Competitive Grants in the New Millennium:
A Global Workshop for Designers and Practitioners

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Organizers

Francisco José Becker Reifschneider - Embrapa
Derek R. Byerlee - The World Bank
Francisco Basílio de Souza - Inter-American Development Bank

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Sponsors

Brazilian Ministry of Agriculture and Food Supply
Esplanada dos Ministérios - Bloco D
70043-900 Brasilia, DF
Brazil

IDB - Inter-American Development Bank
1300 New York Avenue, NW
Washington, DC 20577
USA

Embrapa - Brazilian Agricultural
Research Corporation
Parque Estação Biológica - PqEB
Final Av. W3 Norte
70770-901 Brasília, DF
Brazil

The World Bank
1818 H Street, NW
Washington, DC 20433
USA

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Francisco José Becker Reifschneider, Embrapa
Derek R. Byerlee, The World Bank
Pamela George, The World Bank
Uma Lele, The World Bank

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Embrapa - Brazilian Agricultural Research Corporation

Alberto Duque Portugal

President

This book is one of the outcomes of the *"Competitive Grants in the New Millennium - A Global Workshop for Designers and Practitioners"*, a three-day workshop on competitive grants systems sponsored by the Brazilian Ministry of Agriculture and Food Supply - through Embrapa - the Inter-American Development Bank, and the World Bank, held in Brasília, Brazil, in May 2000.

It is a collection of sixteen papers written by specialists who are directly involved with competitive grants programs, presenting their experiences in projects in Ghana and some other African countries, Bangladesh, Brazil, Colombia, Croatia, Ecuador, Nepal, Nicaragua and the United States of America.

Thus, the papers published here under "Country Cases" are a result of the effort of each country's representative to present his or her country's or institution's experience, enhanced with the comments and lessons learned during the workshop.

The book that follows is the result of a joint effort to overcome constraints related to the planning and implementation of competitive grants programs, one of the systems used by several countries to foster agricultural and natural resource research and development. It is not a guide, but a collection of best practices that have worked so far, and a portrait of the best solutions found in each of the country cases presented.

IDB - Inter-American Development Bank
Waldemar Wirsig
Representative in Brazil

In keeping with a long tradition of support for agricultural research in Latin America and the Caribbean, the Inter-American Development Bank takes special satisfaction in having been able to cosponsor, jointly with Embrapa and the World Bank the event held in Brasilia last May, "Competitive Grants in the New Millennium, a Global Workshop for Designers and Practitioners", which form the basis for these proceedings.

The Workshop provided an excellent opportunity for the exchange of experiences and identification of common issues, constraints and solutions found during the design and implementation of Competitive Grant Programs (CGPs). A set of background papers provided the basis for discussions that, in turn, were followed by thematic group exchanges on key issues. The present publication is based on the papers and discussions held during the workshop. It is intended to serve as an operational working document for designers and practitioners.

By way of introduction to the more detailed discussion of the country experiences that follow, we would like to offer some tentative conclusions as points of reflection on Competitive Grants Programs. They are based on recent experiences about such programs for the development of agricultural technology in Latin America and the Caribbean, including operations financed by the IDB.

- Competitive Grant Programs or, in short, CGPs are mechanisms to allocate resources in a given system. They are not a panacea that will fix all problems at all times. If they are developed, care must be taken to address the specific needs and challenges of each particular situation.

- CGPs can be an effective component of a portfolio of funding mechanisms; they must complement rather than substitute long-term public funding for strategic research through block grants. Experience with advanced systems suggests that when institutional block grants fall below 40-50% of the funding portfolio, the viability of long-term research is compromised.

- A necessary condition for CGPs to function is the existence of a market for technological services where competition can actually take place. Moreover, a basic research capacity is essential if competition is to solicit a range of new innovative ideas.

- Because CGPs could be effective instruments to redirect research priorities, a transparent system of identifying national priorities and a clear indication of the subset of the national priorities addressed by the CGP are necessary. Lack of clarity may mean that the "demand driven system" will be driven by the demand of the executing agencies rather then the demands of the intended beneficiaries.

- Success may breed success. Well designed CGPs may help reverse the trend towards underinvestment in developing countries. If the Program gets a deserved reputation for quality, fairness, relevance and flexibility, and if it demonstrates the desired impact on efficiency, effectiveness, institutional development and fiscal goals, it will become sustainable. As the experience of advanced systems demonstrates, stakeholders will call for an increase in the share of research that is competitively determined if the system is seen as effective and fair. This share could rise progressively over 10-20 years to perhaps a third of the research portfolio.

- If a competitive grant system is needed, each country should design one that is specifically tailored to its capacity and circumstances. This must be compatible with the size of the research system, the human and financial resources available, and the sources of support needed for sustainability. In this manner, the attributes of successful systems are ensured; they are fairness, quality, relevance and flexibility. Furthermore, if a CGP is successful, the system may expect the competitive share to grow over time with the support of all stakeholders.

The World Bank

Gobind Nankani
Director in Brazil

It is a pleasure for me to open this Global Workshop on Competitive Grants in the New Millenium organized jointly by EMBRAPA, the World Bank and the Inter-American Development Bank.

The workshop sponsorship is in the tradition of a number of areas in which EMBRAPA has been a leader in addressing international issues and the World Bank has been Embrapa's active partner in these initiatives. One level of such cooperation is, of course, through our investment lending in Science and Technology, one of which on the Brazilian Competitive Grants Program in Agricultural Research, a flagship program for the World Bank, which I understand is going to be a focus of your discussions over the next two and a half days. In addition, at the broader international level,EMBRAPA and the World Bank have been cooperating in addressing the implications of globalization and the rapid changes in the international scene in the areas of science and technology for developing countries as well as the World Bank's roll as a development bank.

In June of 1998, EMBRAPA and the Bank jointly organized two workshops in Washington. One related to intellectual property rights in agriculture and the implications of proprietary technologies for the Bank's borrowing countries. Another was on measuring productivity of investments in agricultural research. This is the third such jointly organized workshop in the area of international technology issues related to agriculture, demonstrating once again that EMBRAPA is not only a leader within developing countries in addressing these issues at home but it is also a leader in cooperation with multilateral development banks in sharing its experience with other developing countries facing similar issues.

The EMBRAPA initiative is symptomatic of the four major changes that are taking place at the international level with profound implications for developing countries and the World Bank. These include:

1. Globalization, particularly including trade and investment liberalization with increased scope for agricultural trade involving developing countries.
2. Rapidly increasing private sector investment in agricultural research, particularly in developed countries and the increased interest in capital investment by multinational corporations in seed and other industries in developing countries.
3. The related growing importance of proprietary technologies.
4. The slowing of public sector investments in both developed and developing countries.

A major consequence of these developments is that the gap between developed and developing countries in investment in science and technology has been increasing rapidly, reducing access by developing countries to the newly developed proprietary technologies.

These changes have other profound implications for developing countries. The first and foremost among them is the increased need to forge new partnerships with the private sector such that they maintain continued access to new technologies while ensuring the supply of technologies through public sector investments to the poorest households unable to access commercial technologies. The second is the need to get their public sector institutions geared up institutionally and legally to forge the new partnerships and maintain some control over the new technologies being developed through intellectual property rights. The third is to increase the efficiency of the very limited public sector investment resources going into agricultural research and to focus public sector research in areas where the private sector is unlikely to venture. Finally, to train their human capital so that they are able to meet the challenges of globalization and privatization while addressing the social and environmental concerns that the public sector must face.

I would like to elaborate briefly on these points, as they are central to the objectives of this workshop.

The importance of globalization on trade and investment hardly needs any documentation from me. Brazil has already become a leader in trade in soybeans and citrus and with its huge resources, it hopes to capture larger market shares in soybeans through its no till technologies.

The growing investment by the private sector in transgenic varieties of crops such as soybeans, and the associated debate on their use in Europe, have offered both new challenges and new opportunities to countries such as Brazil. Private sector investments in agricultural research have been growing in industrial countries at 5% a year, and currently stand at 50% or more of total investments in agricultural research in industrial countries compared to 10% to 15% in developing countries. Despite the slow growth at around 1% per year in public sector investments, the share of agricultural GDP invested by the public and private sectors combined in agricultural research today stands at 5% to 6% in industrial countries compared to 0.5% in developing countries.

Much of this research is leading to new technologies and tools that are in the private sector with strong property rights attached to them.

Investments by the private sector in developing countries have also been increasing but not at the same rate. In addition, much of that investment - through purchases of seed companies by multinational corporations as in the case of Brazil - is based on research from developed countries and is leading to proprietary technologies and even analytical tools needed for doing research. Most of the technologies developed by the private sector understandably tend to be for the benefit of farming households already in the commercial sector. This poses a major challenge for the research systems to develop partnerships with the private sector, both to maintain access to the supply of new technologies, and particularly, to develop appropriate technologies for poor households.

The Agricultural Technology Project funded by the World Bank in Brazil is addressing many of these issues through a competitive grants program and through institutional development. The reason that we consider this to be a flagship project among the Bank's investments in agricultural technology around the world; is that in less than three years the competitive grants program has managed to establish a high quality research program and forge important partnerships with a large number

of universities, the private sector, farmer's organizations, etc., so as to bring to bear basic science to develop applied solutions to the needs of farmers and agribusinesses. Over ninety institutions are already involved in these partnerships.

The project is also addressing important challenges of globalization and intellectual property rights by forging partnerships with the science and technology institutions of industrial countries through a novel program called LABEX. This has resulted in placing Brazilian scientists in the USDA and in U.S. universities. I am pleased to know that Dr. Sally Rockey, the head of the USDA's 250 million dollar competitive grants program in agriculture is not only participating in this workshop but is a member of the mid-term review of the Agricultural Technology Project, sharing her experience with Brazil in a practical way and praising the quality of the project. The project is also forging important partnerships with the CGIAR centers and financing a considerable amount of training of Brazilian scientists in the areas of intellectual property rights.

Despite all of these contributions from the World Bank, my colleagues in the Bank agree that the superb performance of this project is largely a result of the strong political will in EMBRAPA to reform its agricultural system for the new millennium. Uma Lele, the leader of our Agricultural Technology project and an advisor in the Bank tells me that the Bank learns as much from Brazil as Brazil perhaps gains from the Bank.

The biggest challenge the project is facing - as you will see - is the shortage of counterpart funds, symptomatic of governments going through severe adjustments in their fiscal systems and perhaps not giving as much priority to public sector investment in agricultural technology as they should - particularly in view of the rapid changes in the global economy that I mentioned above. These are also the problems that other developing countries are facing with greater severity.

I wish you all the best in addressing these challenging issues of advancing globalization and science and diminishing resources, stressing the need for us all to focus on increasing the productivity of investments. The competitive grants program is an important tool to achieve increases in research productivity.

Executive Summary [1]

Pamela George

Competitive Grants in the New Millennium:
A Global Workshop for Designers and Practitioners
May 16-18, 2000, Brasília

Sponsored by the Brazilian Ministry of Agriculture and Food Supply through the Brazilian Agricultural Research Corporation (EMBRAPA), the World Bank through AKIS, and the Inter-American Development Bank.

The workshop provided a forum for the exchange of experiences in the design and implementation of competitive grant programs for research and extension (CGPs). This was achieved through the participation of over 60 designers and practitioners from fifteen competitive grant programs in Africa, Asia, Latin America, and the United States of America. Representatives of the World Bank and the Inter-American Development Bank also shared their perspectives, as did a number of the international centers of the Consultative Group on International Agricultural Research (CGIAR). This report provides a brief outline of concerns and lessons learned from common experiences in competitive programs from country, regional, and donor perspectives. The full proceedings will be available on the Internet when finalized.

Participants identified a range of issues that influence both policy formulation and the performance of competitive programs. These include the evolutionary status of the R&D system, size and economic status of the country, source of funds, commitment of the government, and differences in objectives. Programs therefore need to be tailored closely

[1] The Spanish and French versions were prepared by Joaquim Osório Pires da Silva and Lucia Tunes, respectively.

to the specific situation, as was evident in the country studies presented in the workshop. There were, however, common elements that ran through the individual programs, and these are outlined briefly below.

1. Key considerations when introducing a competitive program

- Competitive programs are a funding mechanism with both advantages and disadvantages. They are not appropriate in all situations, and should be linked with other funding sources for research, extension and training to promote a complementary system of R&D funding.
- The overarching consideration in both industrial and developing countries is the **sustainability** of funds, and in some instances, the availability of the approved budget.
- The maturity of the national research, development and extension system has a major impact on the ability of a competitive program to reach its potential.
- The cost of establishing a competitive program can be high. Resources need to be invested up front to ensure that it is structured to fit the institutional environment.

2. Program policy and administration

The major lessons for successful implementation are:

- Strong and independent governance is essential.
- Programs should be piloted and then scaled up as experience is gained and internalized. Qualitative and quantitative measures should be used to track progress.
- Specific priorities (commodities and/or thematic areas) need to be developed that reflect both national policies and strategies, and demands from beneficiaries.
- A rigorous, independent, and transparent review process that treats all proposals equally must be introduced from the beginning.
- Monitoring and evaluation guidelines with clear objectives and indicators for the program as a whole, and for individual projects, must be implemented from the outset.

- Cost-effectiveness of procedures to keep overhead low must be balanced against the need to ensure accountability and transparency of operations. An affordable Management Information System (MIS) or similar program is highly desirable.
- Risky projects and unknown providers should be funded to the extent that the budget allows, and that the proposals meet the strict evaluation criteria. Criteria for selection should balance both innovative and traditional approaches.
- Program guidelines in the form of a manual should be very detailed with respect to the process, and should be revised continuously as experience is gained.
- Training programs are needed for all stakeholders to ensure that the program is competently run and a high level of performance is attained.

3. Establishing procedures for a positive impact on institutional reform

Most development programs have an objective of promoting institutional reform in public organizations. This objective is facilitated by:

- Pro-active development of proposals through the development of networks and providing training for weaker institutes, including collaborative multi-institutional activities.
- Placing a ceiling on awards to individual organizations to avoid dominance.
- The use of a pre-proposal stage that allows the program to work with authors of selected pre-proposals to develop solid proposals that are relevant to the program.
- Promoting co-operation through the competitive process on a partnership basis. Collaborative activities will move over time from a personal to an institutional level.
- An awareness of public and private sector perceptions of each other and allow time to build trust.
- The development of mechanisms to internalize experiences from competitive funding to upgrade quality of block (or core) funding (e.g., peer review).

4. Ensuring relevance and dissemination

- Base priorities and thematic areas on the national strategy and alter them as change occurs.
- Ensure explicit plans for technology transfer are included in proposals.
- Make provisions in the overall program procedures for follow up projects to enable transfer or further development of promising technologies.
- Identify and involve the various components of the private sectorearly in the planning stage, and ensure that collaboration is mutually beneficial.

5. Common challenges

The discussions prompted many more questions and identified areas of concern for which there are no easy answers. Learning by doing was important in all cases. A number of challenges were identified which are common across several programs.

- There is a need to balance local ownership of the program with independence from political interference. This requires a clear distinction between the functions of policy, proposal evaluation, secretariat and administration, and research execution. Governments have a role in setting priorities for the use of public funds, but governance and peer reviews need to be autonomous.
- There is the 'small country' problem in the availability of human and financial resources that are needed to support a competitive program, and a difficulty in ensuring objective review of proposals. Many smaller countries also experienced domination and lack of coordination among donors. That made it difficult to integrate the programs with nationally identified strategies.
- The development of a relevant and balanced program to capture spillover from a coherent and synergistic portfolio of research and extension, against an entirely demand driven approach that can result in a fragmented portfolio.
- The institutional and financial sustainability of the program at the end of donor funding is another issue. Many programs are now administered by short-term institutional arrangements.

- In emerging systems with diverse institutional capability, there can be a high level of stress on the weaker institutes to perform. The scarce resources invested in alleviating this problem should be weighed against their effective use; i.e. clearing the 'dead wood' out of the system.
- Establishing an appropriate balance between competitive and block (core) funding, and the relative roles of each. Competitive funds do not replace block funds.
- There is the issue of balancing of public and private objectives. This means protecting proprietary knowledge and technologies to attract the participation of the private sector, while ensuring that public funds are used for social objectives. Likewise, equity concerns must be weighed against the needs of a competitive market economy.

6. Closing comments

The introduction of competitive programs must be carefully considered, as it is one option among many. Further, CGPs should be structured according to the stage of development and economic environment, with realistic objectives and focused priorities. A higher level of donor coordination and complementarity is also desirable. Plans for the sustainability of the program must be prepared from the onset.

Sumario Ejecutivo [1]

Pamela George

Fondos de Subvención Competitivos en el Nuevo Milenio: Taller Global para Proyectistas y Agentes de Práctica 16-18 de mayo de 2000, Brasília

Patrocinado conjuntamente por el Ministerio Brasileño de Agricultura y Abastecimiento a través de la Empresa Brasileña de Investigaciones Agropecuarias (EMBRAPA),el Banco Mundial, por medio de AKIS, y por el Banco Interamericano de Desarrollo.

El taller proporcionó un simposio para el intercambio de experiencias en proyección y puesta en marcha de programas de fondos de subvención competitivos destinados a la investigación y a la extensión (CGP). Contó con la participación de más de 60 proyectistas y agentes de práctica de 14 programas de fondos de subvención competitivos de África, Asia, Latinoamérica y de los Estados Unidos. También participaron representantes del Banco Mundial y del Banco Interamericano de Desarrollo con sus sugerencias, así como innumerables centros internacionales del Grupo de Consultores sobre Investigación Internacional en Agropecuaria (CGIAR). El presente informe no es sino un breve sumario de las inquietudes y lecciones aprendidas en programas competitivos a partir de las experiencias comunes vividas por países, regiones y patrocinadores. El informe completo, después de terminado, estará disponible por Internet.

Los participantes identificaron una cantidad de cuestiones que influyeron ya sea, sobre la formulación de políticas, como sobre el desempeño de los programas competitivos. Tales cuestiones abarcaron

[1] The Spanish version was prepared by Joaquim Osório Pires da Silva.

el estado de evolución del sistema de investigación y desarrollo, la dimensión y la situación económica del país, la fuente de los fondos, la participación del gobierno y las diferencias en los objetivos. Los programas necesitan ser diseñados lo más cercano posible a la situación específica, como quedó evidente en los estudios nacionales presentados en el taller. Sin embargo, se descubrieron en los programas individuales elementos comunes, que se describen brevemente a continuación.

1. **Consideraciones básicas, al implementarse un programa com petitivo:**

- Programas competitivos son mecanismos de fondos, con sus ventajas y desventajas. No existen programas que se ajusten a todas las situaciones, y por eso deben ser asociados a otras fuentes de fondos de investigación, extensión y capacitación, a fin de pro mover un sistema complementario de fondos de investigación y desarrollo.
- La consideración más importante ya sea, en los países industriali zados, como en los países en desarrollo, es la **sostenibilidad** de los fondos y, en algunos casos, la disponibilidad del presupuesto aprobado.
- La madurez del sistema nacional de investigación, desarrollo y extensión ejerce un impacto mayor para que la capacidad del pro grama competitivo alcance su potencial.
- El costo para establecer un programa competitivo puede ser alto. Se necesita la inversión previa de recursos a fin de garantizar que el programa esté bien estructurado dentro del contexto institucional.

2. **Política y administración del programa**

Las principales lecciones para una puesta en marcha bien lograda son:

- Es esencial que el gobierno esté bien establecido y sea independiente.
- Los programas deben tener seguimiento y evolucionar en la medida en que ganan experiencia y tienen aceptación. Utilizar datos cualitativos y cuantitativos para monitorear el avance.
- Se deben desarrollar prioridades específicas (de bienes y/o de áreas temáticas) para que reflejen ya sea las políticas y estrategias

nacionales como las necesidades de los beneficiarios.

- Hay que introducir, desde el comienzo, un proceso de revisión riguroso, independiente y transparente, que abarque todas las propuestas.
- Desde el inicio se deben establecer las líneas de control y evaluación, con objetivos claros e indicadores, abarcando el programa como un todo, además de los proyectos individuales.
- La eficiencia en los procedimientos de costes para mantener bajos los gastos debe estar balanceada con la necesidad de garantizar la responsabilidad y la transparencia de las operaciones. Es altamente deseable que se pueda contar con un MIS - *Management Information System* [Sistema de informaciones gerenciales].
- Sólo se deben financiar proyectos arriesgados, o proveedores desconocidos, en la medida de la disponibilidad presupuestaria y de la conformidad de la propuesta con los criterios estrictos de evaluación. Los criterios de selección deben balancear los planteamientos innovadores con los tradicionales.
- Los principios del programa, en la forma de un manual, deben contener todos los detalles del proceso, y seguir siendo revisados continuamente con los avances de la experiencia.
- Se debe capacitar a los que dan soporte los programas, a fin de garantizar que el programa será llevado competentemente y que se logre un alto nivel de desempeño.

3. Establecimiento de medidas para un impacto positivo en la reforma institucional

Muchos de los programas de desarrollo tienen, entre sus metas, una que fomente la reforma institucional en organizaciones públicas. Esos objetivos son proporcionados por:

- El desarrollo pro-activo de propuestas a través del desarrollo de redes y la oferta de capacitación para institutos más débiles, incluso actividades de cooperación multi-institucional.
- La fijación de un techo para las subvenciones a instituciones par ticulares, con el propósito de evitar dominación.
- La utilización de un período de prepropuesta, que permita al programa trabajar con los autores de las mismas, logrando así desarrollar propuestas sólidas relevantes para el programa.

- El fomento de la cooperación a través del proceso competitivo sobre base asociativa. Las actividades cooperativas se trasladarán, con el tiempo, del nivel personal para el nivel institucional.
- La atención a las percepciones recíprocas de los sectores público y privado y la concesión de tiempo para que se firme la confianza.
- El desarrollo de mecanismos para la apropiación de experiencias resultantes de fondos competitivos, a fin de elevar la calidad del fondo de bloque (o nuclear); por ejemplo, revisiones entre iguales.

4. Garantía de la importancia y divulgación

- Apoyar, en las estrategias nacionales, las prioridades y las áreas temáticas y promover alteraciones, cuando ocurran cambios.
- Garantizar que estén explícitos en las propuestas los planes de transferencia de tecnología.
- Prevenir en todo el programa procedimientos para proyectos de continuación, con el propósito de hacer transferencias o desarrollo posterior de tecnologías prometedoras.
- Identificar e involucrar tempranamente, ya en la fase de la planificación, los distintos componentes del sector privado y garantizar que la cooperación produzca beneficio mutuo.

5. Desafíos comunes

Las discusiones abrieron otras cuestiones más, e identificaron áreas de preocupación, para las cuales no hay respuestas fáciles. De todas maneras, era importante aprender con la práctica. Se identificaron muchos retos comunes a diversos programas.

- La necesidad de contrabalancear, por un lado, la propiedad local del programa con la independencia de interferencias políticas, por otro. Ello supone una distinción muy clara entre funciones de política, evaluación propuesta, servicios de secretaría y administración, así como ejecución de investigación. Los gobiernos tienen la función de fijar prioridades en el uso de fondos públicos, pero la conducción y las revisiones entre iguales necesitan ser autónomas.
- El problema del "país pequeño" en disponer de los recursos humanos y financieros que necesita para llevar adelante un programa competitivo, y la dificultad en garantizar la revisió

objetiva de propuestas. Muchos países menores también hanexperimentado la dominación y la falta de coordinación entre los patrocinadores, lo que dificultó la integración del programa con las estrategias identificadas nacionalmente.

- El desarrollo de un programa relevante y balanceado por el cual se pueda detectar excedentes a partir de una cartera coherente y sinérgica de investigación y extensión, en contraste con un planteamiento completamente dirigido para la demanda, que puede resultar en una cartera fragmentada.
- Sostenibilidad institucional y financiera de un programa al término del fondo del patrocinador. Muchos programas son administrados actualmente por arreglos institucionales de corto plazo.
- En sistemas emergentes, con capacidad institucional diversificada, puede ocurrir una gran presión sobre institutos más débiles para que demuestren alto desempeño. Los parcos recursos invertidos para atenuar ese problema deberían confrontarse con su utilidad efectiva, es decir, la de expulsar del sistema la "madera podrida".
- Establecimiento de un balance adecuado entre fondos competitivos y fondos de bloque (nucleares), y las funciones relativas de cada uno. Fondos competitivos no reemplazan a fondos de bloque.
- Contrabalancear objetivos públicos y privados. Esto significa la necesidad de proteger la propiedad del conocimiento y de tecnologías para atraer la participación del sector privado, mientras se garantiza que los fondos públicos se están utilizando en objetivos sociales. Del mismo modo, deben ponderadas preocupaciones a respecto de la equidad con las necesidades de una economía de mercado competitivo.

6. Comentarios finales

La introducción de programas competitivos debe ser considerada con mucho cuidado, como una opción entre muchas otras. Además, Proyectos de Fondos de Subvención Competitivos de Investigación y Extensión deben estar estructurados de acuerdo con el nivel de desarrollo y el entorno económico, y contener objetivos coherentes con la realidad y enfocando prioridades. También es deseable un nivel más alto de coordinación y complementariedad entre los patrocinadores. Se deben prever, desde un comienzo, planes de sostenibilidad del programa.

Résumé [1]

Pamela George

Financements Compétitifs dans le Nouveau Millenium: Atelier Global pour les Planificateurs et Realisateurs de Projets 16-18 mai 2000, Brasília

Sous les auspices du Ministère Brésilien de l´Agriculture et de l'Approvisionnement, par le biais de l'Entreprise Brésilienne de Recherche Agricole (EMBRAPA), de la Banque Mondiale, par le biais de l´AKIS, et de la Banque Inter-Américaine de Développement.

L' atelier a présenté un forum pour l'échange d'expériences sur la conception et la mise en place de programmes compétitifs de financement pour la recherche et l'extension (CGPs). Ceci a été réalisé avec la participation de plus de 60 planificateurs et réalisateurs de 14 programmes compétitifs de financement en Afrique, en Asie, en Amérique Latine, et aux Etats-Unis de l'Amérique. Les représentants de la Banque mondiale et de la Banque inter-américaine de développement ont également partagé leurs perspectives, de même qu'un certain nombre de centres internationaux du Groupe consultatif sur la recherche agricole internationale (CGIAR). Ce rapport fournit un aperçu des soucis et des leçons apprises par les expériences communes provenant des programmes compétitifs depuis les perspectives du pays, de la région et du donneur. Les démarches complètes seront disponibles sur l' Internet dès qu'elles seront finies.

