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Semi-Annual Report to the USAID Mission to Brazil on
U.S.-Brazil Joint Study Group Activities

The first Brazil-U.S. Workshop on the Contributions of Science and Technology to Development, held in Brazil in April 1966, identified a number of key problem areas which required greater in-depth study. It was recommended these studies be carried out by joint study groups, composed of expert and influential Brazilian and U.S. scientists, engineers and government planners, which would meet periodically in Brazil and the United States to analyze these problems and submit recommendations for consideration by appropriate U.S., Brazilian and international private and public institutions.

The following priority issues were agreed upon by the Brazilian National Research Council (CNPq) with the concurrence of the USAID Mission in Brazil and the National Academy of Sciences of the United States for study group action: industrial research; norms, measurements and testing; agricultural research; and agricultural economics.

Each study group worked out its own plan of action in accordance with the terms of reference broadly agreed upon. The groups have been meeting during the past year and a half, supported until February 1968 by LA regional funds and subsequently under contract AID/csd-1122 which includes task orders from USAID/Rio. Included in the membership of these study groups were natural and social scientists, engineers, government officials, and others from public and private institutions.

The Industrial Research Study Group, composed of ten Brazilians and ten Americans representing research institutes, universities, industry and government, was charged with formulating recommendations to promote the development of Brazil's industrial research capabilities and their application to general economic development. The group held four joint meetings: the first in Rio de Janeiro and São Paulo in April 1967; the second in Columbus, Ohio, in August 1967; the third in Belo Horizonte in February 1968; the final meeting took place in Dallas, Texas, in July 1968. Brazilian study group members took advantage of meetings held in the United States to visit a wide variety of industrial research facilities related to their interests and needs, as well as educational, governmental and other institutions.

Similar visits to Brazilian establishments were made by members of the U.S. panel. The group completed its draft final report which, upon final review and translation by the Brazilian panel, will be formally submitted to the CNPq, the NAS and USAID. The sponsoring organizations will transmit the report to appropriate authorities in Brazil and the United States for consideration and action. Although the present group will be dissolved, strong recommendations have been made to continue the CNPq-NAS relationship in industrial research in a new phase of activities related to the implementation of the study group recommendations.

The Study Group on Norms, Measurements and Testing has been considering the problem of industrial norms, standards of measurement, performance testing of products and materials, quality controls, voluntary and mandatory systems for certification and compliance with standards. This group, consisting of five Brazilians and six Americans, has held three meetings. The first was held in May 1967 at the U.S. National Bureau of Standards; the second in Brazil in August-September 1967; and the third in March 1968 in Washington. The Brazil panel is completing a draft of the final report for consideration by the U.S. panel towards the end of October. Should this draft be substantially acceptable, the study group may be able to complete its work without benefit of a fourth meeting as initially envisaged. The final report will be transmitted to the CNPq and NAS by the joint group. No further activities of this group are envisaged beyond a possible fourth meeting.

The Study Group on Agricultural Research, composed of three U.S. and three Brazilian agriculturalists, will develop recommendations to be submitted to the CNPq and NAS on the improvement of agricultural research in Brazil. These recommendations will identify priority areas which should receive attention from national, bilateral and international technical assistance programs. At its first meeting in Brazil in January 1968, the group identified key problems of agricultural research institutions and advised the CNPq to organize committees to gather, over the next 12 months, the detailed information required to make meaningful and feasible recommendations. Preceeding the meeting, U.S. members visited selected Brazilian agricultural research institutions. The group also held joint meetings with the Study Group on Agricultural Economics and proposes to work closely with this group during the period of the studies.

The Agricultural Economics Study Group, also composed of three Brazilian and three U.S. members, will recommend ways to strengthen agricultural economics as an academic discipline and to bring economic analysis to bear in establishing agricultural research priorities on a continuing basis. The group's first meeting also held in Brazil in January 1968, was devoted to an examination of weaknesses in the field of agricultural economics in Brazil and to devising the goals and a strategy for the conduct of their inquiry.

While the Ministry of Agriculture has so far been unable to appoint members to the Brazilian work teams to implement the detailed data gathering recommendations of the study groups, it is nonetheless encouraging to note that a number of the principles propounded in the reports, particularly those relating to the coordination of efforts and the participation of economists in the planning and evaluation of agricultural research, have been included in the Brazilian Government's five-year development plan.

Plans are being made to hold a joint seminar on agricultural research management in February 1969, in Brazil, which will involve not only members of the Study Groups, but directors of state and federal research stations, universities and schools of agriculture, and other interested organizations. It is hoped this will increase the cooperation and coordination in the use of the limited research resources towards the solution of common problems. The economics group will also discuss the recently completed survey of graduate study in agricultural economics in Brazil, Peru and Mexico, and the Agricultural Development Council's study on research evaluation in Brazil.

The three members of the Mineral Resources Study Group have had a long and active association through their involvement in the cooperative programs of the U.S. and Brazilian national geological services. NAS-AID contract funds have not been required to support their meetings. The group has formulated a number of recommendations aimed at improving geological research and graduate education in Brazil, and meets approximately once a year to evaluate ongoing and potentially new activities.

Two additional study groups -- one in postgraduate chemistry training and research, the other in computer science -- were recommended at the second Brazil-U.S. workshop held in Washington, D.C., in February 1968.

The study Group on Graduate Teaching and Research in Chemistry, composed of ten U.S. and nine Brazilian chemists, is formulating a cooperative program to develop Brazilian centers for graduate training and research in chemistry. The group held its first meeting in Brazil in August 1968, and the second meeting in California in September. All members of the group will participate actively in implementing the program presently being developed. This program is intended to mobilize outstanding, young U.S. chemists in developing Brazilian research capabilities in specific fields of chemistry related to development in Brazil. The program envisages a two or three year commitment by U.S. "Foreign Science Fellows" in chemical teaching and research in the Universities of Rio and São Paulo. Senior U.S. scientists will act in a supervisory role in this cooperative program.

In September 1968, a U.S. computer scientist visited university and related computer facilities in Rio de Janeiro and São Paulo and discussed with Brazilian scientists the future of computer research in Brazil and the feasibility of organizing a small joing Brazil-U.S. team to study the problem in greater depth.

Reports on each of the two new study groups will be forwarded separately upon their completion in the next month or two. Progress reports outlining the goals and activities of the other groups are enclosed. Two of the groups, the industrial research and standards groups, have final reports in or near completion. These will be forwarded to USAID/Rio in the next month or two. In the meantime, a preliminary copy of the industrial research report has been given to the Mission informally.

These reports reflect the careful thinking and high qualifications the participants brought to bear on the complex problems to which they addressed themselves. The genuine enthusiasm and dedication of the Brazilians and Americans who have participated in these activities has been extremely gratifying. All have willingly spent long hours, during and between joint meetings, on their task. A strong feeling of mutual respect developed among the members of each group, inspiring a frankness of discussion essential for a thorough understanding of the problems involved and for formulation of realistic and effective recommendations.

The Brazilian Five-Year Plan for the Development and Technology clearly represents an attempt to bring the scientific community of Brazil into the planning for the future of science and technology, an effort which seems without parallel in Latin America and most other parts of the world. Many of the ideas and preliminary recommendations of the various joint study groups have found their way into this document. Its chapter on industrial research was indeed written by two members of the Brazil panel of the Joint Study Group. The initiative and heightened effectiveness of the CNPq in the formulation of Brazil's science policy has been attributed by Brazilians to the stimulus of the joint activities of the National Academy of Sciences and the Brazilian Research Council.

Progress Report of the Joint U.S.-Brazil Study Group on Industrial Research

by
Persio de Souza Santos
Head of the Brazilian Group on Industrial Research

The group for industrial research was organized according to a recommendation approved during the Itatiaia workshop in 1966. In March 1967, the Deliberative Board of CNPq appointed a certain number of people as members of the CNPq's group for Industrial Research. Similar invitations were made in the United States by the National Academy of Sciences. The first meeting of the U.S.-Brazil panel was agreed to be in Rio de Janeiro in April 1967.

Rio de Janeiro Meeting

The Brazilian group plus ten invited guests from different branches of industrial activities had a preliminary meeting with Mr. Julien Engel from NAS and coordinator of the U.S. group. Literature was distributed by Mr. Engel about the qualifications of the ten U.S. members of the group and a broad definition of industrial research was offered in order to define the work of the panel.

One week later, April 10, the U.S. group arrived and three full-day meetings took place in Rio de Janeiro at the Brazilian Academy of Sciences and CNPq. During these meetings, twenty verbal reports, about 20 minutes long,were presented by Brazilians in order to give a general outlook of the Brazilian situation on industrial research. Free discussion was established and several decisions were made, as follows:

(a) A model was approved for the final report to be written by the group, aiming to impress and influence the decision-making organizations in Brazil in order to increase industrial research in quantity and quality.

(b) The Brazilian group agreed in writing a series of papers covering information and data on research, educational and industrial activities to serve as a background to the final report.

(c) The papers, in English, were to be ready in July 1967, to be reported by their authors in August 1967, during the second meeting of the panel at the Battelle Memorial Institute in Columbus, Ohio.

