p>1. CET has capacity to coordinate and control the developed system. 2. CET providing leadership and guidance, conducting evaluations of research proposals, and advising State on resource allocations in science and technology.</p>	<p>B.3. (as related to purpose)</p> <p>1. Implementation of the system and demonstration projects will evidence ability of CET and research institutes to provide industry with means of selecting, adapting, and generating technology.</p>
<p>C.1. Outputs</p> <p>1. Trained staff available for performing functions required. 2. Being effectively managed. 3. Functional capacity adequate to meet demands on organization. 4. Information needed by system is available and being provided as required. 5. USF capable of supporting training needs of system.</p>	<p>C.2. Output Indicators</p> <p>1. Ninety percent of CET trained in respective functional areas. 2. Administrative routines and procedures developed and in use. 3. Functional capacity in following areas established: a) Planning, Programming and Evaluation: Staff capability developed. b) Technical assistance and training: Capable of providing assistance. c) Market Services: Capable of providing market information. d) Management Extension: Capable of providing modern mgmt. assistance to industry. 4. General information network designed. User-oriented system for standard references and patents is organized & operating. 5. Graduate courses are developed or strengthened in areas such as Research Management, quality control, market research, information</p>	<p>C.3. (as related to outputs)</p> <p>1. Qualified personnel can be recruited, trained and motivated to remain with the CET. 2. System to be controlled and coordinated by the CET can be effectively managed. 3. Functions strengthened are those required to effectively implement the system. 4. Information available is relevant to needs of users. 5. Industry, government and research institutes will use capabilities developed.</p>
<p>D.1. Inputs</p> <p><u>Loan Funds</u></p> <p>1. Long term consultants 2. Short term consultants 3. U.S. support staff 4. Post doctoral fellows 5. Participant Training State of São Paulo (See Section V - Financial Analysis)</p>	<p>D.2. Budget Schedule sciences and industrial and agricultural engineering at USF through post doctoral program administered by CET. Short courses and workshops, principally for the private sector would also be developed.</p> <p>D.3. Budget Schedule</p> <p>(See Section V and Annex VIII, Exhibit H)</p> <p style="text-align: center;">BEST AVAILABLE COPY</p>	<p>D.4. (as related to inputs)</p> <p>1. Qualified personnel can be recruited for and provided to CET. 2. CET will select and make staff available for training.</p>

Institute of Food Technology (ITAL)
LOGICAL FRAMEWORK MATRIX -

Summary	Objectively Verifiable Indicators	Important Assumptions
<p>A.1. Goal</p> <p>1. Maintain Brazil's annual economic growth rate at 7% to 11%.</p>	<p>A.2. Measurement of Goal Achievement</p> <p>1. GNP increase from 7% to 11% per year. 2. Increase per capita income to \$890 by 1980.</p>	<p>A.3. (as related to goal)</p> <p>1. GOB and State of São Paulo maintain goal of economic growth and provide resources necessary to achieve such a goal.</p>
<p>B.1. Purpose</p> <p>1. Increase the Brazilian capability for selecting, adopting, and generating technology and foster increased utilization of this capability by industry and agro-industry.</p>	<p>B.2. End of Project Status</p> <p>1. Modern management procedures and staff upgrading have developed institute's infrastructure to point where industrial contracts are providing substantial share of income. 2. Engineering, research, and demonstration projects in food technology have demonstrated value of institute to industrial sector.</p>	<p>B.3. (as related to purpose)</p> <p>1. Demonstration projects will evidence ability of ITAL to provide industry with means of selecting, adopting, and generating technology.</p>
<p>C.1. Outputs</p> <p>1. Modern research mgmt. and planning procedures established. 2. Capable of servicing industrial needs and obtaining contracts with industry. 3. Staff trained and capable of analyzing markets, determining reasons for acceptability or non-acceptability of products, and analyzing product usage. 4. Staff trained and capable of establishing testing, methodologies and quality control procedures. 5. A simple collection, storage and retrieval system D.1. inputs would be established. 6. Demonstration projects in meat, fish and marine resources, tropical fruits, packaging (coordinated by and in conjunction with IPT) or other high potential areas have been undertaken.</p> <p><u>D.1. Inputs</u> <u>Local Funds</u></p> <p>1. Long Term Consultants 2. Short Term consultants 3. U. S. support Staff 4. Participant Training State of São Paulo (See Section V - Financial Analysis)</p>	<p>C.2. Output Indicators</p> <p>1. Management staff trained and performing effectively. 2. Technological Extension Service staffed and performing functions required. 3. Marketing Services Unit established and functioning. 4. Reference and Testing Laboratory in food technology established and functioning. 5. Information terminal established, operational and linked to General Information System. 6. Demonstration projects completed and successful results sold to industry.</p> <p>D.2. Budget Schedule</p> <p style="text-align: center;">(See Section V and Annex VIII, Exhibit H)</p>	<p>C.3. (as related to outputs)</p> <p>1. Trained personnel can be motivated to remain with ITAL. 2. Industry will use service capability which is developed. 3. Marketing information obtained is accurate and relevant to industrial needs. 4. Testing facilities, once established, will be used by industry. 5. Information system compatible with general system. 6. Demonstration projects will be successful.</p> <p>D.3. (as related to inputs)</p> <p>1. Qualified personnel can be recruited for and provided to ITAL. 2. ITAL will select and make staff available for training.</p>