Les participants ont identifié un nombre de questions qui influent sur la formulation de la politique et l'exécution de programmes compétitifs. Celles-ci comprennent l'état évolutif du système de R&D, la dimension

[1] The French version was prepared by Lucia Tunes.

et la situation économique du pays, l'origine des ressources, l'engagement du gouvernement, et les différences dans les objectifs. Les programmes doivent donc être soigneusement élaborés selon la situation spécifique, ce qui s'est montré évident dans les études des pays présentées dans l'atelier. Il y avait, cependant, des éléments communs qui se sont trouvés dans chaque programme, et sont décrits brièvement ci-dessous.

1. Considérations principales lors de la présentation d'un programme compétitif

- Les programmes compétitifs constituent un mécanisme de financement qui offre, en même temps, des avantages et des incovénients. Ils ne sont pas appropriés à toutes les situations, et devraient être liés à d'autres sources de financement pour la recherche, l'extension et l'entraînement pour promouvoir un système complémentaire du financement de R&D.
- La considération fondamentale dans les pays industrialisés, ainsi que dans les pays en voie de développement, est la **durabilité**des fonds, et parfois, la disponibilité du budget approuvé.
- La maturité du système national de recherche, de développement et d'extension a un impact important sur la capacité d'un programme compétitif d'atteindre son potentiel.
- Le coût d'établir un programme compétitif peut être haut. Des ressources doivent être investies dès le début pour garantir qu'il soit structuré pour s'adapter à l'environnement institutionel.

2. La politique et la gestion des programmes

Les leçons principales pour une mise en place réussie sont les suivantes:

- Le gouvernement fort et indépendant est essentiel.
- Les programmes devraient être pilotés et puis mésurés, autant que l'expérience est acquise et assimilée. Utilisez les mesures qualitatives et quantitatives pour tracer le progrès.
- Des priorités spécifiques (des produits et/ou des zones thématiques) doivent être développées pour traduire les politiques et les stratégies nationales et les demandes des bénéficiaires.

- Un processus d'analyse rigoureux, indépendant et transparent, qui traite toutes les propositions d'une manière égale, doit être présent dès le début.
- Des directives de surveillance et d'évaluation avec des objectifs clairs et des indicateurs pour le programme comme un tout et pour chaque projet individuel, doivent être mises en oeuvre dès le début.
- La rentabilité des procédures pour maintenir les coûts bas doit être considérée par rapport à la nécessité d'assurer la crédibilité et la transparence des exécutions. Un Système intégré de gestion accessible (SIG) ou un programme semblable est fort souhaitable.
- Des projets de risque et des fournisseurs inconnus devraient être financés dans la mesure où le budget permettrait et les propositions devraient satisfaire les critères restreints d'évaluation. Les critères pour la sélection devraient mettre en équilibre tant les approches innovatrices comme les traditionnelles.
- Les directives de programme sous forme d'un manuel devraient être très détaillées en qui concerne le processus, et devraient être mises à jour sans interruption tant que l´expérience serait acquise.
- Les programmes de formation sont nécessaires pour tous les dépositaires pour garantir que l'exécution du programme soit faite avec compétence et une performance de haut niveau soit atteinte.

3. Établissant des procédures pour un impact positif sur la réforme institutionnelle

La plupart des programmes de développement ont l'objetif de favoriser la réforme institutionnelle dans les organismes publics. Cet objectif est facilité par :

- Le développement pro-actif des propositions moyennant le développement des réseaux , et l'apport d'entraînement aux instituts plus faibles, y compris des activités multi-institutionnelles de collaboration.
- Le placement d'un plafond en ce qui concerne les prix accordés à des organismes individuels pour éviter la domination.
- L'utilisation d'une étape de pré-proposition qui permet au programme de travailler avec des auteurs des pré-propositions choisies, pour développer des propositions solides qui seront adéquates au programme.

- La promotion de coopération moyennant un processus compétitif sur une base d'association. Des activités de collaboration, au fil des temps, quitteront le niveau personnel pour accéder au niveau institutionnel.
- L'attention accordée aux perceptions du secteur public envers le secteur privé et vice-versa, leur accordant le temps nécéssaire pour établir une confiance réciproque.
- Le développement de mécanismes pour saisir les expériences provenant du financement compétitif, ayant pour but l'amélioration de la qualité du financement en bloc (ou en noyau) ; par exemple, les revisions par les pairs.

4. Assurer la pertinence et la diffusion

- Basez les priorités et les zones thématiques sur la stratégie nationale et modifiez-les à mesure que les transformations ont lieu.
- Assurez que les plans spécifiques pour le transfert de technologie soient inclus dans les propositions.
- Considérez l'inclusion, dans toutes les procédures générales des programmes, de projets de suivi pour permettre le transfert de technologie ou le développement de technologies viables.
- Identifiez et engagez les divers composants du secteur privé le plus tôt possible dans l'étape de planification et assurez-vous que la collaboration soit mutuellement salutaire.

5. Des défis en commun

Les discussions ont entraîné un plus grand nombre de questions, et ont identifié les sujets de préoccupation à l'égard desquels il n'y a aucune réponse facile. Apprendre par l'expérience a été important dans tous les cas. On a identifié un certain nombre de défis qui sont communs à plusieurs programmes.

- La nécessité de maintenir l'équilibre entre la propriété locale du programme et l'indépendance vis-à-vis l'interférence politique. Ceci exige une distinction claire entre les fonctions de la politique, de l'évaluation de proposition, du secrétariat et de la gestion et de l'exécution de recherches. Les gouvernements ont leur rôle en

établissant des priorités pour l'usage des fonds publics, mais la direction et l'analyse par les pairs doivent être autonomes.

- Le problème du "petit pays" - disponibilité des ressources humaines et financières qui sont nécessaires pour supporter un programme compétitif, et la difficulté d'assurer une analyse objective des propositions. Plusieurs pays plus petits ont aussi experimenté la domination et le manque de coordination parmi les donneurs, ce qui a rendu difficile d'intégrer le programme avec des stratégies identifiées nationalement.
- Le développement d'un programme approprié et équilibré pour saisir l'embrun provenant d'un ensemble de programmes cohérents et synergiques de recherches et d'extension, contre une approche entièrement tournée vers la demande, ce qui peut avoir comme conséquence un ensemble de programmes fragmentés.
- La " durabilité " institutionnelle et financière du programme à la fin du financement du distributeur. Plusieurs programmes sont maintenant gérés par des mesures institutionnelles de court terme.
- Dans les systèmes qui surgissent et qui ont une compétence institutionnelle diverse, il peut y avoir une forte pression sur les instituts plus faibles pour exécuter le travail. Les modestes ressources investies pour alléger ce problème devraient être pesées contre leur utilisation effective - ça veut dire, en retirant le bois mort hors du système.
- L'établissement d'un équilibre approprié entre le financement compétitif et le financement en bloc (ou en noyau), et les rôles relatifs de chacun. Les fonds compétitifs ne substituent les fonds en bloc.
- La mise en équilibre des objectifs publics et privés. Ceci signifie le besoin de protéger la connaissance et les technologies de propriété pour attirer la participation du secteur privé, tout en assurant que des fonds publics soient utilisés pour des objectifs sociaux. De même, des soucis de capitaux propres doivent être pesés contre les besoins d'une économie de marché compétitif.

6. Commentaires finaux

L'introduction des programmes compétitifs doit être soigneusement considérée car c'est une option parmi beaucoup d'autres. De plus, les CGPs devraient être structurés selon l'étape du développement et de

l'environnement économique, avec des objectifs réalistes et des priorités focalisées. Un niveau plus élevé de la coordination et de la complémentarité du donneur est également souhaitable. Les plans pour la " durabilité " du programme doivent être préparés dès le début.

Introduction

Competitive Grants in the New Millennium: the Devil is in the Detail [1]

Howard Elliott

The context

Participants of the "*Competitive Grants in the New Millennium: a Global Workshop for Designers and Practitioners*" have accepted the proposition of the opening speakers that we work in a context of globalization of science and technology. Innovation comes from various sources and some of them are outside the agricultural sector (e.g. biotechnology and information and communications technology). The private sector is playing an increasing role in developing and controlling this technology, raising concerns that the developing countries will have reduced access to it. A general slowing of public investment in agriculture and agricultural research in both developed and developing countries requires us to find new ways of financing research and getting the most impact from the expenditures we do make. A special effort is needed to prepare research institutions to deal effectively with the private sector.

The plenary agreed that research systems are becoming more pluralistic in both the sources of funding and the responsibility for execution. They need to be reorganized to take advantage of the multiple sources of innovation. New partnerships will be needed to ensure increased productivity and increased competitiveness. However, reform from within the NARIs is proving difficult. One means of making research more "demand-driven" is through new funding mechanisms that help redirect efforts that are now at the margin to new priorities. It was recognized that competitive grants are one mechanism in a portfolio of funding alternatives, not a universal panacea for all of research's problems.

[1] Inspired by a comment of one of our workshop organizers, I have titled this summary "The Devil is in the Detail". It forced me to structure my summary in a way that recorded our basic agreements and sought insight in the details of the various experiences presented.

Advantages and disadvantages of Competitive Grant Programs

It is not necessary to repeat the list of advantages and alleged disadvantages of competitive grants found in *"Characteristics of Successful Agricultural Research Competitive Grant Programs"*.[2] To be fair, each of the advantages and disadvantages can be shown to be true in at least one documented case, and the net value added of a CGP is very case-specific. A competitive grant program may focus resources and reward innovative ideas just as it may end up funding a set of *ad hoc* projects with no overriding strategy for the fund and may stifle innovation by funding only established researchers. The positive effect on the research that is funded may be offset by the demoralizing effect they have on the rest of the system, especially if they create a dual class of research in the country. If scientific excellence is the only criterion used, they may discriminate in practice against the poorer regions and less developed institutions. They may be used successfully to encourage collaboration but their competitive nature may lead to reduced information sharing.

The project bias of competitive funds reduces their ability to build human and institutional capacity, although, with a coherent strategy and proper management, nothing stops them from making a succession of awards that may actually produce long-term institutional development. It is in this respect that the "devil is in the detail".

The importance of Competitive Grants

The importance of competitive grants to the financing of research is clearly specific to each country and driven by a number of different forces. The impact that they can have depends on their importance in total research funding, the leverage they bring in directing programs, and the degree of constancy of support they provide.

Information presented by the World Bank shows the diversity of experience.[3] In Africa and Asia, 95% of World Bank support to research still goes to institutional loans and grants, while in Latin America and ECA only 15% goes to institutions and competitive grants account for 48% and user funds make up 37% of support. In the US, competitive grants make up only 12-15% of the USDA support for research.

[2] In this publication, chapter 12 by Elliott, H. and Echeverria, R. "Characteristics of Successful Agricultural Research Competitive Grant Programs".

[3] Idem, chapter 15 by Byerlee, Derek "Competitive Funding of Agricultural Research in the World Bank : Lessons and Challenges".

It is also necessary to look at the leverage that competitive grants have over the nature of the research program. While they may remain a small percentage of total research funding, they may actually be the primary source of operating costs and small equipment and, through this, direct the (fixed cost) human resources to specific areas of research.[4]

It is worth repeating the objectives sought by competitive grant programs as seen by the World Bank:

· Improve research quality
· Ensure user-oriented priorities
· Promote new research agendas
· Reduce research cost through award to most efficient producer
· Reform institutions
· Promote institutional pluralism and partnerships
· Tap new sources of funding

I have reordered them from the way they were originally presented to group them by objective. The first three bullets concern the allocation of resources to clear priorities; the fourth has to do with efficiency of research as shown in the market; the fifth and six try to change (or bypass) institutions and prescribe how research should be done. The final bullet suggests that new sources of funding can be tapped if expenditures can be earmarked to research of interest to those sources.

Issues arising in the workshop presentations

Recognizing that it is impossible to do justice to the individual presentations, I would like to highlight certain points from the various presentations and hopefully redirect the reader back to the individual case study for more detailed treatment of the issue in its context.

a. Structure and governance of competitive grant programs

The separation of the funding from the execution of research is put forward as a principle of effective national agricultural research systems - NARs.[5] However, we have seen that competitive funds may be found separate from the National Agricultural Research Institute - NARI, attached to the NARI, and completely inside the NARI. Structure and

[4] In this publication, chapter 15 by Rockey, Sally. "Competitive Grants for U.S. Agricultural Research: The long and hard road to sucess!!!!"
[5] Byerlee, D. and Gary Alex (1998) Strengthening National Agricultural Research Systems: Policy Issues and Good Practice. Washington, D.C. The World Bank

governance are usually the result of complex political and historical forces, which may explain why external recommendations need to be tempered by local knowledge.

The size of the total research system and availability of qualified board members and potential peer reviewers are also important considerations. Large research systems are better able to run competitive grant programs. First, they have the diversity and the capacity that can lead to effective partnerships and coalitions. Second, a competitive program needs to have true competitors. Large systems are more likely to have groups that present true alternatives as sources of ideas or as contractors for the research output. As a general rule, therefore, we can say that competitive grant programs are best when a capacity exists to be mobilized, when competition helps add value to the research process, and eligibility is wide. If the research objective, the target of the project, and the eligibility were too localized, it would be preferable to (1) contract the research directly or (2) fund the local institution. Little value added is gained from the competitive mechanism.

b. Interaction with policymakers

The workshop focused on national competitive funds where it is possible to bring together the three sides of the "sustainability triangle": financing mechanisms, institutions and policy frameworks. The challenge for competitive funding programs is to understand the policy process, build a constituency among research and users, and expand the policy dialogue. At the national level, there is a policymaking apex that can be identified and approached.

The governance of regional and global competitive funds raises more difficult questions for priority setting and governance. The experience with sub-regional organizations (e.g. the Latin American PROCIs and the three African organizations) bring out the absence of a policymaking apex, the differences in goals among the sub-regions, and the potential for competition in product markets that affect decisions. The typology presented by the Inter-American Development Bank highlighted that there are spillovers among national S&T councils, national agricultural technology funds, regional funds, and international funds. The policy and funding spillovers merit further study.[6]

[6] In this publication, chapter 13 by Delgado et al. “Some Experiences from Financing Competitive Funds for Agricultural Research in Latin America”.

c. Some common lessons

It is most efficient to list a number of points on which most people seem to have agreed before going on to highlights of particular cases. The commonly agreed points are as follows:

- It is important to have a strong board for a CGP that is autonomousfrom the government. While "politics can kill CGPs"[7], theparticipants recognized the need for political support to research and the fact that other funding mechanisms can better serve politically motivated goals.
- Stakeholder participation in governance and priority setting needs to be designed into the program. Good stakeholder participation may also help ensure the autonomy of the program from politics.
- Clear priorities are essential for CGPs. These are best kept to a defined subset of the national priorities so that the fund can focus on objectives most appropriately advanced through competition.
- Credible peer review is critical to success. Reviews must be rigorous, transparent, anonymous, and autonomous.
- High standards must be established from the beginning. For this reason, it is recommended that the funds start small and build up progressively. In an early phase, it may be necessary to invest in developing proposals: training scientists in proposal writing, organizing workshops to improve submissions, and arranging mentors from outside the system to improve the science.
- Projects should install monitoring and evaluation from the beginning and include plans for the "dissemination pathways".
- The question of sustainability of support needs to be dealt with in the beginning.

With these commonly agreed points, let us look at some of the details.

d. Details on common issues.

The issues that have been highlighted in the experience of the participants are:

Technology transfer: The links with technology transfer need to be worked out as part of the research project. The competitive grant fund

[7] Idem, chapter 10 by Rockey, S. "Competitive Grants for U.S. Agricultural Research: The long and hard road to sucess!!!!"

may or may not include the dissemination aspects in its support, but the pathway to development should be specified. The proportion of the budget that is appropriate for development uptake is location specific and not necessarily part of a technology fund's mandate.

Peer review: For peer review to be credible, a CGP must have eminent scientists (including social scientists) on the board and on review panels. A wide pool of expertise is needed for reviews and may require external reviewers. It is the job of the board to ensure quality, fairness, relevance and flexibility. A pattern of rotation needs to be put in place that keeps some institutional memory while bringing in new ideas. A fund needs to have a long-term strategy but remain open to new ideas.

Institutional reform: The way a CGP is structured and governed will have an effect on the traditional research system. It may reinforce traditional structures, by-pass them, or anticipate future changes in structure. It may be the embryo of a new pluralistic system. The potential impact is usually well understood by the actors.

Capacity building: Since competitive grant programs usually judge each proposal on its own merits, they are seldom credited with being good instruments for capacity building. However, if the fund has a clear strategy, it may have a positive effect on institutional capacity through the training and experience given to junior researchers working on projects and through support to a succession of projects that take the results of basic research to final applications. This requires a fund with both an institutional strategy and an institutional memory.

Ensuring flexibility: Competitive grant programs may be used to address new issues, fund output (projects) rather than input (institutions), and to take on new agendas until they become part of the regular program. If they represent additional resources rather than a new means of allocating existing resources they can achieve this.However, if competitive funds do not provide full support to a project but require counterpart contributions, they may leverage increasingly scarce institutional funds to special agendas and actually decrease flexibility by locking resources into narrow deliverables. Flexibility is needed from both the donors and recipients.

e. Selected Highlights from the cases

Maintaining government support: USDA-National Research Initiative (NRI)

Competitive grants account for only 1/6th of the USDA research budget. As such, they are one element in a total funding portfolio that also includes formula funds for the state research and experiment system and special non-competitive grants to particular institutions. While the US Congress can put boundaries on topics, eligibility, and types of projects to be funded, the NRI has sought the widest eligibility possible. Since other mechanisms take care of specific objectives, (institution building, support to poorer states) the NRI can concentrate on maintaining the credibility of the science they support. The integrity of the review process helps maintain their autonomy from politics.

Building on what exists: PRODETAB (Brazil)

Although PRODETAB represents only 2% of Embrapa's total funding, its share in flexible operating funds is greater. A decision was made to build PRODETAB's peer review process on one that already existed in Embrapa while bringing in more participatory processes. It has helped the program get started and, in turn, is helping promote a competitive and collaborative culture in the rest of the institution. The program is reported to deal with many of the potential weaknesses of competitive programs: it provides special mechanisms for the poor (agricultura familiar); it consciously supports young researchers and new ideas; and promotes partnerships with universities and state-level research. It has also been essential to develop Embrapa's policy towards intellectual property as a base for better relations with the private sector.

A transition to Sustainability: HARP (Nepal)

The Hill Agricultural Research Project - a five-year, US$20 million project of Nepal and the UK's Department for International Development - aims to establish a sustainable and effective hill agricultural research system to enhance the livelihoods of hill farm families. At the end of the period, the two principal research stations will be modified to a level at which the National Agricultural Research Council can financially

and administratively absorb. The associated Hill Research Project (HRP) included a competitive grant facility to demonstrate the value of time bound research, widen the number of research providers, and promote an "output-orientation" of research. Particular effort was focused on strengthening dissemination pathways. The discussion highlighted issues of donor coordination, the independence of the national authority managing the agricultural research and development fund, and the need for management tools to ensure accountability and institutional sustainability.

Managing pluralism: Chile

In Chile, the principle of "state subsidiarity" is strongly maintained. This has given rise to a research and development system characterized by a multiplicity of organizations, development funds, and research suppliers. State support is around 40 percent of the total. While there is a National Research Council for Science and Technology (CONICYT) and an associated fund (FONDECYT) there is no body focused specially on agricultural research. The private sector also has a fund for collaboration with S&T organizations. The Ministry of Agriculture has different sources of support for research of different types. However, the need for research to get money from a variety of facilities and the absence of coordination has led to a fragmented portfolio of projects.

The importance of having clear priorities for the competitive fund is reinforced when there is no other mechanism for coordination. The need for clarity extends to criteria for selection and consistency in their application. The private sector is still learning how to interact with public institutions.

Designing a Competitive Grant Program: Ecuador

Two highlights of the case of Ecuador are: the design of a competitive grant program to re-dynamize a national institute; and the reliance on a foreign consulting organization (NRI) to implement the project. Given the history of relations between the national institute and the research foundation, this choice may have been useful in establishing the autonomy of the program. The design of the fund sought client-orientation, wide participation in research, and international alliances. Administratively,

they sought to focus rapidly, be user-friendly, and provide smooth disbursement. Part of the user-friendliness was to build project preparation skills. Project ideas were accepted or rejected quickly and effort went into improving the 23 percent of proposals accepted for further development. The management unit at this point found itself in a delicate position of supporting project development while organizing the evaluation. In terms of lessons, the autonomy of the fund from the public research institution was underlined as a protection against political interference, as were strict controls and transparency.

Internal contracting: Bangladesh

The contract research program of the Bangladesh Agricultural Research Council (BARC) provides a contrast to the competitive grants discussed in other presentations. It is a mechanism for awarding grants to conduct specific research that BARC identifies as needed to support national development goals. BARC has used this to promote inter disciplinary and inter-institutional research. In a new IDA-funded project, a redesigned vetting scheme has been introduced. It provides for participation by regional and national research-extension committees.

The internal approval process was described as long and rigorous. The research division of the proponent must approve proposals for submission; they then pass through a technical division of BARC and a technical advisory council (composed of eminent scientists and senior managers). The final stages include review by the Executive Council and the Governing Board.

The presentation was frank in describing constraints experienced by the program: the need to follow civil service regulations; remuneration below that provided by private consulting opportunities and direct contracts with donors; the partial nature of support; and the difficulty BARC has in monitoring and evaluating outputs. In fact, the research institute hosting the projects may not feel responsibility for the project because BARC has funded the scientist and not the institute. A move from contract to competitive grants may improve some, but not all of these problems. In the final analysis, BARC still appears to be worried about the "complexity" that comes with open competition.

The element that stood out in the presentation of the Agricultural Technology Development Project (PRONATTA) was the institutional development component that accompanied the competitive fund. The competitive fund seems to have successfully contributed to partnerships among research, farmers, NGOs and the private sector. Although the national research corporation (CORPOICA) continues to be the largest recipient of funds (at 46 percent of the total), it must still compete with new suppliers of R&D services. In discussion, it was noted that PRONATTA is a very small component of the agricultural R&D expenditure, but it has been strategically useful to complement block grants in a time of funding restriction.

The institutional component provides for a Management Coordinating Unit and the creation of national and regional panels. The delegation of priority setting to the regional level is emerging as a principal feature of PRONATTA. The sole top-down restriction appears to be a demand that projects serve the needs of small farmers. Various mechanisms of support to project development at the regional level have been put in place, including an institutional strengthening network. Local participation in funding of projects has indicated that projects are "demand-driven". This has attracted some new donor funding.

f. Bringing the threads together.

In the foregoing discussion, the principles and practices that were highlights in the very original material presented and rich discussions held during the workshop were brought out. The main conclusions from the workshop are:

- Competitive grant programs can be valuable tools as complementsto strong institutional funding.
- As a tool, they may be used productively to pursue a clear objective but they cannot achieve multiple objectives at the same time.
- If competitive grants are to be productive, this requires attention to institutional development to both manage the program and exe cute the research.

- Competitive grant programs must be tailored to the size, resources, and objectives of each country or sub-sector they serve.
- Sustainability of the competitive grant culture depends on the autonomy of the fund, transparency and integrity of the process, and credibility of the results.

The "devil is in the detail" and the details are, most definitely, in the rich contributions that have been made in this workshop.

Country Cases

Chapter 1 - African Countries

Financing Agricultural Research in Africa: the Sustainable Financing Initiative

Derick W. Brinkerhoff

Introduction

Over the past twenty-five years, African agricultural research and natural resources management (AR/NRM) institutions have relied on international donors and national governments for the largest part of their research program and operating support. Under pressure from structural adjustment policies to decrease public spending, many national governments starting in the late 1980s began to cut funding for research institutions. At the same time, the public flow of resources to research became increasingly unreliable. The international donor community filled some of the funding gap, but as assistance priorities change and foreign assistance budgets decline, it is clear that reliance upon external funding for the agricultural research sector is not sustainable. Most African countries, however, depend heavily on their natural resource base and agricultural production for the livelihoods of the majority of the population. Agricultural research as well as technology development and transfer remain critical to their economic development.

The development of African agricultural science and technology, and especially the viability of African AR/NRM institutions, continues to be heavily influenced as well by other global forces. The globalization of financial markets, with an emphasis on export trade and competitive advantage, and the search for new products and new market opportunities (e.g., biotechnology), makes research and technology transfer all the more important for Africa's development. Participation in the global economy for agriculture/natural resource-dependent Africa depends upon effective linkages among research and technology producers, consumers, and funders.

In response to the need to address issues of financial sustainability for AR/NRM, the U.S. Agency for International Development (USAID), Bureau for Africa, Office of Sustainable Development, (AFR/SD), in cooperation with the Special Program for African Agricultural Research (SPAAR), housed at the World Bank, launched the Sustainable Financing Initiative (SFI) in 1994-95. This paper provides an overview of SFI, including its core analytic and operational approaches, past and current activities, and future directions.

Sustainable Financing: What is it?

At first glance, the definition of sustainable financing appears obvious. Most research managers would say that sustainable financing means having sufficient resources to cover the operating and capital expenses of their programs without having to worry about a shortfall. While this accounting notion of balancing budgets, expenditures, and investment is certainly relevant, sustainable financing contains other critical dimensions beyond basic sufficiency. Sustainable financing requires attention to financial mechanisms (both for mobilizing and allocating

Table 1. Sustainable Financing: Results Framework

Strategic Objective	Stable, broad-based, and sufficient funding is mobilized and allocated for high priority research and development and effectively performing research and technology programs.
Intermediate Result #1	Diversified mix of regional, national, and local funding mechanisms provide reliable and adequate resource flows to programs and institutions.
Intermediate Result #2	Responsive and results-driven Ag/NRM institutions and partners effectively fulfill their roles and responsibilities in generating R&D targeted on user needs and priorities.
Intermediate Result #3	Supportive and coherent policies enhance R&D applications, impacts, and competitiveness, and provide appropriate institutional incentives.

funds); the public institutions along with their private sector and NGO partners that are involved in generating, disseminating, and applying research and technology; and the policy framework that influences how a country's research and development (R&D) system functions. In seeking a clear definition, it is useful to think about sustainable financing in terms of its ultimate objective and what is needed to achieve that objective. This approach to defining sustainable financing is illustrated in the following table.

