

**Making Competitive Grants Programs of the National  
Agricultural Research Systems Work:  
Learning from the Brazilian Experience**

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# **Making Competitive Grants Programs of the National Agricultural Research Systems Work: Learning from the Brazilian Experience**

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In the last few years there has been increasing interest in establishing competitive grants programs in agricultural research in developing countries. In donor funded projects, these programs are often seen as a compliment to the ongoing research programs undertaken through regular long term research funding, but often pose the risk of being viewed, especially by finance officers of the donor country, as a panacea, and a substitute for regular long term research

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funding. Their design and implementation needs to reflect understanding of a complexity of factors needed to make them work effectively. Besides, as with many other things, the devil of the competitive grants programs tends to be in the crucial details. Therefore, sharing experience among developing countries that are experimenting with competitive grants programs is of interest. The design of Brazil's competitive grants program in agriculture is drawing extensively on international and domestic experience.

The competitive system established and implemented by EMBRAPA (Empresa Brasileira de Pesquisa Agropecuária) actively seeks to increase competitiveness and partnerships among participating institutions. Access to grant funding by the entire national agricultural research system, through the process of a competitive system, will enhance the quality of project proposals, and support the improvement of research results and better linkages of research to felt demands. Through partnerships, the Brazil Agricultural Technology Development Project expects to capitalize on the complementarity of Brazilian researchers with those at the global level and their corresponding institutions. At the national level, a much better and efficient use of available infrastructure (labs, etc.) should be attained.

This paper briefly reviews the recent Brazilian experience and offers its full operational manual for review and possible wider adaptation as appropriate in other countries.

Competitive programs are seen as a way of:

- diversifying agricultural research systems from the predominantly public sector National Agricultural Research Institutions (NARIs) to other agents of agricultural research, i.e., state and local research and extension institutions, universities, and the private sector thereby modeling the existing overall research capacity in the country;
- diversifying and gradually increasing financial resources for research from the private sector, farmers' organizations, etc. making research financing more sustainable;
- getting the users of research (such as the private sector and farmers' organizations) more directly involved in planning and implementation of research and technology transfer and making research and technology transfer more client oriented;
- increasing the efficiency of public sector research by opening it up to wider competition and rewarding the best proposals;
- bringing high technology to bear on research by allowing and promoting partnerships with institutions of more technologically advanced countries;
- fostering partnerships among and within R & D institutions;
- enhancing research capacity in areas of the country which are weak in conducting research; and
- targeting R & D activities to critical (strategic) themes of interest to the government.

All of the above considerations were important to EMBRAPA in establishing a competitive grants program of agriculture research in 1996. EMBRAPA is the designated leader of Brazil's national agricultural research system—Sistema Nacional de Pesquisa Agropecuária (SNPA).

The competitive grants program is supported by the World Bank through a \$60 million loan over a five year period. The loan constitutes 50 percent of the total project costs. The remaining 50% of the resources come from treasury (25.4%), EMBRAPA (10.7%) and participating research institutions (see table 1).

**Table 1 Financing Plan (US\$ millions)**

Source	\$
Government (25.4%)	30.5
EMBRAPA (10.7%)	12.8
Other (beneficiaries) (13.9%)	16.7
IBRD (50%)	60.0
<b>Total</b>	<b>120.0</b>

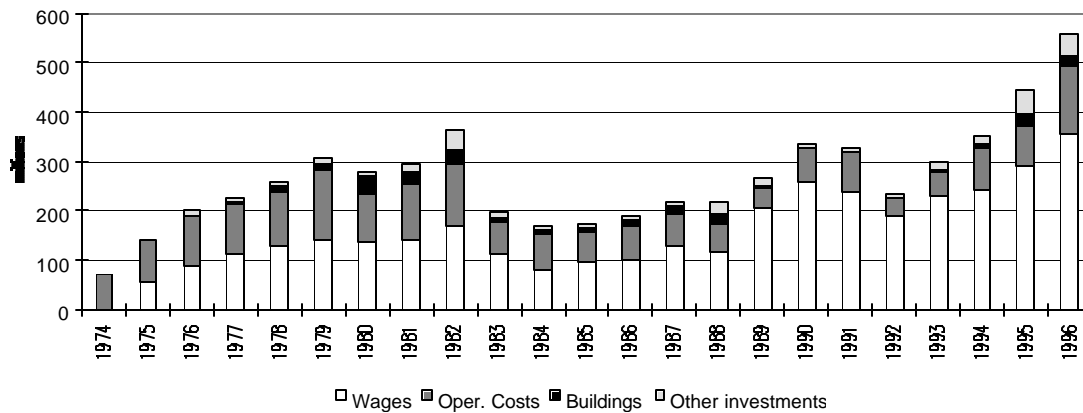
Sixty percent of the total project costs (or \$ 72 million) are allocated to the competitive grants program. Most of the remaining resources are allocated to institutional strengthening, development of partnerships with the CGIAR Centers and institutions of advanced countries, monitoring and evaluation (see table 2).