The panel then went to São Paulo, visiting Instituto de Pesquisas Tecnológicas, Instituto de Tecnologia de Alimentos, Instituto Tecnológico da Aeronáutica and had a meeting with the directors of U.S. industrial organizations in São Paulo; some of them also visited other states of Brazil.

The Brazilian group had afterwards 15 full-day meetings in Rio de Janeiro to discuss and organize the following reports:

A. André Tosello (Instituto de Tecnologia de Alimentos, Campinas)- Primary Sketch on Industrial Research in Brazil.

B. George S. Moraes (SINVAC, Governador Valadares)- Profile of Industrial Research System with Case Studies of Successful and Unsuccessful Industrial Research Programs.

C. Remolo Ciola (Refinaria de Petróleo União, São Paulo)- Utilization of Human Resources.

D. Antonio Seabra Moggi (Petrobrás, Rio de Janeiro)- A National Information System.

E. Pérsio de Souza Santos (IPT e EPUSP)- CNPq Role in Industrial Research in the Past Five Years.

F. Pérsio de Souza Santos (IPT e EPUSP)- Industrial Research Output in the Past Five Years.

G. Joaquim F. de Carvalho (Ministério do Plajenamento, Rio de Janeiro)- International Cooperative Activities in Industrial Research: Technical Assistance.

H. Kurt Politzer (Universidade do Brasil)- Industrial Research - Fiscal Incentives, Tax Legislation and Effect of General Business Conditions.

I. Juvenal Ozorio (CEIQUIM, Ministério da Indústria e Comércio)- Sources and Levels of Finance for Industrial Research.

J. Pérsio de Souza Santos, Nelson Gutheil, Abrahão Iachan- Technological Institutes: A Comparative Analysis.

Columbus Meeting

The U.S.-Brazil panel had three full-day meetings (August 14-16) in Columbus, Ohio, at the Battelle Memorial Institute. The papers were presented by their authors and fully discussed by the panel. A list of suggestions and recommendations was written. The form of presentation of the final report of the group was approved. A third meeting of the panel was ascertained to be in Belo Horizonte, Minas Gerais in the third week of February 1968. The suggested draft of the recommendations to improve industrial research is going to be discussed in this Belo Horizonte meeting.

After the Columbus meeting, the members of the Brazilian group visited 65 organizations for research in industry, universities and government. A report of the activities of the Brazilian group was presented at a meeting of the Deliberative Board of CNPq.

Eight meetings were made in Rio de Janeiro for the suggestions to be presented in Belo Horizonte, which were sent, in the middle of January 1968, to Mr. Julien Engel for distribution to the U.S. group.

Progress Report of the Joint U.S.-Brazil Study Group on Norms, Measurements, and Testing

by
Julien Engel
National Academy of Sciences

In its discussion of the assistance that science and technology can render industry, the Itatiaia Workshop made a couple of recommendations which led to the creation of the Joint Study Group on which I have the pleasure of reporting this afternoon. The rapporteur's summary of that Itatiaia discussion indicated that

> "the participants ... recognize the importance of the establishment of an expanded standards activity formed around the present Bureau of Weights and Measures as a nucleus."

Later on, in a summary of the principal recommendations, the Workshop concluded with this statement:

> "The participants of the workshop recognize the importance of the establishment of a Brazilian National Bureau of Standards. In order to aid the long-range development of such a bureau of standards, it is recommended that a joint subcommittee... be established."

Despite this rather specific charge, the Study Group now in existence operates under the name of Joint Study Group on Norms, Measurements, and Testing, and by implication remains rather silent on the matter of a Brazilian NBS. There is an explanation for this which needs to be stated here. As we began giving effect to the Itatiaia recommendation, and on both the Brazilian and U.S. sides selecting the specialists who were to constitute the membership of the group, it became quite evident to both sides that to take the workshop's recommendations explicitly as a point of departure would be to prejudge the very outcome of the inquiry that needed to be made. Furthermore, the U.S. members--largely drawn from our NBS--were not at all sure that their institution was a particularly apt or useful model for emulation in the Brazilian context; and the Brazilian members were not at all sure that the most pressing Brazilian needs would be usefully or efficiently met by an institution given to the pursuits of the U.S. NBS.

In short, after due consultation with the CNPq and the NAS, the Group decided to start with a clean slate and, broadly within the intent of the original charge, to formulate its own terms of reference, which are to consider and make recommendations with respect to these five questions:

(a) the present organization, programs, personnel and equipment related to norms, standards of measurement, and testing in Brazil;

(b) the role of government, industry, educational institutions, and technical societies in their fields;

(c) the associated interrelationships between technological institutes, universities, industry, state and federal governments, science related institutions with regard to financing, direction, and control;

(d) the adequacy of relationship between organizations and activity relating to codes and specifications covering products and commodities;

(e) the present and anticipated requirements of measurement standards and techniques in relation to Brazil's economy, its development plans, and its relations with international markets.

The Study Group can be said to have been in effective operation for about nine months. During this time each national panel has met several times, and the two panels have come together for joint meetings twice. A third joint meeting will take place early next month.

The first joint meeting took place in the United States, at the NBS, last May, with the participation on the Brazilian side of a nucleus team of two persons under the chairmanship of Admiral Geraldo Maia, the U.S. panel of six members under the chairmanship of Dr. Ralph Sawyer, plus a dozen consultants from various divisions of our NBS. It was then that the two groups decided that they should address themselves to a set of problems substantially different from, though related to, the one identified at Itatiaia (that is the establishment of a Brazilian NBS), and which would include consideration of the following factors among others: development of industrial norms and related standards of measurement, performance testing of products and materials, quality controls, voluntary and mandatory system for certification and compliance with standards or specifications, and so forth. In the United States, these various functions and activities are carried out by a loose and quite unrational complex of agencies and institutions, public and private, largely <u>outside of</u>, but working in friendly collaboration with, the NBS.

The particular relevance of this aspect of the problem should be quite obvious: Brazil has undertaken a marked industrialization effort; its changing economic conditions away from a highly protected, import substitution oriented economy make for increased industrial competition at home and for increased pressures to expand its exports of manufactured goods. Thus, the two panels concluded that Brazil's priority needs were for a system <u>custom-tailored to Brazilian realities</u> able to undertake

essentially the same activities and perform the same services as the mixed complex of private-public, voluntary-mandatory operating in the United States (and, incidentally, not to excessive satisfaction on the part of a good many Americans!).

The Group came to a second basic conclusion: the magnitude of the problem and the multiplicity of industrial sectors to be affected by whatever scheme would ultimately come about--and this coming about would be directly dependent on the active collaboration of the industrail sector--required for sheer reasons of practicality that this task be approached on a sector by sector basis.

The electronic-electrical sector was to be given initial attention and with satisfactory progress there and the acquisition of experience applicable to other sectors, the Group would move on to consideration of (in this order) the mechanical, steel, non-ferrous metals, automobiles, and ship-building industries. Implicit in this approach, of course, is the assumption that the relationship being established would extend well beyond the eighteen months initially projected and would go on for as long as the job required or the money lasted.

In the course of the second joint meeting, in Brazil this past August and September, the U.S. panel had opportunity to visit Brazil's principal institutes of technology, many of which have delegated responsibility for metrology, the Brazilian Institute of Weights and Measures, the Brazilian Association for Technical Norms (ABNT), as well as a broad range of Brazilian and foreign-owned industrial enterprises. These visits, combined with extended discussions between the two panels, produced general agreement on several points among others:

1. need for certain changes in the structure, procedure, staffing and missions of institutions like the Brazilian Institute of Weights and Measures, and the Brazilian Association for Technical Norms;

2. need for more active and broader involvement of Brazilian industry in the formulation of Brazilian standards, which in number and coverage are grossly inadequate for Brazil's requirements;

3. need for more agressive campaigns to educate Brazilian Government and industry on the advantages of standardization;

4. need for the development of institutional, legal or financial devices to motivate compliance by industry with recognized standards.

The third joint meeting of the Study Group is scheduled for early March here in Washington. In preparation for it, the Group had agreed in Rio to undertake the following "homework" tasks, which would constitute the basis for the next round of discussions and also serve as

the basis after proper consideration, for a first statement and recommendations of the Group:

> The U.S. panel was to formulate a model plan for an integrated Brazilian system covering norms, testing and means for promoting compliance; this plan to be inspired ~~by all~~ relevant experience, indeed perhaps more European than American.
>
> The Brazil panel was to formulate a plan for a model system of weights and measures with emphasis on both technical and legal aspects of metrology, taking into account existing institutions and legislation.

Both of these homework tasks have been completed, but they are very tentative exercises, rough approximations of what is desirable and feasible. The two plans need considerable discussion and refinement, and furthermore the two plans must be meshed into a single system before they can be unveiled to the hard glare of public inspection, and this, of course, is what the Group intends to do next month.