This table illustrates the critical linkages among sustainability, demand, and performance. If stakeholders and research and technology end-users feel that research programs have effectively performed to achieve desired purposes, ongoing support and funding are more likely. To reach this goal, national agricultural research systems (NARSs) need: diversified and reliable financing mechanisms; reformed and revitalized institutions, working in synergistic partnership with the private sector and NGOs; and policy frameworks that support demand-driven R&D and that offer incentives for performance. All of these elements combine to define sustainable financing. They point to a clear set of intermediate results that need to be attained in order to bring financial sustainability within the grasp of Africa's NARSs.

Sustainable Financing: Emerging Challenges and Opportunities

Agricultural research has made major contributions to economic growth and the alleviation of poverty; yet research systems face declining and unstable public funding, both from national and international sources. As a result, NARSs have experienced severe financial shortages, degradation of capacity, stop-start programs, and brain drain as researchers leave the system. Over the past several years, NARSs across the continent have begun experimenting with new financial mechanisms, and have undertaken institutional reforms to restructure and revitalize. National and regional agricultural research funds, commercialization, and cess-funded research are examples of these new mechanisms. Models of successful institutional reform are beginning to take shape as well. There is an ongoing need to document, take stock of, and share experience with new mechanisms and institutional models. An important emerging challenge concerns the policy framework necessary to support agricultural research and technology transfer. One aspect deals with

gaining a better understanding of supportive policies; another concerns the need to communicate better with stakeholders and policymakers. Researchers have often failed to transmit the message regarding the value of research, and thus have not built understanding of, or support for, the contribution of research to development. As NARSs pursue experimentation with new mechanisms, consolidate institutional reforms, and craft convincing messages to policymakers, opportunities for expanded funding for the agricultural research sector appear more promising than in the past. Another opportunity derives from the interest of the private and NGO sectors in collaborating more closely with public sector research institutions through cross-sectoral partnerships.

The Sustainable Financing Initiative

SFI is intended to promote experimentation with new financial mechanisms to support research and technology transfer. The objectives of SFI are to:

- Strengthen and diversify the financial base of African AR/NRM institutions, and
- Promote AR/NRM institutions' capacity to manage their research and technology transfer programs in a sustainable manner.

Accomplishing the first objective requires identifying alternative sources of funding, particularly from the private sector, and exploring new financial mechanisms. Addressing the second objective involves institutional reforms to reorient AR/NRM institutions to: manage strategically, improve financial systems and accountability, identify and respond to key stakeholders and clients, and link research and technology transfer programs to priority needs. SFI pursues its objectives through a variety of activities: 1) analytical and conceptual work; 2) coalition building within the international community on the importance of AR/NRM and of financial restructuring of research and technology transfer; 3) planning and technical assistance for AR/NRM institutions engaged in reform; and, 4) networking and information-sharing of SFI experience among current and prospective SFI partners and international donors. AID/AFR/SD has taken the lead on the first and third activities. It works jointly with SPAAR on the second and fourth activities.

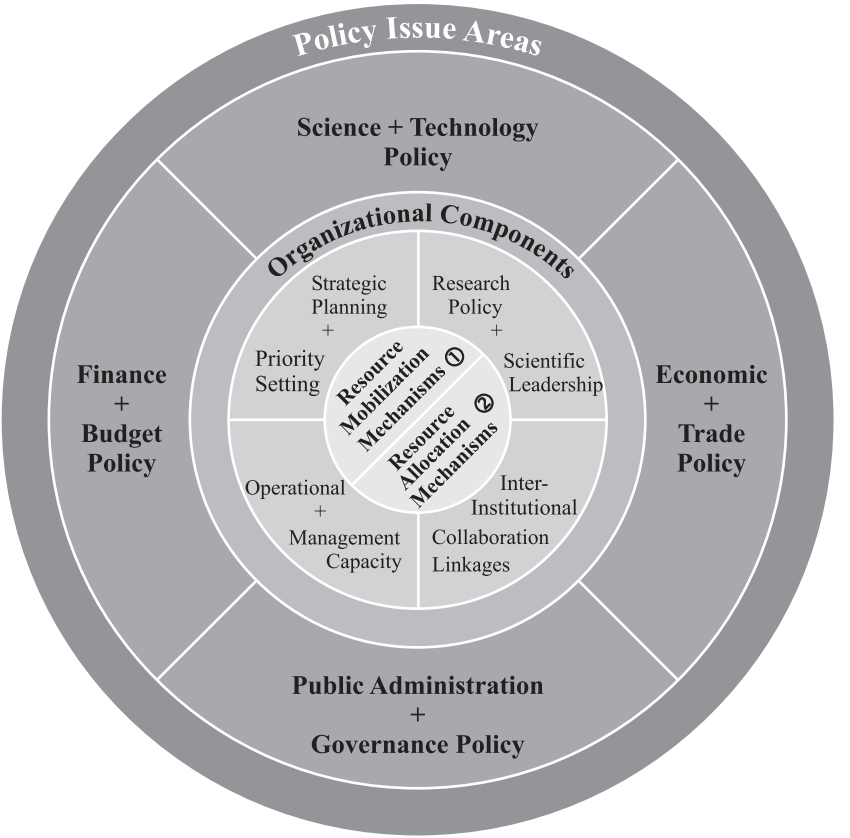
SFI Analytic Framework

It has become increasingly clear that sustainable financing involves much more than increasing and stabilizing financial resource flows to AR/NRM institutions. The diversification of funding sources for agricultural and NRM research leads to policy questions far beyond the agricultural sector, and a broad range of institutional considerations regarding the actors participating in AR/NRM far beyond the public sector. Capacity issues loom large in thinking about the use of various financial mechanisms to facilitate improved functioning within individual institutions, foster competition and demand-driven performance, and improve complementary efforts among the different institutional actors. The interconnected nature of these considerations requires shifting from the macro- to the micro-level and back.

SFI uses an analytic framework that situates the mechanisms for increasing the sustainability of financing within the overlapping organizational and policy environments that influence the selection, use, viability, and effectiveness of these mechanisms (see Bingen and Brinkerhoff, 2000). These three categories of variables (mechanisms, organizational components, policy issue areas) can be thought of as nested systems, each of which sits within a larger system (see Figure 1). This perspective, depicted as three concentric circles, facilitates thinking about what influences the viability of any SFI mechanism, as well as how various mechanisms raise related organizational and policy implications. This type of framework draws attention to the iterative and inter-related nature of decision-making related to sustainable financing and to the hierarchy of objectives involved in achieving financial sustainability (Table 1).

The mechanisms for financial sustainability are located at the center of the framework. These include two types of mechanisms: those designed to mobilize resources, and those designed to allocate resources. For the mobilization of financial resources, the most commonly used mechanisms are: commercialization, research contracts, levies, checkoffs or cesses, corporate joint ventures, and endowments. For the allocation of financial resources, the principal mechanisms include block or formula funding and competitive grant systems (CGSs).

Figure 1: Sustainable Financing Analytic Framework



① Resource Mobilization:

. Commercial Activities
. User Services
. Research Contracts
. Levies
. Checkoffs
. Corporate & Joint Ventures
. Endowments - Research Funds

② Resource Allocation:

. Block Grants/Formula Funding
. Competitive Grants Systems
. Regional Networks & Funds

The second circle comprises the organizational setting within which financing options are designed and implemented. It is useful to divide this setting into four component categories: strategic planning and priority setting, operational and management capacity, research policy and scientific leadership, and inter-institutional collaboration and linkages. These types of organizational components will influence the effective implementation of SFI financial mechanisms selected by an AR/NRM institution. Various financial mechanisms, in turn, can be designed to strengthen various organizational components of an AR/NRM institution.

The third circle contains the policy issue areas that influence the effectiveness of, and possibilities for, implementing selected financial mechanisms, as well as feasibility for a given AR/NRM institution to operate within, and to address components of its organizational setting. Major policy categories include: science and technology, finance and budget, economic and trade, and public administration and governance.

The Road to Sustainability

SFI's approach to sustainability recognizes that it is not an end-state, but rather an ongoing process of creating value for stakeholders so that they continue to provide the resources necessary for the continuation of the valued outputs. "The Road to Sustainability" plots a course of action for research institution managers to prepare their organizations for the changes necessary to survive in new funding environments. The first few steps on the Road constitute an organizational "turnaround" phase. They help managers examine their institution's situation and rebuild support among key stakeholders. The second phase on the Road concentrates on rebuilding institutional capital and then on moving to forward-looking strategic and financial planning. The Road concludes with a campaign for a sustainable balance sheet, through the negotiation of deals for financial mechanisms such as commercialization, dedicated taxes (levies and cesses), debt swaps, CGSs, and/or partial endowments. Table 2 presents the steps on the Road (see Ellsworth, 1998).

Table 2. The Road to Sustainability

Step 1	Organize for Change
Step 2	Clean up the Finances, Starting with a Major Audit and Installation of Accouting and Control Systems
Step 3	Conduct an Organizational Diagnosis
Step 4	Conduct a Regional Niche Assessment
Step 5	Fix the Governance Structure and Enabling Legislation
Step 6	Develop a Preliminary Strategic Vision and Reorganization Plan, then Get Mandate to Proceed from Key Stakeholders
Step 7	Enact the Mandate
Step 8	Get the Internal Incentives Right
Step 9	Prepare a Long-Term Sustainability Plan
Step 10	Implement the Plan

SFI Assistance Activities

Early SFI activities focused on identification and analysis of financing mechanisms (see, for example, Kalaitzandonakes, 1997; Gilles, 1997). AFR/SD commissioned several studies that informed the discussions and preliminary planning of SFI's field component, which was launched at a workshop held in Maastricht in September 1995 attended by the leadership of African AR/NRM institutions, donor officials, and technical experts. The workshop reviewed experience from other parts of the world with innovative financing mechanisms, and helped participants to clarify the financing problem confronting African AR/NRM institutions and to develop preliminary SFI workplans to search for solutions. At the SPAAR plenary meeting in Uganda in February 1996, three institutions were selected for assistance in implementing their SFI workplans: the Southern Africa Centre for Cooperation in Agricultural Research and Training (SACCAR) in Gabarone, the Network for Environment and Sustainable Development in Africa (NESDA) in Abidjan, and Ghana's Council for Scientific and Industrial Research (CSIR) in Accra. Subsequently two additional institutions were included for SFI assistance: ASARECA

(Association for Strengthening Agricultural Research in Eastern and Central Africa) in Entebbe, and the Agricultural Research Council (ARC) and the Department of Research and Specialist Services (DRSS) in Harare. Some assistance was also provided to the Madagascar Environmental Endowment Fund, Tany Meva. Beginning in 1998, SFI worked with two commodity research networks in Southern Africa, the Sorghum and Millet Improvement Program (SMIP) and the Southern Africa Root Crops Research Network (SAARNet).

In late 1998, SFI held a roundtable in Washington DC at the World Bank. The objectives of the roundtable were to review SFI experience to date and present lessons learned; review other selected experience with sustainable financing; identify the next generation of SFI issues, challenges, and opportunities; and reach a clearer understanding of current and new financial mechanisms and funding options for agricultural and NRM research. About 25 people attended the roundtable, including core members of the USAID and SPAAR SFI team, experts from other institutions, and the leaders of several of SFI's African partner organizations.

A year later, in December 1999, SFI organized a workshop at the Kenya Agricultural Research Institute (KARI) in Nairobi. Forty-five participants discussed and debated how to generate increased and sustainable funding for agricultural research and technology transfer. African participants came from 12 different countries, and from the public, private, and NGO sectors. They were joined by international donor agency representatives, technical experts, and a staff member of Uruguay's national agricultural research agency. The workshop focused on sharing experience with sustainable financing in Africa and South America, reviewing lessons learned, identifying future challenges and priorities, and discussing next steps.

The Nairobi Workshop

The observations and conclusions that came out of the Nairobi workshop can be divided into four categories: financial mechanisms and funding options, institutional reforms, policy issues, and partnership issues. Beyond conclusions, the workshop participants flagged some critical challenges for the future in each of these categories.

Financial Mechanisms and Funding Options

New financial mechanisms for mobilizing and allocating funding for agricultural research and technology transfer are at the heart of strategies for sustainable financing. The workshop concentrated on three: cesses, competitive grants, and commercialization. A common feature of all of these mechanisms is the need for government and private interests (both the business and NGO communities) to work together to make them effective and sustainable. This requires attention to the links among the mechanisms, institutions, and the policy framework; and touches upon issues of the roles of government and private actors in decision-making and governance of these mechanisms. None of these mechanisms is a substitute for core government funding of research and technology transfer.

Research and development cesses (levies, checkoffs) on exports or production can provide funding for research and technology development for commercial crops, and can help make R&D responsive to client needs. The tea industry in Tanzania has successfully used a cess to establish a demand-driven institute, the Tea Research Institute of Tanzania (TRIT), and to fund its research program. Critical to using cesses is the ability to create value-added for commodity producers so they will have an incentive to support the allocation of the cess for research programs. One way of encouraging industries to support R&D through cesses is for government to provide public matching funds to those generated by the cess, as shown by the Uruguay case. An informal survey taken among African workshop participants revealed that many countries have established commodity cesses. The workshop raised awareness of the potential of cesses and checkoffs for funding R&D.

Competitive grant systems (CGSs) represent a mechanism that has been utilized in different regions of the world to stimulate the development of new and responsive research agendas, and to introduce output-oriented and performance-based incentives for researchers. Participants stressed that making them work effectively calls for transparent and well-communicated procedures, training for scientists, clear connections between national priorities and grants, careful balance between autonomy and accountability, and progress/impact monitoring. CGSs should not be viewed as replacing more traditional

funding procedures, but rather as a supplement to them. CGSs can be used for a variety of purposes, from short- to long-term research. Tailoring them for these different uses takes place through the establishment of purpose-specific criteria for grant awards, performance, and impact achievement. Well-crafted criteria and effective procedures can encourage donors to agree upon similar administrative and reporting requirements that can greatly simplify CGS operations.

Commercialization is another option that agricultural research institutions faced with shrinking public sector budgets frequently employ to supplement their finances. KARI's and CSIR-Ghana's experiences with commercialization illustrate both the promise and the problems with commercialization. KARI has successfully generated resources through seed breeder's rights, contracts with private firms for crop research, and the sale of agricultural services (e.g., soil testing and pesticide residue testing); there is some potential for income generation from commercialization of genetic resources as well. CSIR has been less successful in pursuing commercialization, with the exception of oil palm seed production. Among the reasons are conflicting and unclear government policy messages regarding the definition of commercialization, weak CSIR capacity to identify and respond to user needs, and lack of donor consensus on what commercialization strategies are best for CSIR. While recognizing the desirability of commercialization and the benefits it can bring - in terms of both resources and responsiveness to users - participants were unanimous in their concern that the public goods nature of research not be neglected in the chase for private sector resources. Government funding will always be important to agricultural research institutions. Participants recommended pursuing commercialization with a sharp focus on comparative advantage, and at the same time carrying the message to policymakers regarding the returns to publicly funded research.

Government funding: Government funding has an important place in supporting R&D. Traditionally, public funding has been provided in the form of block grants and/or institutional budget allocations from the treasury or from ministries (e.g., finance, science and technology, agriculture). Despite the criticism that block funding as a mechanism does not provide research institutions with incentives to focus on performance and be responsive to clients, some amount of core funding

for basic operations is necessary. It is important to recognize that alternatives exist for government funding that extend beyond complete reliance on block grants or budget allocations. For example, governments can fund R&D by allocating commodity taxes to research cesses and/or by contributing funds to CGSs along with the private sector and international donors.

Institutional Reforms

Robust and performance-focused institutions are essential to effective NARSs, but, too frequently, they are lacking. Restructuring is one approach used by policymakers and managers to adjust organizations to changes in the environment or new demands and circumstances. Structural changes may help improve the quality of work, manage scarce resources more carefully, bolster staff morale, and generate outside support for the work of the organization. For example, in 1996 in Tanzania, the Ministry of Agriculture and Cooperatives devolved responsibility for tea research to a new autonomous institution, TRIT, with a board of directors that included both government and industry representatives. The new institution represents a promising example of institutional reform instigated by industry and government stakeholders that explicitly reframes the tea research mandate around responsiveness to industry demand and high quality performance. Another nascent example comes from Côte d'Ivoire, where over the past year the NARI has been transformed into a non-governmental entity with the government as the minority shareholder. CNRA is poised for success, though its potential is at present largely untested. Work remains to be done on revamping management systems and procedures to assure that the institution can take effective advantage of its new status, and respond to demand. The INIA-Uruguay case, where in 1990 the research institute was restructured as an autonomous agency, serves as a testament to the beneficial results of a reinvigorated structure and to the importance of an active board of directors. INIA's board is composed of four farmer representatives (two regular and two alternate) and two public sector members; one of latter serves as president. Other countries can learn from these examples.

Policy Issues for Agricultural Research Financing

Throughout the workshop, participants confirmed the importance of conducive policies for agricultural research funding. A critical point made repeatedly was the need for public discussion, debate, and information dissemination regarding the role of agricultural research and technology in socio-economic development, rural poverty alleviation, income generation, food and nutritional security, and sustainable natural resources management. A policy framework is needed that: a) increases the efficiency of resource allocation to research, b) enhances the ability of research systems to generate and disseminate new technology, c) promotes stable funding flows to research systems from government, d) induces the formation of partnerships between researchers and research/technology users, and e) promotes performance incentives for agricultural research. Creating such a framework, participants agreed, involves analysis to identify policies necessary to achieve these five objectives, and outreach for sensitization and advocacy to the broader policy community beyond the usual interlocutors that researchers are used to dealing with. Successful outreach depends upon crafting and delivering messages that resonate with this broader community's interests. Researchers should link what they can contribute to larger development policy issues. The research community needs to avoid being perceived by policymakers as simply an interest group pleading for more resources. This means it is important that positive links to stakeholders are established so that they will make the case for the value of research.

Partnerships for Research and Technology Transfer

A paramount theme at the workshop was the centrality of partnerships. Participants from the public as well as the private and non-governmental sectors converged in a common recognition that each of their sectors has an important role to play in developing and maintaining effective and sustainable NARSs. While recognizing that, for the most part, public sector research and technology transfer institutions have in the past failed to provide the research output and technologies to meet user needs; nonetheless, the private and NGO sectors are eager to collaborate with public research entities to improve the situation. Among the roster of potential partners to link with public researchers are commodity associations, local as well as national governments (e.g., decentralized

extension services), universities, and very importantly, farmers' associations. Successful partnerships will concentrate upon research and technology development that is targeted on key problems and constraints, and is cost-effective; the catchphrase is "value for money." They will include farmers as full participants in research priority-setting and fieldwork, and recognize the realities facing farmers in terms of risk, market outlets, credit constraints, transportation infrastructure, and so on. Partnerships pose management challenges as well, since they call for new interfaces between cooperating sectors and high degrees of coordination and integration.

Challenges Identified

Sustainable financing remains a critical problem for the effectiveness of agricultural research and technology transfer. It needs to be a top priority for Africa's NARIs and NARSs.

Financial Mechanisms

- Better documentation and dissemination of ongoing innovation and experimentation. A need to get the attention of policymakers.
- A mix of mechanisms is needed: budget line item funding, commercial contracts, competitive grants and endowments. A need to maintain focus on all components of the mix, with realistic expectations for each one.
- Recognize that success with mechanisms is dependent upon institutional capacity.

Institutions

- Institutional capacity building remains a core challenge.
- New challenges for research institutions are posed by decentralization, privatization, and pressures for accountability.
- The management challenge is increased by the cross-sectoral nature of sustainable research systems: new partnerships.
- Leadership and commitment for reform are critical but can be hard to find/sustain.

Policy

- More understanding of the policy process is essential.
- Better-targeted and effective policy communication and advocacy is required.
- More constituency building is needed among research and technology users regarding the link between policies and sustainable financing.
- There is a need to expand the policy focus beyond agriculture to include science & technology policy: broader policy frameworks.

Partnerships

- Moving from "buzz word" to reality: what works and how?
- Identifying and working with new partners; e.g., farmers associations, agribusinesses, and agricultural development banks.
- Building new skills for managing partnerships.

Current and Planned SFI Activities

To respond to these challenges, SFI developed an options paper that was discussed at the SPAAR Plenary meetings in Conakry in April 2000. Based on those discussions, SFI's current and future activities include the following:

Financial Mechanisms

- An inventory of selected African experience with financial mechanisms. This study expands upon and formalizes an informal survey conducted at the Nairobi workshop
- ASARECA Regional Fund: Establish a CGS at ASARECA.
- Tree Crops Network Fund: Design and set up a CGS for tree crops R&D in West Africa.
- Training in proposal development and preparation for researchers to help them develop fundable proposals.
- Training in grant management to build CGS managers capacities in overseeing the grant-making process from start to finish, from running an efficient proposal solicitation, review, and award process, to monitoring and evaluation.

- Training in commercialization to help researchers and research managers develop skills in identifying private sector opportunities, discussing research and technology needs with private sector operators, costing proposals, and negotiating commercial contracts.

Institutions

- Identification of partners requiring capacity-building support. SFI partners planning or carrying out institutional reforms will selfassess and self-nominate for assistance needs.
- Preparation and implementation of institutional reforms. These could address such issues as accounting and financial systems improvement, management systems for commercialization, establishment of pre-conditions for partnerships, researcher incentive systems, etc.
- Analysis leading to institutional quality certification to develop a set of agreed-upon accounting and financial management standards. This could be used to assure potential funders that their resources would be transparently utilized and accounted for.
- Training in strategic management of research systems to give NARS managers the capacity to anticipate change, clarify their mission and mandate, focus on the key features of their external environments, identify stakeholders, and plan for the achievement of long-term financial and impact objectives.

Policy

- Study of policy frameworks for African agricultural research and technology transfer. This study will: a) identify the policy factors related to fostering or limiting the effective operation of sustainable agricultural research and technology transfer systems; b) prioritize those factors in terms of impact and importance; and c) propose strategies for improving the policy framework for agricultural research and technology transfer.
- Development of policy communication strategies and design information campaigns that relate agricultural research to poverty

alleviation, income generation, sustainable NRM, etc. These could be done nationally or regionally. Countries/regions would be selected based on the willingness of local champions to take the lead on the strategies and the campaigns.

- Coalition-building of stakeholders supportive of increased and stable funding for agricultural research and technology transfer.
- Training in policy communications, advocacy and lobbying to help researchers become better communicators and advocates for agricultural research.
- Training in policy analysis and research to help researchers understand the policy process and explore ways to make agricultural research results useful for policy clients as well as for technology users.

Partnerships

- Survey and analysis of partnerships to identify who is currently pursuing research and technology transfer partnerships, inventory their key features and activities, analyze outcomes, and categorize constraints. Analysis will focus on success factors, best practices, strategies, lessons, etc.
- Facilitation of partnership formation. This could involve, for example, working with farmers' or commodity producers' associations to develop outreach plans to new partners, to refine or restructure existing partnerships to make them more effective.
- Training in partnership formation and management.

Information dissemination

- Expanded interactive SFI website (*www.worldbank.org/afr/aftsr/sfi1.htm*).
- Regional, or in some cases, national workshops and seminars.
- Publications, including AID/AFR/SD's publications series of SFI reports and World Bank documents of interest to the agricultural and NRM research community, for example ESDAR reports, and AKIS publications.

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Chapter 2 - Bangladesh

Contract Research Scheme - an Experience of Competitive Research Funding [1]

Wais Kabir

Introduction to Agriculture in Bangladesh

Bangladesh is one of the world's most densely populated countries, and its economy is ranked as low-income, considering the national annual income per person. Agriculture (crops, livestock, fisheries and forestry) remains an important sector in the country's economy. At present it contributes about 30% to the GDP, provides employment to about 65% of the workforce and accounts for 17% of export earnings. Economic growth sufficient to relieve poverty requires stimulating significant growth in agricultural output and productivity. Bangladesh has a total of 7.2 million hectares of net arable land. The crop sector alone accounts for a 73% share of agricultural output followed by fisheries, livestock, and forestry. Within the crop sector, rice dominates the total cultivated land.

Introduction to the Agricultural Research System in Bangladesh

Several agricultural research institutes and two universities are carrying out most of the agricultural research. The Bangladesh Agricultural Research Council (BARC) was established in 1973 as the national agency to coordinate agricultural research in the country. Ten agricultural research institutes now constitute the National Agricultural Research System (NARS). The Bangladesh Agricultural Research Council (BARC) is the apex body that coordinates the research activities within the NARS. BARC leads the NARS in terms of planning and establishing priorities, monitoring of existing research programs and feedback evaluation of the programs, coordination among various

[1] The views expressed in this article are the authors own and in no way reflect official views of the institute he serves.

programs and activities. The BARC is now controlled by a Governing Body (GB) that is represented by a wide range of public and private members, taking into consideration stakeholder participation. The GB is chaired by the Minister of Agriculture and co-chaired in rotation by the Minister for Livestock and Fisheries and Minister for Environment and Forestry.

The Executive Council is the second highest body of NARS after the GB. It is composed of the chief executive of BARC as chairman, head of the divisions of BARC and head of the NARS institutes. It implements the decisions of the council and approves the research program of NARS.

NARS Institutes:

1. Bangladesh Agricultural Research Institute, BARI
2. Bangladesh Rice Research Institute, BRRI
3. Bangladesh Jute Research Institute, BJRI
4. Bangladesh Livestock Research Institute, BLRI
5. Bangladesh Fisheries Research Institute, BFRI
6. Bangladesh Forest Research Institute, BFRI
7. Bangladesh Sugarcane Research Institute, BSRI
8. Bangladesh Institute of Nuclear Agriculture, BINA
9. Bangladesh Tea Research Institute, BTRI
10. Soil Resource Research Institute, SRDI

Other than the above institutes, two agricultural universities, some public universities, scientific and industrial research agencies, NGOs and few private firms are associated with NARS activities.

NARS employs about 1700 scientists and technologists. Each institute has research stations/substations spread throughout the country, representing thirty agroecological zones. NARS has approximately five thousand hectares of research area. Among the total number of researchers, about two hundred are PhDs, and one hundred and sixty are MSs in major fields of agriculture (agronomy, breeding, entomology, horticulture, soil, water management, livestock, fisheries, forestry etc.). Agricultural research expertise has been centered mainly in commodity based institutes that give little choice for competition in research granting. The public agricultural universities also have about five hundred researchers/teachers.

The administrative nature of the institutes under NARS is not homogeneous; some are government departments while others are autonomous under different ministries. Autonomous institutes are run by the Board of Management and represented by scientists outside the institutes, representative of the public and private sectors.