**Table 2 Project Components**

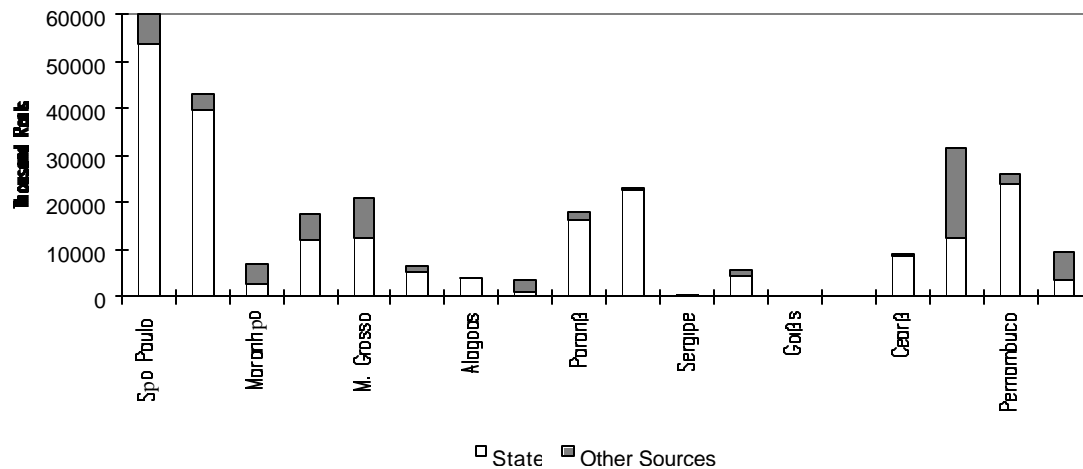
Component	Indicative Cost (US\$M)	% of Total
I. Competitive Grants System	72.0	60.0
II. Institutional Strengthening	44.7	37.2
III. Project administration Management Information Systems, Monitoring and Evaluation	3.3	2.8
<b>Total</b>	<b>120.0</b>	<b>100.0</b>

The annualized total project costs constitute less than two percent of EMBRAPA's annual budget which was approximately \$550 million in 1996 (see figure 1) and less than one percent of the total national research expenditures of about \$950 million in 1997, including those of the state research and extension expenditures (see figure 2).

**Figure 1 Evolution of EMBRAPA's Budget (in 1996 US\$)**



**Figure 2 Budget of State Research Systems (1996)**



**Research Priority Areas:**

The five broad priority areas are grounded in Brazil's specific needs. There is a general recognition that many of the 4.5 million small farm households, known in Brazil as family agriculture, have not benefited as much from EMBRAPA's research products as they might due to weak linkages between research and extension, major differences in research and extension

capacities of different states, and often unstable and unpredictable support to the state research and extension systems by the states. Establishment of partnerships and the stipulation that any Brazilian institution including farmers' organizations can compete by preparing proposals for technology transfer, or applied and adaptive research jointly, with the state research and extension systems, EMBRAPA and/or universities, can enable rapid dissemination of existing technologies, and result in more articulated research priorities for the family farm sector. The key requirement is mandatory partnership with any established Brazilian agricultural R & D institution.

Brazil is one of the largest store houses of plant genetic diversity among tropical countries. Despite its innovative work on a variety of natural resource management issues, as for example on the management of acid soils, sustainable exploitation of tropical forests, and integrated pest management, there are still many outstanding resource management issues which need attention, e.g. alternative environmentally sound technologies for increased and growing use of pesticides, especially on fruits and vegetables, which affect consumer health and trade prospects, the management of degraded soils, problems of deforestation and runoff of agrochemicals in the rivers.

Rapid advances in science, particularly in biotechnology, but also in GIS, computer sciences, and the related institutional changes (such as IPR) that have prompted increased investments, calls for Brazil to continuously develop its own internal capacity in these emerging areas while engaging in strategic partnerships with advanced institutions to ensure that research of high priority to Brazil is conducted using modern scientific methods.