The Brazil panel is also expected to formulate a project for the establishment of a pilot government and industry-supported standards control facility for electronic components, in line with the sector approach alluded to earlier. The proposed unit would undertake the drafting of standards in the electronics fields for submission to ABNT's formal approval procedures, would establish measuring methods, and perform certain other services.

In view of the fact that the two panels have thus far had opportunity only to exchange working papers on the issues under consideration, without yet the extensive discussion which will bring their respective views within a sound and realistic perspective, it would be premature--and indeed quite out of place--for me to go into the substance of their thinking. This the Joint Study Group should be in a position to reveal shortly after their forthcoming meeting.

Progress Report of the Joint U.S.-Brazil Study Group on Agricultural Research

by

Brazilian Members
Ady Raul da Silva, Chairman
Roberto Meirelles de Miranda
Glauco Pinto Viegas

U.S. Members
Roy L. Lovvorn, Chairman
R. K. Frevert
H. Rex Thomas

The Joint Study Group was created through a recommendation made at the Itatiaia Workshop of the U.S.-Brazil science cooperation program between the Brazilian National Research Council (CNPq) and the U.S. National Academy of Sciences (NAS) in April 1966. In January 1968 the U.S. members of the Study Group visited Brazil for the first meeting with the Brazilian members at which the following objectives and methodology for the study were agreed.

Objectives

The main objective is to develop recommendations to the CNPq and NAS on the improvement of agricultural research in Brazil. These recommendations will indicate priority areas which may receive attention from national, bilateral, and international technical assistance programs.

Introduction

The first visit to Brazil of the U.S. members of the group enabled them to become acquainted with the problems of research at the federal, state, and university levels by visits to a number of selected institutions (Appendix 1) and to hold discussions with their Brazilian colleagues to agree on the objectives, scope and future activity of the Study Group. Recognizing the importance of making meaningful suggestions regarding agricultural research in Brazil, based on considerably more detailed information than could be covered in a three-week visit, the group proposes that studies detailed below should be carried out by the CNPq and other appropriate organizations over a period of approximately twelve months, with further joint meetings of the group in the United States and Brazil as are feasible and appropriate. A report based on these studies will be presented to the 1969 Science Workshop of the Cooperative Science Program.

The Group also held joint meetings with the Study Group on Agricultural Economics, and proposes to work closely with this group during the period of the studies. A section of their preliminary draft as relates to this report is attached (Appendix 2).

The continuation of the activities of the Group after the completion of the initial studies is advisable for counseling during implementation of the recommendations.

Throughout the two weeks of visits made to institutions the Group was impressed with the following general observations:

1. Lack of funds at the time they are needed.

2. Application of a disproportionate amount of funds for maintenance as opposed to actual research projects.

3. A large number of institutions operating under different administrative authorities and systems of administration.

4. A shortage of well-trained senior research personnel and a lack of capacity to train them.

5. Limitations in the system of promotion, particularly relating to merit and incentive.

6. Disparity between salaries for research and teaching, and the small difference in pay scale between capable junior and senior technical personnel.

7. Lack of connection between research, teaching and extension institutions.

8. Difficulties of communication between institutions, organizations, and individuals conducting agricultural research.

9. Lack of economic interpretation given to the experimental results.

10. Under-utilization of building, equipment, and personnel.

These impressions from a short visit and other points should be evaluated critically through studies which it is proposed should be carried out by, or under the auspices of, the CNPq before the next meeting of the Group. The data will assist the Group in arriving at proper definitive conclusions and recommendations.

Basic Information Necessary for the Study of the Improvement of Agricultural Research in Brazil

It is proposed that the analysis of agricultural research in Brazil and the problems of increasing its value and effectiveness be undertaken with emphasis on a number of broad areas described in this section.

A. Research Institutions

In order to arrive at suggestions for improving agricultural research the present situation must be described and possible alternatives indicated. It is therefore proposed that:

1. An inventory be made of the number, location, physical facilities, equipment and personnel of the present research stations, including their branch stations.

2. The same data as required under 1 be provided for institutions doing research on forestry and rural economics. (This will enable the Group to consider the advisability of combining these disciplines with plant and animal sciences, soil science, rural engineering, and processing of plant and animal products in the different institutions.)

3. An examination be made of the administration of research institutions, under the following headings:

   a. Control at national, regional and state levels, and the degree of autonomy.

   b. Administration of funding--time of funding, flexibility, and sources, including federal, state, taxation, endowment, income from produce, and contracts.

   c. The desirability of preparing a five or ten year development plan for individual research institutions with annual review.

   d. The need for a national and/or regional agricultural research advisory committee, composed of representatives from various institutions.

   e. The training of research administrators.

   f. A mechanism for the planning and evaluation of research projects.

B. Scientific Manpower

One of the principal problems facing agricultural research is the provision of adequately trained technical and administrative personnel in the appropriate geographic locations to carry out the required research. On the basis of information collected the following topics will be considered in greater detail:

1. The discovery and stimulation of interest by undergraduates in research as a vocation.

2. Selection and training of personnel:

   a. Graduate training

   b. Further training and research

   c. Exchange of personnel between institutions for training purposes

3. Salary policy:

   a. Special salary for research

   b. Recognition of merit

   c. Difference between salary at beginning and end of research career

   d. Salary differential for personnel with higher degrees or qualifications

   e. Careers in research recognized through honorary degrees

4. Dual position in teaching and research.

5. Participation in graduate teaching by research institute personnel.

6. Tenure.

7. Supporting personnel:

   a. Medium education

   b. Personnel

8. Perquisites:

   a. Free housing

   b. Other non-salary benefits

9. Twin systems of career:

   a. Equal salary

   b. Recognition for administrative and technical responsibilities

10. Training for administration of research.

11. Scientific recognition through academies, professional societies, prizes, awards, etc.

C. Support of Agricultural Research

The total amount of funds used in Brazil for agricultural research has not as yet been precisely estimated. It is suggested that an inventory of these funds available to each institution in the different regions be prepared. This inventory will provide elements for judgment on the distribution of resources for different institutions and will allow the group to make suggestions on new sources of funds:

1. Present sources of funds:

   a. Direct federal and state appropriations from budget

   b. Special taxes

   c. Income from institutions

   d. Contracts from agencies requiring research; such as

      IBC - Brazilian Coffee Institute
      IBFD - Brazilian Forestry Development Institute
      IAA - Alcohol and Sugar Institute
      IBRA - Brazilian Agrarian Reform Institute
      INDA - Brazilian Agricultural Development Institute
      SUDENE - Superintendency for Development of the Northeastern Region
      SUDAM - Superintendency for Development of the Amazon Region
      SUVALE - Superintendency of the Sao Francisco River Valley

   e. Loans from banks

   f. Grants from foundations

2. Other possible sources of funds:

   a. Tax deductions as incentive to application of private money on agricultural research

   b. Grants from private industry

   c. Research by private industry

D. Research Priorities

There is need of a study of the mechanism of establishing and ranking priorities in agricultural research in Brazil:

1. The following criteria for establishing and ranking research priorities may be considered:

   a. Governmental policies

   b. Current economic and social importance

   c. Market potential

   d. Availability of institutions personnel and funds

   e. Scientific importance

   f. Use of natural resources

   g. Occupation of less developed territories

   h. Benefits in relation to cost of research

   i. Urgency of research

   j. Feasibility and likelihood of successful completion in a reasonable period of time

   k. Likelihood of similar research being undertaken elsewhere

   l. Likelihood of results being adopted and implemented on a wide scale

2. Research priorities already established may be considered:

   a. Five-year plan of the CNPq

   b. Ministry of Agriculture National Plans

   c. Plans of other institutions

E. Coordination of Research

Research activity in Brazil is the responsibility, through different laws, of many types of institutions, including:

1. CNPq.

2. Ministry of Agriculture.

3. State Secretariats of Agriculture.

4. Universities.

5. Regional organizations, such as SUDAM, SUDENE, Bank of North East.

6. Miscellaneous, such as the Institute of Sugar and Alcohol, the Bank of Brazil (cocoa research), and private institutions.

Having this activity under so many administrations calls for a system to bring their programs together with a view to planning complementary actions towards higher efficiency and better use of investments made in research.

It is therefore proposed that the CNPq prepare a study of the alternative methods through which coordination might be achieved and the degree and amount of coordination which might be desirable between these organizations.

F. Linking Agricultural Research Institutions with Associated Organizations and Institutions

In Brazil agricultural research is carried out principally by research institutes. The teaching, extension and related functions are, with notable exceptions, carried out independently by different institutions. An analysis of this situation should cover the following points:

1. Relationship between research and education. A study should be made of the most desirable administrative relationship:

   a. Research and medium-level education

   b. Research and professional education

   c. Research and graduate education (centers of excellence)

   d. Research and short-course training

   e. Research and extension

2. Providing research results for others:

   a. Teaching institutions

   b. Extension

   c. Credit

   d. Farmers

e. Industry and commerce

f. Scientific institutions

g. Economic institutions

h. Government ministries, planning, etc.