Technological Research Institute (IPT)

LOGICAL FRAMEWORK MATRIX -

AID 1025-3 (7-71)

Summary	Objectively Verifiable Indicators	Important Assumptions
<p>A.1. Goal</p> <p>1. Maintain Brazil's annual economic growth rate of 7% to 11%.</p>	<p>A.2. Measurement of Goal Achievement</p> <p>1. G.P. increase from 7% to 11% per year. 2. Increase per capita income to \$890 by 1980.</p>	<p>A.3. (as related to goal)</p> <p>1. COB and State of São Paulo maintain goal of economic growth and provide resources necessary to achieve such a goal.</p>
<p>B.1. Purpose</p> <p>1. Increase the Brazilian capability for selecting, adopting, and generating technology and foster increased utilization of this capacity by industry and agro-industry.</p>	<p>B.2. End of Project Status</p> <p>1. Modern management procedures and staff upgrading have developed institute's infrastructure to point where industrial contracts are providing substantial share of income. 2. Engineering, research and development projects in metallurgy have demonstrated value of institute to industrial sector.</p>	<p>B.3. (as related to purpose)</p> <p>1. Demonstration projects will evidence ability of IPT to provide industry with means of selecting, adopting, and generating technology.</p>
<p>C.1. Outputs</p> <p>1. Modern research mgmt. and planning procedures established. 2. Capable of servicing industrial needs and obtaining contracts with industry. 3. Staff trained and capable of analyzing markets, determining reasons for acceptability or non-acceptability of products, and analyzing product usage. 4. Staff trained and capable of establishing testing, methodologies and quality control procedures. 5. A simple collection, storage and retrieval system.</p>	<p>C.2. Output Indicators</p> <p>1. Management staff trained and performing effectively. 2. Technological Extension Service staffed and performing functions required. 3. Marketing Services Unit established and functioning. 4. Reference and Testing Laboratory in metallurgy established and functioning. 5. Information terminal established, operational and linked to General Information System. 6. Demonstration projects completed and successful results sold to industry.</p>	<p>C.3. (as related to outputs)</p> <p>1. Trained personnel can be motivated to remain with IPT. 2. Industry will use service capability which is developed. 3. Marketing information obtained is accurate and relevant to industrial needs. 4. Testing facilities, once established, will be used by industry. 5. Information system compatible with general system. 6. Demonstration projects will be successful.</p>
<p>D.1. Inputs would be established.</p> <p>1. Demonstration projects in explosive cladding, forming and welding; weathering steels, surface quality of steels; packaging; or other high potential area have been undertaken.</p> <p>D.1. Inputs</p> <p><u>Loan Funds</u></p> <p>1. Long Term consultants 2. Short Term consultants 3. U.S. support staff 4. Participant Training <u>State of São Paulo</u> (See Section V - Financial Analysis)</p>	<p>D.2. Budget Schedule</p> <p>(See Section V and Annex VIII, Exhibit H)</p>	<p>D.3. (as related to inputs)</p> <p>1. Qualified personnel can be recruited for and provided to IPT. 2. IPT will select and make staff available for training.</p>

ANNEX IX
EXHIBIT C

DRAFT LOAN AUTHORIZATION

Provided from: Alliance for Progress Funds

BRAZIL: Science & Technology for Development

Pursuant to the authority vested in the Administrator, Agency for International Development by the Foreign Assistance Act of 1961, as amended, and the delegations of authority issued thereunder, I hereby authorized the establishment of a loan ("Loan") pursuant to Part I, Chapter 2, Title VI, Alliance for Progress to the State of Sao Paulo ("Borrower") of not to exceed fifteen million dollars (\$15,000,000) to finance the dollar costs of a program of technical assistance and training in the industrial and agro-industrial sectors in the State of Sao Paulo, subject to the following terms:

1. Interest and Terms of Repayment

- a) Borrower shall repay the Loan in United States dollars within thirty (30) years from the date of the first disbursement under the Loan, including a grace period of not to exceed ten (10) years. Borrower shall pay interest in United States dollars on the disbursed balance of the Loan of two percent (2%) per annum during the grace period and four percent (4%) thereafter.
- b) If prior to the date on which the first interest payment is due, the Government of Brazil ("Government") so elects, the Borrower shall fulfill its dollar obligation under the Loan by paying to the government in the currency of Brazil the equivalent, determined as of the time and in a manner satisfactory to A.I.D., of the United States dollar amounts payable to A.I.D. (under a) above, and in the event of such election, the Government shall pay to A.I.D.:
 - (i) the equivalent in United States dollars, determined as of the time and in a manner calculated to obtain repayment of all dollars disbursed plus interest, of all amounts paid to Government as follows:
 - 1) all interest immediately upon receipt subject to Government's right to retain all payments in excess of two percent (2%) per annum during a grace period of not to exceed 10 (ten) years from the first disbursement under the loan

("Government Grace Period") and all payments in excess of three percent (3%) per annum thereafter.

2) principal within forty (40) years, including the Government grace period.

(ii) interest in United States dollars of two percent (2%) per annum during the Government grace period, and three percent (3%) per annum thereafter on all amounts of outstanding principal paid by Borrower to Government from the respective dates of such payments of principal.

2. Other Terms and Conditions

- a) Except for marine insurance and ocean shipping, goods and services financed under the loan shall have their source and origin in the US and in countries included in A.I.D. Geographic Code 941. Marine insurance financed under the loan shall have its source and origin in the US or in any country included in A.I.D. Code 941, provided, however, that such insurance may be financed under the loan only if it is obtained on a competitive basis and any claims thereunder are payable in convertible currencies. Ocean shipping financed under the loan shall be procured in any country included in A.I.D. Geographic Code 941.
- b) The loan shall be guaranteed by the Government of Brazil in form and substance satisfactory to A.I.D.
- c) As a condition precedent to the disbursement of any funds under the loan, the Borrower shall submit to A.I.D. in form and substance satisfactory to A.I.D. the criteria and procedures the Borrower will utilize in carrying out the Program.

- d) Prior to any disbursement the State of Sao Paulo will provide evidence, satisfactory to A.I.D. that funds will be provided to cover all local currency costs for the first year of the program.
- e) The Borrower will designate a part of the CET's budget and staff to the task of recruitment of participants and projects outside of the State of Sao Paulo, with special emphasis on the Northeast states of Brazil and to make special effort to promote projects that will be of interest to such areas.
- f) The Borrower will take all necessary measures to maximize the participation of small and medium firms in the BADESP Fund, and also will establish target levels, mutually acceptable to AID and CET, of small and medium firm project approvals by the CET.
- g) The loan shall be subject to such other terms and conditions as A.I.D. may deem necessary.

Administrator

Date

DAEC Comments on IRR Review

1. QUESTION

Analysis of likely beneficiaries (i.e. both industrial clients and consumers of products resulting from improved technology of program, including both demonstration and sub-system projects. Extent to which program will focus on small and medium firms and rationale for such a focus. Means for assuring that this focus will be operationally meaningful. Desirability of limiting program to small and medium size firms. Conditions under which multi-national firms can participate in program, including safeguards against multi-nationals substituting BADESCP low cost venture funds for their own on-going EDR expenditures. Extent to which multi-nationals can be tapped to develop resources to support system. Basis for conclusion that there will be ample demand from industry for services from institutions to be strengthened under proposed loan.

ANSWER

To the extent that industrial firms actively participate in the program, they'll stand better chances in contributing to reduced costs of domestic production, and participating more substantially in the Brazilian effort of promoting exports. They'll also contribute to higher living standards, particularly of lower income groups.

Industrial statistics for Brazil and for São Paulo indicate that small and medium scale firms are the most likely ones to benefit by and large from this program. Some employment effect may be expected from the participation of small and medium scale firms in the program, as, in fact, they contribute to both employment and value-added as much or more than large establishments. Assessment of industry's interest for demonstration projects indicates a stronger interest from small and medium scale firms to participate in these projects than from large establishments. This seems to confirm the notion that financially strong companies are rarely interested in undertaking development work merely because money is available on favorable terms. The relatively high responsiveness of potential beneficiaries of demonstration projects also suggests the existence of an ample demand for the services to be rendered by this program. Participation in the Fund for Scientific and Technological Development by multinational companies may be justified provided that: they can demonstrate that Fund financing will result in research being undertaken in Brazil, which would otherwise be undertaken in the parent country; when they serve as a channel to small and medium size suppliers and when the research is peculiar to Brazilian conditions, taste, product lines, rare material availability, etc.