Finally, the increased international competitive pressures call for Brazil to serve the needs of its large and important growing agro-industrial sector ( $\pm 40\%$  GNP) by engaging it in partnerships in research and technology transfer, including training its own scientists and science managers in issues important in establishing public-private partnerships such as Intellectual Property Rights, Plant Variety Protection and biosafety.

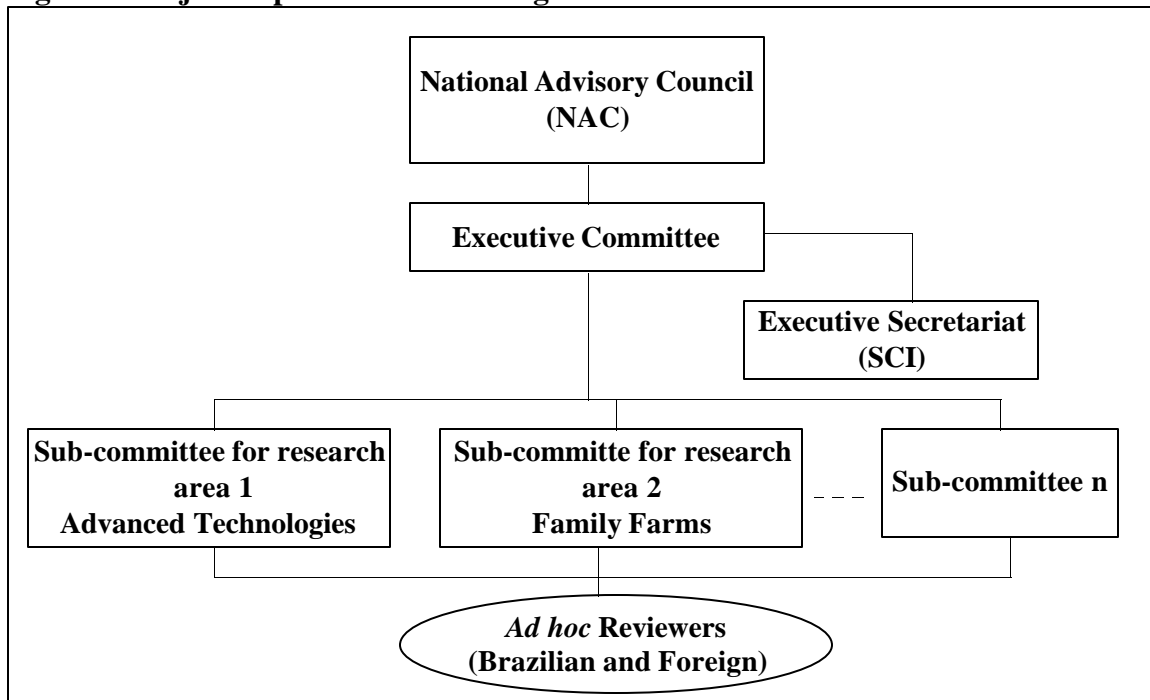
The competitive research program therefore supports five areas of research:

- Family agriculture;
- Natural Resource Management;
- Advanced (including bio) Technologies;
- Agribusiness; and
- Strategic research (i.e., research of high priority not undertaken by any of the programs).

### **Project Implementation Arrangements:**

The competitive system is implemented by EMBRAPA through an Executive Committee (see figure 3) which draws on EMBRAPA's existing structure of research management, but operates independently of it.

**Figure 3 Project Implementation Arrangements**



The executive committee (EC) is presided over by a research manager in EMBRAPA and consists of 8 members who are researchers or research managers—4 from EMBRAPA and 4 from non-EMBRAPA sources. Research priorities are established by the EC with the input of the National Advisory Council established under the project which represents a broad range of interests including clients of research, exporters, NGOs, small and large farmers’ organizations and scientists. Requests for Proposals (RFPs) are regularly announced once a year through announcements in the Brazilian Federal Register, major newspapers and the internet. An operational manual (attached) outlines the rules by which the competitive grants process operates. Anonymous reviews by reviewers external and internal to EMBRAPA are managed by the technical committees. They consist of EMBRAPA and non EMBRAPA researchers, the latter predominating. Reviewers review the proposals and submit their recommendations to the sub-committee which make hierarchical recommendations to the Executive Committee which makes final selection among proposals.

**The Size of Research Grants:**

The research grants consist of those of less than \$5,000 for preparation of projects, those between \$40, 000 and \$500,000 and those above \$500,000. By learning lessons from the execution of the competitive grants program, by the end of the project period, i.e. five years, EMBRAPA plans to allocate 30% of the national agricultural research system’s budget to the competitive grants programs.