G. Responsibility For Agricultural Research

A study should be made of alternative mechanisms for administering agricultural research:

1. Ministry of Agriculture and other ministries.

2. State Secretariats.

3. Universities.

4. Autonomous research.

H. International Scientific and Technical Assistance

A variety of agencies are providing inputs into Brazil's agricultural development. This should be examined within the context of the national problem in relation to the objectives of this study:

1. The relationship of international technical assistance to the system of research coordination to be developed.

2. The programs of the agencies:

   a. International agencies including

      UN - FAO, UNESCO, UNDP
      OEA - Inter-American Institute of Agricultural Sciences

   b. Bi-lateral agreements between governments

   c. Private organizations

3. Technical cooperation with mutual benefits for the countries involved:

   a. Exchange of personnel - profession and student

   b. Exchange of documentation

   c. Exchange of material - plants, animals, etc.

   d. Meetings, congresses, seminars, workshops, etc.

4. Exchange of international scientists among institutions in Brazil. This study should include the feasibility of utilizing the unique talents of international technicians for specific short-term assignments at institutions other than those to which they are assigned.

I. National Technical Assistance

The possibility of the more advanced Brazilian research institutions giving technical assistance to the less developed should be explored in detail. This cooperation has the attractions of common language, low cost, easier adjustment of the technical personnel, etc.

The ways and means of carrying this out would be an appropriate area for the Group to examine under the following headings:

1. Funding agency or agencies.

2. Method of conducting research at advanced institutions for less advanced while simultaneously training personnel for the latter.

3. Cooperation and counseling.

J. Documentation

Need for coordination in this area is particularly great where the resources available are limited. Particular areas which might be examined are:

1. Libraries - exchange of material, cards, abstracts, specialization.

2. Releasing information and printing material.

3. Development of Brazilian journals covering large fields with subscription in sections.

4. Cost of printing.

5. Assistance with subscription to foreign journals.

K. Dissemination of Research Results

This topic should be examined as a limiting factor in the utilization of research results:

1. Methods of dissemination of research information among scientists:

   a. Journals and technical bulletins, books

b. Meetings, symposia, conferences, seminars and professional societies

2. Specialized dissemination to associated organizations:

a. Extension agencies

b. Government ministries

c. Credit agencies

d. Private industry and commerce

3. General information for public - radio, TV, magazines, newspapers.

Implementation

It is obviously impossible for the Group to carry out the activities indicated above in the three weeks available. Therefore, it is suggested that the CNPq assume the initiative in organizing appropriate committees and/or staff personnel and funding for this purpose, in collaboration with other agencies. Special consideration should be given to DPEA (Ministry of Agriculture Research Department), USAID contract personnel and some regional institutions.

These studies would provide the bases for the next report of the Joint Study Group. This information is obviously of value independently of the Group's activities.

In view of the magnitude of the task it is recommended that action should be taken in the following sequence:

1. Inventory of Brazilian agricultural research.

2. Establishment of a committee to study alternative mechanisms for assessing and ranking research priorities, with representation from CNPq, Ministry of Agriculture, State Secretariats of Agriculture, universities, and members at large.

3. Establishment of a committee to examine alternative methods of collaboration between the various agencies in a systematic attack on agricultural research priority problems.

4. Establishment of a committee to consider manpower problems.

5. Establishment of committees to implement other studies not included in items 1-4.

6. It is recommended that Brazilian personnel experienced in agricultural research administration who might be assigned staff responsibility for supervising the preparation of an

agricultural development plan, be sent as soon as feasible to the United States for training in the procedures used by the U.S. Department of Agriculture and the Land Grant Colleges in developing its recent report, "A National Program of Research for Agriculture." Personnel to have responsibility for research evaluations should also have training in the new techniques being used in the planning, programming, and budgeting system.

7. It is recommended that experts from the U.S. Department of Agriculture familiar with developing research inventories be sent to Brazil for a short period to work with the Brazilian scientists sent to the United States for training.

8. Brazilian members of the group should continue getting information together, forwarding information to the U.S. members to keep them informed of the progress being made in the studies.

9. Time table.

   a. Examination of the progress report by the Workshop, February 4-10, 1968

   b. CNPq study of the organization of subcommittees, budget and funding

   c. Organization of the subcommittees. (These items should be completed by March 31, 1968.)

   d. Inventory should be prepared between March 31 and September 30, 1968

   e. The subcommittee should present their report by October 31, 1968

   f. Each group member will study the reports of the subcommittees and present their suggestions up to December 31, 1968

   g. The draft of the first report should be discussed at meetings of the national groups held in January or February 1969

   h. The draft of the report should be ready by February 28, 1969

   i. Meeting of the joing study group for the conclusion of the report should occur in the middle of March 1969

   j. The report will be presented to the Workshop in middle of April 1969

Appendix "1"

Visit of the Agricultural Group of Cooperation Between the Brazilian National Research Council and U. S. National Academy of Sciences

Period: January 7 to 26, 1968

Group from NAS	Group from CNPq
Roy L. Lovvorn	Glauco Pinto Viegas
R. K. Frevert	Ady Raul da Silva
H. Rex Thomas	Roberto Meirelles de Miranda
M.G.C. McDonald Dow	

1. Arrival at Belem, Para, January 7.

2. Visit at Belem, January 8:

   a. Institute of Agricultural Research of Ministry of Agriculture (IPEAN)

   b. College of Agriculture

   c. Secretary of Agriculture

3. Drs. Frevert and Miranda visited on January 9 the College of Agriculture of the University of Ceara.

4. The other members traveled to Recife, Pernambuco, and visited the Agricultural Research Institute (IPA), January 9.

All members visited on January 10 the Institute for Agriculture Research of the Ministry of Agriculture for the Northeast (IPEANE) and the SUDENE (Government Agency for the Development of the Northeast).

5. The group traveled to Rio and was received by the President, Vice-President and the staff members of the Brazilian National Research Council on January 11.

6. On January 12 the group visited the Rural University and the Institute of Agriculture Research (IPEACS) at km 47, State of Rio de Janeiro.

7. Preliminary meeting of the group for the outline of the progress report was held on January 13.

8. The group visited the headquarters of the Department of Agriculture Research of the Ministry of Agriculture and its Divisions of Soils and Food Technology, I.R.I. Research Institute, and USAID Offices.

9. Meeting was held at National Research Council for discussion of the information at hand and planning for future inquiries on January 16 traveling to Campinas, São Paulo in the afternoon.

10. The Institute for Agriculture Research of the State of São Paulo, Campinas, the Tropical Center for Research on Food and Technology, the Research Center of Animal Nutrition at Nova Odessa, the Division of Specialized Technical Assistance (DATE), the College of Agriculture of the University of São Paulo, Piracicaba and the Biological Institute of the State of São Paulo were visited in January 17, 18, and 19.

11. A meeting with the general coordinator for Agricultural Research at the State of São Paulo and the directors of research of the visited institutions was held on January 19.

12. The Institute for Agriculture Research of the Ministry of Agriculture (IPEACO) at Sete Lagoas, Minas Gerais, in the region of "cerrado" was visited on January 20.

13. The Rural University of the State of Minas Gerais, Vicosa, was visited on January 21 and 22, and the group returned to Rio de Janeiro.

14. A joint meeting with Agriculture Economics Group was held on January 23 at the Brazilian Academy of Sciences.

15. Discussion, recommendations and final draft of the progress report were made, in meetings on January 24, 25, and 26.

16. Presentation of progress report to the President of the Brazilian National Research Council, January 26, and return to the United States.

Appendix "2"

The Economic Dimension of Agricultural Research Needs to be Given More Emphasis*

Agricultural economics has been relatively neglected as a discipline in Brazil. As a consequence, there are only a couple of reasonably strong centers of agricultural economics in the country. This results in the almost complete lack of agricultural policy research, and the failure to have an economic interpretation of utilization of agricultural physical research.

As first steps to improve this situation, the following recommendations need to be considered:

1. Research in agricultural economics should be considered an integral part of agricultural research

   It is recommended that the CNPq, the Ministry of Agriculture, secretariats of agriculture, universities, and other agricultural research institutions clearly recognize that a comprehensive agricultural research program which will best serve Brazilian agriculture must include, as an integral part, an appropriate staff and program of work in agricultural economics. It is further recommended that national, state, and private research policies, programs and budgets be developed in a manner such that this aspect of the agricultural sciences receives adequate financial resources on a continuing and timely basis.

   As suggested below, agricultural economics can contribute in the detailed planning and interpretation of results for various technical research projects, in applying such information for improved farm management as well as in conducting research on marketing and policy problems. Some part of this task can be accomplished by placing economists in close cooperation with other technical research workers in agriculture. Other parts of the task require research agencies specialized in agricultural economics. Both types of organization are essential if agricultural economics is to make its maximum contribution to the effectiveness of agricultural research.

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* Partial text of this appendix is contained in section "Goals and Strategy"-Part A of the Progress Report on Agricultural Economics.

2. Agricultural economics should be established as a permanent component of the six regional Institutes that make up DPEA and in such other research institutions where viable.

New discoveries and new technologies are of little use to the farmer if they are not profitable. Moreover, the farmer wants to know more than whether fertilizer will increase yields, for example. He wants to know, given that fertilizer is profitable, how much should be used, and in what proportions.