The scientific expertise of NGOs and the private sector in the field of agricultural research is minimal with little or no research infrastructure or background. A few private research entities are now emerging but their focus is mainly on policy and socio-economic research requiring minimal infrastructure support.

Financing of Agricultural Research

The World Bank (IDA) and USAID have been the main donors supporting the agricultural research system in Bangladesh. Collaborative research with international agricultural research centers is also carried out in some institutes. Donor projects with domestic counter-part funding constitute the NARS budget.

The research operational budget (cost for input, labor, travel) has been very low compared to total budget allocation for the NARS institutes, with an average of around 10%. Major expenditure occurs because of salaries and other overhead line items.

Every year, the Ministry of Science and Technology provides research grants towards innovative scientific research among different individuals/ agencies. The average size of the grant is about one or two thousand dollars each reaching a total of fifty thousand dollars.

The evaluation process of this grant is simple: different international development partners working in the country support research but mostly on policy, planning and economic studies.

Most universities and private agencies participate in this research with a block grant without any competition. Public universities receive a modest research grant from the University Grants Commission.

The Contract Research Scheme, an Alternate Source of Research Funding

Contract research is a form of research funding provided to research institutes/agencies on contract basis against an approved proposal submitted by a researcher of the institute. The process of granting contracts is getting more competitive through evaluation. The contract research program of the Bangladesh Agricultural Research Council (BARC) is a mechanism for awarding grants to conduct specific research by the scientists of the NARS and elsewhere that are identified by BARC as necessary in support of the national development goals. The contract research scheme provides complementary funds to the agricultural research institutes/agencies on a competitive basis. The contract research focuses efforts on areas of immediate concern to seek ways of increasing agricultural productivity in Bangladesh. These are relatively short-term and designed to find solutions of a practical nature in which inter disciplinary and inter-institutional expertise can be used to address specific problems of agricultural production as defined in the National Development Plan. Under the scheme, funds are awarded to institutes/ agencies to conduct research either singly or in collaboration with scientists at the same institute, other institutes or in farmers' fields in the service areas of their respective agencies.

Contract research has been institutionalized at BARC as supported by the Agricultural Research Projects I and II (IDA I and IDA II) since 1976. Mainly NARS institutes, some public research agencies and universities participated in the program. US$1.35 million (less than 50% of the provision) was spent during 1981-87 under a project provision of the World Bank. Over the last several years, the contract research has yielded several benefits. It has enabled BARC to adequately support research on problem areas of high priority and high probability of success within a reasonable period. It has encouraged inter-disciplinary and inter institutional research collaboration, resulting in effective and meaningful utilization of expertise and other resources. Due to these advantages, BARC is very much in favor of continuing the contract research program with different research institutes.

At present, under the project funding of Agricultural Research Management Project (ARMP, IDA credit), a provision of US$7.7 million

(13% of the total project cost of US$59 million) has been allotted for contract research grants for the 1997-2001 period. The current project has been designed for a wider participation of various stakeholder agencies including the private sector and NGOs.

The evaluation process has been redesigned to include vetting by regional and national extension-research committees - ATC/NATCC. The Agricultural Technical Committee (ATC) provides a forum for linkage between extension and research staff at the regional level while NATCC is the highest forum at the national level.

The contract research program has the following cycle of operation:

- Fixation of the priority of research areas
- Call for contract research proposals
- Vetting from Regional/National Committee
- Submission of proposals
- Review process for approval
  - Technical Division Level (processing)
  - Technical Advisory Committee (TAC)
  - Executive Council & endorsement in the Governing Body
- Contract signing
- Release of fund in installments
- Monitoring: desk monitoring and field monitoring
- Submission of quarterly technical and financial reports
- Submission of annual reports
- Presentation of the progress in the annual review workshop and evaluation
- Submission of Final reports (completion report)
- Evaluation of the process
- Technology transfer

The priorities of the researchable areas are established based on the document "Strategic Plan for the National Agricultural Research System to the Year 2010 and Beyond". The document is prepared with the participation of experts from various disciplines and with the leadership of BARC. Input for the document comes from relevant literature and the outcome of national seminars and workshops. Moreover, workshops and seminars are also organized to set the priorities. The technology/

information generated through contract research is disseminated through the process of technology transfer.

Participation and Ceiling for Each Contract Grant

All institutes involved in agricultural research - including, but not limited to the NARS - are eligible for grants made under the provision. Usually, any amount is acceptable but US$ 50,000.00 (maximum) per contract has been found to be most manageable. Operational support and research personnel of essential nature are allowed under the contract grant. Small equipment of a maximum 20% of the total cost is admissible under the contract. Research proposals of a maximum of three years duration are allowed for funding the ongoing project.

Approval Process

The grant to be sanctioned under the contract research scheme is evaluated based on a number of priority criteria and a scoring system. The scoring depends on the following criteria from the proposals:

- Capability of the proponent within the resources available
- Field orientation/solving current issues/problems (the proposals are vetted in the ATC/NATC depending the regional or national nature of the problem)
- Immediate applicability
- Representative of a major area
- Soundness of methodology and high probability of success
- Reasonability of budget
- Inter-institutional
- Inter disciplinary

The proponent institute/agency evaluates the proposals before their submission to the BARC. After the proposals reach BARC, they are distributed to the related technical divisions for processing. The technical divisions then pass the proposals to the Technical Advisory Committee (TAC) for evaluation and recommendation. The members of the TAC are drawn from a pool of professional experts maintained at BARC and senior level managers of BARC including the program leader of socio-economics. The proposal is sent to the members of the TAC ahead of the

meeting. Anonymity of the external TAC members (experts) is maintained. Recommended proposals are given to the Executive Council (as described above) for final approval but the endorsement of the GB is necessary before funding. The approval process has been made transparent throughout the cycle. The evaluators screen all of the proposals submitted and the proponents whose projects fail to qualify are informed of the outcome of the evaluation process.

The fund is released in installments with initial 25% of the total cost made available shortly after the contract signing and 65% released based on progress toward project milestones. Ten percent of the total cost remains with the council (BARC) until a satisfactory final report is submitted. Project monitoring is based on regular quarterly progress reports sent by the recipient and field visits by the concerned division of BARC when necessary. In addition, monitoring is done centrally by a multidisciplinary team. Total disbursement under contract research has been US$2.2 million as of March 2000. This represents 50% of the total fund committed (US$5.4 million).

Agencies Participating in the Current Contract Research Grant

A large number of government, NGO and private sector agencies applied for the grant by submitting proposals. Seven hundred proposals were received following an open announcement in March 2000. Of these, two hundred and thirty one research proposals (33%) qualified following the evaluation process and have been accepted for implementation. NGOs and private sector organizations took part in the bidding for competitive grants under contract research for the first time. NARS agencies occupy the major share of contracts followed by universities as shown in the Table 1. The distribution of grants among different areas of research varies. The share of crop research is highest (34%) followed by soils (13.6%), economics and social science (9.5%), and livestock (8.4%).

Constraints and Limitations of the Operation of Contract Research Grant

Contract research has been supported as one of the components of donor supported projects. This funding system has been unsustainable due to intermittent funding support. The life of the contract ends with

the end of the mother project. This affects the continuity of the research endeavor.

Table 1. Distribution of Contract Research Grant under Agricultural Research Management Project (ARMP) as of March 2000.

SI. No.	Institutes involved	Total no. of contracts	% of total contacts
1	NARS	127	55
2	Universities	73	31
3	Other public agencies	10	4.3
4	NGOs	16	07
5	Private agency	5	2
	Total	**231**	**100**

As stated earlier, actual utilization of the fund remains below the budget provision in the project. The committed cost ranges from 50 to 60% of the provision. The inadequate and wide-ranging research capacities of the system are some of the reasons for this. The lack of additional support and strength to monitor the individual grant hampers contract research performance.

The proponent agency's lack of appreciation of its role as a stakeholder in the research being undertaken restricts proper research performance. Often, there is the feeling that the research is sponsored by another agency (BARC).

Contract grants provide less attractive financial remuneration to the researchers. This discourages potential researchers from participating. Direct contact with donor supported piecemeal research work provides more remuneration than the contract research grants.

The inadequate research capacity of the NGOs and the private sector restricts their participation. The contract grant does not provide equipment

support, and many research agencies with adequate expertise fail to participate due to this.

Due to its attachment with investment projects, the contract research scheme is time bound and a large number of proposals are to be managed in a stipulated period that creates management problems.

Conclusion

In Bangladesh, contract research has been in operation for donor supported projects but has not been sustained on continuous basis. The existing time bound source of funding on a temporary basis for contact research can be made sustainable by devising alternate mechanisms. A form of endowment fund (or seed money) with or without project attachment could have significant results in financing the research on a competitive and sustainable basis. This could make management easier and only potential research would be patronized in a sustainable manner in areas of immediate intervention. It is expected that the research output will be enhanced through the system proposed.

Incentives may be provided to researchers and the research managers to create a more competitive environment. Institutional arrangements may be made for this. However, for a more competitive environment, more experimentation in this area is required. An orientation course for capable NGOs and private sector organizations may be arranged to upgrade their proposal writing skills and develop awareness on the objectives of the grant. Instead of submitting complete proposals, the proponents may submit a concept note (pre-proposal) without details in the initial stage of submission. An alternative evaluation process may be examined to make it more simple and competitive.

The capabilities of both public and private agencies should be strengthened in terms of facilities and expertise in order to be able to compete in the contract grant process.

Chapter 3 - Brazil

Embrapa's Competitive Grants Scheme (PRODETAB)[1]

Francisco J. B. Reifschneider

Introduction

Embrapa, the Brazilian Agricultural Research Corporation, initiated internal discussions in 1995 towards the establishment of a strategy that would lead to the financing of a new operation by the World Bank, the fourth since Embrapa´s inception in 1973. The project proposal, named ***PRODETAB*** - Projeto de Desenvolvimento de Tecnologia Agropecuária para o Brasil (Agricultural Technology Project) considered the establishment of a competitive grants scheme (CGS) for agricultural research & development as its main component.

Previous experience in Brazil in the implementation of competitive grants systems is rich and successful, and federal and state agencies such as the National Research Council and FAPESP, FAPEMIG and FAPERJ have acquired considerable experience in running competitive grants systems. This experience was fully utilized by the team designing the operation of ***PRODETAB's*** CGS.

Key elements that determined Embrapa´s main interest in the establishment of such a system were: a) to strengthen the National Agricultural Research System (NARS), coordinated by Embrapa; b) to increase the R&D cooperation among national and international, private and public institutions, including Embrapa´s own research centers; c) to increase the linkages between stronger and weaker national agricultural R&D institutions, as to allow capacity building in the less developed partner institutions; d) to experiment with a new, flexible, participative, transparent and targeted R&D project selection, financing, monitoring

[1] In this publication, chapter 11 by Lele and Bresnyan on Competitive Grants Programs: The Case of Prodetab in Brazil presents the World Bank view on the Brazilian program.

and evaluation scheme; and e) to complement the core program with a competitive grants system which could, therefore, be targeted to four key areas, namely small farm agriculture, natural resources management, advanced technologies, and agribusiness, in addition to strategic studies. It is relevant to mention that the new Brazilian Constitution, passed in 1998, established a new set of limitations on the allocation of federal resources to states, which actually limited the ways that partnerships had been originally built and expanded through Embrapa's actions as leader of the National Agricultural Research System. Therefore, the increased flexibility that could be built into a new CGS was also of paramount importance to support the agricultural research sector in a large country with a myriad of agroecosystems.

The World Bank loan was approved in 1997 and project implementation was immediately initiated.

Key Characteristics of PRODETAB's Competitive Grants Scheme

Joint CGS development: PRODETAB's CGS has benefited greatly from the discussions held with the World Bank teams responsible for joint project preparation and supervision in the last three years. World Bank experience in the establishment of CGS elsewhere, and the national experience already referred to, were of capital importance to the establishment of a CGS that built upon previous experience and lessons.

Main specific objectives: To increase the efficiency of fund allocation for agricultural research and technology transfer, increasing the quality of proposals and consequently of R&D activities; to foster multidisciplinary and multi-institutional interactions among the members of the NARS, diversifying partnerships nationally and internationally; to increase funding opportunities for NARS institutions, paying particular attention to the inclusion of universities, producers' associations and non governmental organizations; to mobilize professionals - and not only scientists - in the agricultural field who were not previously engaged in agricultural research and development; to increase the relevance of agricultural research and technology transfer by making it more client-oriented; and to increase agricultural R&D impact, both upstream and downstream.

Focus areas/research lines supported: The CGS, due to the limitation of resources and the need to clearly show impact, concentrated its support on four main areas - small farm agriculture (locally referred to as family agriculture), advanced technologies, natural resources, and agribusiness. Additionally, previously unanticipated strategic studies of regional or national relevance could be supported. Within the focus areas, each call for bids specifically defines which research and development themes are supported. Emphasis is given to small farm agriculture and natural resources.

Priority setting: Certainly one of the most complex activities of PRODETAB's CGS, priorities are set for each call for bids through extensive consultation with key stakeholders including the Ministry of Agriculture and Food Supply, EMBRAPA's national program technical committees, private sector representatives (full spectrum), and the research and NGO communities. Previous priority setting exercises held by other institutions in Brazil are key inputs to the CGS own exercise, which may also involve consultation through specific workshops. Final decision on R&D lines to be supported in each call for bids, as well as resources available for each of the lines, rests with PRODETAB's Executive Committee.

Broad institutional/professional base: To expand the participation of stakeholders, the CGS was designed to focus its initial evaluation on the quality of the proposal without relying heavily on the purely academic qualification of the proposing R&D team. This "non-elitist" approach allowed the rapid mobilization of human resources that, otherwise, would have been excluded from the process. Projects require at least two and a maximum of five institutions as executing agencies. As part of the R&D project, each executing agency has a specific subproject which presents in detail the research plan (materials, methodology, etc), criteria and indicators for performance assessment and related financial requirements.

Governance: The CGS is managed by an Executive Committee (ExCo) of nine members, the majority being external to EMBRAPA. The president of ExCo is nominated by the president of Embrapa. ExCo is supported by a Secretariat which is part of Embrapa's Secretariat for International Cooperation (SCI). CGS operations are very complex due

to the restrictive Brazilian legislation, and the CGS Secretariat makes full use of Embrapa's own technical and administrative units (Technical Committees, Legal Office, Finance Department, Audit Office etc.) for project management and support. This has allowed the CGS to be run by a very small group of professionals at SCI. Nonetheless, small and manageable conflicts due to competing activities are observed daily.

Financial resources: Although PRODETAB's total allocation to the CGS (US$72 million in five years) represents only a fraction of Embrapa's US$330 million/yr budget, the R&D project resource management flexibility built in the CGS has been an element of project manager empowerment previously absent in the NARS. The use of private foundations as financial resource managers on behalf of the participating institutions in individual R&D projects was of critical significance for this added flexibility.

Stakeholders' participation: During the preparation and initial stages of the CGS operation, major efforts were made to ensure stakeholders' views were properly considered and incorporated. This required the CGS Secretariat to travel extensively in order to introduce the newly established CGS to potential client institutions and to hold national teleconferences open to the public. A roster of over 1,500 public and private organizations was developed and a direct mail system was put in place to ensure the call for bids were properly advertised and mobilized as much participation as possible. National organizations were advised that foreign (national and international) advanced research organizations could also participate if their activities were to be developed in Brazil - a governmental requirement. Effective stakeholders participation has also allowed the CGS to greatly simplify the often purely bureaucratic requirements for project proposal submission. Although the burden on researchers and other R&D professionals has been reduced to a minimum, federal legislation imposes tight controls on financial management and, more recently, on technical outcomes - a welcomed change in federal auditing procedures.

Upper level commitment: In 1999, Brazil faced a major financial crisis which had a direct impact on budget allocated to PRODETAB[2] as a whole. To maintain CGS credibility and to guarantee the continuity of ongoing CGS-supported R&D projects, EMBRAPA reallocated funds

[2] For details on PRODETAB as a whole refer to Lele and Bresnyan's paper.

from PRODETAB's institutional strengthening component into the CGS. This decision has had a large and additional positive impact on PRODETAB's CGS perception by stakeholders.

Transparency: The broad constituency of the CGS' Executive Committee, the regular use of internet and direct mail to keep proponents informed of the decisions, the disclosure of information related to proposal review, and the constant involvement of stakeholders in different aspects of CGS implementation and adjustment have allowed participants to recognize transparency as an important element of PRODETAB's CGS. Constant improvements to ensure an ever-increasing degree of transparency, while ensuring confidentiality when required (due to intellectual property issues, for example) are, however, a must. Project related documents (proposal forms, contracts, financial reports, etc.) are all available through the internet, on diskettes and in printed form.

Monitoring and Evaluation (M&E): It is generally recognized that many CGS lack strong M&E, mostly due to the expense and operational difficulties associated with the implementation of an effective and efficient M&E procedure. PRODETAB's CGS has tried to address this issue by organizing visits to individual projects, with the participation of members of the ExCo with other scientists who act as project reviewers, using standardized forms for project assessment. Additionally, R&D project coordinators have come together to discuss ways of improving project implementation. This exchange of experiences has been a rich provider of input for the adjustment of CGS procedures. In addition to monitoring progress of individual projects, previously agreed indicators are used to assess CGS progress as a whole.

Flexibility in allocation of World Bank's resources to R&D projects: Despite the fact that World Bank finances 50% of PRODETAB, required counterpart resources in individual R&D projects is variable. This has allowed PRODETAB's CGS to favor, for example, research and development work for small farm agriculture where PRODETAB's contribution has been 70% since inception. This added flexibility negotiated with the World Bank during project preparation has allowed a much larger number of small organizations to participate in the CGS.

Project Performance

Since 1997, five call for bids have been published. Not all areas have been considered in every call due to budget limitations. The following tables present an overview of the CGS performance.

Conclusion

The Competitive Grant Scheme being implemented by EMBRAPA is viewed as a positive experience not only because it has been reaching the agreed goals and expected impacts, but above all due to the introduction of new ways of supporting agricultural research and development in the country. The spill over effect onto Embrapa's and other state agricultural research systems has been significant and, to date, two additional Brazilian states (states of São Paulo and Paraná) have started to establish their own CGS for the agricultural area. With an adequate scientific and technological market in place, CGS are mechanisms that can further enhance the R&D capacity of a country by mobilizing resources in innovative ways. The bureaucratic hurdles and the sustainability of a CGS once external financing is over present major challenges to those responsible for implementation.

PRODETAB CGS. Institutional participation (# of projects) by call and geographic region (*)

Region	# projects submitted						# projects approved					
	1/97	1/98	2/98	1/99	2/99	Total	1/97	1/98	2/98	1/99	2/99	Total
MID-WEST	**20**	**27**	**6**	**5**	**22**	**80**	**1**	**8**	**0**	**0**	**3**	**12**
Distrito Federal	12	17	6	4	12	51	1	6	0	0	3	10
Goiás	4	4	0	0	8	16	0	1	0	0	0	1
Mato Grosso	1	1	0	1	1	4	0	0	0	0	0	0
Mato Grosso do Sul	3	5	0	0	1	9	0	1	0	0	0	1
NORTHEAST	**44**	**40**	**4**	**6**	**17**	**111**	**4**	**4**	**0**	**0**	**2**	**10**
Bahia	7	4	1	1	4	17	1	0	0	0	0	1
Ceará	15	14	1	1	4	35	0	2	0	0	1	3
Maranhão	2	1	0	1	0	4	0	0	0	0	0	0
Paraíba	7	9	1	1	1	19	0	1	0	0	0	1
Pernambuco	13	7	1	1	7	29	3	1	0	0	1	5
Piauí	0	1	0	0	0	1	0	0	0	0	0	0
Rio Grande do Norte	0	3	0	1	1	5	0	0	0	0	0	0
Sergipe	0	1	0	0	0	1	0	0	0	0	0	0
NORTH	**11**	**15**	**2**	**1**	**10**	**39**	**1**	**4**	**2**	**0**	**1**	**8**
Acre	1	2	1	0	0	4	0	0	1	0	0	1
Amazonas	0	5	0	1	6	12	0	1	0	0	0	1
Pará	8	7	1	0	4	20	0	3	1	0	1	5
Rondônia	2	0	0	0	0	2	1	0	0	0	0	1
Roraima	0	1	0	0	0	1	0	0	0	0	0	0
SOUTHEAST	**36**	**39**	**14**	**20**	**35**	**144**	**3**	**5**	**3**	**5**	**12**	**28**
Espírito Santo	2	2	2	1	0	7	0	0	0	0	0	0
Minas Gerais	13	17	4	9	14	57	2	3	0	1	5	11
Rio de Janeiro	9	8	2	7	9	35	1	2	1	3	4	11
São Paulo	12	12	6	3	12	45	0	0	2	1	3	6
SOUTH	**26**	**47**	**11**	**18**	**31**	**133**	**0**	**5**	**0**	**1**	**5**	**11**
Paraná	8	16	3	7	11	45	0	1	0	0	2	3
Rio Grande do Sul	13	20	3	3	6	45	0	1	0	0	0	1
Santa Catarina	5	11	5	8	14	43	0	3	0	1	3	7
TOTAL	**127***	**168**	**37**	**50**	**115**	**507****	**9**	**26**	**5**	**6**	**23**	**69**

(*) Considering only the location of the coordinating institution.
(**) Includes 1 project submitted but out-of-scope.

PRODETAB CGS. Institutional participation (# of projects) by call and theme

Area	# projects submitted						# projects approved					
	1/97	1/98	2/98	1/99	2/99	Total	1/97	1/98	2/98	1/99	2/99	Total
FAMILY FARMING	58	63	-	18	30	169	4	8	-	1	4	17
ADVANCED TECHNOLOGY	35	49	-	12	14	110	0	8	-	4	3	15
NATURAL RESOURCES	28	41	1	19	60	149	4	8	0	1	13	26
AGRIBUSINESS	11	10	22	1	11	55	1	2	2	0	3	8
STRATEGIC STUDIES	4	5	14	-	-	23	0	0	3	-	-	3
TOTAL	**136**	**168**	**37**	**50**	**115**	**506**	**9**	**26**	**5**	**6**	**23**	**69**

PRODETAB CGS. Institutional participation

Category	# of projects coordinated / # of subprojects implemented													
	1/97		1/98		2/98		1/99		2/99		Total			
	Projs.	Subp.	Projs.	Subp.	Projs.	Subp.	Projs.	Subp.	Projs.	Subp.	Projs.	%.	Subp.	%.
EMBRAPA	6	13	18	34	3	7	4	9	14	31	45	65	94	44
STATE RESEARCH ORGS.	1	3	3	14	0	1	1	4	6	15	11	16	37	18
UNIVERSITIES	1	6	4	22	1	2	0	6	2	19	8	12	55	26
OTHERS	1	3	1	7	1	3	1	2	1	11	5	7	26	12
TOTAL	**9**	**25**	**26**	**77**	**5**	**13**	**6**	**21**	**23**	**76**	**69**	**100**	**212**	**100**

(-) Areas not considered in the specific call.

PRODETAB CGS. Participation of Embrapa units (# of projects approved)

Embrapa Units	Call 1/97		Call 1/98		Call 2/98		Call 1/99		Call 2/99		Total	
	Projs.	Subp.	Projs.	Subp.	Projs.	Subp.	Projs.	Subp.	Projs.	Subp.	Projs.	Subp.
Embrapa Acre					1	2					**1**	**2**
Embrapa Agricultural Instrumentation								1		1		**2**
Embrapa Agrobiology	1	2					1	1		1	**2**	**4**
Embrapa Cassava & Fruits	1	1									**1**	**1**
Embrapa Cerrados			1	3							**1**	**3**
Embrapa Cotton			1	1							**1**	**1**
Embrapa Dairy Cattle	1	2							3	4	**4**	**6**
Embrapa Eastern Amazon			2	3	1	2				2	**3**	**7**
Embrapa Environment				1								**1**
Embrapa Food Technology			1	1		1			1	2	**2**	**4**
Embrapa Forestry				1					2	3	**2**	**4**
Embrapa Genetic Resources & Biotechnology			3	4					2	3	**5**	**7**
Embrapa Information Technology Agropecuária								1				**1**
Embrapa Maize & Sorghum	1	3	2	5			1	1	2	6	**6**	**15**
Embrapa Pantanal			1	2							**1**	**2**
Embrapa Pig & Poultry				1								**1**
Embrapa Rice & Beans			1	1							**1**	**1**
Embrapa Rondonia	1	3									**1**	**3**
Embrapa Secretariat for Strategic Management						1						**1**
Embrapa Soils			1	1			2	4	1	2	**4**	**7**
Embrapa Southeast Cattle					1	1					**1**	**1**
Embrapa Sovbean				1								**1**
Embrapa Temperature Agriculture				1				1				**2**
Embrapa Tropical Agroindustry			2	3					1	2	**3**	**5**
Embrapa Tropical Semiarid	1	2	1	1					1	1	**3**	**4**
Embrapa Vegetables			1	3					1	4	**2**	**7**
Embrapa Western Amazon			1	1							**1**	**1**
TOTAL	**6**	**13**	**18**	**34**	**3**	**7**	**4**	**9**	**14**	**31**	**45**	**94**

* Projs. refers to the number of projects coordinated. Subps. refers to the number of subprojects implemented.

Chapter 4 - Colombia

The Agricultural Technology Development Project

Luis Ernesto Villegas and Orlando Meneses Peña

Introduction

In June 1995, the Colombian government received a loan from the World Bank designed to consolidate and to strengthen the national system of technology transfer. This loan gave birth to PRONATTA, The Agricultural Technology Development Project of Colombia. Its overall purpose is to increase the productive innovation of the small farmer; its central objective is to provide the institutional coordination for agricultural technology development.

One of the main characteristics of PRONATTA is its open and competitive nature. Because of this, and its other innovative features, the administrative structure developed by PRONATTA has served as an institutional model for the consolidation and strengthening of research and technology transfer.