The first call of the competitive grants program was announced on September 2, 1997. Proposals were due by October 17th and reviewed by the committee November 20-28, 1997. Awards were announced on December 2, 1997.

One hundred thirty seven proposals were received, most of very high quality. However, 105 had to be disqualified due to insufficient documentation legally required in each proposal. Nine of the 32 were awarded grants. The distribution of proposals in terms of regional representation, diversity of institutions and priority areas was very encouraging. Although research and technology transfer capacity was feared to be limited in family agriculture, 58 of the 137 proposals were on family agriculture. Similarly, although research capacity is generally believed to be weaker in the Northeast and North, 44 and 11 proposals respectively, were from these two regions, and 50% were from non-EMBRAPA institutions. Four of the nine grants were awarded to family agriculture and one to a landless workers' union working jointly with EMBRAPA. The areas of research announced in the first RFP were repeated in the second so that proposals which were disqualified due to insufficient documentation in the first round could be resubmitted after meeting all the legal requirements.

### **Conditions for Agricultural Research in Brazil**

Results of the first year are encouraging, but it is too early to judge the extent to which the competitive program will achieve its stated objectives. Several factors in Brazil are potentially favorable to making the competitive program successful. Government of Brazil has demonstrated strong commitment to agricultural research. Although research expenditures are difficult to compare across countries, 0.9 percent of agricultural GDP is invested in agricultural research compared to less than 0.5 percent typical in most developing countries. Almost all these resources have come from domestic resource mobilization. Even under the current period of austerity, resources to EMBRAPA have been generally maintained while those to many other programs have been cut, showing the strong support the government accords agricultural research.

Brazil's dependence on external assistance has been minimal. Less than 5 percent of EMBRAPA's annual budget is derived from external financing, mostly in the form of loans from the World Bank and Inter-American Development Bank at commercial interest rates. There is almost no bilateral aid. Relationship with industrial countries consists of research partnerships, training and technical assistance to third countries, the latter in its initial stages. This means Government of Brazil has had considerable autonomy in the use of resources which it has used well in strengthening its national agricultural research system.

### **Good Leadership:**

EMBRAPA, established in the early 1970s, has generally enjoyed strong leadership. Its Presidents have typically been scientists and science administrators with good knowledge and



appreciation of research management and considerable independence in the day to day management of research. This is reflected in the generally high quality of research when assessed in terms of number of publications in reputed journals, impact on productivity growth (almost all of the increase in agricultural production growth rate of 3.7% from 1990 to 1995 has come from productivity growth rather than increased input use) or rates of return. EMBRAPA has been a world leader in commodity research and certain specific topics of research including on natural resource management.

**High Rates of Return on Past Research:**

Much of the past research has been quite successful with demonstrable results both in commodities and natural resource management. This has helped to maintain strong political and popular support for agricultural research in Brazil and particularly for EMBRAPA. According to the World Bank’s Operational Evaluation Department, among developing countries, Brazil has had the largest number of evaluations documenting impact of agricultural research in terms of the number of commodities for which rates of return estimates exist. They range from 20 percent to 197 percent.

**Good Use of Past Investments:**

Past investments in physical structures including those funded by multilateral financial institutions have been well maintained.

**Human Capital and Institutional Pluralism:**

Brazil has 5,400 full time equivalent of scientists in agricultural research and an annual budget of nearly \$900 million, a population of 159 million and per capita income of \$4800 (see table 3). It is the third largest agricultural research system in the developing

**Table 3 Vital Statistics on Brazil**

Population (millions) 1995	GNP per capita (US\$) 1997	Ag. as share of GNP (%) 1990	Labor force in ag. (%) 1990-95	Ag. annual growth (%) 1990-95
159.2	4847	10.1	27	3.7

world. In addition to EMBRAPA there are another 2,300 scientists in the state agricultural research and extension systems. Brazil also has a strong university base with nearly 4,800 professors in the country (see table 4). About 20 percent of the university staff time is spent on research. The regional distribution of scientists is however uneven and mirrors EMBRAPA’s own distribution of the research centers (see map 1). It is relatively strong in the more

industrialized South and the Southeast compared to the North (with most of the forest resources) and the Northeast (with most of the rural poverty).