In addition to this, he needs information on how different products fit together to make a profitable system of farming. This involves not only some knowledge of the physical relationships involved, but also the economics of how the various inputs and enterprises fit together. For this reason, the output of the physical research will be more useful to the farmer if it is synthesized and analyzed in the context of a total farm organization.

As agricultural research institutions develop their programs, agricultural economics can contribute to the establishment of priorities. These priorities are based on such things as the availability of human resources, the probability of success in the research venture, and some notion of the economic viability of the respective crop or product. It is important that economic consideration be considered in establishing these priorities. Recommendation should be considered at two levels:

a. It is recommended that a team of at least three agricultural economists (with at least the M.S.) be placed in each of the regional institutes and in other research centers where viable. These economists would have the following functions:

(1) Help in designing the experiments and research so that economically meaningful results can be derived from them.

(2) Interpret the results of the physical research from an economic standpoint. This is especially important in fertilizer and animal nutrition research, but even such things as disease and insect control have an economic dimension.

(3) Develop a program of farm management research. This will involve the synthesization of the results of the physical research into economically profitable systems, and the conduction of farm management surveys which will indicate what is taking place in the rural sector and serve as a basis for developing the new systems.

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

The field of agricultural economics as a discipline encompasses much more than these four functions. However, such things as price analysis, detailed analyses of the marketing system, the evaluation of agricultural policy, and work on more basic economic development and resource allocations problems should be left to institutions that specialize in agricultural economic research. An attempt should be made to integrate the economists located in the research stations with the specialized agricultural economics centers.

b. <u>It is recommended that a small advisory group of agricultural economists also be established at the decision-making and planning level to help in establishing priorities for biological and physical research.</u>

In addition to the decisions at the regional level it is also important that priorities be established at the national level. This group would assure that economic considerations will be included in establishing these priorities. This group would draw on the centers of agricultural economics for advice and the necessary analysis.

Several agricultural economics research and teaching institutions need to be added to complement those already existing in São Paulo and Minas Gerais. This can be done by encouraging the growth of small units in one or two other regions and one on a national basis. The existing centers, which are reasonably strong, warrant continued support.

The existing graduate programs need to be continued and strengthened. They furnish numerous opportunities for both research and training, with systematic and reasonably secure sources of support.

More elaboration of these comments and issues will be developed in the report of the Agricultural Economics Committee.

Progress Report of the Joint U.S.-Brazil Study Group on Agricultural Economics

by

Brazilian Members
Rui Miller Paiva, Chairman
Victor J. Pellegrini
Constantino Carneiro Fraga

U. S. Members
G. Edward Schuh, Chairman
D. Woods Thomas
Lawrence W. Witt

Introduction

This report has its origin in a meeting of the U.S.-Brazil Science Cooperation Program held in Itatiaia in 1966. This meeting was jointly sponsored by the Brazilian National Research Council and the U.S. National Academy of Sciences.

One result of that meeting was an agreement to establish three binational agricultural study groups, each of which would make recommendations in specific areas. These three study groups were:

1. Study Group on Agricultural Research

2. Study Group on Agricultural Economics

3. Study Group on the Establishment of Germ Plasm Banks and the Development of Plant Collections

It was intended that the first two of these groups would work together in making suggestion for the improvement of agricultural research in Brazil. The original terms of reference given to the Study Group on Agricultural Economics indicated that it was to establish priorities for agricultural technical research based on the relative supply and demand conditions for food products in Brazil.

Later discussion led to an expansion of the terms of reference to include the following:

"1. Establish priorities for agricultural technical research based on the relative supply and demand conditions for food products in Brazil;

2. Serve as a review-board for economic analysis and policy recommendations of the (proposed) USAID-Brazil internal economic analysis group;

3. Review the results of economic studies in order to appraise and revise policy recommendations for agricultural development in Brazil;

4. Consider and make recommendations on establishing research priorities for research in agricultural economics."

This revision in the terms of reference seemed desirable in view of the particular needs of Brazil and the experience of the men chosen to make up the committee.

The Study Group was to carry out its work over an 18-month period. In this period, meetings were to take place in both the U.S. and Brazil.

The Study Group on Agricultural Economics met for the first time in Rio de Janeiro from January 22-30, 1968. Preliminary discussions led to a decision to broaden further the focus of the Study Group, and led to a recommendation that certain of the assignments might better be carried out on a continuing basis rather than as a once-for-all set of recommendations.

As a result, the objectives of the group became the following:

1. To suggest ways in which agricultural economics could be integrated with the physical and biological agricultural research.

2. To suggest ways in which economic analysis could be brought to bear in establishing research priorities on a continuing basis.

3. To suggest steps to be taken which will strengthen agricultural economics as a science and discipline in Brazil. Special emphasis is to be given to:

   a. Strengthening teaching programs in agricultural economics

   b. Strengthening research in agricultural economics generally, but most specifically, that useful for policy purposes.

4. To suggest ways in which a permanent council of Economic Advisors for Brazilian Agricultural Development could be established which would guide the development of the growing profession, advise on national agricultural policy, and advise on programs of international assistance to the agricultural sector of Brazil.

The present report represents the first step in attaining these objectives. The suggestions for objective one were attached to the report of the Agricultural Study Group.

Status of Agricultural Economics in Brazil

Agricultural economics, as a profession and as a field of study, is of recent origin in Brazil. Prior to World War II, there were no formally-trained agricultural economists actively involved in research, teaching or public service. In the universities, undergraduate instruction in this subject matter was limited to one course, at most two, as part of the Engineer Agronomo Curriculum. Formal programs of graduate study were non-existent. Useful programs of systematic scientific inquiry were almost completely absent. Nobody of scientific knowledge relative to the agricultural economy was available. The situation in public entities at the national and state levels was equally dismal.

During the 1940's and 1950's, some growth in the profession took place. This was characterized by the gradual evolution of a small group of agricultural economists with advanced scientific training abroad. Equally, a few agricultural economics programs took root. Notable among these were the Division of Agricultural Economics in the Secretariat of Agriculture in São Paulo and the Department of Agricultural Economics in the Superior School of Agriculture of the Rural University of the State of Minas Gerais. Still, as late as 1960, the profession was clearly in its infancy with but a handful of well-trained and experienced professionals. The state of knowledge relative to the Brazilian agricultural economy continued relatively low. With few exceptions, the profession was not in a position to make meaningful contributions to rational public decision-making at national and state levels, nor at the farm and agricultural business firm level.

The late start and slow growth of the profession in Brazil is attributable to a number of factors. First, it has evolved in the environment of the Brazilian school of agronomy. Such schools, with some exceptions, have been modeled after European schools and universities. They have been highly theoretical and isolated from the problems of Brazilian agriculture. Their limited concern for contemporary problems did not provide much opportunity for agricultural economics to come into play. Second, the schools of agronomy have tended to be autonomous, with little or no relation to other academic faculties, where intellectual interaction with other social sciences and other disciplines could take place. Third, the discipline of economics itself, until recently, has not developed in Brazilian faculties, and provided no base for the development of agricultural economics as the applied field.

In 1960, Nicholls* appraised the status of the agricultural economics profession in Brazil. In commenting on undergraduate teaching, he indicated:

*Nicholls, William H. (Vanderbilt University). Confidential report to the Ford Foundation entitled "An appraisal of Brazilian agricultural economics," July 1960.

1. The American concept of the "major field" was wholly absent in the undergraduate curriculum of Brazilian colleges of agriculture.

2. Unlike at least some of the technical fields of agriculture, agricultural economics had not yet won in Brazil a place in institutionalized research or extension. As a result, the few professional job opportunities for agricultural economists did not encourage undergraduate or postgraduate specialization in this field.

3. In Brazil's technically-oriented Faculties of Agronomy, the field of "rural economics" represented a distinct minority interest, making its internal expansion extremely difficult and sometimes impossible.

4. Brazil's catedráticos in Rural Economics had not yet produced an intellectual leader whose powers of intellect, personality, and leadership were sufficient to gain a position of respect for this unfamiliar and somewhat suspect field.

5. Brazil's professors of Rural Economics had not yet found that happy combination of theory and application needed for fruitful and effective demonstration of the value and importance of their field.

6. As a subject which cut across two important fields, agricultural economics in Brazil suffered unusually severely from almost absolute separation, both physically and intellectually, between the faculties of agriculture and the faculties of economics.

During the 1960's, interest in and growth of the profession accelerated, albeit from a narrow base. Currently, undergraduate specialization in agricultural economics is possible at two institutions--Viçosa and Piracicaba. Graduate programs leading to the Master of Science degree are available at three institutions--Viçosa, Piracicaba and Rio Grande do Sul. The number of Brazilian agricultural economists with advanced training at home and abroad has increased sharply. It is estimated that there are approximately 90 agricultural economists with Master of Science or higher level of training active in Brazil at the present. Additionally, there are some 40 students currently pursuing graduate programs at the M.S. and Ph.D. levels in this country and abroad, plus others who have advanced level training without obtaining the degree. The total number of people with some graduate level training is therefore approximately 150.