The main activities of the program used to support the objectives of PRONATTA are:

- The implementation of a competitive fund
- The introduction of a demand-driven scheme to improve the quality and efficiency of agricultural research
- The submission of projects to be reviewed by regional panels of external experts
- The execution of the institutional development component
- The implementation of the agricultural technology information system

Objectives and Description

The Program has the following objectives:

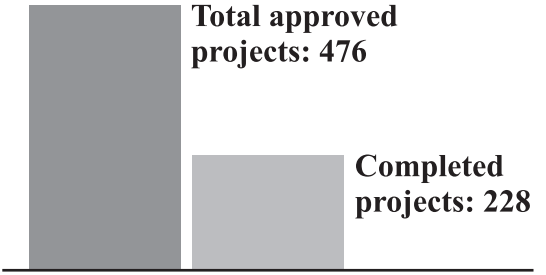
- To put in place a new system of agricultural research to build institutional capacity
- To promote the development and testing of technical packages particularly appropriate for small farmers
- To promote private sector participation in agricultural research
- To improve the quality and efficiency of agricultural research by introducing a demand-driven, competitive selection system that would co-finance projects
- To revitalize underused physical and human assets that exist within Colombia's research system

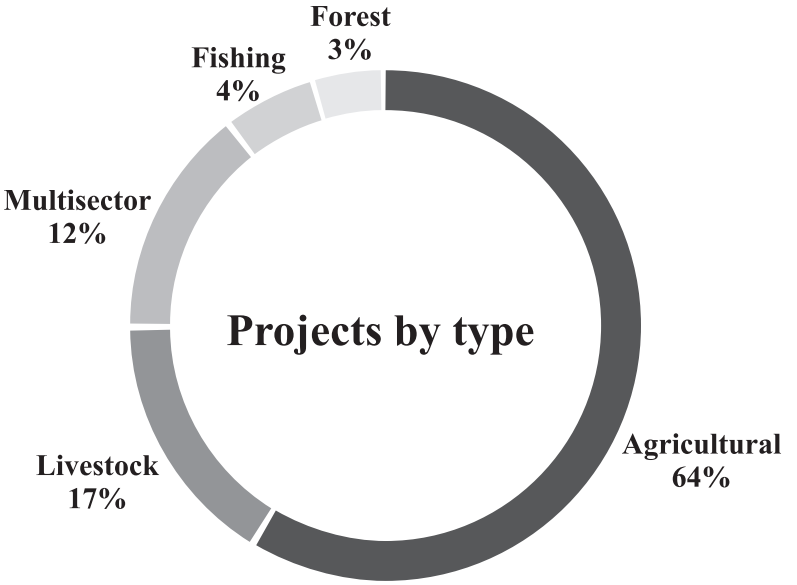
PRONATTA has two strategic components:

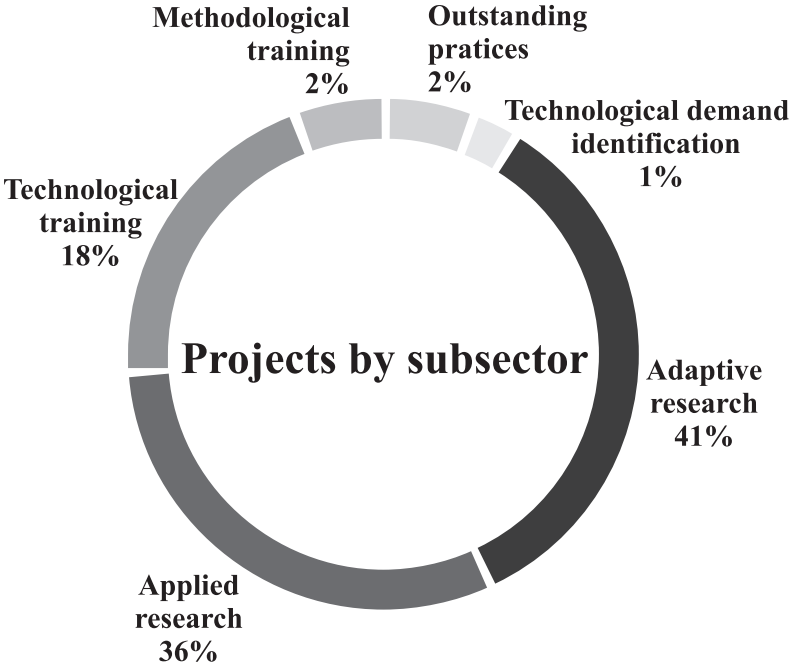
- A Competitive Fund
- An Institutional Development Component

Competitive Fund:

PRONATTA's Competitive Fund is a mechanism for co-financing technology development and technology transfer projects. These projects include applied and adaptive research (including adjustment, validation and promotion activities) and training projects for small farmers in agricultural technologies. To date, PRONATTA has implemented five competitive calls that have led to the approval of 476 projects, of which 228 have been finished. PRONATTA has promoted a new model of technology transference that involves farmers, NGOs, and the private sector in a variety of formal and informal partnerships; as well as information dissemination and feedback mechanisms.




Forest
3%
Fishing
4%
Multisector
12%
Projects by type
Livestock
17%
Agricultural
64%


Methodological
training
2%
Outstanding
pratices
2%
Technological demand
identification
1%
Technological
training
18%
Projects by subsector
Adaptive
research
41%
Applied
research
36%

Through its institutional development component, PRONATTA has established and supported the Management Coordinating Unit (MCU), and the National and Regional Panels. The Management Coordinating Unit reports to the council and is responsible for the overall coordination and supervision of the program. The MCU also manages the technical evaluation and screening of projects. The MCU prepares, signs, administers, and oversees the technical and financial auditing of co-financing contracts with the implementing entities, through a fiduciary. The Institutional Component seeks to strengthen the organizations at a regional level. In this sense, PRONATTA emphasizes that agricultural technology development is closely related to institutional development.

Administrative Structure and Project Costs

In order to attend to its mission, PRONATTA has organized itself as a special coordinating unit that answers to the minister of agriculture. Its administrative structure has three levels:

- An Executive Council that is the top decision-making and institutional coordination level
- A Coordinating Unit that has the responsibility of supervising and coordinating the technical, operative and financial activities
- The Regional Units that coordinate PRONATTA's activities at the regional level and are the main liaison of the Program with the localities

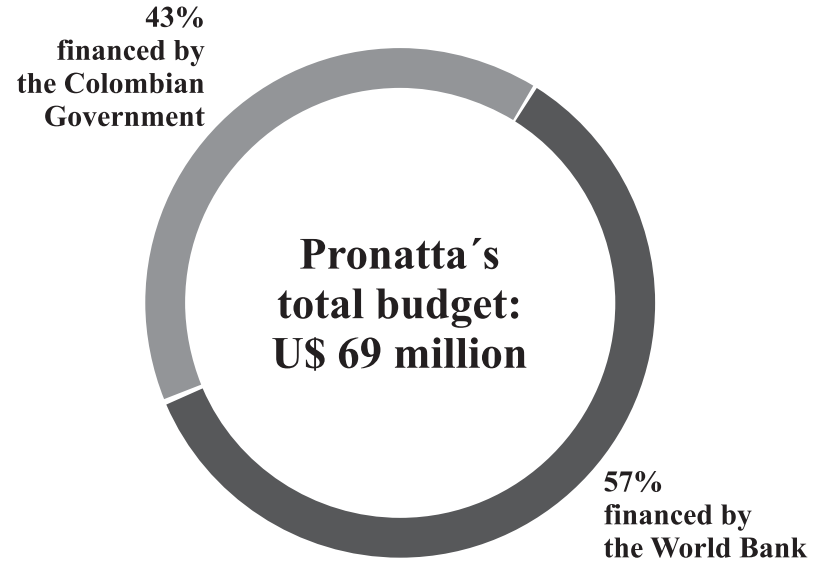
The total project costs are estimated at US$69 million; 57% of this is financed with credit from The World Bank and 43% from the Colombian Government.

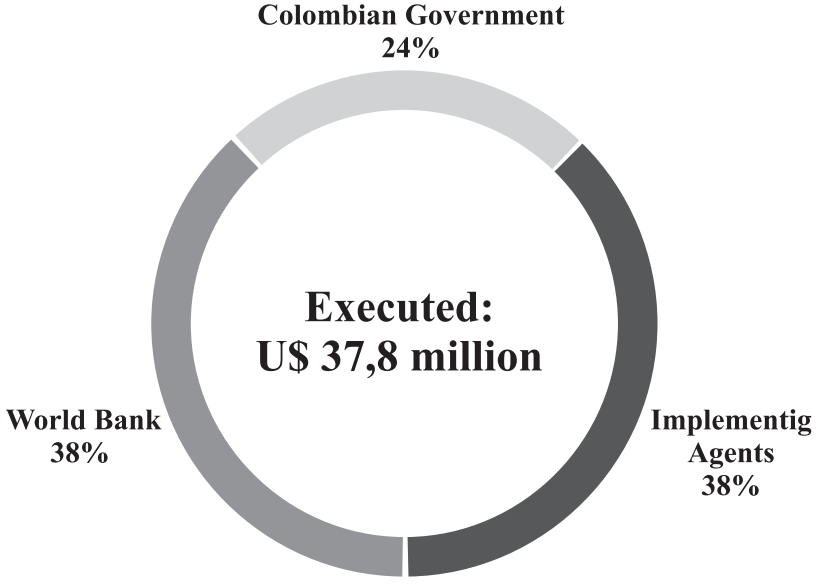
Characteristics of the Program

Public Competition:

1. Public calls for proposals have been done every year and have been publicized throughout the country.

2. PRONATTA has established a model for allocating resources to stimulate the participation of public, mixed and private organizations, so that the proposals compete with each other in order to improve quality of the projects to be co-financed.


43%
financed by
the Colombian
Government
Pronatta´s
total budget:
U$ 69 million
57%
financed by
the World Bank


Colombian Government
24%
Executed:
U$ 37,8 million
World Bank
38%
Implementig
Agents
38%

3. Scheme for demand-driven requests: during its initial phase (1995-1997), PRONATTA did not establish thematic priority areas. The reasons for this decision were:

- The definition of thematic areas by a central bureaucracy was not in line with the government's policies of openness, decentralization and privatization.
- The success of the initial phase depended on the acceptance and assimilation of PRONATTA's rules by the organizations.
- The role of the central level consisted of introducing the offer of technological services and products.
- Delegation by the Executive Council of the definition of priorities to the regional level was, and still is, a principal feature.
- At the beginning of the third year of program execution, the Colombian Government and the World Bank carried out a midterm review. The results of the review led to adjustments in the scheme.

4. Social demand emphasis: PRONATTA has placed a social demand emphasis in its projects, especially when they are formulated by farmer organizations. PRONATTA only co-finances those projects that respond to the real needs of small farmers.

5. Independent regional and external peer review of the projects: The most important characteristic of PRONATTA is the process of project review by regional panels conformed by external experts. This feature is fundamental to the design of PRONATTA as a competitive fund.

6. Project Co-financing: PRONATTA implements a scheme of project co-finance. This instrument promotes private sector participation in Agricultural Research.

Institutional Development Component:
This component includes:

- The formation and consolidation of the Regional Coordinating Units;
- The creation of a special Institutional Strengthening Network (ISN);

- An interesting methodology system for local planning has been developed;
- A sub-component of PRONATTA is the student intern program, by which students who are to graduate from the university accompany the execution of the projects, improving their quality and giving the undergraduates the opportunity to work in the regions and in the fields of their major areas;
- PRONATTA, as one of the actors that conform The National System of Agricultural Science and Technology (SNCTA), is striving towards the strengthening and optimization of the system that now presents deficiencies in its functionality.

7. A new focus on administrative management: to improve the execution capacity and to guarantee the success of the projects co-financed, PRONATTA adopted a new management focus consisting of:

- A technical cooperation agreement;
- The assignment of a fiduciary to manage the financial resources that the implementing agents of the project receive.

Major Constraints in the Implementation of the Program

- PRONATTA, in order to break with the usual centralized system, faced the challenge of changing the public organization apparatus. This change implied the introduction of new forms of relations between the public and private sectors and the adoption of market mechanisms for the allocation of public funds.
- The weakness of the organizations was evident, especially in some regions of the country. The low technical quality and the lack of operative criteria produced, in the first calls, an inferior success rate for the proponents in those regions. Finally, the distribution of the financial resources showed inequity among Colombian regions.
- The new model of proposal evaluation was not assimilated immediately by the organizations.
- The 1998 midterm review detected that the demand-driven scheme was not sufficiently focussed. This situation was related to a possible thematic dispersion of PRONATTA's portfolio and the

fact that the desired attention was not given to strategic areas for the policymakers.

- When the competitive grant component was initiated, the scheme for monitoring and evaluation of the co-financed projects was not established. However, the component of monitoring and evaluation has already started its activities and today it plays a very important role in supporting the program.

Solutions Adopted

- In order to promote institutional strengthening, PRONATTA has defined itself as a mixed model for investment in agricultural research and technology transfer. In this sense, the program joins government (PRONATTA and the implementing agents).
- The institutional development component implemented a strategy for the empowerment of weak regions, by creating a special Institutional Strengthening Network (ISN), which induced social capital in the regions with less opportunity.
- The network (ISN) has permitted regional actors (farmer's organization, stakeholders, policymakers, technical local services) to construct agendas and establish priorities for research. Additionally, the ISN strategy establishes possibilities for joint ventures between public corporations, mixed organizations and the private sector.
- With ISN, it was possible to overcome the regional inequality to access resources of the fund. Moreover, the empowered social capital and the transparency of selection of projects, created a feeling of trust that led to favorable conditions for technology development. The conformation of the network improved the number and the quality of projects presented to the panels.
- The publication of precise terms of reference, the consistency of the rules in the calls for proposals and the transparency in the selection of projects to be co-financed have permitted, through the repetitive interaction, the organizations to assimilate and accept PRONATTA's rules.
- The program has advanced the consolidation of a decentralized model for the construction of agendas and portfolios in research and technology transfer. However, to advance and to improve the demand driven scheme, PRONATTA has initiated an analysis of

the prioritization of regional strategic areas. Furthermore, to complement the demand driven scheme, PRONATTA will put forth specific calls in strategic areas that have not been attended by the demand driven scheme this year.

- PRONATTA has developed a system for monitoring and evaluation of all co-financed projects. The Regional Coordination Units participate and external regional panelists who participate in the ex ante evaluation support it. 60% of the projects that have been completed were evaluated by experts with very satisfactory results; the remaining 40% are in the process of evaluation. PRONATTA has initiated an impact evaluation of the program.

Lessons Learned / Final Comments

- The most important result of PRONATTA is its consolidation as a competitive fund that has contributed to the generation of a new culture of technology development. In this sense, PRONATTA has created a new public model for allocation of resources for research and technology transfer.
- The demand-driven mechanism has permitted PRONATTA to apply the principle of decentralization and enforce regional autonomy. The construction of the research agenda is today in transition to a model that allows the binding together of regional and national priorities.
- The ISN strategy has shown the high potential of regional gathering spaces (nodos) in boosting human and physical resources when there is cooperation and complementation in order to optimize knowledge and skills. PRONATTA recognizes the concept that the access and management of agricultural technology to improve the quality of life of the small farmer cannot be separated from the need to strengthen learning processes and institutional development.
- Acknowledging the good practices of the program and looking towards the empowerment of the NGOs that are attached to PRONATTA's network, the British Government donated an important sum in sterling pounds to create a sub-project to support the strengthening of organizations in the region.
- The model implemented by PRONATTA as a competitive fund could very successfully be applied by other institutions of the government for the allocation of public resources, not only in the agricultural sector.

Chapter 5 - Croatia

Croatian National Agricultural Research System

Jasmina Lukac Havranek, Miroslav Bozic and Mina Dordevic

Key Words:

applied and development research; research project submission, evaluation and selection; related research issues

Introduction

Official orientation of the Croatian Government in regard to the agricultural sector is a focus on the development of the private, family farming sector within a market economy. In order to enforce the structural adjustment process in agricultural research, the Ministry of Agriculture and Forestry (MAF) established the Agricultural Research Council (ARC) with the support of a World Bank loan.

ARC Missions, Objectives and Organizational Structure

The Agricultural Research Council (ARC) fosters applied and development agricultural research aimed at direct application on farmers' fields through the Fund for Applied and Development Research (Fund). For this purpose, ARC supports farmers' participation in setting research priorities and research project implementation and financing.

The mission of the fund is to increase the competitiveness of the agricultural sector in the domestic and world markets through applied scientific research, thus ensuring higher quality of agricultural products and meeting domestic demand.

The main objective of the ARC is to initiate the knowledge transfer process from scientific institutions to farmers' fields through extension service. This knowledge transfer mechanism will indirectly strengthen research policy and identify research priority processes, resulting in stronger research-extension-farmer linkages.

Specific objectives are:

- To initiate and sustain a process where past academic and production oriented research is replaced by a more analytical, multidisciplinary, economic and producer constraint oriented approach.

- To establish effective participation of producers in identifying research priorities and deciding on allocation of funds to research projects.

- To introduce a rational planning of research projects to resolve readily identifiable constraints at the farm level, with due consideration of the total socio-economic farm system.

- To provide for a system that can generate research projects, award priorities and effectively implement them.

- To develop strong linkages between research and extension through which technology transfer and information flow maintains its relevance to farmers' needs.

- To better equip the research services to adjust to the requirements of private farming needs and to enable them to implement contract research at field level.

- To ensure the availability and continuity of research resources for research activities aimed at producing public goods that are useful for the broader private farming community, thus complementing the applied research financed through the Ministry of Science and Technology.

- To encourage cooperation among diverse research organizations in order to conduct research projects.

The resources generated from investing the fund's capital and other contributions are used for competitive, non-reimbursable financing of priority research projects identified by the ARC through competitive bidding procedures.

The ARC consists of representatives of different stakeholder groups in the agricultural sector, which are as follows:

- Farmer representatives (9)
- Scientific institutions representatives (3)
- Food processing industry representative (1)
- Croatian Agricultural Extension Institute (CAEI) representative (1)
- Ministry of Science and Technology (MOST) representative (1)
- ARC President and Secretary

Direct participation of the majority of stakeholders' representatives in creating a national agricultural research policy enables a more objective approach to problem solving and improve the quality of decision-making process. Agricultural development issues are too complex to be resolved by researchers or agricultural policy decision-makers. This many-sided approach gives a sense of ownership under a defined solution, which is then supported, politically, financially and institutionally in the agricultural sector.

Setting Research Priorities

Research priorities are set at ARC meetings using the brainstorming method. It is predicted that in the future some more sophisticated methods will be used.

Priority subjects for research:

1. Development of programs for integrated plant protection of fruits, vines and vegetables that would be used within an early-warning system.

2. Development of a model for land consolidation and agriculture infrastructure and models of organization and management of family farm.

3. Quality of products on family farms (eco-production, bioproduction, and indigenous products).

4. Models of mixed family farms (tourism on family farms and resource protection).

5. Glasshouse and greenhouse production.

Research Project Evaluation and Selection Process

To make the overall submission, evaluation and selection process more transparent, ARC is trying to establish a formal procedure for the evaluation of research proposals to the fund grants. Establishing a formal evaluation procedure is in its first phase with the tendency to continually improve and up-date according to new methodologies in other countries.

The evaluation process and criteria presented in this paper were applied to proposals submitted in the second round of awarding research projects and are outlined below:

All submitted proposals had to meet three basic criteria in the preliminary selection:

1. Meeting one of the defined research priority areas - assessed by a technical panel consisting of five scientists, each covering one priority area;
2. Meeting financial requirements stated in the competitive tender reviewed by the ARC Secretariat;
3. Amount of financial resources required in proposal should not exceed 50% of total required budget - reviewed by ARC Secretariat.

Project proposals that met preliminary criteria proceeded to the three-part evaluation process involving scientific, extensionists and producers assessment. Evaluation procedure is also stated in competitive tender and is as followed:

A) The expected impact and relevance of the research project for improving the productivity and competitiveness in the priority research subject. This set of criteria assesses the importance of the problem that

the research project would address. Researchers submitting the project should provide reliable estimates based on the best possible data, for criteria one and two. The farmer members of ARC, with the support of the secretary and assistant-secretary will undertake the evaluation of impact and relevance. Three criteria were included:

1. The share of production that is affected by the problem or constraint that the project aims to overcome (maximally 13 points).
2. The possibility of farmer's income increasing in short time (maximally 10 points).
3. Evidence that the project was identified and developed in collaboration with a farmer community (maximally 10 points).

B) The quality of research: This set of criteria assesses the feasibility and the expected success of the research strategy that is developed in the research proposal. Other scientists will undertake the evaluation of this set of criteria. Five criteria were included:

1. The quality of the research proposal, as expressed through a clear problem description, a set of clear objectives, well defined methodologies, concrete expected results and milestones and reasonable budgets and time frames. The workshop participants considered this to be an extremely important criterion (maximally15 points).
2. The reputation of the lead researcher, as indicated by earlier applied research projects that were successfully completed, by the quality of education, and the quality of the publication record (maximally 5 points).
3. The multidisciplinary and multi-institutional nature of the project: projects in which scientists from different disciplines and different institutions participate should have priority (maximally 5 points).
4. The availability of the required facilities: projects that have access to all required facilities will be preferred over those that will need to acquire facilities (maximally 5 points).
5. The extent to which research will be undertaken on farms (maximally 5 points).

C) The diffusion potential of the expected results. This set of criteria measures the applicability of the project results in the conditions of the

farmer and the feasibility that the project results would be diffused throughout the target population. Specialists from the extension service will evaluate this set of criteria:

1. Simplicity of the proposed solution: simple solutions tend to be more adaptable than complex ones and should be given priority (maximally 8 points).
2. The extent to which the proposed technologies reduce the risks that farmers face. In general, risk-reducing technologies are those that stabilize the net income from the commodity (mostly by reducing variability in production). Improved pest and disease control practices are normally risk reducing, but increased fertilizer applications are normally risk increasing. Risk increasing technologies enhance the variability of production and income, and may increase cash costs. Risk reducing solutions tend to be more adaptable than non-risk reducing technologies (maximally 8 points).
3. Collaboration in the research project with the extension service. Such collaboration tends to enhance the chance that the extension service will take up the solution, and it tends to guide research towards practical rather than scientific solutions (maximally 8 points).
4. The probability that farmers will benefit immediately from the adoption of the proposed solution. Farmers tend to prefer technologies with a rapid return (maximally 8 points).

Total of 100 points

On the basis of collection and processing of evaluation results, final decisions about fund allocation are made by the ARC.

The evaluation process and criteria worked out for the next awarding rounds and published in ARC Manual of Operation are:

Proposal Evaluation Criteria

Preliminary review

In preliminary reviews, the ARC Secretariat with the assistance of ARC members appoints a technical panel consisting of scientists and

other agricultural experts to evaluate project proposals on the basis of preliminary criteria. The technical panel functions so that each priority theme is assigned to one expert in the panel who evaluates all project proposals whether or not they are consistent with the relevant topic. Then, the same evaluator assesses consistent proposals according to five other preliminary criteria.

Preliminary criteria

Consistency: The proposals must be directly and explicitly consistent with the ARC missions and objectives. It must provide for activities in priority task areas that are fundable by the Fund, as stipulated in the applicable call for proposals.

Inter-institutional nature: Research project proposals that - in preparation and implementation process - involve more than one research institution or several disciplinary departments of the same institution will be given preference over mono-institutional or mono-disciplinary research projects.

*Duration of the project and grant limi*t: The project proposals are funded for a maximum of three years, and have to respect the maximum fundable amounts, overall and by expense category, that is stated in the call for submitting research proposals.

Identification of executing agency and lead project team: The proposal must clearly identify which entity is the principal executing agency, and which are its venture partners. Proposals must list the names and institutions of the researchers in the project team, identifying the principal investigator or team leader. Any changes in the composition of the project team (e.g., upper-level professional staff and experts retained) after selection must be reported to the ARC Secretariat.

*Commitment of contribution*s: Proposals must clearly indicate the input of human, material and financial resources to be provided by the principal executing agency and its partners and must include documentation confirming such commitments.

General aspects of proposal presentation: Proposals must follow the proposal application form.

In phase two, the preliminary evaluation process is followed by external evaluation of project proposals meeting preliminary criteria.

A tripartite evaluation process, consisting of peer-review, extension evaluation and producers evaluation, is applied to those proposals.

Peer-review evaluation process

Peer-review evaluation is implemented on the basis of four criteria: (1) economic, financial and social impact, (2) technical quality, (3) institutional capacity and (4) environmental impact. These criteria are ranked by order of importance: 40%, 30%, 15% and 15%, respectively.

(1) Economic, Financial, and Social Impact (*16 points*)

The economic assessment attempts to establish the economic impact of the proposed project at the national level. Thus, proposals focusing on production aspects take into account the significance of the expected improvement in production value (based on production volume, product quality, efficient use of production factors, and other improvements that may result from introducing a new product). Proposals focusing on sector activities evaluate the economic strength of that specific sector, the magnitude of the problems being addressed, and the estimated extent to which the proposed project can correct them.

The financial assessment endeavors to establish whether the proposed solution for the problem or research result is financially feasible for farmers.

The social assessment considers the project's possible effects on employment and income, as well as opportunities for participation by the most vulnerable social groups: small producers, producers in war devastated areas or other less favorable areas.

The economic, financial and social impact assessment requires information on:

(i) Direct and indirect beneficiaries of the project
(ii) Probability of success of the proposed activities and potential rates of adoption of new generated technologies
(iii) Expected incremental economic, financial and social effect on aspects such as regional changes in production value, increased productivity, enhanced product quality, cost fluctuation, effect on income level and employment
(iv) Expected indirect effects of technologies, such as those caused by spillovers of research results.

(2) Technical Quality (*12 points*)

The project proposals must offer a solid response to a priority problem or research opportunity, along with innovative, coherent and inclusive strategies. The purpose of assessing technical quality is to determine the scope of the proposal and whether it has been properly formulated; i.e., whether it makes sense scientifically and technically, whether there are alternatives or more promising avenues, and whether there are efficient mechanisms proposed to transfer or disseminate the expected results. The project's technical quality will be assessed on the basis of the following criteria:

(i) Scope of the proposal in terms of diversity of disciplines involved, size of geographic area affected by the problem, and the degree of joint activity and inter-institutional relations;
(ii) Clear description of the expected outcomes;
(iii) Quality of scientific or technical design of the proposal, based on clear objectives, specific activities, internal logic, quality and rigorous nature of the scientific and technical foundation;
(iv) Quality and currency of materials and methods for achieving the objectives and expected outcomes;
(v) Internal financial consistency of the proposal;
(vi) Feasibility of meeting the proposed activity schedule, with a sequential breakdown of phases or stages included, linkages and degree of dependence;
(vii) Likelihood of the project's success and risks associated with the various phases and components;
(viii) Possible multiplier effect, taking into account the use of the products and regarding them as input for other activities.

(3) Institutional Capacity (*6 points*)

The function of the institutional evaluation is to establish the managerial capabilities of the executing agencies - i.e., whether they have the technical capacity, the experience and the managerial, administrative and control systems required to implement the project.