**Table 4 Professors in the Agricultural Sciences Post-graduate courses, 1993**

	Total 1/	Full-time	Doctorate Candidates
Brazil	4,794	3,023	3,775
North	79	64	63
Northeast	504	327	287
Southeast	3,206	1,946	2,775
South	881	623	546
Center-West	124	63	104

Source: CAPES; adapted by EMBRAPA.

1/ There are 4,794 professors in the country; 3,023 are full-time permanent and 3,775 are doctorate candidates. It is estimated that approximately 20% of their time is allocated to research. Thus, there would be 958 equivalent-researchers

At 2,300 scientists EMBRAPA is roughly the size of USDA. Nearly 900 of the 2,300 scientific staff in EMBRAPA have Ph.D.s, 70 percent of those from the U.S. and others mostly from European countries. Brazil's scientific strength is 6 times as large and annual budget three times the size of the collectivity of the 16 centers of the Consultative Group on International Agricultural Research. With such a strong human capital base and continuing linkages with institutions in advanced countries, there is greater recognition and understanding of the need for reforms to address the many external and internal challenges faced by the SNPA than is perhaps true in many developing countries.

Brazil has nearly 600 farmers' cooperatives, farmers' organizations and NGOs. Again their numbers are greater in the South and Southwest than in the North or Northeast.

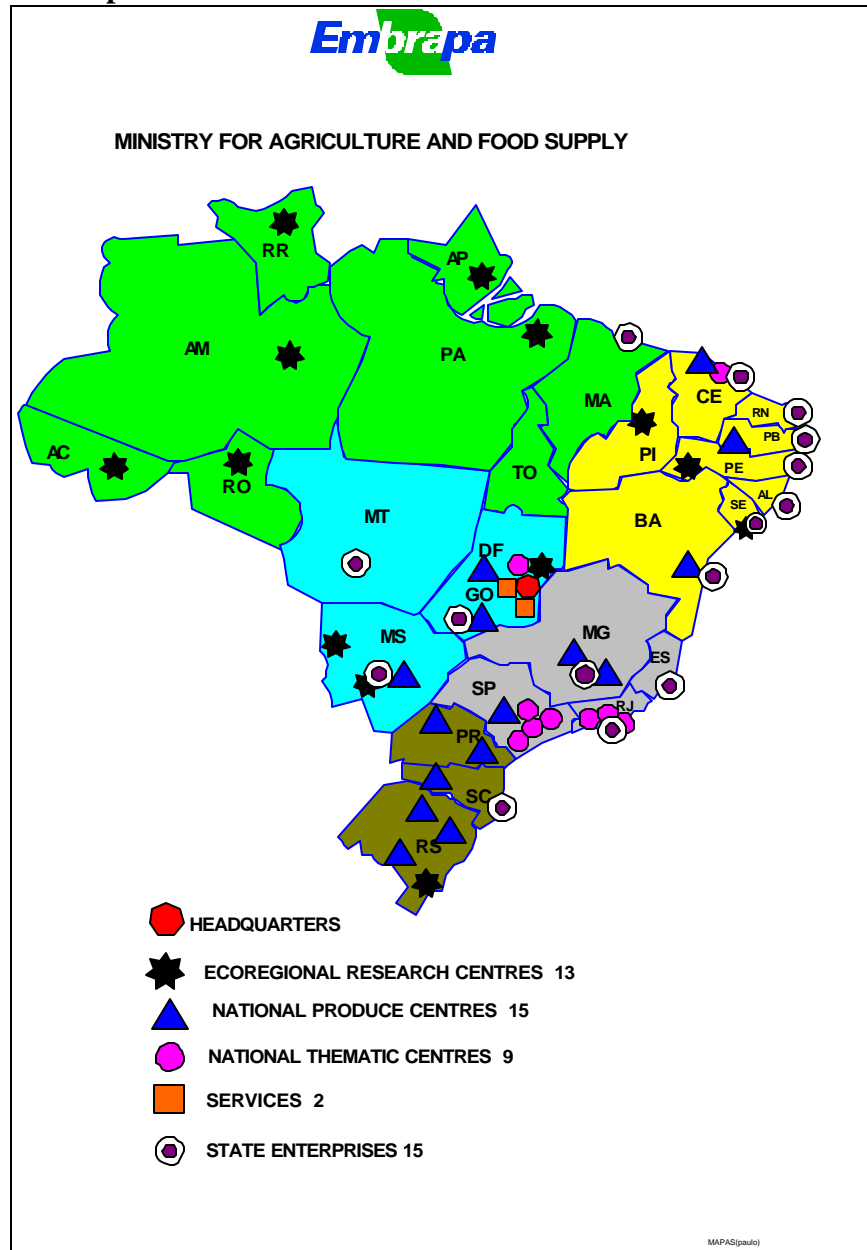
The large size of the research system means there is plenty of scope for internal competition, and for objective reviews of proposals, a situation not typical of small countries or developing countries which have not historically supported agricultural research. Even in a large country such as Brazil, there are fields of research in which the research community tends to be small, requiring active interactions with researchers in the international community to obtain objective assessments of research proposals. EMBRAPA has research collaborations with a large number of institutions in advanced countries.