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The Fund will be mainly available to small and medium-sized firms except in those unusual cases when large companies can demonstrate that the use of the Fund is essential to their decision in undertaking significant projects. For more details, please refer to

2. QUESTION

Analysis of criteria and guidelines for use of BADESP revolving fund.

ANSWER

Please refer to Section V in CAP.

3. QUESTION

Specific information on how benefits of program will be transferred to other parts of Brazil. Beyond permissive arrangements, what type of measures or action plans are contemplated to stimulate participation of industry, agro-industry and research institutions outside São Paulo?

ANSWER

In order to promote the transfer of the benefits of this program to other parts of Brazil, the State of São Paulo has already signed or is in the process of signing formal cooperative agreements with the States of Bahia, Ceará, Pará, Rio Grande do Norte and Minas Gerais, Pernambuco, and Rio de Janeiro. These agreements are to promote technical assistance in the research in specific technological areas, a continuous exchange of scientific information and the training in São Paulo research institutions of technicians from other states. São Paulo officials have also agreed to include technicians from collaborating institutions in other states as candidates for participant training in the United States under the loan.

The São Paulo research institutions, IPT is already actively collaborating with the Foundation for Scientific Development of the State of Bahia in the areas of technology and urban problems with the State of Pará, in the area of tropical fruits, which is one of the priority sectors in the program.

Just recently, ITAL has submitted to the Ministry of Agriculture a five-year plan for the research on food products technology, PLANITA (Integrated National Plan for Food Products Technology) to be carried out in the PROTERRA area.

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4. QUESTION

With respect to income distribution and employment effects of project, CAP should respond to the policy determination signed by the Administrator on October 2, 1972. (See AIDFO Circular A-1413 dated 10/7/72). Extent to which it would be desirable and/or feasible to attempt to bias the technology generated under the program toward labor-intensivity. In this connection, as a means of maximizing positive employment and income distribution impact Mission should consider feasibility of allocating a portion of loan (e.g., 1/3) for technology transfer in Northeast or of creating a separate NE research center to stimulate development of technologists appropriate to NE conditions. CAP should contain Mission's conclusion whether such approaches would be feasible at this time, together with supporting arguments. Subsequent to DAEC

meeting, it was recommended that Mission seek agreement of borrower to include provision in the loan for training of key planners and technical personnel in income distribution, employment, and labor intensity considerations. CAP should include information on agreement reached with borrower in this regard.

ANSWER

The first and second part of this question are addressed in Annex XI, Exhibit A.

This project is highly complex, involving design and implantation of complex components such as a technical information system, technological extension services, and international and domestic market research. USAID has considered the feasibility of allocating a specific portion of the loan to the Northeast. The only NE institution with any short-run potential, to our knowledge, is the Foundation for Scientific Development of the State of Bahia. This newly founded institution does not yet have the professional depth and experience to participate effectively in a separate overall systems approach such as that envisaged for São Paulo.

Realizing the complexity of this program, the Borrower has agreed to include a covenant in the loan agreement to provide for the training of their planners and technical personnel in income distribution, employment and labor intensity considerations.

5. QUESTION

With respect to services to be financed by AID loan, CAP should contain reasonably detailed draft scopes of work for major contracts, as well as a description of the procurement procedures to be followed by Borrower for professional services contracts to be financed under Loan (i. e., will Capital Project Guidelines M.O. 1442.1 be utilized?) Also, CAP should contain draft Annex I to Loan Agreement ("Project Description").

ANSWER

For the answer to the first part of this question, please refer to SECTION VI.

This loan will finance ^{at least} four contracts between the São Paulo Council of Technology and American entities which will provide (a) technological consultants and (b) training. The specific training will be decided and scheduled by the CET and the contractor(s) as the program progresses. The specifics of the technological consultancies will be similarly determined. However, the prime original need has already been established : advice on the organizational structure and the planning of a technology program. The initiation of certain services essential to the progress of the program are also now known to require outside help. These include : reference information centers, marketing services, quality control services, and technological extension services. The latter, initially, will have more the character of a technology sales and promotion department,

since the progress of the program hinges in the final analysis upon increased use by industry of technological services. Finally, rapid progress of the program requires a certain number of early instances which unmistakably demonstrate to the business community that investments in technology pay dividends. For this reason, among others, it has been decided to undertake immediate activities in two promising fields: metallurgy and food technology.