Institutional experience is evaluated on the basis of the capacity to research the proposed topics, qualification of the principal technical team, their background and scientific/technical performance.

Institutional capacity is all the more important in proposals that favor inter-institutional action and joint research among research entities at the national or regional level.

(4) Environmental Impact (*6 points*)

The environmental assessment is aimed at establishing the net result that the project activities will have for the environment. This analysis examines the expected effects on the environment and the proposed palliative measures, if any, of the activities in the cycle covering both the research process and the general adoption of the resulting technological developments.

Projects should include means of verifying environmental impact to facilitate the assessment of environmental effects, both positive and negative, in short and medium term as well as the measures proposed to mitigate possible negative effects. The impact indicators to be considered include effects on water quality and availability, soil, plants, animals and other natural resources, and quality of agricultural products.

The ARC does not finance projects that have a negative environmental effect. On the basis of the aforementioned impact assessment criteria, it favors proposals that focus comprehensively on environmental issues and that foster the development of technologies that are sustainable from an environmental standpoint.

The maximum score achieved in peer-review evaluation process could come to 40% of maximum score that could be achieved in the tripartite evaluation process.

Farmer´s Evaluation Process

Farmers' evaluation procedure is based on the following criteria:

(i) The share of production that is affected by the problem or constraint that the project aims to overcome, or the possibility of introducing a new product for which there exists significant market demand. Project proposals should describe identified problems in detail based on statistical data (13 points).
(ii) The possibilities of an increase in farmer's income in a short time (10 points).
(iii) Evidence that the project was identified and developed in collaboration with a farmer community (10 points).

The maximum score achieved in the farmer's evaluation process could come to 30% of the maximum score that could be achieved in the tripartite evaluation process.

Proposal Selection Process

Projects are selected based on a confidential external technical evaluation, using short-term consultancies of experts possessing a well-known reputation in each subject area (peer or panel review evaluation). Proposals of peer-reviewers are prepared by the ARC Secretariat on the basis of technical panel suggestions, and ARC makes the final decision.

The proposal selection process is the responsibility of the ARC, with support and coordination provided by the Secretariat. The Secretariat submits the list of proposals to the ARC ranked in the order of the score received in the evaluation process, keeps records of action taken, and provides reports to project officers who appropriately request them.

The weight of each criterion within the overall score reflects the relative importance of its contribution to the attainment of the fund's objective. The total score for the scientific evaluation is distributed among the principal criteria according to the following relative weights: Economic - Financial - Social Impact, 40%; Technical Quality, 30%; Institutional Capacity, 15% and Environmental Impact, 15% - which represents 40% in the overall evaluation process.

The relative weight of the extension evaluation amounts to 30% in the overall evaluation process, as well as the farmer's evaluation.

The threshold in each part of the evaluation process amounts to 30% of maximal score, that is: 12 points for peer-review, 9 points for extension and 9 points for farmers' evaluation.

Under no circumstances may proposals be modified during the evaluation process. There may be no adjustment to goals, budget or any other factor. The overall clarity and accuracy of a proposal is the sole responsibility of the submitting institution, and any lack thereof directly affects the scoring of the proposal and its likelihood of selection.

On-going Research Projects

In first call for submitting research project proposals, one hundred and twenty proposals were received from fifteen agricultural research institutions.

After a detailed evaluation process, sixty-four projects from eight institutions were selected for funding in three tender rounds.

In second call for submitting research project proposals, eighty-six proposals were received, and thirty-four approved in the two rounds.

The projects involve about five hundred researchers and thirteen institutions.

Participating research institutions are:

1. Faculty of Agriculture, University of Zagreb
2. Veterinary Faculty, University of Zagreb
3. Faculty of Agriculture, University of Osijek
4. Faculty for Food Processing Technology, University of Osijek
5. Agriculture Institute, University of Osijek
6. Institute for Sugar Beet, University of Osijek
7. Agricultural College at Križevci
8. Institute for Agriculture and Tourism, Porec
9. Institute for Adriatic Cultures and Karst Melioration, Split

Research-extension Linkages

To date, ARC and CAEI have established very good communication and collaboration mechanisms, which now need to be formalized.

To strengthen and sustain their impact through time, ARC and CAEI developed the memorandum of understanding that spells out roles and responsibilities of research and extension in diagnostic activities, review of research proposals, implementation of on-farm research, formulation of technical recommendations, and training of extension specialists.

Within this memorandum, an annual work plan would be drawn up detailing research and extension activities to be conducted in the following year together with responsibilities of each party, including funding responsibility. The annual work plan would specify the following activities:

- Scheduling of joint research-extension diagnostic surveys (identifying farmers problems on the field or regional planning);
- Evaluation of submitted research project proposals according to the criteria and procedure established by ARC;
- Extensionists participation in research projects implementation according to the contract signed between executing institution and CIAE;
- Field monitoring and supervision of on-going research projects;
- Development of technical packages;
- Establishment of three specialized research-extension teams in three different regions in Croatia.

Management Information System (MIS)

By the end of last year, the Management Information System was developed to assist the management of agricultural research. The program was called Divina after the old Croatian goddess of agriculture. This information system is primarily intended for ARC to monitor research project implementation and allocation of fund resources to applied agricultural research.

For that purpose, the system is comprised of many principal written and graphical reports sorted by:

- Executing institution of research project
- Location of executing institution
- Principal investigator
- Županija where research has been implemented
- Number of publicly announced tender
- Tender round, if it exists
- Project status, active or finished
- Scientific research area
- Defined research priority
- Research period

The system is also comprised of financial reports that serve to track fund disbursements. Besides reports, the system includes the content of all granted research projects according to the application form.

Scientific Literature

In order to develop an on-line information system in the central agricultural library at the Faculty of Agriculture University of Zagreb, the ARC procured scientific literature (books and journals, and relevant electronic databases) and required software and hardware. About seven hundred titles of have been procured, as well as subscriptions to electronic databases and literature, intranet access to databases, online journals, and selected CD-ROMs.

Scientific International Cooperation

In last year, ARC announced an open tender to support an international cooperation of scientists working on awarded research projects. Scientists are encouraged to participate in the following fields of collaboration:

- Applied agricultural research management, especially setting research priorities, monitoring the implementation of research projects, evaluating achieved research results, on-farm research methodology etc.;
- Educational courses in new, high priority scientific fields;
- Participation in study tours, international conferences, workshops, etc.;
- Study tours for ARC staff and members.

Conclusions

In the last three years of the ARC existence, the major subject learned - which can also be considered as a major constraint - is the establishment of criteria and procedures for proposal evaluation process. The criteria should be relevant and responsive to the ARC goals and purpose, and the overall procedure should be transparent to the broad agricultural community. In endeavoring to achieve that, ARC was helped by World Bank staff recommendations, foreign technical assistance and different study cases of other countries.

Further constraints that ARC faces is the difficulty to clearly present to researchers the exact goals and purpose of the Fund for Applied and Development Research that ARC administers, as well as the type of research that ARC, as a governmental public entity, wishes to finance.

Other constrains ARC finds are more on the level of the individual research project. Many projects are quite complex in terms of number of participating researchers, while the number of farms involved in the projects is rather small. In many cases, the projects concern a testing or trying of improved farm management towards higher input and output levels. This is good and useful; in fact, it involves researchers in participatory explorative farm management. However, it tends to focus more on advanced farmers and larger corporate farms. Small farms, which are large in number, were considered difficult to research scientifically. Farm management, however simple, also needs to be improved on the small and marginal farms.

Most projects are a series of part-time activities by a number of people. This creates management problems. This is quite common, and usually projects succeed because of the devotion of researchers and project staff. Nevertheless, a more compact and concerted actual management seems necessary; researchers, especially researchers who communicate with farmers, need to have a clear picture of the final objectives and the terms of reference of all the project research staff.

One of the major endeavors of ARC is improving collaboration and using the existing capabilities, experience and data in the various organizations that participate in ARC funded research.

Problems Currently Experienced by Researchers

Visiting farmers and fields
Teaching of farmers
Unpredictable expenses
Research-extension linkages
Evaluation of on-farm research
Understanding of farmers needs and problems
Trust of farmers in research's experiments
Old laboratory equipment
Rejection of first research proposal
Not enough resources; resources come too late in relation to the growing season
Research management problems at farm level
Differences between farmers (knowledge, financing, risks)
Farmers are not interessed in experiments
Obsolete mechanization on farms
Use of research results in pratice and how to explain this to decision-makers
Lack of team work, weak information flow between researchers
Lack of techinical and economic information from family farms
Expensive research staff

Chapter 6 - Ecuador

The Competitive Agricultural Research Fund in Ecuador [1]

Jonathan Woolley

Introduction

A competitive fund for agricultural research is one of the components of the modernisation program for Agricultural Services (PROMSA) in Ecuador. Work commenced in January 1999 with loan funding from the World Bank and with the private company Natural Resources International Ltd. (NRIL) as the technical administrator on contract for four years to the Ministry of Agriculture (MAG). NRIL is responsible for establishing the Competitive Fund Management Unit (UEFC), the design and implementation of processes, advising MAG on research priorities, stimulating interest in agricultural research and monitoring and evaluation of projects financed by the Fund. The UEFC is staffed by an expatriate director, two project officers, a director of finance and administration, a part-time adviser on monitoring and evaluation and five support staff. The value of the fund is US$ 10.59 million; with counterpart contributions from research suppliers, it is expected to finance approximately one hundred research projects and twenty international strategic alliances with a total value of approximately US$17 to US$20 million. Emphasis is on supplying operational costs to potentiate underused research staff and facilities; modest funding for specialist consultants and equipment is also permitted.

While research projects are directed primarily at Ecuadorian research institutions and individuals, international strategic alliances improve the future research capacity of Ecuador through support from overseas in the importation and adaptation of applicable technologies, improving research methodologies and strengthening postgraduate education for

[1] Presented at the Global Workshop "Competitive Grants in the New Millennium", Brasilia, 16-18 May 2000. The support of all members of the UEFC/NR International team and of UIP staff in developing the ideas presented is gratefully acknowledged, but the opinions expressed are those of the author and not necessarily those of the UEFC, UIP or NR International.

agricultural researchers within Ecuador. Present limits for grants are US$75,000 for research projects and US$325,000 for international strategic alliances. The requirement for counterpart funding provided by beneficiaries is at present a minimum of 35% of total project costs.

Because the research system has been virtually unfunded for several years and because of introductory seminars given by the UEFC with a total attendance of over three hundred, there has been a huge response to the fund. In the first call for research proposals (March 1999), three hundred and seventy-eight "profiles" (concept notes) were received that involved two hundred and fifty Ecuadorian institutions. Sixty-four profiles were selected for further development, of which fifty-nine are expected to be signed as research projects (forty-six have been signed up to May 15, 2000). 69% of profiles included institutional collaboration and there was good coverage of geographical areas, research themes and commodities included in the priorities.

In the first call for international strategic alliances (July 1999) seventy-two were received, led by forty-three different national institutions, with the participation of eighty-six overseas institutions from twenty-two countries. Nineteen were approved for further development, grouped into fourteen potential projects.

In response to the combined call announced in January 2000, one hundred and forty-seven research profiles and twenty-nine alliance profiles were received. Twenty-seven research profiles and four alliance profiles have been selected for development into projects with twenty-two second-priority research profiles held in reserve.

The participation of the national agricultural research institute (INIAP) has been approximately 20% in research profiles submitted and 40% in projects approved (less in international alliances). INIAP has so far displayed higher than average collaboration with other institutions in the projects it leads, which indicates an important change in institutional attitudes.

Situation to which the Competitive Fund responds

The competitive fund was proposed by the government and the World Bank to remedy the following features of a very depressed agricultural research system in Ecuador:

- Levels of technology and yields generally lower than in neighbouring countries;
- Investment in agricultural research lower than in neighbouring countries that compete for export markets;
- Lack of researchers in many key thematic areas;
- An undynamic principal research institute (INIAP) after years of deteriorating salaries and a failed attempt to become autonomous;
- Research results not always of interest to clients;
- Isolation from researchers in other countries, leading to the danger of duplicating work already conducted;
- Universities, NGOs and private industry relatively inactive in research;
- Large and small producers, farmer associations, industry and exporters demanding more practical information on technological innovations.

Principal Objectives and Strategies

Long-term goals are to provide: a reliable, detailed and accessible information bank for Ecuadorian agriculture; increases in production for export and internal markets and agroindustry; poverty reduction through reduced price of basic foods, increased rural and urban employment opportunities and increased income for peasant farmers.

The short-term objectives are: more competitive, client-oriented attitudes among researchers; information and technology for producers; masters' and short postgraduate courses for agricultural researchers; mature international alliances to strengthen future research; and a competitive fund operating smoothly and transparently as a focus for agricultural research in future decades.

Having the following main design features, the fund is:

Diverse, stimulating the participation of both established institutions and those that are newer to research; it especially encourages links between the public and private sectors.

Transparent, with an administration that is independent of government, independent and anonymous selection panels and provision

of complete information to participants about reasons for selection or rejection of their proposals.

Broad-based, covering small, medium and large farmers, all geographic regions of the country, activities from production through storage and processing to marketing and agroindustry in crops, livestock and agroforestry.

Client-oriented with emphasis on applied and adaptive research and on participation of farmer groups and associations in the preparation and execution of projects.

Issues and Solutions

The competitive fund has been successfully established with broad participation and support during a time of deep economic and political crisis in Ecuador. This is a powerful illustration of the validity of the mechanism and its potential to generate enthusiasm and support for relevant research. However, since this workshop concentrates on issues in competitive fund design and implementation, we focus below more on continuing challenges than on achievements.

Dual role of the UEFC

Because of the relative inexperience of some aspects of agricultural research, especially project preparation, among most new research providers and some of the more established ones, the UEFC has to act as both a neutral Secretariat for the fund and as support for project development. Without this dual role it would be almost impossible to involve new research suppliers or stimulate innovative partnerships. The key to the paradox of implementing the dual role has been to call for proposals in a two-stage process. Suppliers are invited to submit project profiles that are judged more on their potential than on their detailed content. The panel applies heavy selection pressure for quality and relevance at this stage (presently only 15-20% pass this filter) and selected profiles are invited for preparation as full projects. The panel meets again to verify that projects have taken into account their previous recommendations and have been satisfactorily prepared. Selection pressure is lower at this stage (in the first call over 90% succeeded).

Under its operational rules, the UEFC is permitted to give detailed advice and support to profiles that have passed the first selection, but only general advice on submission of profiles before that selection.

Other features that have been supportive of the dual role are the absence of pre-registration requirements for research suppliers, broad research priorities in the first call, and major investment in workshops and one-on-one support for those preparing research projects.

Integration of technical and financial fund administration

Fund administration was originally designed with technical aspects under the control of the consulting firm that was to run the UEFC and financial administration in the Ministry of Agriculture Implementation Unit (UIP). Apparently, the perception of the designers was that it would be difficult for a private company to administer public funds. However NRIL has found that within projects and within its own team structure it is highly desirable to integrate these two aspects. Arrangements such as trust funds would provide a transparent and safe mechanism for a private company to manage large amounts of public funding without the need to provide costly guarantees. Unfortunately, unifying these aspects of management in an existing contract requires the preparation of new public-private agreements. Meanwhile, the rapid progress of the fund in signing a large number of contracts was jeopardised for several months by cash flow problems from the World Bank through the UIP special account to research suppliers.

Research-extension links

For various non-technical reasons, PROMSA was designed with research and extension separated and financed by different international banks and managed by different consulting firms. Additionally, there is less emphasis on the smallest farmers in the extension component than in the research component. Both consultancy firms have attempted to bridge the gap between them. The UEFC insists that all projects should indicate user demand for the proposed research through diagnosis or other mechanisms and should include a plan for the diffusion of research results successfully achieved. Those responsible for bridging the research-extension gap must be named and budget included for this

purpose. The UTE, the unit responsible for the extension component, has provided the results of diagnosis of demand by users groups to the UEFC.

Truly integrated research and extension projects are hindered because the UTE has no mechanism for financing validation of technology by its user groups and because the UEFC has received few proposals in adaptive research, despite encouraging their presentation.

Forming robust international alliances

From the start, the UEFC and UIP have adopted the philosophy that Ecuadorian institutions should determine where alliances are needed and should take the lead in their formation. This approach contrasts strongly with the typical regional collaboration model traditionally propagated by some international research centres and others where it sometimes appears that the overseas institution determines the priorities as well as the model and induces participating countries to conform. Thus, although the call for alliances has been announced internationally, our emphasis has been on helping Ecuadorian institutions find suitable partners. A drawback has been that the Ecuadorian lead institution sometimes lacks sufficient vision to conceive clearly the partnership that is needed.

Educational alliances in postgraduate agricultural research have been particularly difficult to develop. In many proposed courses there is an insufficient research base and the proposed professors have little more knowledge or experience than their students.

Financial sustainability

Various mechanisms under discussion contribute to a vision of how the fund might reach financial sustainability beyond the initial loan funding from the World Bank.

- Through counterpart contributions from research suppliers, almost never in cash. These contributions have greatly exceeded the minimum requirements. For example, in the first call for research proposals, counterpart represents 47% of the total value of projects

compared to the 25% minimum required in that call.

- From international and bilateral funding sources that wish to invest in research in Ecuador. The UEFC believes that it can establish a highly respected mechanism for the administration of research funds that will attract donations and loans.
- Contributions from government of funds that would previously have been assigned as block grants once it has acquired confidence in the competitive fund mechanism.
- Reinvestment of royalties generated from intellectual property developed with fund contributions.

With reference to the last item, the UEFC and UIP are designing contractual mechanisms to permit shared ownership of research according to relative contributions from the fund and counterpart contributions.

Future administration

The initial model for establishing the competitive fund was private sector management responsible to government through an implementing unit temporarily set up for the life of the project. The day-to-day challenge in this model is to find the balance between the accountability and integration of the private sector unit (UEFC) with the public sector unit (UIP), without simply developing two units both tied to the rules of the public sector. Visions of the future that are being developed at present need to specify where the fund administration will be located (e.g., NGO, foundation or semi-autonomous unit). Additionally, the model needs to define the size and responsibility of the government unit through which it will be linked to the public sector. It will also be necessary to link into the existing model institutions (such as INIAP) that obtain public funding for research. Will they obtain all of their funding through the competitive fund? Will they, in addition, have their own restricted competitive fund or will they continue to receive some income from block grants?

Institutional strengthening under the competitive fund mechanism is rapid because all research suppliers that compete are exposed to the concepts and process of competitive funding and to principles of sound project design. Because 90% of UEFC staff is Ecuadorian, institutional stability is also strengthened.

Lessons Learned

Although the competitive fund has only been running for 16 months, a number of important lessons have already been learned.

- A "user friendly" approach in supporting research suppliers and guiding those whose proposals have not been selected has been vital for establishing broad support and participation in the competitive fund; there have been very few protests about the results. Strangely, only about five percent of proposers invited to resubmit their profiles with important modifications in the second call actually did so; we are investigating the reasons.
- Although broader research priorities in key commodities and research areas stimulated wide initial participation, it will be necessary to focus priorities quite rapidly as the fund matures. We are working to develop a list of specific and slightly broader research themes as a basis for the third call.
- Poor knowledge and experience in project structure and presentation is as great a barrier to a competitive fund as lack of innovative proposals. Either the Secretariat or some other group must invest in training research suppliers on this topic. The UEFC has so far done most of this work in Ecuador.
- Although ample time was offered between profile acceptance and project submission deadlines (eight months in the first call), research suppliers did not use the time for extra diagnosis, exploratory experimentation or stakeholder meetings as they had been encouraged in project preparation workshops. Instead they merely delayed submission while project justifications and institutional arrangements often remained weak. Preparation time has been reduced to ten weeks in the second call.
- In Ecuador, as in many countries, institutional control mechanisms (government audit and procurement, etc.) on public servants are extremely strict and tend to inhibit the design of innovative streamlined mechanisms such as those for competitive fund. As a result, it is difficult in Ecuador to conceive how, in the foreseeable future, a public institution could be wholly responsible for competitive fund management.
- Smooth disbursement of funds is vital and must be safeguarded in the early stages of competitive fund implementation. In our case,

the excellent institutional reputation of the competitive fund was initially jeopardised because the World Bank rules would not permit disbursements to a UIP that had not solved a number of financial and administrative problems. Ideally, a mechanism, such as a trust fund, should be found to "reserve" the funds for project advances well in advance of the moment they will be needed.

Chapter 7 - Ghana

Preparation towards the Implementation of a Competitive Agricultural Research Grant Scheme in Ghana

Emmanuel Owusu-Bennoah

Introduction

In 1989, the Ministry of Food and Agriculture launched its accelerated agricultural growth and development strategy (AAGDS) to increase the pace of the sector's growth from the current annual average rate from 3-4% to 5-6% in support of attaining the goals of Government of Ghana's long-term vision 2020 program. The main elements of the strategy are: (i) increasing access to improved agricultural technology (ii) promoting the production and marketing of selected agricultural commodities (iii) improving rural infrastructure (iv) increasing access to rural finance (v) improving producer's and agro-processors access to domestic, regional and international markets. The proposed Agricultural Services sub-Sector Investment Program (AgSSIP) with loan funding from the World Bank is one of the major instruments for implementing this strategy, dealing mainly with the first two elements. The main elements of the strategy are to: (i) increase agricultural production and diversification at a rapid pace so that rural incomes will be increased, rural poverty reduced, food security improved and the basis for accelerated overall growth in the economy established and (ii) promote farming systems and practices that will ensure sustainable use of the natural resources base.

Research constitutes an important component of AgSSIP. It is required to generate technologies and facilitate access to agricultural technologies that would help in attaining the government's accelerated agricultural growth of 5 - 6% per annum on a sustainable basis. Users of agricultural research will participate in priority setting, funding and delivery of these services to ensure that they are demand driven, in accord with national

development priorities, the needs of farmers and the sustainable use of Ghana's natural resource base; as well as to increase their financial sustainability.

Specific activities of the agricultural research component of AgSSIP would be to: (i) improve research governance, management and financial accountability: (ii) introduce sustainable and competitive research financing, including competitive research grant schemes and voluntary contributions from research users; (iii) mainstream gender and equity considerations in extension services; and (iv) forge strong linkages with sources of agricultural technology. Under the research component, funds will be made available to support the priority/core research and also the proposed competitive agricultural research programs. The introduction of the competitive grant scheme is seen as one of several instruments to allocate research funds to scientists.

This paper describes the preparations towards the implementation of competitive research grants scheme in Ghana.

Administrative Structure

The competitive agricultural research grants scheme emerged from the research grant scheme instituted in 1992 under the National Agricultural Research Project (NARP). The agricultural research institutes and universities were the traditional beneficiaries of the grants under the scheme. The track record of the research grant scheme under NARP was mixed. Even though it was managed smoothly and the quality of the research projects was high, the relevance of the projects to client needs was questionable and the scheme was very fragmented.

The scheme was seen as the most supply-driven part of the research system. Under AgSSIP, the competitive agricultural research grant scheme has been broadened to include participation of non-governmental organizations (NGOs), farmer/commodity organizations, agribusiness concerns and other stakeholders. The government of Ghana and donors see competitive funding mechanisms as effective tools to redirect priorities and strengthen the participation of universities and other non-public and private sector research organizations. Directors of research institutes also see this scheme as an additional source of scarce operating funds and as a means to develop joint ventures with other public and private sector research organizations.

The principal objective of the new scheme is to harness an under-utilized research capacity, which will bring significant benefits to end-users either directly or through contributions to other research. It is the aim of the scheme also to improve the quality and efficiency of agricultural research by introducing a demand-driven, competitive selection system that would co-finance projects.

As part of our preparation towards the implementation of this scheme, an important manual, which gives detailed information about the Competitive Agricultural Research Grant Scheme (CARGS) has been put together. This manual will assist individual scientists and institutions in their applications for grants under the scheme.

We have visited universities and research institutes throughout the country to sensitize researchers about the scheme. Efforts have also been made to educate other stakeholders through workshops.

Research Grant Board

Under the over-all policy guidance of the National Agricultural Research Policy sub-Committee (ARPC), a five member Research Grant Board (RGB) has been formed. The composition of the RGB is as follows:

- One agricultural scientist affiliated with the Council for Scientific and Industrial Research (CSIR-Ghana).
- Three stakeholders (NGO, agribusiness, farmer).
- One expert in policy objectives and public extension (Ministry of Food and Agriculture).

The principal task of this board is to select for funding proposals that best serve the objectives approved by the ARPC.

Research Grant Scheme (RGS) Secretariat

A research grant scheme Secretariat has been created at the Council for Scientific and Industrial Research, with the deputy director-general of the Agriculture, Forestry and Fisheries Sector (AFFS) as the head. The RGS Secretariat is given the task to:

- Disseminate information about the scheme and publicize calls for proposals that for proposals will be made in January and July each year.
- Organize administrative and technical pre-screening of the proposals to ensure that the prescribed format for RGS application and procedures are followed.
- Monitor and evaluate projects in consultation with the recipient organizations.
- Liaise with stakeholders, including potential new sources of funding.

Types of Grants

The RGS will support three types of research and development (R&D) activities.

i. It will provide funding for strategic research that is targeted at solving problems of national importance and has clearly identified users (end-users or applied researchers).

ii. The scheme will provide funds for applied and adaptive research that is exceptionally innovative, responds to pressing new needs or opportunities, brings together new partners, or cuts across several disciplines and commodities in such a way that has been catered for by the existing priority research programs despite its merits. The scheme is not intended to be a "second chance" for proposals rejected by priority research programs.

iii. The scheme will provide support for downstream research and development activities such as pilot projects that demonstrate the potential of improved technologies or develop research results into commercial products.

Size of Grants

The upper limit of grants to be approved by the scheme per project shall be $50,000. There will also be an option under the scheme for supporting small projects by individual researchers. The grant for such projects shall not exceed $10,000. Under the scheme it is proposed to

move funds progressively from the priority research programs to competitive funding through CARGS.

The scheme intends to support fifty research projects during phase one of AgSSIP. Twenty-five projects will be funded in each of the first two years of the scheme. No new project will be supported in the third year, as it is unlikely such projects will be completed before the external evaluation of AgSSIP phase one.

Review of Proposals

There will be a pre-screening of all research proposals received by the RGS Secretariat. Two specialists in the subject area of the proposal will further assess proposals that pass this initial screening.

The comments of the national research program coordinators will be solicited on proposals in the fields covered by or closely related to their programs.