These professionals are rather highly concentrated in a few states. Minas Gerais has approximately 30, Sao Paulo approximately 15, Rio Grande do Sul approximately 20, Guanabara approximately 10, and Ceara and Pernambuco approximately 12. The remainder are distributed almost singly throughout the country.

Significant research programs are being developed in conjunction with the graduate programs in the three superior level teaching programs. The research capacities of the agricultural economics divisions of the secretariats of agriculture in the states of São Paulo and Minas Gerais are substantial and growing. Similarly, a few national entities, e.g., the Ministry of Agriculture, and in the Ministry of Planning, IPEA, are beginning to develop scientific research capacity of note. A national system of market news is evolving, as such activities in five states (Sao Paulo, Minas Gerais, Rio Grande do Sul, Guanabara, and Paraná) are linked through the Ministry of Agriculture. A national system of crop forecasts has already been developed, plus a monthly agricultural situation report for the Central and South producing areas of Brazil.

Institutional arrangements for the conduct of effective agricultural economics work have improved materially in a few significant cases. With the reorganization of the UREMG some two and half years ago, the Institute of Agricultural Economics was given the freedom and responsibility to develop undergraduate programs, research, and extension education programs. The creation of responsibility for graduate programs in agricultural economics at Piracicaba and Rio Grande do Sul is having similar effects in these institutions. The implantation of the economics and statistics project in the Secretariat of Agriculture in Minas Gerais has created an institutional vehicle with significant potential for brining economics to bear on state government policy.

Despite the positive changes that have characterized the agricultural economics profession in recent years, it is clear that this branch of the agricultural sciences continues to be relatively weak, both in absolute and relative terms. It does not have the capacity to provide the kind and magnitude of scientific and intellectual inputs essential to the sustained growth of Brazilian agriculture. The major weaknesses of the profession, at this time are:

1. The lack of adequate numbers of well-trained agricultural economists in the several sub-disciplines of the field. In a relative sense, this problem is most serious in the macro-analysis and public policy areas

2. Incomplete and imperfect integration of viable agricultural economics units in (a) the university system, (b) the non-university physical and biological agricultural research system, (c) the agricultural policy and action program agencies of state and federal governments.

3. The lack of an adequate conceptual and empirical knowledge base relative to the economics of Brazilian agriculture.

4. The lack of institutional capacity and adequate public support to expand the supply of agricultural economists and knowledge of the economics of agriculture at a rate consistent with national needs.

5. Imperfect recognition in both the public sector and the private sector of the potential contribution of economic analysis to more rational decision-making.

Brazil's Needs for Economic and Social Analysis of Agriculture

The national government daily makes important economic decisions affecting agriculture. Some of these decisions are being made within the several ministries, especially in Agriculture, Education, Planning, Treasury, and Commerce. Other national level decisions take place in various autarchies concerned with a specific commodity, such as coffee, sugar, and alcohol institutes. Still other decisions, sometimes applicable to specific regions, are made in institutes dedicated to particular functions, such as INDA (National Institute for Agricultural Development), IBRA (Brazilian Institute for Agrarian Reform), and SUDENE (Superintendency for the Economic Development of the Northeast). This substantial influence of the national government occurs without the benefit of analysis relative to the economic impact of these policies on agriculture, in general or upon specific sections of it. Also, there is little knowledge of the environment of agriculture, that is, the actual on-farm and farm-to-market situation in which the programs operate.

Similarly in the states, many public agencies make economic decisions or a wide variety of issues, but with little information on the consequences of their actions. Many of these actions appear to be inconsistent, often short term, and less effective than they might be. Private individuals too, make decisions important to them, to their suppliers, and to their customers with too limited a flow of timely economic information which could assist them in their farming or business ventures.

The Committee is concerned that important analyses of the economic problems in agriculture, that can lead to better public and private decision making, are not available or appear only on rare occasions. These concepts lead to an emphasis on applied research, but certainly also include basic studies on the operation of the agricultural economy, and its interrelation with the rest of the economy. Similarly, the social and other human relationships within agriculture and between rural people and the rest of society receive little research attention. Though much social and economic data which can contribute to understanding does not now exist, it is not necessary to develop an inventory of the data and information needed for relevant economic, social, and statistical research. Rather, the Committee wishes to focus on problems and how better understanding can be brought to the decision-making processes through systematic study.

A great variety of problems and subjects challenge the attention of rural social scientists. Criteria and priorities for selection among them need to be developed. This Committee has discussed this problem and can suggest some areas meriting serious attention, but cannot

possibly specify a "Master Plan," nor does it seem desirable to do so. Moreover, the importance of a specific project will change over time as new problems emerge. In the remainder of this section a number of Brazilian problems which applied social science research can help clarify are suggested. No priorities are implied by the order of listing.

In very broad terms, the methods by which the Brazilian government supports national economic objectives have impacts upon agriculture. Few of these effects are understood, and not enough attention is given to them. The efforts to increase the industrialization of the Brazilian economy often imply higher prices for agricultural inputs and for farm people as consumers. Import substitution policies, international trade policies, the ways in which foreign exchange is allocated and the adjustment of specific commodity prices during inflation have particular impacts on commodities important to agriculture. Modern inputs, such as tractors, fertilizer and insecticides have substantial potential in expanding the production and increasing the productivity of agriculture, yet frequently, the effect of the policies listed above is to make these inputs more expensive to Brazilian farmers than to competing farmers in other countries, and to discourage the modernization of traditional agriculture. Modern inputs do not receive adequate attention as potential strategic inputs, and as one result, Brazil has difficulties in competing in world markets.

Decisions at this broad level of policy, even with perfect understanding, will not and should not always be resolved for the benefit of one group of people, be they agricultural and rural people, consumers, business groups, or laborers. But information and analyses are needed which will provide an understanding of the consequences of such policies upon rural people with some analysis of alternative courses of action. This Committee believes that studies of this type, at an adequate level of quality, would be utilized in a significant way to improve the quality of Brazilian national decisions and development plan implementation.

The need is even clearer when examining the specific programs in agriculture of the several ministries, autarchies, functional institutes, and commodity organizations. This includes such programs as minimum prices, taxation on products important to agriculture, land settlement and migration, agricultural credit, land tenure, community development, extension education and research services, road construction and improving the marketing infrastructure. The administrators of such programs would be able to make their decisions with more confidence and with more appropriate choices among alternatives if they had access to a flow of studies appropriate to the problems they face.

But the analyses discussed so far will be more adequate and more accurate if supported by and related to specific studies of farms, marketing firms and the functioning of rural communities. Moreover, the problems of public and private agencies in the states, and of the farmers themselves require the results of economic and social studies as they make decisions appropriate to their situation. Brazilian

agriculture consists of millions of operating units, each of them allocating the resources at their disposal. In the aggregate, these decisions determine the volume of farm products available to the Brazilian economy. The suppliers of inputs, the marketers of farm products, and the public agencies seeking to influence the farm and market decisions need analyses that can help them understand the process by which such production decisions are made.

One of the important problems in this area is to use presently known technology to synthesize improved farm organizations which can expand production and increase the income of the farmer and the agricultural sector. Such studies can provide a stimulus and guide to individual farmers as they attempt to improve their own situation. They can also suggest the types of loans, extension programs, and other activities that public agencies might sponsor.

The agricultural research institutes functioning in various parts of the country are seeking new technologies applicable to agriculture. The creation of such technologies may not be very meaningful unless their application is profitable to the individual farmer or marketing firm. The questions as to whether the proposed innovation is profitable, and the level of use at which it is most profitable are both relevant. Recent advances in agricultural economics have developed scientific procedures which should be incorporated into the design of physical and biological research, and into the analysis of the results. This procedure can provide information for answering many of the economic questions at the same time that the technical results are obtained. Moreover, as innovations are identified, there is a need to study how they relate to existing patterns of production and to possible new patterns of farming with new combinations of inputs and enterprises. As economists work cooperatively with agricultural production scientists, both will gain knowledge which will enable them to help assess priorities and establish criteria appropriate in choosing among alternative technical research projects--a process by which the very limited scientifically trained people and financial resources are more effectively utilized.

Other social sciences can also contribute to a better understanding of Brazil's rural problems. Attitudes toward innovation and the process by which new technology is learned and adopted need to be understood, so that the technical and economic advances by the agricultural research institutes and the specialized agricultural economic research organizations are communicated to farmers in forms and patterns that facilitate adoption.

Food production does not end when the products are produced. The commodities must be transported from the farm, perhaps processed, packaged, stored and moved into the retail trade or into international markets. Brazil's population is increasing rapidly, and an increasing proportion is living in cities and towns. More products are required as population and real per capita income increases, and more must be marketed into urban centers as the urban proportion of total population

increases. Quite possibly, these combined will require substantial changes in the structure of markets and marketing practices.

An examination of these forces can provide insights useful to marketing firms, to the banks which finance them, and to public agencies called upon to help provide the marketing infrastructure [illegible] Or, regional changes in population and income will expand the size of one market relative to another.