**A Culture of Competition:**

An additional favorable factor for the competitive grants program is that Brazil as a whole, currently has several competitive grants programs underway in various sectors (biotechnology, industry, environment, space research, etc.) with a relatively well established tradition of

competition among scientists, especially from universities, and know-how among science managers in designing and implementing competitive grants programs.

**Map 1**



The World Bank has been supporting some of these general competitive programs through science and technology projects. It is not unusual in Brazil to use the U.S. National Science Foundation as a comparator against which to judge the performance of the Brazilian competitive systems. For several years, even EMBRAPA has allocated its own research funds through competition which, with the new constitution of 1988, was severely curtailed. Many

EMBRAPA scientists and those from universities and state systems compete in these programs and are used to preparing research proposals of high quality.

Despite these many favorable factors, the external and internal challenges for the Brazilian National Agricultural Research System has faced are numerous. They include the:

- growing international competition through NAFTA, Mercosur and WTO;
- domestic budget constraints leading to pressure to use resources efficiently;
- need to demonstrate to the policymakers and clients (mostly urban) of research the willingness of the public sector institutions to be accountable and to undertake difficult reforms;
- need to keep up with the rapid advances in international science;
- need to impact on the 4.5 million family (small) farm households that have not benefited as much from agricultural research as they could;
- important but changing role of agricultural research;
- weaker and varied capacity among states; and
- unpredictable levels of funding for agricultural research and extension at the state level (see figure 2) in a situation of increasing decentralization of roles and responsibilities to the states.

### **Strong Ownership of Reforms and Project Formulation:**

The awareness of these external and internal constraints within Brazil and particularly EMBRAPA has been strong. The demand for reforms originated in Brazil rather than being imposed externally. As a result the project ideas were initiated by EMBRAPA and the preparation was carried out by EMBRAPA using its own funds, with strong internal input, rather than through overwhelming reliance on external consultants, or agencies, although external actors played an important catalytic role in several regards, as well as providing legitimacy and support for difficult reforms internally. The project also had strong support from the Ministry of Planning. This was demonstrated by the inclusion of the budgetary allocation of Brazil's share of project resources for the following year, in anticipation of approval of the project by the World Bank's board of directors, therefore avoiding delays in implementation.

The design of the project, and particularly the competitive grants program, involved extensive consultations with EMBRAPA's research centers, state research and extension systems, universities and farmers' organizations leading to a teleconference involving over 750 institutions throughout Brazil; today, over 1500 institutions in Brazil receive regular information or call for bids. This meant that those most likely to participate in a competition were ready to prepare proposals even before the competition was announced, and a strong sense of ownership developed for the project during the course of project preparation although there were sources of resistance to reforms initially.

### **Sources of Resistance to Reforms:**

The fact that the Executive Committee and EMBRAPA's key research managers are involved in the implementation of this project at different levels means that successful elements of the project can be incorporated in EMBRAPA's operations on a routine basis.

There was concern outside EMBRAPA that the competition will not be fair and objective and will favor EMBRAPA scientists, or that weak research centers even of EMBRAPA, and particularly those of the state research and extension systems will not be able to compete as effectively as the strong ones. The results of the first competition have changed this view.

### **Lessons Learned:**

Through the financing of the first nine (out of 137) projects presented as a result of the first call for bids, several lessons were learned:

1. contrary to expectations, most of the projects came from northeastern Brazil, and were on family agriculture-related matters;
2. formal documentation required by the Brazilian legislation was a major impediment for the approval of projects in the first call; however, the second call for bids clearly indicated that researchers became fully aware of the administrative requirements and complied with them satisfactorily;
3. the establishment of new partnerships, commonly between very strong and very weak institutions indicated that overall project quality could be substantially raised, and that specific training for both weaker and stronger institutions would be desirable; and
4. the development of a partnership data bank is being assessed at this time; it would provide institutions with institutional information detailing with strengths, interests, opportunities, etc. which would hopefully help Brazilian institutions better identify potential partners.