The AID loan project will finance technical assistance and training for selected elements of the system. The AID project will principally involve four major state supported institutions: CET, IPT (Institute of Technological Research), ITAL (Institute of Food Technology) and through the CET to the University of São Paulo. (Other institutions will receive limited technical assistance and training grants).

6. QUESTION

Information on types of evaluation of program to be carried out, including description of type of implementation plans to be required, form and periodicity of reports to USAID, and monitoring. Presume that evaluation system would be designed as to indicate to AID whether or not project is achieving intended purpose.

ANSWER

Please refer to Section VI in CAP.

7. QUESTION

DAEC concerned about retention of trained staff in institutes.
CAP should indicate what state is doing or plans to in this regard,
and indicate whether a covenant in the AID Loan Agreement supporting
executive branch initiatives would serve a useful purpose.

ANSWER

Please refer to Summary and Recommendations, Number 9, item II.

8. QUESTION

Regarding terms, PPC has informed IA that given absence of studies
justifying terms to Brazil other than most concessional, Mission
should seek to negotiate two-step loan (including GOB Guaranty) as
indicated in IRR with most concessional terms extended to GOB.
Be advised that this decision supercedes that which had been made
at DAEC review.

ANSWER

Please refer to Summary and Recommendations, Number 2.

9. Given number of unknowns with respect to how proposed system will
operate, 5 year AID funding commitment appeared excessive. DAEC
concluded that until we have more knowledge of project's operation,
it would be advisable to limit AID's commitment to first 3 years of
project unless CAP can demonstrate that such a limitation on initial

AID support would cause fundamental damage to project.

ANSWER

Please refer to Summary and Recommendation, Number 9 - item I.

INCOME DISTRIBUTION, EMPLOYMENT AND PATENT POLICY

Following the IRR review, to assist the Mission in examining the issues raised, Dr. Fred Levy spent ten days in Rio de Janeiro and Sao Paulo. Dr. Levy, in addition to his review of all aspects of the CAP focused more specifically on three aspects of the program: its implications for employment, income distribution, and industrial competition. He concluded that few definitive answers can be developed immediately. A discussion of these issues follows. The Mission expects to take those issues into account in one or more of the three following ways: 1. By including in the program itself provision for more detailed examination of certain subjects which in their nature require extended analysis; 2. By negotiating for inclusion in the loan agreement these points susceptible of such agreement; 3. By inclusion of attention to certain points (a) in the criteria for approval of research projects, and (b) in the agenda for the periodic joint AID-borrower progress and evaluation reviews.

Employment

Although the creation of jobs is not a primary objective of this program, employment consideration should impose a constraint on selection of sub-projects. Thus, a number of avenues have been explored for biasing the project toward the development of labor-intensive technology. Some of these appear infeasible, however, and none offer clearcut results. It is useful to distinguish two forms of technological innovation that may be generated by this program: (1) those that result in the production of a good or service new to the Brazilian economy; (2) those that provide an economically more efficient technique for producing an existing good or service. In the first case, other things being equal, new job opportunities will be created, and the question is of degree, i.e., the choice among factor proportions where more than one production technique is available. In the second case, actual labor displacement may occur if the new technique is more capital-intensive than the old, and the growth of quantity demanded is not sufficient to offset the increase in labor productivity. A general insufficiency of aggregate demand and/or distortions and rigidities in factor pricing may prevent the displaced labor from being reemployed. It is price distortion that is a greater problem currently in Brazil.

A fundamental question raised at the IRR concerned price distortions in Brazilian factor markets which favor excessive capital intensiveness, as compared with the real relative costs of capital and labor in Brazil.

As a consequence, other things being equal, employment opportunities grow less rapidly in relation to total output than would be economically optimal and socially desirable. Time and available data have not permitted a detailed study of price distortion but it is believed, as detailed in Section IV, that the GOB is making progress in reducing its magnitude.

The USAID program can have little impact on investment incentive policies, social welfare legislation, and market structures that may be necessary to rationalize factor prices. A lesser alternative might be to require that appropriate shadow prices be applied in the evaluation of requests for funding product research and development and the consequent capital expenditures. In order to make the shadow prices operational, however, higher capital charges and/or payroll subsidies would have to be imposed on the participating firms. The former would chase them from the program, and the latter would be financially and politically infeasible.