Marketing also benefits from the availability of data on current production, current prices, and crop conditions. [illegible] systems for collecting data on Brazilian agriculture do not function as well as it might. Systematic research is needed on new procedures leading to more reliable and timely data.

Such analyses of agricultural production and marketing provide basic information useful in contributing to the solution of policy questions raised at the beginning of this section. For example, the analysis of the changing demand for various farm products coupled with studies of farm organization and production permit a more accurate perception of the impact of minimum prices (or price ceilings) upon the production of the affected and competing commodities, and upon the income of various types of farms producing such products. As another example, studies of farm organization and the most profitable combination of traditional and modern inputs can suggest the most appropriate uses of agricultural credit. Credit organizations can draw on such studies periodically to identify loan needs and loan programs most likely to be effective in developing agriculture.

Finally, as Brazilian and international agencies make decisions among possible loan and technical assistance programs, there is much uncertainty and imperfect knowledge relative to the productivity of alternative investments, in developing the infrastructure or investing in operating programs, in supporting or creating one or another type of institution. The skilled economist can better contribute to such decisions when he can examine and draw on a flow of research results from agricultural economic research--research which provides more understanding of the way in which the agricultural economy functions, and the productivity which various inputs have in the farm business, in marketing firms, and in public programs. With a combination of micro and macro level studies ranging from the farm and the community to the nation as a whole, even to the nation in world economy, the loan and assistance programs that are chosen will likely make a larger contribution to expanding the levels of living of the Brazilian people.

Goals and Strategy

Specific goals to be sought and strategies which might be followed to strengthen agricultural economics as a science, to maximize the contribution of agriculturaleconomics to technical agricultural researc, and to improve decision-making in the formulation of national economic policy are presented in this section.

A. The economic dimension of agricultural research needs to be given greater emphasis.*

Agricultural economics has been relatively neglected as a discipline in Brazil. As a consequence, there are few reasonably strong centers of agricultural economics in the country. This has resulted in the almost complete lack of agricultural policy research, and the absence of essential economic interpretations of physical and biological research.

As first steps to improve this situation, the following recommendations need to be considered:

1. Research in agricultural economics should be considered an integral part of agricultural research

It is recommended that the Brazilian National Research Council, the Ministry of Agriculture, secretariats of agriculture, universities, and other agricultural research institutions recognize that a comprehensive agricultural research program which will best serve Brazilian agriculture must include, as an integral part, an appropriate staff and program of work in agricultural economics. It is further recommended that national, state, and private research policies, programs and budgets be developed in such a manner that this aspect of the agricultural sciences receives adequate financial resources on a continuing and timely basis.

As suggested below, agricultural economics can contribute in the detailed planning and interpretation of results for various technical research projects, in applying such information for improved farm management, as well as in conducting research on marketing and policy problems. Some part of this task can be accomplished by placing economists in close cooperation with other technical research workers in agriculture. Other parts of the task require research agencies specialized in agricultural economics. Both types of organizations are essential if agricultural economics is to make maximum contribution to the effectiveness of agricultural research.

*This section is based on the report attached to the Study Group on Agricultural Research, which also includes a statement about the need to strengthen specialized centers of agricultural economics.

2. Agricultural economics should be established as a permanent component of the six regional Institutes that make up the Department of Agricultural Research and Experimentation (DPEA, the Ministry of Agriculture) and in such other research institutions where viable

New discoveries and new technologies are of little use to the farmer if they are not profitable. Moreover, the farmer wants to know more than whether fertilizer will increase yields, for example. He wants to know, given that fertilizer is profitable, how much should be used, and in what proportions.

In addition to this, he needs information on how different products fit together to make a profitable system of farming. This involves not only some knowledge of the physical relationships involved, but also economics of how the various inputs and enterprises fit together. For this reason, the output of the physical research will be more useful to the farmer if it is synthesized and analyzed in the context of a total farm organization.

As agricultural research institutions develop their programs, agricultural economics can contribute to the establishment of priorities. These priorities are based on such things as the availability of human resources, the probability of success in the research venture, and some notion of the economic viability of the respective crop or product. It is important that economic factors be considered in establishing these priorities. Recommendations should be considered at two levels:

a. It is recommended that a team of at least three agricultural economists (with at least the M.S.) be placed in each of the regional institutes and other research centers where viable. These economists would have the following functions:

(1) Help in designing the experiments and research so that economically meaningful results can be derived from them.

(2) Interpret the results of the physical research from an economic standpoint. This is especially important in fertilizer and animal nutrition research, but even such things as disease and insect control have an economic dimension.

(3) Develop a program of farm management research. This will involve the synthesization of the results of the physical research into economically profitable systems, and the conduct of farm

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

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

The field of agricultural economics as a discipline encompasses much more than these four functions. However, such things as price analysis, detailed analyses of the marketing system, the evaluation of agricultural policy, and work on more basic economic development and resource allocation problems should be left to institutions that specialize in agricultural economic research. An attempt should be made to integrate the economists located in the research stations with the specialized agricultural economics centers.

b. It is recommended that a small advisory group of agricultural economists be established at the national decision-making and planning level to help in establishing priorities for biological and physical research.

In addition to decisions at the regional level, it is also important that priorities be established at the national level. This group would assure that economic factors will be considered in establishing these priorities. This group would draw on the specialized centers of agricultural economics and the regional economics groups for advice and necessary analyses.

B. The profession of agricultural economics needs to be further developed.*

Agricultural economics, as a science, has been largely ignored in the development of Brazilian agricultural sciences. It remains one of the major gaps in the agricultural research-teaching-extension

*This and the following section draw heavily on a 5-year program paper developed for the Ford Foundation, which gives considerable emphasis to developing agricultural economics. The program paper for the Foundation was prepared by Dr. G. Edward Schuh, one of the members of the Study Group on Agricultural Economics.

infrastructure. As short a time ago as 1960, there were in Brazil only five or six men with the M.S. in agricultural economics, departments of agricultural economics in the schools of agronomy were weak, and only one institution (the Divisão de Economia Rural of the Agricultural Secretariat of São Paulo) was doing any serious agricultural economics research.

Since that time, the Rural University of Minas Gerais with the combined efforts of the Ford Foundation, USAID, Purdue University has developed a graduate training program. Some sixty M.S.'s have been produced, and some valuable empirical research based on field data has been completed.

A small graduate program has been started at the Federal University of Rio Grande do Sul. A somewhat more ambitious program has been initiated at the Agronomy School in Piracicaba. Both have been developed with support of USAID and North American universities. An economic analysis and statistics group in the Agricultural Secretariat of Minas Gerais has been developed with the assistance of the Ford Foundation and Purdue University.

Despite the above, much remains to be done to develop a strong scientific discipline. The graduate programs turn out only a rather limited number of professionals. Some six to eight students are now in the U.S. working toward the Ph.D.; only one Ph.D. has returned to Brazil.

On the other hand, the Divisão de Economia Rural in São Paulo has continued to develop, albeit slowly, and a critical mass of young M.S.'s have been assembled in the Agricultural Secretariat of Minas Gerais. In addition, increased emphasis is being given to agricultural economics in the Institute of Applied Economic Research (IPEA) of the Ministry of Planning.

High priority must be given to further development of this sorely neglected profession. Development efforts should concentrate on both the demand and supply side of the market. That is, the capacity for providing graduate training within the country should be increased at the same time as viable institutions, in which critical masses of agricultural economists can work effectively, are developed.

It is recommended that the development of the agricultural economics profession in Brazil, <u>in the next five years</u>, be guided by the following set of minimal goals or targets:

1. To have 30-40 men with the Ph.D. degree or well along in their doctoral studies. A realistic target is to have some 20 completed Ph.D.'s working in the country by 1972.

2. To have 250-300 men with the M.S. degree working in the country. (A top-heavy structure with numerous Ph.D.'s

and no underlying base should be avoided. Efforts should be made to develop specialization at the undergraduate level, and to increase substantially the number of men trained at the M S. level.)

3. To develop at least four strong regional centers or complexes in agricultural economics. Each of these should have a strong training component plus a strong research component through which economists are seeking to solve regional problems (See below.)

4. The development of at least one viable Ph.D.-level training program in Brazil.

5. To develop comprehensive research programs that are more than just the by-product of ongoing graduate programs.

C. Capacity for policy analysis and research must be expanded.

In part because of the lack of trained manpower, very little research and analysis for policy decisions is done. The Division of Rural Economics in São Paulo is by far the strongest and has accumulated a great deal of experience. The Economics and Statistics Group in the Agricultural Secretariat of Minas Gerais is in a position to do some good work, but was only recently organized. Capacity for policy analyses at the national level is limited despite the fact that the Ministry of Agriculture has an Economics Department, and the Ministry of Planning has a small group of agricultural economists.