The RGB will select research proposals and approve grants for their implementation, taking into consideration assessment reports or comments from the Assessors and Program Coordinators, as well as specific priorities mentioned in the call for proposals and general priorities approved by ARPC.

Financial Administration and Procedures

Financial administration and procedures to be used under the scheme have been given in the manual. Efforts will be made to educate grant beneficiaries and the heads of their institutions to ensure compliance.

Reporting, Monitoring and Evaluation

The principal investigator of the project will be required to submit a progress report to the RGS Secretariat every six months from the date of commencement of the project. Investigators will be sanctioned if they fail to submit their reports by the due date. Based on the progress report of the project, the Secretariat will undertake routine monitoring. Substantive monitoring and evaluation visits by scientists/experts knowledgeable in the field of study of the research project shall be undertaken periodically.

Upon completion of the project, the principal investigator shall also be required to submit a financial statement and two bound copies of the final report of the project to the RGS Secretariat. Appropriate sets of criteria have been constructed to help with the assessment of all projects. These criteria include efficiency, effectiveness, accountability and transparency of the research project.

Conclusion

The intensive education and the manual that has been prepared may ensure the successful implementation of the competitive research grants scheme in Ghana. It is hoped that the scheme will bring the best out of the Ghanaian scientists and the competitive process itself will help raise science in the country. Even though the experience from many countries (Woolley, 2000; George, 2000 Villegas, 2000) would indicate that a target for competitive funding would normally be 25-33% of total funding, the target for the scheme has been at 50% priority funding for the country. It is assumed that the trend to competitively allocate research resources will work well in Ghana and that research institutes will have to acquire a greater share of their funding through competition in the foreseeable future. Hopefully, the experiences gained by countries such as Brazil, India and China (Delgado *et al*., 2000) will guide the implementation of the scheme in Ghana.

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Chapter 8 - Nepal

The Hill Research Programme of the Hill Agriculture Research Project - A Working Model of a Competitive Grant Fund

John B. Abington

Introduction

The Hill Agriculture Research Project (HARP) is a five-year project funded by the British Government Department for International Development (DFID) in Nepal. It is a follow-up to two long-term projects previously supported by the British Government at the Pakhribas and Lumle Agricultural Centres, which are located in the mid-hill districts of the eastern and western regions of the country. In 1994, the decision was made that the two Centres would relinquish their direct British Government funding, and would be integrated into the Nepal Agricultural Research Council (NARC). The reason for this was that their size in terms of staff numbers, and hence the level of financial input needed to support that level of staffing, was unsustainable either by the British Government or His Majesty's Government of Nepal (HMGN). From 1989 to 1995, the total annual budget for the two centres was £2.4 million, which at the time was equal to the entire annual budget for NARC for the rest of Nepal.

In order to facilitate the handover process, and at the same time to continue to support hill agriculture research and development in Nepal, the HARP was designed to continue with overall annual funding at the previous level, however, this was not to be directed solely at Pakhribas and Lumle. Although some block grant funding for the two centres will continue for the duration of the HARP, this is at a much-reduced level and decreases annually. When the decision to reduce the block grant funding was made, it was agreed to establish a competitive grant fund, called the Hill Research Programme (HRP), which was initially open

only to a restricted number of the hill research stations of NARC. At the same time that block grant funding was being reduced annually at Pakhribas and Lumle, the amount of funding available in the HRP was increased from £0.5 million to £1.5 million annually. It is on the establishment, development and operation of the HRP that this paper will focus.

Principles of the Hill Research Programme

The HRP has been designed with the objective of supporting the development of high quality research outputs that address the problems and production constraints of hill farming families in Nepal. The purpose of the HARP itself is to establish a sustainable and effective hill agriculture research system. This contributes to the wider objective of livelihoods of hill farm families being enhanced on a sustainable basis.

The programme supports research projects that address the Agricultural Perspectives Plan (APP), which is the official strategy document for agricultural development in Nepal for a twenty-year period beginning in 1995. The HRP aims to demonstrate the benefits of competitive time-bound research, implemented through projects developed by collaborative partnerships between a number of research providers. The fundamental principle upon which it is based is the clear separation of the roles of research providers and research purchasers in determining the allocation of funds. It is also designed to assist NARC - the main research provider and the co-ordinating body for agricultural research in Nepal - to develop the capacity to do contract research, and in the medium to long term to diversify its funding sources.

Hill Research Programme Management Structure

The Hill Agriculture Research Project (HARP) has a two-tier management structure. For the overall project, a Steering Committee has the role of guiding the implementation of the HARP and its constituent Hill Research Programme. The Steering Committee establishes the strategic priority areas for the HRP as set out in the Agricultural Perspective Plan (APP), the Ninth Development Plan for Nepal and in NARC's own strategy statement. It encourages effective liaison and linkages between the HRP, other research programmes (e.g. the DFID

Renewable Natural Resources Research Strategy, CGIAR Centres, and Research Councils in neighbouring countries), HMGN Stations and other donors. It also has a monitoring role, which is to review the development of the HARP and reports of its progress, to review the development of the HRP and to evaluate its progress in achieving the outputs specified, to recommend periodic independent reviews of projects and programme activities, and to review the annual programme report and approve its submission to the NARC Council and DFID.

The composition of this committee is as follows:

Secretary for Agriculture	Ministry of Agriculture (Chairman)
Director	HARP (Member Secretary)
Director General	Department of Agriculture
Director General	Department of Livestock Services
Executive Director	Nepal Agricultural Research Council
Rural Livelihoods Adviser	DFID Nepal
Chairman	Technical-sub Committee
Joint Secretary M & E	Ministry of Agriculture
Independent Member	Currently Senior Programme Adviser FAO

Subordinate to the Steering Committee is the Technical sub-Committee. The purpose of this committee is to ensure the approval of appropriate agricultural research projects that investigate demand led research problems aligned with national policies in order to improve the productivity of hill farming systems in Nepal. It also oversees the allocation and use of funds available under the HRP. Specifically, the committee establishes and publishes research project selection criteria in accordance with the APP, the Ninth Development Plan and NARC strategy. It calls for and reviews project concept notes for compliance with HRP priorities and criteria and, as necessary, commissions and evaluates external appraisals of the technical merit of project proposals and awards funding for those projects that are approved. Finally, the committee evaluates project monitoring reports and output, to determine whether or not funding should continue, and recommends remedial action or termination as necessary to the Steering Committee, which usually accepts and ratifies the recommendations.

The Technical sub-Committee is:

Chairman	An independent luminary
Director	HARP
Executive Director	Nepal Agricultural Research Council
(These three individuals form a link with the Steering Committee)	
HRP Manager	HARP
Two farmers	One male and one female
(These six individuals comprise a "core group" with voting rights)	
Director of Planning	Nepal Agricultural Research Council
Director of Foreign	Ministry of Forests and Soil Conservation
NGO Representative	
Gender expert	
Agro-forestry expert	
Deputy Director (Planning)	Department of Agriculture
Deputy Director (Planning)	Department of Livestock Services

In addition, there is an independently located Secretariat whose function is to administer the HRP fund based on the portfolio of projects approved by the above committees. The office staff is comprised of the HARP Director, the HRP Manager, an office manager and seven other staff members for secretarial and general office services, including a driver and a watchman.

Eligible research and research contractors to HRP

Research can be used to finance crops, livestock, agro-forestry and non-specific "factor" research such as soil fertility, integrated pest management and sustainable resource management. The HRP can also finance research on policy topics (e.g. markets, employment and distribution of benefits) and on methods within the research project cycle, from identification of research project/needs to impact evaluation of research. Though originally open only to five NARC hill stations, HRP funds have subsequently been made available to any research provider with a proven capacity to undertake research in the topics outlined above. The formal contractual arrangements for carrying out the approved research project are presently made between the HRP Secretariat director representing DFID, and the institute or organisation concerned.

Criteria for peer review

Assessments of project concept notes and project proposals are carried out through a process of peer review by independent assessors who remain anonymous to the applicants; the process is the same across all programme areas. All assessors are given training in how the assessment process should be undertaken.

Each proposal is sent to a minimum of three reviewers: two to assess the technical content and validity, and one to assess the extent to which the wider social, economic and environmental issues have been considered and addressed. All reviewers follow the same procedures and questionnaires. While assessment will always contain an element of subjectivity, the procedure adopted for the HRP tries to be as objective as possible. Assessment is made against a series of questions under nine area headings. Each assessor is required to indicate "Yes", "No" or "Partially" as to whether the question posed has been satisfactorily answered in the proposal. A score is then assigned against a previously established maximum for each question; in addition, the assessor is required to provide a short written comment as to why the answer and score have been given. At the end of the concept note assessment process, each assessor ranks the concept note against one of the following grades:

A Highly recommended for implementation;
B Worthwhile calling for a full project proposal;
C Recommended for further consideration after concept note has been resubmitted following a limited number of concerns being addressed;
D The research and development topic is of high priority but considerable work is needed before the concept note can be accepted for further consideration;
E Reject outright.

Table 1 shows the nine main topic areas against which the assessments are made for concept notes and full proposals, and the proportion of marks awarded in the assessment process against the more specific questions under each heading.

Table 1. Main topic area headings and proportion of marks awarded in the HRP assessment process

Area heading	Proportion
1. Alignment with national and regional policies	4%
2. The extent to which the proposal clearly shows it address a farmer identified priority	7%
3. The extent to which the literature review of past work supports the proposed project	9%
4. How much consideration has been given to social and economic conditions of targeted farm households	15%
5. The logic and technical content of the proposal, and its feasibility	30%
6. Who will benefit from the project and how	14%
7. Whether the impact of the project outputs upon the evironment has been considered	6%
8. The extent to which the technology adoption processes and uptake pathways have been identified	6%
9. The adequacy of the budget to achieve the project purpose	9%

Allocation of available budget to priority areas

For the first three years of the Hill Research Programme, budgets have been allocated based on the priority areas established within the Agricultural Perspective Plan (APP), the twenty-year strategy for agricultural development in Nepal. Within the first five-year implementation plan for the APP, indicative budgetary allocations were presented for agricultural technology development. These budgets were adopted as the basis for allocation of HRP funds by the Technical sub-Committee, but were modified to address more directly the priority areas for hill agriculture development. The Technical sub-Committee has used its discretion to further amend allocations on an annual basis in light of the portfolio of projects already awarded, and to target priority areas where an insufficiency of proposals was received in earlier years. A summary of these allocations is presented in Table 2.

Table 2. Proportional allocations of funding to different priority hill development areas of the Hill Research Programme funds 1998 to 2000

Development priority	APP allocation	HARP 1998/99 allocation	HARP 1999/00 allocation	HARP 2000/01 allocation
High intensity systems	**40% of total**	**35% of total**	**30% of total**	**15% of total**
Soil fertility	40%	30%	30%	30%
Variety development	30%	40%	35%	35%
Integrated pest management	15%	15%	20%	20%
Cropping systems	15%	15%	15%	15%
High value commodities	**25% of total**	**30% of total**	**35% of total**	**15% of total**
Citrus	30%	30%	25%	25%
Vegetables/Vegetable seed	20%	20%	25%	25%
Other horticulture	20%	10%	10%	10%
Livestock	30%	40%	40%	40%
Outreath programmes	**20% of total**	**20% of total**	**15% of total**	**40% of total**
Other research topics	**15% of total**	**15% of total**	**20% of total**	**30% of total**
Agroforestry	Not specified	Not specified	30%	30%
Marketing	Not specified	Not specified	20%	30%
Situation/Problem analysis	Not specified	Not specified	15%	10%
Post harvest	Not specified	Not specified	20%	20%
Niche crops/rural livelihoods	Not specified	Not specified	15%	10%

Allowable expenditure in HRP budgets

Eligible expenditure under HRP budgeting procedures provides for staff expenses, operational costs, equipment and supplies, training and publication, overhead and contingencies.

Staff costs include the salaries of contract staff and other payments to staff in all categories (paid on a permanent, contract and daily basis) by the organisation concerned. However, if staff costs become too great a proportion of the implementation budget, the project is likely to be rejected in a competitive situation.

Operational costs can include expenses of employing labour to carry out field trials, duty travel for staff implementing projects in situations away from their home station, costs of using vehicles, and purchase of supplies.

Equipment costs are for those small capital items considered necessary to enable project implementation. Large single items of capital equipment that are expensive relative to the total cost of the project are likely to count against a proposal. As a matter of principle, the HRP is not to be used for development of research facilities or other infrastructure.

Training and publication funds are directed towards dissemination of information at the end of a project. Short term technical training or study tours integral to the proposed research (up to three months maximum) are allowable where needed to develop skills of technical and other support staff.

Overhead is paid in recognition that carrying out research projects has a cost in terms of station infrastructure use, and depreciation of laboratory and field equipment and vehicles, which will need to be maintained and eventually replaced. Again, under a competitive system, if this is element is pitched too high by the provider, a project is unlikely to be accepted.

The contingency line is not a "miscellaneous items" vote line, but allows for unforeseen circumstances occurring during project implementation, and is only accessible for use with the authority of the HARP Secretariat.

The HARP is a grant in aid programme of the British Government Department for International Development, and while the project continues, equipment purchased under the project remains the property of the British Government. However, at the end of the project period it is common to donate such equipment to the institute concerned.

Status of the Hill Research Programme

There have been five calls for project concept notes since 1997. Priorities for allocating funding to different research topics were

developed by the Technical sub-Committee based upon the stated objectives of the Agricultural Perspectives Plan (APP) for hill agriculture development. Every year, prior to the call for concept notes, the Technical sub-Committee re-examines the amount of research funding currently allocated to the APP priority topics, and adjusts the amount of new funds to each accordingly.

Access to the HRP was originally confined to five NARC hill research stations. In 1997, a pilot test of the procedures for assessing projects and making grants was initiated. Funding for the pilot process was restricted to an award of £5,000 for each station involved. The element of competition was introduced by requesting more than one proposal from the staff at each station. Prior to the call for concept notes, training in concept note and full proposal writing was given by HARP to the staff who would be submitting the proposals. Assessors were also given training in the methodologies of assessment required by the HARP Secretariat.

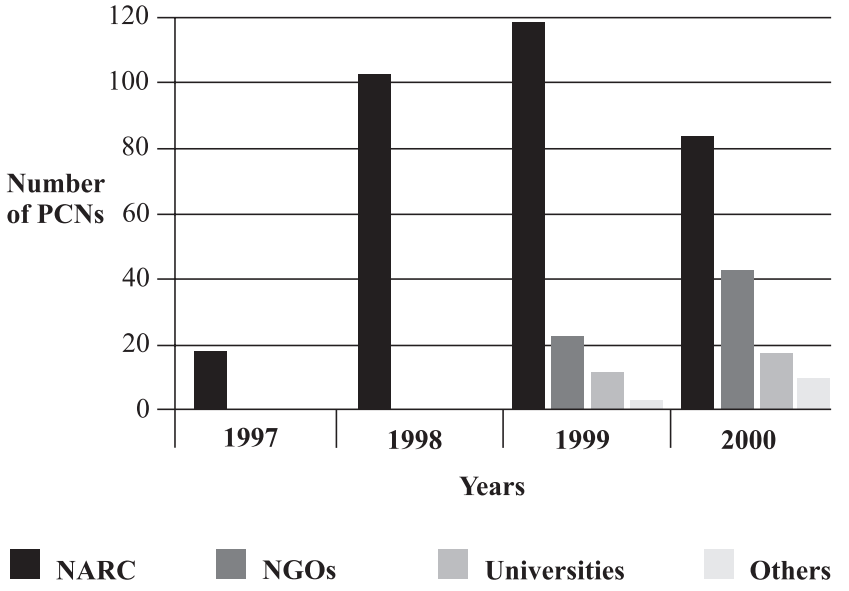
Based on the feedback and the experience gained - both by scientists submitting proposals and the assessors evaluating them - the procedures adopted for making awards and for training courses have been refined and updated.

The start of the 1998/99 Nepalese financial year was the first full year of fund operation and during that year thirty-five projects were approved for funding. Following full initiation of the fund, a second call was made in July 1999. This call showed a lack of proposals in areas considered vital to hill agriculture development from the five NARC stations involved. A second call that was restricted to those areas was made and allowed access to the fund by any research provider.

Following an Output to Purpose review of the HARP in February 1999, which included an assessment of the response to limited open competition, it was recommended that projects starting in July 2000, the HRP should be opened to all. A total of seventeen research providers including NARC, NGO's, Tribhuvan University, the Departments of Agriculture and Livestock Services, and private enterprise have been, and continue to be, involved in project development and implementation. Figure 1 shows that since opening up the HRP to full competition,

providers other than the national research institute are becoming increasingly involved. To date, within the five calls for proposals, 444 concept notes have been received and processed, and funds have been or will be awarded to 124 full projects. Figure 1 shows how origins of proposals to the fund have changed with time.

Figure 1. HRP submissions by provider



Monitoring and evaluation

Though competitive grant systems are supposed to produce a more effective and efficient national research system; to date there has been little objective evidence presented and analysed to show that this is in fact the case. There is little point in changing the method and emphasis of agricultural research funding in a country through establishing a competitive grant system unless its impact both as an agent for institutional change in the national research system, and the impact of the individual projects upon improving the livelihoods of rural households is assessed, measured and quantified.

The HARP memorandum LOGFRAME contains an activity calling for monitoring and evaluation of the HRP to be undertaken. This requires measurement of the adoption (and uptake) of research project outputs and impact evaluation of the new technology on hill farming communities who are its ultimate beneficiaries. The effectiveness of competitive grant funding, both as a method of producing effective outputs from agricultural research, and as an agent for engendering management and procedural reforms within the national research system also needs assessment. The procedures to enable impact assessment to be carried out ex post of project implementation are therefore being established. The design of the evaluation framework has to articulate the change model that underpins the contribution of agricultural research towards improved rural livelihoods and be based on the following:

- A basic understanding of the main determinants of livelihoods of the target communities;
- The accurate identification of constraints within farming systems to improved livelihoods;
- The identification of priorities for developing improved technology and the spreading of innovation;
- The testing of technology development and of innovations, and the operation of a mechanism for their dissemination and replication;
- The degree of innovation achieved and the contribution made to livelihoods.

Much of the groundwork for this can and should be achieved at the design stage of a competitive grant system. The process has to begin with the setting of clear priorities and targets by the fund administrators that the research proposals accepted for funding will address. The procedures and criteria for proposal presentation and assessment form the second stage. Those proposals considered unlikely to achieve impact are eliminated. Essential to a successful application process is the use of the information generated as indicators in the LOGFRAME (or similar planning tool), which in the case of the HRP constitutes a part of every project proposal, as does a chart of project activities. Without this information, a project is not accepted.

Monitoring and evaluation begins at the project planning stage, and for the HRP, progress monitoring is undertaken throughout the life of each project. This progress monitoring takes the form of regular technical progress reports by all project leaders measured against "milestones" together with a summary of expenditure, three times per year. In addition, the HARP Secretariat staff makes regular and unannounced monitoring visits to projects as deemed necessary. Research contractors are also required to submit a final project report within three months of the agreed end date of the project in which all output and dissemination activities are specified.

While some limited evaluation of every HRP project can be achieved in this way, detailed ex post measurement of impact is only practical for a sample of projects. To attempt to measure the impact of all projects is neither realistic nor cost effective.

For the routine monitoring of project activities and ultimate impact assessment, a good management information system is essential. The design of an information system and its subsequent operation is also in the progress of being established as part of the monitoring and evaluation process for HARP.

All of this carries a cost, both in staff time and as a direct financial cost. These are factors that are not often considered in the establishment phase of a competitive grant system. Indeed, in the case of the HARP, while the intent to carry out monitoring and evaluation was expressed in the original project document, no separate time-frame or budgetary allocation was provided during its inception, and it is only now, after two years of HRP implementation, that these issues are being addressed. In one sense, this is an advantage, as having the experience of implementing the HRP projects means that the management information system can be designed to answer appropriate questions asked of it. However, the downside is that some projects will have been completed before the system to evaluate their impact is in place and fully operational, and any baseline information collected may not truly represent the ex ante situation of the farming families for whom the technology is intended.

General issues and conclusions

The HARP Hill Research Programme is a new enterprise for Nepal, and though accepted as being innovative, it is at present a donor agency initiative. As such, unless it is accepted and absorbed into the Nepalese system, its principles are unsustainable and it will remain as a "one-off" experience. The Ministry of Agriculture of His Majesty's Government of Nepal has expressed interest in establishing a competitive grant system to complement block grant funding for agricultural research and extension in Nepal. A study of the opportunities and the legal, financial and administrative issues that need to be addressed in introducing a competitive grant system has been commissioned. A key issue to be resolved for the Nepal situation is a recognition that within the agricultural development process, the HRP and any national competitive grant system can only complement, and cannot completely replace block grant funding of agricultural research and extension. Although aid donors welcome the principles of competitive grants because they result in output-oriented projects, and that the recipients can be held accountable, the amount of HMGN funding that should be devoted to each in Nepal will have to be determined. The real advantage of establishing a competitive grant system in Nepal may be that it will allow a balanced approach to the future funding of agricultural research and development.

Other donor agencies and HMGN are already operating small funds in other contexts such as soil conservation, rural water supply, and poverty alleviation with some success. The crucial issue for success, in all cases, is the eventual establishment of a truly independent panel to administer the awarding of the grant that would be free from political and other vested interests. This is a principle that may take time to be accepted by all participants in the debate during the formulation of a competitive grant system; but it should always be the eventual objective.

There is little doubt as to the value of having pilot tested the HRP methodologies before proceeding to a full competitive grant scheme.

It allowed testing of the procedures for submission and assessment of concept notes and proposals, project implementation and reporting, and the technical and financial evaluation of the reports received. It also allowed an assessment to be made of the number and quality of proposals received from other research providers when the fund was opened to

competition between a number of providers. As the awards made under both pilot schemes were relatively small, the level of risk of failure was minimised. Pilot testing is recommended as a routine to be adopted when new funds are to be established.

The role of providers other than NARC, and their ability of to carry out effective research programmes and projects, is an issue of concern in opening the HRP to all. To minimise this risk, capability statements against a set of assessment criteria are required of all organisations (including NARC stations) that apply for HRP funding.

In conclusion, the introduction of the HRP competitive fund to Nepal can be said to have genuinely accessed and stimulated the national research system, including the National Institute. This is apparent from the diversity of organisations applying for grants and the number of concept notes received by the HRP. A major improvement over the prevailing system of awarding block grant funding to national institutions is that the collaboration and partnerships between research organisations and individuals possessing different skills and abilities is beginning to occur in Nepal. This is in response to the need to deliver output and disseminate the technology produced, and the realisation that no single institution can possess all of the skills or personnel required to achieve this. This in turn has enabled effective targeting of the priority topics of the APP by those most likely to deliver the desired results.

Although the impact of competitive systems in bringing about institutional change has not been comprehensively analysed and quantitatively evaluated, there is evidence in Nepal that the procedures and practices adopted by the HRP are beginning to trickle down and be implemented in the programmes and projects funded through the annual government block grants. If, in the longer term, competitive grant systems achieve nothing else, they will have acted as a catalyst for moribund organisations to reorganise and reform. They oblige scientists and technicians first to learn and adopt good principles and practices for research planning and implementation, and then to direct their research effort towards the customers they are supposed to serve. This in itself would be no mean achievement.

Chapter 9 - Nicaragua

The Competitive Agricultural Technology Fund in Nicaragua

Víctor Blandón Rivera [1]

Introduction

Nicaragua is the largest country in Central America, but today it is the third poorest country in Latin America. Its economy is based on the export of agricultural products, but the yields in coffee, corn and rice are half that of El Salvador. The level of technology and investment in agricultural research is lower than that in neighboring countries. Only a third of the land irrigated in the 1970´s is irrigated today. Within the country, researchers work in isolation, and do not often have contact with researchers abroad. There is lack of human resources to perform research of relevance as well as of financial resources to acquire modern equipment, laboratories and books, which can lead to a duplication of work. Consequently, part of the research done so far by universities, the public sector and NGOs has not been as relevant to the development of the country. However, the present government views the agricultural sector as the centerpiece for development. Through the Ministry of Agriculture and Forestry (MAG-FOR), it is currently defining policies and strategies will contribute to its growth and improvement.

To contribute to the development of the agricultural sector, in 1993 the government created the Nicaraguan Institute for Agricultural Technology (INTA) as a component of the Nicaraguan Agricultural Technology and Land Management Project (ATLMP - Id. 7780), with loan funding from the World Bank (WB) and the Swiss Agency for Development and Cooperation (COSUDE). The creation of an agricultural research fund was one of the tasks of INTA. Its goals were: (1) to facilitate the access of the agricultural sector to strategic and

[1] The author is the Executive Secretary of the Nicaraguan Competitive Fund for Technological Agricultural Research (FAITAN), Managua, Nicaragua. Email: *faitan@ibw.com.ni*

technological innovations; and (2) to strengthen the establishment of the National System of Agricultural Technology. The implementation of the Nicaraguan Competitive Fund for Technological Agricultural Research (FAITAN) started in August 1998, with administrative support of INTA.

The agricultural research fund should have begun after the midterm evaluation of the ATLMP in 1996, but its establishment was delayed because the preparation of the operational manual needed more time than had been planned. The value of the fund was US $ 350,000 with an expected contribution from the research suppliers of a minimum equivalent of 25% of the total research project costs. The counterpart contribution went to salaries, infrastructure and equipment. However, in the first phase of the implementation of the fund, it was more important to enhance human resources and to use the available infrastructure and equipment of the research suppliers (universities, institutes and research centers), than to ask for contributions from the beneficiaries of the technology, mainly because of the critical economic situation of that sector.

An executive secretary was in charge of the technical implementation of the fund, supported by an Autonomous Technical Committee (CTF), which is an independent and pluralistic board that represents the entire spectrum of stakeholders, made up of seven members: three representatives of the public sector; two representatives from agricultural universities and regional research centers; one from producers organizations; and one from an agronomist association.

Objectives and Strategies

FAITAN was designed with the following objectives: (1) to give financial support to strategic research projects and special studies in priority areas to overcome technological problems of the agricultural sector; (2) to strengthen INTA's capacity to attend to the technological demands of its clients; (3) to encourage a wider participation of scientists and research suppliers in the performance of strategic research projects and special studies of relevance to the agricultural sector. FAITAN could also be used to promote joint activities between the public sector and the private one, universities, NGOs and international agricultural research institutions.