Another possibility would be to bias the program in favor of small and medium-sized firms. Such an emphasis appears desirable from a number of viewpoints as will be further elaborated below. In the present context, the suggestion has been made that the smaller firms probably lack access to many of the subsidized investment programs of the government and therefore face more realistic factor prices. The extent to which this may be true has not been verified, but if there is a significant difference between the factor price ratios faced by small and large firms, the former could be expected to choose more labor-intensive technologies than the latter, other things being equal.

It should be noted that the effect on employment will depend on the marginal changes in labor coefficient and total output caused by the innovation, as well as the pre-existing averages. Algebraically:

$$\Delta N = \frac{N}{Q} \cdot \Delta Q + Q \cdot \Delta \left(\frac{N}{Q} \right) + \Delta Q \cdot \Delta \left(\frac{N}{Q} \right) , \text{ where}$$

N is employed labor and Q is level of output. To illustrate, available data indicate that labor productivity in the relatively capital-intensive Brazilian chemical industry grew around 3 percent per year between 1959 and 1969. Value-added in the industry rose almost 6 percent per year, however, and as a consequence 18,000 new production jobs were created. Similarly, in the metallurgy sector labor productivity rose at a rapid 4.6 percent rate, but 45,000 new jobs appeared as value added increased 7.5% p.a.

On the other hand, labor productivity apparently rose even more rapidly in the relatively labor intensive textile industry, and when total output growth failed to keep pace 36,000 jobs were lost.

As these data point out, the demand stimulated by the innovation is as important as the impact on factor proportions. To the extent that small and medium firms face greater competitive pressures, cost-reducing innovations are more likely to be passed on to the consumer in lower prices, thus stimulating the growth of quantity demanded. Where economies of scale are important, (a smaller proportion of cases than often thought), on the other hand, large size may be necessary to break into the market and create job opportunities at all. Such questions must be analyzed on a case-by-case basis. A general case may be made that preference ought to be given to products having a high price-elasticity of demand.

It can be noted in Annex VII, Exhibit G that the vast majority of Brazilian firms fall in the small category; i.e., have fewer than 50 employees. The average firm size in the metallurgy sector is substantially higher than the average for all manufacturing, while the food processing industry is more skewed toward smaller firms than the average. Even in metallurgy, almost two-thirds of the establishments have fewer than 50 employees and 95 percent have fewer than 500. (It should also be taken into account, however, that firm sizes in Sao Paulo are considerably larger than the national average, providing one among several reasons for spreading the use of research capacity generated under this loan outside the State of Sao Paulo.)

The participant firms' source of credit for the present program is BADESC. None of these funds are provided by the loan. USAID has practically no leverage over BADESC lending policies.

Thus, the GOB has made a basic policy decision that there should be no discrimination among firms (as opposed to among projects) in the use of BADESP credit. Project evaluation, however, will be in the hands of the CET. The point at which the Mission will attack the employment question, therefore, would be in the CET's review of project proposals.

RECOMMENDATIONS AND PROPOSED USAID ACTIONS

A moderately persuasive case can be made for attempting to skew project selection in the direction of small-and medium-sized firms. They are less likely to be biased in favor of capital intensive techniques, more likely to be under competitive pressure, and, hence, more likely to contribute to income distribution objectives. Nevertheless, there are sufficient uncertainties to argue against any rigid set of criteria based on firm size. This would not preclude, however, a set of project selection guidelines that gave some presumptive advantage to the smaller firms; or placed a stronger burden of proof on large firms. Dr. Levy recommends and the Mission agrees to negotiate the the following recommendations with the CET for inclusion in the Loan Agreement.

a. Targeting a minimum proportion of CET project approvals (by number or by financial magnitude) to applications from small and medium-sized firms.

b. Earmarking a part of CET's budget (and/or staff) to the recruitment of small and medium firm participants.

c. Establish as the first step in loan implementation, the formulation of a set of guidelines or manual, acceptable to USAID, for the evaluation of project applications, it being understood that the likely impact on employment, income distribution, and the general competitiveness of the industry will be among the criteria to be applied. The guidelines would be refined over time as relevant data becomes available, including that deriving from the evaluation of projects already undertaken.

d. A covenant in the loan agreement whereby CET pledges to give special attention to the problems of small and medium firms and to make a special effort to attract them to the program.