The scarcity of qualified technicians to do development planning or to provide guidance to public policy-makers is a serious problem. For example, one of the serious shortcomings of the Alliance for Progress was the very unrealistic view it took of the available stock of technical competency and empirical knowledge available to implement such far-reaching programs. Exhortations to provide plans and programs were at best hollow sounding when there was neither the technical competency, the basic data, nor the knowledge of the economic system to do a rational planning or analysis. High priority should be given to further developing this important capability. It is a means of capturing the payoff from investments in trained people, and requires the development of viable institutions where well-trained technicians can work effectively. Specific targets which should be considered are as follows:

1. The development of at least one policy-research group for work at the national level

The location of this is not clear at the present time. The Fundação Getúlio Vargas is a logical choice, but to date has expressed little interest. The resource base in the Ministry of Agriculture is extremely limited. Perhaps the logical choise is in IPEA within the Ministry of Planning, where some strength exists and attitudes are good. An

alternative would be an inter-ministerial committee involving the Ministry of Agriculture, the Ministry of Finance, and the Ministry of Planning.

An advisory group provided by the University of California at Berkeley now functions in the Ministry of Planning. However, their work is primarily concerned with budget programming, and not with policy making and policy research per se. What is needed is at least one institution, somewhat removed from the decision-making process, dedicated to the research on which public policy decision-making can be based. This national research institution will constitute one of the major sources of economic knowledge produced through in-depth research.

2. The development of four policy research groups that could influence regional economic policy

One such group (Divisão de Economia Rural of São Paulo Agricultural Secretariat) exists as one of the two strong points of agricultural economics work in Brazil. Its involvement in agricultural policy matters at both the state and federal level is continuous and positive.

A second center (Secretariat of Agriculture, Minas Gerais) is being developed. After the short span of three years it has developed data sources, a data collection capacity, and gained some much needed experience in policy studies. In addition, a critical mass of eight agricultural economists with M.S. level training has been assembled.

A third center should be developed in the Northeast. The Banco do Nordeste has some twenty technicians working as agricultural economists in two sectors of the Bank. These men need to be provided with advanced training which would enable them to develop strong programs of agricultural policy research.

The fourth center should be located in the South. The base for this center exists in the Institute of Economic Studies and Research (IEPE) of the Federal University of Rio Grande do Sul. This institution has been doing research in agricultural economics for a number of years. With this experience, a strong program could be developed which would provide the analysis for the southern part of the country.

Efforts should be made to link these four regional centers together as much as possible, and to make their regional analyses relevant to national policy making.

D. A permanent advisory committee for agricultural economics should be established.

The state of the agricultural economics profession and science in Brazil has been explored earlier in this report. The systematic strengthening of this scientific field is clearly in the national interest.

The strengthening of a discipline such as this will require substantial resources. Some resources are being directed to this end already. It appears that additional resources will be available through the loan currently being negotiated between USAID and the CNPq. It is important that additional resources be obtained. One possibility of funds for this purpose has come to the attention of this Study Group. It appears possible that a fraction of the annual interest to be paid on the agricultural sector loan currently being negotiated could be earmarked for research on agricultural policy and related matters. If used appropriately, these resources could strengthen the profession of agricultural economics at the same time that research results are obtained. It is proposed that the Joint U.S.-Brazil Study Group on Agricultural Economics of the National Research Council of Brazil and the National Academy of Sciences of the United States be constituted as a permanent Joint Commission on Agricultural Economics. It is recommended that this permanent Commission be responsible to the Brazilian National Research Council and the National Academy of Sciences of the United States through the U.S.-Brazil Science Cooperation Program. The general responsibilities of this Commission will be:

(a) to provide intellectual guidance and leadership to the development of the agricultural economics profession in Brazil;

(b) to assist in the creation of stronger and more viable internal programs of research and education in agricultural economics;

(c) to expand opportunities for professional interactions among Brazilian agricultural economists and their colleagues in the United States and other nations.

Were the additional funds suggested above actually attained for the development of the profession, the Commission could advise on the use of these resources for the strengthening of the profession. The immediate tasks before the Commission in this next year are threefold:

1. Explore alternative ways in which a permanent Council of Economic Advisors could be established to advise on national agricultural policy and on programs of international assistance to the agricultural sector of Brazil. The possible structure, mechanics, organization, function,

and procedures of such an organization needs to be examined.

2. Devise ways in which agricultural economics can be strengthened and the recommendations of this report can be implemented.

3. Identify ways in which continuous support can be provided to research for policy purposes.

Progress Report of the Joint U.S.-Brazil Study Group on Mineral Resources

by
Annibal Alves Bastos
Brazil Study Group on Mineral Resources

Introduction

According to the understanding reached at the first Brazil-U.S. Workshop held in Itatiaia in April of 1966, we present below an outline of the conclusions of the study group on "Mineral Resources." We would like to point out that the structure, already established, serves as much as a systematic method of orientation as a form of execution, in that it effects the five-year "Scientific and Technological Development Plan" (1968-1972) developed by the CNPq.

The outline is based on order of priority, restricted however to the more immediate needs without pretending to take in all of the numerous subjects of great importance already well known and felt by the technicians and directors of the research institutions.

We could enumerate them but we will simply say that they are matters concerned with the chapters on "Research, Education and Technology."

We will limit ourselves to the subjects that were dealt with before and which, along the same order of priority, take into consideration higher education and research:

1. Course for the Master's Degree

   Of the three Brazilian universities having Schools of Geology, Rio de Janeiro, São Paulo and Rio Grande do Sul, only the first one--Rio de Janeiro--will initiate a course for the Master's Degree in Geology, as applied to Engineering, in 1968

   That School has the necessary equipment, organized programs and a sufficient number of candidates to fill the existing vacancies.

   In order to function in the second trimester of 1968, the School considers the collaboration of excellent professors of primary importance. One professor is needed to teach "Mechanics of Rocks," another for "Geophysics" and a third for "Mineral Economics."

   The specialist in geophysics would teach and also carry out studies as referred to in the Brazilian Program of the International Project of the Upper Mantle.

The School of Geology of São Paulo, due to the fact that it already has a Master's Course, did not make any immediate requests. Nevertheless, it is possible that it will present its program in the second semester of this year or no later than the beginning of 1969.

Even though the conditions existed to start a graduate course (already approved), the third school, that of Porto Alegre, Rio de Grande do Sul, was forced to delay the start of such a course as the activities of its organizers were taken up by the Gondwana Congress.

2. Study of the Formation of Tropical Lands in Brazil

Because of its importance, this problem (of interest to geology, mining, and agriculture) deserves special consideration. Without the detailed knowledge of the soil, its characteristics, behavior of its elements, and its geochemical functions, the needs of agriculture will not be attended to since other professionals, who are not geologists or geochemists, are hardly in a position to carry out such studies.

The Geochemical Laboratory in the State of Bahia represents a base that could be extended to include facilities for the training of personnel in this specialty.

In Rio de Janeiro, the interest in this problem is demonstrated by the accord reached with a professor from the University of Manchester, who is a specialist in this field.

3. Geology and Paleontology

These two areas, lacking in technico-scientific support, and presently not in a position to accompany the national developments, are about to demand means that will permit a rapid updating of knowledge, so that they will constitute real elements of progress.

According to what had previously been established, and which has the same validity today, it would be advisable to make available to the DNPM two geologists: one a specialist in sedimentology and the other in geochemistry.

To attend to the needs of the Section on Paleontology of the DNPM, a specialist in ostracoids and another in foraminifers is highly recommended. It is essential to put the Laboratory for the Preparation of Fossils in a position that will enable it to handle a new phase of intensified research, which is the objective of the support we are asking for now.

4. Mineral Research Laboratory

The preoccupation of increasing the number of researchers, of attending to the needs of the existing laboratories, and of creating conditions so that new laboratories can be installed is clearly expressed in the Five-Year Plan of the CNPq.

The lack of research in mineral resources is being felt and for this reason we should add another item to the program now being discussed, that is the creation of a mineral research laboratory in the DNPM.

The training of specialists is imperative for the execution of this plan on a short-term basis. Here, as in other programs, it would be advisable to train a "Head of Research" as well as a sufficient number of assistants for the start of its activities.

The right action to be taken should be to send to the United States three fellows or grantees, for a period of time still to be decided upon, to be trained in specialized laboratories, and to send to Brazil one or two technicians to program, project, and orient those grantees returning to Brazil from their internships in American laboratories.

Resume of the Mineral Research Program

1. Master's Course

Professors to come to Brazil: a specialist in the mechanics of rocks in the second semester of 1968 to Rio de Janeiro; a specialist in geophysics in the second semester of 1968 to Rio de Janeiro; and a specialist in mineral economics in the second semester of 1968 to Rio de Janeiro.

2. Study of the Formation of Tropical Lands

Researchers to come to Brazil: to the Geochemical Laboratory of the Federal University of Bahia in the second semester of 1968 or the first semester of 1969.

3. Geology and Paleontology

Technico-scientific support: two geologists, one a specialist in sedimentology and one in geochemistry; two paleontologists, and a specialist in ostracods and one in foraminifers.

4. Mineral Research Laboratory

Specialists to come to Brazil: one "Head of Research" in the second semester of 1968 to Rio de Janeiro.

Specialists to go to the United States: one "Head of Research," three fellows and two researchers.