Income Distribution

The prospective impact of the science and technology program on income distribution is even more difficult to anticipate than the employment effects. The two concerns are, of course, related; an unemployed worker earns no income, and the structure of taxes and prices will affect income shares as well as capital-labor ratios. Beyond that, however, the distribution of income among those who are employed will depend on the relative demands created for the various skill levels and specializations. In terms of factor proportions, the Mission is concerned about excessive skill intensity as well as capital intensity.

It is possible that production techniques imported from the more advanced countries may have biased demand in the Brazilian labor market in the direction of skill intensity. There is evidence that the relatively more rapid growth of demand for more highly educated labor accounts for a significant fraction of the increased income inequality that apparently occurred in Brazil between 1960 and 1970. Relative salaries do reflect these supply and demand differences, and one might therefore expect Brazilian produced technology to be better adapted to Brazilian skill endowments with somewhat more confidence than is the case with the capital-labor choice. On the other hand, in some lines of production there may be a higher degree of substitutability between capital and skilled labor than between skilled and unskilled labor. In other words, skill shortages may result in the increased use of automatic machinery rather than increased employment of unskilled labor. The ultimate solution in that case may have to come from intensification of existing programs for the broadbased upgrading of the labor force, as well as more rational pricing of capital relative to labor.

The clearest danger that the project presents to a more socially desirable income distribution is with respect to the already gross imbalance between Sao Paulo and the rest of Brazil. Paulista industrialists enjoy a substantial advantage over entrepreneurs elsewhere in the country by virtue of their superior experience; communications, financial, power, and marketing infrastructure; trained labor force; international contacts; etc. (Sao Paulo was the only economic region of Brazil to increase its share of the national income between 1960 and 1970.) Unless a substantial effort is made to bring out-of-State firms into the program, the research facilities being developed will provide one more locational advantage to firms in the State.

In our conversation with Miguel Colassuano and Jose Pastore, they indicated their awareness of this problem and their intention to give special attention to the "selling" effort outside the State.

RECOMMENDATIONS AND PROPOSED USAID ACTIONS

The clearest problem for income distribution involves the program's location in the State of Sao Paulo. The Mission agrees with Dr. Levy's recommendation that a significant fraction of the work undertaken should accrue to the benefit of out-of-state firms. Since out-of-state firms are, on average, significantly smaller than Sao Paulo firms, such an achievement would also contribute to the objectives of the previous recommendation. USAID will negotiate the following:

a. Earmarking part of CET's budget or staff to the task of recruiting participants outside the State.

b. Adding to the loan agreement a covenant whereby the CET pledges to make a special effort to promote projects of interest to other regions and to recruit the participation of out-of-state firms.

Patent Policy and Industrial Competitiveness

Another potential problem related to employment and income distribution concerns the patenting of innovations resulting from the research program. There are essentially three possibilities as the program is now conceived: (1) a state research institution initiates the research in which case the resulting innovations belong to the public domain; (2) a contracting firm elects to accept full risk on the project and thereby gains full proprietary rights to whatever patents may ensue; and (3) the State and the firm share the risks of the project, and any resulting patents are therefore also shared in some as yet undefined way.

The extent to which the benefits of technological innovation get passed on to consumers, and get multiplied by stimulating innovativeness in other firms, depends in large part on the competitiveness of the market place. The international markets are presumed to be competitive. However, the research facilities this program is designed to enhance, as well as others that are influenced by this experience, will also be serving domestic markets. The manner of handling patents can significantly effect the outcome.

For example, a firm with substantial market power may find it more profitable to bottle up a socially desirable innovation for an extended period of time rather than to scrap its existing capital stock. (Some firms in the United States have been known to engage in a strategy of collecting patents with the purpose of blocking potential competitors from the market rather than putting the protected innovations into use). Similarly, where competition is weak, a cost-cutting innovation may simply inflate the profits of the firm with no price reductions being passed on to consumers, and no increase in physical output or employment. (It is interesting to note that a casual review of available data shows no evidence of any correlation between firm size and profit rates in Brazil. A study of the determinants of innovativeness and productive efficiency in Brazilian industry would provide a useful input to the CET's activities).

RECOMMENDATIONS AND PROPOSED USAID ACTIONS

Dr. Levy and Mission representatives have discussed the possibility of establishing the principle of residual State rights to an innovation if not introduced within a reasonable period of time. It was also agreed that an analysis of industrial competitiveness would be considered for inclusion in the CET's project evaluation system. Both of the possibilities will be studied by the CET management group during the first phase of loan implementation.

PRELIMINARY PROGRAM DESCRIPTION FOR USE IN PREPARING ANNEX I
OF THE LOAN AGREEMENT

I - OBJECTIVES

1. General

Through the São Paulo Council of Technology, and in close cooperation with the national authorities involved in technological matters, to establish a system to increase the use by industries of technological services, to increase the range of technological services available, to improve the capacity of various institutions to provide technological services, and in general to adopt procedures for the planning and coordination of technological activities.

2. Specific

a. Research Planning & Management

To integrate into research institutions modern research planning and management procedures, including flexible project management systems, planning and evaluation procedures, contracting procedures, and cost accounting methods.

b. Reference & Testing Laboratories

To establish a certification system. Through technological extension units, to make available to industry the reference laboratories of ITAL and ITP in the areas of food technology and metallurgy.

c. Technological Extension Units

To establish technological extension units which will make known to industry nationwide the services available from research institutions; and to promote the use of those services.

d. Marketing

To train the staffs of the research institutes in market analysis and product and market evaluation.

e. Information Terminals

To establish information terminals for the collecting, storage, retrieval and dissemination of technological and market information. (It is intended that in the early stages, these terminals will be organized on a simple postal, telegraphic, telephone basis, with selective coverage as to areas of technology, so as to build a broader information system on specific practical needs and experience.)

f. Demonstration Projects

To demonstrate, through a few examples in the metallurgy and food processing industries, that increased use of research and adaptive technology can improve the productivity, competitive position, and profits of Brazilian industries.

II - PARTICIPATING ENTITIES AND THEIR FUNCTIONS

1. The CET sets policy; designs, coordinates and manages the program. All loan-financed contracts will be with the CET though in most cases the contracts will provide consultants and experts to work with other institutions.

2. The IPT, assisted by loan-financed consultants and experts, provides industrial research and technical assistance to industry; performs testing and analysis; develops standards; and operates pilot-demonstration plants.

3. The ITAL, assisted by loan-financed consultants and experts, promotes research and the application of new techniques in the preparation, storage, processing, packing, distribution, and use of foodstuffs; cooperates with the universities in the training of food technologists; arranges or carries out training for middle level technicians and industry personnel; and advises official credit institutions on food industry proposals.

4. The USP trains scientists, researchers and expert technicians at all levels. USP staff provides researchers and consultants on industrial problems. It also designs and offers courses to meet the needs of industry, and to train personnel in the various specialties required for the operation of the program.

5. BADESP, through its Fund for Technological Development and with the guidance of the CET as to technical aspects of proposals, offers incentive financing for industrial and market research.

6. Other smaller or more specialized research institutions also participate (through sub-contracts, for instance) in aspects of the program where their expertise is pertinent.

III - LOAN-FINANCED ELEMENTS

1. Loan-financed contracts will cover the dollar costs of U.S. consultants and experts. Four contracts will initiate the loan aspect of the program.

a. General Research Management. This contractor, working with the CET management group will advise upon developing the structure of the CET; overall management; staff development; the planning of training; and coordination of the program, including the programs of other contractors.

In addition, the contract will provide technical assistance in a variety of disciplines.

b. Metallurgy. This contractor will work with IPT on overall institutional improvements (including capacity for problem identification, market and economic analysis, relations with other institutions, and research management), and on five presently identifiable research projects.

c. Food Technology. This contractor will work with the ITAL on food technology problems (with initial emphasis on meats, fish and tropical fruits) including performance standards, packaging, and marketing.

d. Quality Assurance. This "contract" with the U.S. Bureau of Standards will provide consultants and experts to advise the CET in the development of a Brazilian system of standards and quality assurance.

Other contracts may be approved as the program progresses.

2. Training will be ^{a/} large element in each of the contracts.

Training will be selected, designed and scheduled by the particular institution involved with the advice of the contract consultants and under the program guidance of the CET. Training will be carried out in Brazil by U.S. experts and by sending trainees to the United States.

3. The CET will examine with the general research management contractor and with the USP the possibility of using a small number of U.S. post-doctoral research fellows.

IV - FINANCING METHOD

Loan-financed activities, covering dollar costs only, will be handled by normal A.I.D. letter of commitment, letter of credit procedures. The CET and the Brazilian research and training entities involved in the

several aspects of the program will make required organizational changes and assign portions of their normal budgetary resources to program-related activities. One measure of the progress of the program will be the rate of increase of income to the research entities from industrial contracts.

V - PERIODIC JOINT REVIEWS

The CET and A.I.D. will carry out periodic joint reviews of program status and evaluations of the program, with the participation as appropriate of other involved institutions and the several contractors.