To achieve greater synergy and cost-effectiveness, FAITAN encourages collaboration between local institutions and foreign institutions, while fostering greater participation of stakeholders in making the research portfolio.

Procedure

In order to set up a demand-driven portfolio agenda, farmers' organizations and INTA were asked to present research profiles to FAITAN. Twenty-nine research profiles (term of references - TORs) were received, twenty-one came from INTA. Forty-eight percent of the profiles were related to corn, rice, beans and sorghum, showing the poor diversification of the research activities in Nicaragua.

Consultants and individual scientists were invited to register in the FAITAN data bank through an announcement in the three biggest local daily newspapers. Invitations were also sent to diplomatic representations, in order to have foreign firms, as well as to research centers and universities already in the data bank. The CTF carried out a strategic assessment with the objective of avoiding duplications of work being done by other institutions, also because some profiles were mandatory for INTA. After that, and following bid procedures of the World Bank, nine TORs were selected according to: (1) socio-economic importance; (2) relevance and severity of the issues; and (3) feasibility of adoption of the technology by farmers. The timeframe for the approved TORs varied from six months to three years. Taking into account the closing date of the ATLMP, the decision was made to start with the projects that needed no more than twelve months to be carried out.

Four TORs fulfilled that condition. According to the norms of "Short List Selection Based on Quality - and Cost of the Consultant", a minimum of three and a maximum of six research suppliers for each profile were invited to present a technical and financial proposal. A total of eighteen research suppliers were invited to present proposals. A peer review panel made up of three external experts evaluated eleven proposals and made technical recommendations to the CTF, which made the final decisions. At present, FAITAN has awarded grants to five research projects.

FAITAN Grants Awarded

	Time of Execution	Project Costs (US $)		
		Counter -part	FAITAN	Total costs
Integrated Pest Management with emphasis on the use of entomopathogen fungi	12 months	56,770.00	66,809.57	123,579.57
Influence of Rural Communication on the Adoption of Agricultural Technologies in Nicaragua	5 months	25,842.41	46,995.19	72,837.60
Basic grains seeds stored under different environmental conditions of seed producers	12 months	36,765.50	54,650.16	91,415.66
Effect os Harvest and Post Harvest Management on the Quality of Fruits and Vegetables	12 months	29,110.00	104,950.00	134,060.00
Evaluation of Marango (*Moringa oleifera* L.) as an essential component of a feeding system of pigs	8 months	23,875.00	20,819.50	44,694.50
TOTAL		**172,362.91**	**294,224.42**	**466,587.33**

Problems and Solutions

The establishment of FAITAN created expectations within the research community, but the procedures of "Short List Selection Based on Quality - and Cost of the Consultant" did not seem to be the most appropriate way to capitalize on it. Research suppliers demand Public calls to compete, but they were not considered in the FAITAN Handbook, probably because of the small amount of funds that were available and the closing date of the project. Some research suppliers invited to present proposals did not react in time; sometimes because their experts were not available, sometimes because they were not interested in the specific topic, or in the worst cases, because the information did not reach the right people (researchers instead of legal representatives). In other cases, the research proposals were of poor quality. Therefore, in two of the four cases, it was necessary to make a second invitation to present proposals. This delayed the implementation of the fund.

Although FAITAN has its own Handbook of Operations, some processes like the selection of consultants, the evaluation of proposals or the bidding procedures were incomplete or not well described. "The Guidelines: Selection and Employment of Consultants by World Bank Borrowers" was supposed to be a complement to the FAITAN Handbook, but on some issues, there were contradictions. In order to solve these problems, the CTF had to ask the Project Coordination Unit (PCU) to define clear rules and functions for each organization in order to facilitate the implementation of the fund.

The selection of proposals was primarily a task for the members of the CTF. A peer review procedure was not included in the handbook to evaluate proposals, but as it was a recommendation of the WB, it was included. The existence of two bodies with the same function of evaluating proposals caused some conflict. In the end, reviewers made the technical assessment of the proposals and the CTF made the final decision.

Although INTA provides the executive secretary of FAITAN with administrative support and pays his/her salary, the executive secretary answers to the president of the independent board called CTF. However, the PCU has the responsibility of facilitating the implementation process of the project and checking that the procedures developed are in accordance with the norms of the WB. The functions of each body were not clear enough and caused conflict and misunderstanding as to where the responsibilities of each began and ended.

Lessons Learned

The implementation of a competitive fund for agricultural research was a new and unknown experience. Different problems appeared from which we learned valuable lessons.

- In a short period of time, farmer's organizations are not prepared to present their research proposals. Activities should be carried out to build strategic alliances with universities, research centers and NGOs that would allow the presentation of proposals of high relevance and impact for the development of the sector.

- The "Short List Selection Based on Quality - and Cost of the Consultant" did not seem to be the most appropriate procedure to introduce the concept of competitive funding in a country with a small technological market. In order to familiarize clients with the mandate of competitive funds - and to train the country's researchers and scientists in drafting proposals - workshops and seminars should be carried out before making public calls to compete.

- During the first phase of the implementation of the fund, it is more important to use the available infrastructure and equipment of the research suppliers (universities, institutes and research centers) and to enhance human resources, than to ask for contributions from the beneficiaries of the technology, mainly because of the critical economic situation of this sector.

- Clear rules are needed to improve accountability and transparency for a successful implementation of competitive funds. This includes well-defined functions of each body and operational manuals with tools for the purposed goals.

- Based on the lack of experience in writing research proposals and the small size of our technological market, it is necessary to have a two two-stage selection process to encourage wider participation of research institutions in the call for proposals, since it would not represent a heavy initial investment in project preparation for researchers.

- Assessment criteria for research proposals and projects must be defined according to the objectives and purposes of each fund. In our case, one of the goals of FAITAN was to strengthen the National System for Development of Agricultural Technology, but when competing with foreign research suppliers, local institutions are at a disadvantage and without a chance for success.

- The conformation of strategic alliances should be encouraged in order to increase the research capacities of local institutions, instead of competing against foreigners for the same funds.

- The experience of FAITAN demonstrates the urgent need to define a system of monitoring and evaluation of research projects, with the participation of farmers and local communities. Environmental criteria of compliance must also be included.

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Chapter 10 - United States of America

Competitive Grants for U.S. Agricultural Research The Long and Hard Road to Success

Sally Rockey

Competitive grants are well-established and time-tested methods for funding high quality science in the United States. Agricultural research competitive grant programs exist but are not the dominant method used to fund U.S. agricultural investigation. A look at the history and status of agricultural research will shed light on the challenges in developing and growing competitive agricultural research in this country. This article will address the status of agricultural research, examine the history of competitive grants in agriculture, and address the challenges and successes in developing competitive grants programs.

Currently, agricultural research represents only 4% of the total $40 billion dollar research portfolio funded by the Federal government. Although small, agricultural research investment is vital for maintaining the strong competitive and economic performance of the agricultural enterprise in the U.S. Agricultural research, therefore, faces the real challenge of finding visibility within the large U.S. research system.

To meet this challenge, agricultural research must focus on real world problems that are meaningful to the public and to decision-makers; and it must be of a high scientific quality equivalent to national programs in other disciplines such as medicine or energy. Concentration on real world problems does not exclude the support of fundamental research where the outcomes are yet unknown. Indeed, university and federal scientists continue to pursue fundamental science related to agriculture, and the government is a funder of this type of research. However, history clearly demonstrates that fundamental agricultural research must be justified in practical terms. To this end, agriculture, as opposed to some other research disciplines, has a distinct advantage in adopting research

findings quickly. The university and state extension system continually takes research results and disseminates them to users and practitioners. Additionally, the vast private-sector interest in agriculture assures that fundamental and applied research results are put to immediate use as they become available. Thus, agricultural research, including fundamental sciences, is often quickly applied to problem solving, demonstrating that support for agricultural research is a sound federal investment.

Agricultural research at the federal level is funded through a large network of federal laboratories and intramural scientists, and through extramural support to colleges and universities and other non-federal partners. The current federal investment in agricultural research is about $1.6 billion. Two thirds, or about $1 billion is intramural funding. The other third, or about $600 million, is extramural funding. A number of U.S. Department of Agriculture (USDA) agencies support intramural research including the Agriculture Research Service (ARS), Forest Service (FS) and the Economic Research Service (ERS). The Cooperative State Research, Education and Extension Service (CSREES) is the major extramural research funding agency for the USDA.

CSREES supports research through three funding mechanisms. Formula funds comprise about 40% ($240 million) of CSREES funds. These funds are provided to the experiment stations of 1862 Land Grant Universities, to 1890 Land Grant Institutions, to Schools of Forestry, and to Schools of Veterinary Medicine. Funds are distributed to these schools based on a variety of formulas that may include such items as farm acreage and rural populations. The funds also require matching or counterpart funds. Formula funds provide critically needed base support for agricultural programs at the land-grant universities and are most often directed towards critical local and regional agricultural issues.

A second mechanism of research support used by CSREES is non competitive Special Grants. Special Grants are congressionally mandated research used to target resources in support of a particular research project at a specified land-grant institution. Special grants are used to address pressing localized or regional agricultural issues needing a rapid influx of research support.

The third and final type of research supported by CSREES is competitive research grants. In FY 2000 about 47% ($280 million) of CSREES research funds were distributed competitively. Although there has been growth in the area of competitive grants, competitively awarded funds still only represent 1/6 of the USDA research budget. FY 2000 was a landmark year for agricultural competitive grants with a doubling of the CSREES competitive portfolio to its current funding level. New funds were available through Congress in an unusual manner and may not be available in future years (to be discussed later in this article). Therefore, only one major competitive research grants program with stable funding existed and continues to exist in the USDA: CSREES's National Research Initiative Competitive Grant Program (NRI).

The NRI grew out of a small program that was developed in 1978 called the Competitive Research Grants Program. The challenge facing the agricultural community at the time was to expand federal funding in agricultural research in such a way to attract the best and brightest scientists to work on agricultural issues. The 1977 Farm Bill, the large omnibus bill that guides USDA programs, authorized the competitive grants program to have open eligibility for any type of institution in the country. The goal was to broaden funding of agricultural research beyond the traditional recipients - intramural laboratories and land-grant institutions - and to assure the highest quality science through competition. The program received a $15 million appropriation in FY 1978 to support fundamental science in two areas, plant sciences and human nutrition. During the 1980's, the program grew to about $40 million and expanded to include animal sciences and natural resources.

In 1989 a report by the National Research Council of the National Academy of Sciences was issued called "Investing in Research: A Proposal to Strengthen Agricultural, Food, and Environmental Systems." This report stressed the importance of increasing agricultural research competitive grants and called for a major funding increase to $500 million per year. Based on this report, Congress appropriated $72 million dollars for the NRI in 1991. The new program subsumed the old CRGP and expanded its scope to include research in social sciences, food sciences, and processing of agricultural products. It also led to the development of programs to support new investigators and postdoctoral fellows and to increase capacity at institutions and in states that typically were less successful in obtaining competitive grants.

The NRI has been at level funding of $119 million/year since 1998. Around 2,600 applications are received each year and about 700 awards are made. Most grants range from $60,000 to $250,000 per year for a two to four year duration. Most funds obtained through NRI grants are used to support students, postdoctoral fellowships and technical staffs. Thus, although small, NRI grants are used most appropriately to build human capacity in agriculture and to conduct research to solve today's agricultural problems.

The peer review process developed for the NRI has served as a basis for the peer review used by all CSREES competitive programs. It is viewed as a fair and equitable system that is considered by many as the optimum method for research evaluation used by the federal government today. An active university or federal scientist serves in a part-time capacity as "panel manager" for each NRI program. This individual works with an NRI scientist (program director) to constitute panels of experts who review proposals. Proposals also are sent to ad hoc reviewers; individuals who provide written critiques but do no attend panel meetings. During the review process, all care is taken to avoid perceived or actual conflicts-of-interests and all panel and review processes remain totally confidential. NRI panels are not standing, they are reconstituted annually, but attempts are made to have at least 1/3 of the panel return each year to provide continuity. After proposals are discussed by the panel and ranked relative to each other, the panel manager and program director make final funding determinations by examining proposal budgets and forwarding as many of the recommended proposals as possible. Each applicant receives copies of the proposal reviews and a panel summary. The panel summary is a synopsis of pertinent panel comments and contains justification for why the proposal ranked as it did. Returning reviews is a critical part of the review process for it allows the applicant to have an expert evaluation on what improvements to the proposal can be made in future submissions.

FY 2000 brought dramatic changes to competitive grants in agricultural research. Congress authorized new programs through mandatory funding for CSREES. A small piece of discretionary funds ($39 million) that had been appropriated for special grants and formula funds was reconstituted into a new program called the Integrated Research, Education and Extension Competitive Grants Program that

will support projects in pest management, food safety and water quality. Two other new programs, the Initiative for Future Food and Agricultural Systems and the Fund for Rural America, established competitive grant programs for integrated research, education and extension in a multitude of topic areas. These two programs were established by Congress using mandatory funding, meaning that congressional authorizers directly made available program funds instead of the programs going through the typical appropriation process. However, because of controversy surrounding the use of mandatory funds to support what are typically appropriated activities, future funding for these new programs is tenuous.

What has been learned? Many lessons have been learned from development of competitive grants programs in the USDA.

Competitive grants are a powerful tool to promote high quality science that has impact. The small size of the USDA's competitive research grants portfolio has not diminished the quality of applications, the quality of resulting research, nor the quality of the scientists pursuing agricultural issues. Outcomes from the competitive process and resulting studies clearly demonstrate that competitive grants stimulate innovative research. Competitive grants should be used as a primary method to support quality science in agriculture.

Competitive grants are just one of a number of options to fund agricultural research. Competitive grants should only be implemented if an underlying research infrastructure exists. Competitive grants should not be used if there is a lack of expertise to generate competition. It may be more useful to use other funding mechanisms for developing research programs where expertise is lacking or where the focus of the research is so narrow that only a small pool of scientists has the expertise necessary to conduct the research. Competitive grants also should not be implemented to support research at a localized level where only certain specified institutions have the capacity to address the problem. Competitive grants add the greatest value to research quality and quantity when a strong base research system exists, the expertise is available to stimulate competition, and the topic of the research is broad in scope.

Competitive grants are expensive. The Federal investment in administration of competitive programs (conducting peer review and

pre and post award administration) is large. The NRI has one of the lowest administrative rates in the government (4% of program funds) as opposed to some agencies where administrative costs range from 5 to 11%. However, federal administrative costs pale in comparison to the amount of time and energy expended by applicants and their organizations in preparing and submitting proposals, particularly when one considers that 80% of applications are declined. Therefore, when developing competitive grants programs, a careful assessment should be conducted to determine if funds are available to cover administrative costs and if the payoff of the program merits the efforts that will be expended by the applicants.

Competitive grants programs must be credible to be successful. Political factors, outside pressures and other external considerations that would diminish the transparency and fairness of the competitive process can destroy competitive programs. Competitive grants programs must be independent of these influences. One way to promote independence is to place the program within the government structure where independence can be achieved. For example, the NRI is housed within CSREES. CSREES does not conduct research; therefore the Agency has no scientists that would be competing for NRI funds. By housing the NRI in CSREES, ARS, FS, and other intramural scientists - along with university scientists - can compete for funds because these agencies and organizations are clearly separated from the agency that administers the program. Applicants from all institutions must be assured that only the content of the proposal is driving its evaluation. Once a program has established credibility with its applicants, stakeholders and users, the competitive process can and should be used to justify all actions taken by the program.

Competitive programs should be relevant to stakeholder needs. Stakeholder input should be sought when developing competitive programs. Experience has shown that stakeholders buy into a program more readily when they feel ownership and are part of the process. Competitive programs are more relevant and more easily justified when there is an indication of how the program is responsive to stakeholder needs. While incorporating stakeholders needs is many times easier with applied research programs, programs such as the NRI that support

fundamental science still find the stakeholder process to be useful to understand long-term needs. Programs are often modified to incorporate research areas that are of particular interest to long-term goals of stakeholders. Developing relationships with stakeholders also has assisted in helping stakeholders understand the need for research in agriculture.

Cutting-edge science can be risky. Competitive grant programs that reward high-risk research along with more assured projects should be developed. High-risk projects tend to foster cutting-edge research and payoffs are often great. Although not all funds should be directed towards these projects, some support should be offered to stimulate creative and high-risk studies.

Treat all applicants with respect and professionalism. Applicants view competitive grant applications as testimonials to their work. Each proposal should be treated in a manner that recognizes this fact. Peer review processes should be developed and implemented to treat all applicants fairly and to provide the highest quality review possible. The competitive grants programs to emulate are those where applicants, even when declined, feel they received an impartial and fair review.

Be consistent among programs. If a competitive program has many sub areas or panels, all programs and/or panels should use similar polices and a procedure to maintain the integrity of the process at all levels. Thus, all applicants are treated equally regardless of the proposed topic. To the extent possible, policies for programs should remain consistent from year to year to ensure that applicants know what to expect from the program.

Be as flexible as possible. Where appropriate, programs should be flexible to allow for new research areas that will stimulate creative proposals. Burdens should be reduced on applicants wherever possible to make the application and award process simple. Be creative and innovative both in the types of programs offered and in the administration of the program. Competitive programs should be viewed as evolving and always improving.

What Has Led to Success of the USDA Competitive Grant Programs?

Great science!!! Competitive grant programs are only as good as the science that it supports. In the U.S., agricultural sciences are at the forefront of cutting-edge work and agricultural research is at the forefront of disciplines such as genomics, plant sciences, animal reproduction, economics, forestry, etc. Many talented, bright and innovative scientists work in agricultural-related areas and are quick to look to the NRI as a source of funds. Competitive grants programs such as the NRI have never lacked good, creative proposals. Virtually every panel has many more high quality proposals than ever could be funded.

*The NRI has the broadest eligibility possibl*e. All scientists from every type of institution, including federal laboratories, all colleges and universities, private organizations and even individuals can apply. This has fostered the largest pool of potential applicants possible with good and strong proposals, and has enabled agricultural research to be pursued at all types of institutions. The goal of bringing the best scientific minds to bear on agricultural issues is being reached.

Competitive grants in CSREES are highly credible and trusted by the community. The competitive process serves as a model for other programs including new competitive programs in developing countries. Every study of the NRI has concluded that the peer review process is of high standards. Applicants have every confidence that their proposals will receive a high quality and fair review.

Stakeholders are part of the process. Although receiving stakeholder input has evolved over the years, there is a strong recognition that stakeholders are vital to the overall success of competitive programs. The NRI and other CSREES competitive programs have strived to have better relationships with stakeholders, and to include stakeholders not only in the development of programs but as part of the proposals themselves. Stakeholders feel part of the process and lend support to the programs.

The competitive process is of great benefit to the scientific community. The competitive grants process itself has raised the quality of science by

subjecting agricultural research to critical review from peers and by providing exposure to high quality science to its reviewers. Scientists, who submit applications, obtain a critical assessment that will lead to improvements in future research. Individuals involved in the process, whether panelists or ad hoc reviewers, have an opportunity to read and assess high quality proposals. The process exposes these reviewers to highly meritorious proposals and this exposure enables them to improve their own grant-writing abilities.

A highly competent and dedicated staff. Each NRI staff member contributes to the sustainability of the program by promoting efficiency and innovation in everything they do. As government employees, there is not a more capable and devoted staff.

Future Challenges: Continuing challenges exist for the NRI and other competitive programs in agricultural research. The greatest challenge is the need to find increased and stable funding for the programs. A recent review of the NRI by the National Academy of Sciences National Research Council proclaimed that U.S. agriculture is at risk without a significant funding increase for agricultural research. The NRI is becoming more and more marginalized as increases to other federal research programs grow and the NRI remains significantly under funded. In constant dollars, the NRI has faced devaluation of its grants because of the small grant size and stagnant funding. Scientists are beginning to search elsewhere to find grant programs where their research is applicable and grant size significantly eclipses that of the NRI. The USDA soon faces the real prospect that scientists from outside the department may find no reason to work on agricultural issues because of the shortfall of funding. Increased appropriations are doubtful from a Congress where other competing interests such as crop insurance and emergency spending for natural disaster relief must take precedence. Therefore, the search for funding is always a major challenge.

Another challenge for competitive programs, as for all research, is accountability. Reporting and assessing the impact of research is difficult, especially for fundamental research where the application of results may not occur for decades. Federal agencies must find better ways to speak to the true value of research and make a case for why research should be supported. Monitoring and evaluation also is expensive. The USDA

and CSREES must find cost-effective ways to better pursue the goal of accountability.

The role of the social sciences in agriculture and how best to support social science research continues to be a challenge. Collaboration between social, biological and physical scientists is often not easily fostered. Developing programs that bring these scientists together to address meaningful issues may not be successful. The NRI and other CSREES competitive programs are striving to develop interdisciplinary programs that increase opportunities for social scientists but a comprehensive and systematic methodology to best achieve this goal is under debate.

CSREES faces the continuing challenge of balancing budget requests between formula, special and competitive funding. CSREES recognizes the need for all types of funding mechanisms. However, when budget increases are rare, choices must ultimately be made as to where requests for funding increases will be directed. CSREES, the USDA and the White House particularly are interested in boosting support for competitive programs. CSREES partner institutions, while supportive of competitive funding, most often put formula funding at the top of their priorities when interacting with decision-makers. To do so is quite reasonable, considering that formula funding is critical to the base programs at the land-grant institutions. Therefore, it is often a challenge to find individuals or groups who will champion competitive programs in agricultural research.

Finally, how does one justify increased funding for agricultural research in a country where food is bountiful, inexpensive and among the safest on the planet? There is a great tendency by the public to take for granted the food supply system of this country. Further, there is a lack of understanding of the connection between food available at the grocery store and the farmers and agricultural research that assure its availability. While the public clearly understands and supports increases to medical research, little if any of that same understanding exists for agriculture, even though every person consumes or uses agricultural products virtually everyday. Greater public education is needed to make clear the tie between the food we eat and its production, including the role of research in this successful agricultural enterprise.

Highlights on Competitive Grants Programs

Chapter 11

Competitive Grants Programs: The Case of PRODETAB in Brazil

Uma Lele and Edward Bresnyan

I. Background

Competitive Grants Programs are not a panacea for the reform of public sector agricultural research systems, as their recent popularity leads one to believe. They can however play an important role as one of the many elements of the public sector research reform process in developing countries. Research requires long term stable national support. But to maintain public sector support remains one of the challenges in developing countries. Institutional models of research financing range from budgetary support and block grants to commodity-based financing and competitive grants or some blend of the above. Advanced countries' research systems display four characteristics which developing countries are attempting to emulate:

1. The share of agricultural research in agricultural GDP increases with increased incomes, typically from less than 1% indeveloping countries to between 2% and 4%, as in Canada, the US, Australia. This means substantially greater investment in research, technology development and transfer in absolute and relative terms compared to that occurring in developing countries.

2. The relative share of the public sector expenditures in total research expenditures decreases over time whereas that of the private sector increases. Furthermore the public sector increasingly focuses on the "quintessential public goods research" (i.e., research for which the benefits are long-term, address problems and produce technologies which are unlike to be sold in the market place

because the benefits of such research are difficult to capture for the private sector).

3. The role of universities increases *vis-à-vis* that of public sector research organizations.

4. The role of the local and state research and technology transfer systems increases in *applied* and *adaptive activities*, relative to that of the federal/central government, with the latter playing a more *strategic, catalytic* role in stimulating research in the national research system.

The joint Government of Brazil and World Bank funded PRODETAB is beginning to serve an important function of such diversification. A recently completed midterm review of the PRODETAB project has concluded that in less than 3 years since the World Bank loan became effective and the program got underway its performance can be considered international best practice for other developing countries and emerging economies to emulate *in situations where similar preconditions either exist or can be established*. In addition to the compendium paper by Reifschneider in this same volume, it is useful therefore to share outsiders' perspectives on the Brazil Program particularly in terms of its lessons for similar donor funded programs elsewhere in developing countries.

Rapid changes at the global level, including advances in science, privatization of intellectual property, environmental awareness and WTO rules in the context of expanding international trade, led leaders of Embrapa, the designated head of the Brazilian Agricultural Research System (*Sistema Nacional de Pesquisa Agropecuária*, SNPA) to conclude that the SNPA urgently needed diversified sources of increased research funding to ensure relevant research outputs and results. The 25 year-old program also needed to transit from one in which public resources have been the primary source of financing (and public institutions have been virtually the exclusive source of research output and technology transfer), to a new multi-source, multi-institutional (public/private) system[1]. In view of the growing importance of private investments in agricultural

[1] Nearly 90% of Brazil's annual agricultural research expenditures are estimated currently to be in the public sector. By comparison, the shares of public and private sector financing of agricultural research are approximately equally divided in many industrialized countries. The combined public and private share of agricultural GDP invested in agricultural research in developed countries also tends to be much larger than that in developing countries, i.e., more nearly 2 percent compared to less than one percent in developing countries such as Brazil.

research in Brazil, including the purchases of some of the largest seed companies by multinational corporations, the leadership of Embrapa also concluded that the new system will also allow the public sector research funding to focus more sharply on the output of a public goods nature. It will generate specific solutions to regional and national problems of the kind that the private sector was unlikely to be interested in (i.e., technologies related to small farmers or those related to natural resource management). Furthermore, partnerships between the public and the private sector for joint problem solving needed to increase.

Brazil could establish a highly effective competitive grants program reasonably quickly for a variety of reasons. First, its establishment was a result of national awareness of the need for change. It was not imposed from outside. Second, the Brazilian system is already one of the largest and the most sophisticated among developing countries. With nearly 5,500 full-time researchers in the Brazilian SNPA, it is the largest in Latin American and the third largest agricultural research system worldwide - following China and India. These 5,500 researchers are distributed almost equally between the Brazilian Agricultural Research Corporation - Embrapa (*Empresa Brasileira de Pesquisa Agropecuária*) and the various state research and extension organizations and universities, although there is considerable variability in research capacity among the Brazilian states (see table 1). Indeed this variability strengthened the urgency of establishing a national competitive grants program that will increase synergy between the least and most developed research institutions and states. In contrast the earlier programs financed by the World Bank and the Inter-American Bank had either focused on a specific institutions such as EMBRAPA or in specific parts of the country, i.e., either the Northeast or the South. The size of the Brazilian SNPA is appreciated by the fact that at 0.9 percent of the agricultural GDP invested in agriculture the expenditure is about two times, and the scientific staff over five times, the size of the Consultative Group on International Agricultural Research (CGIAR) system. Brazil also already has a larger share of its agricultural scientists trained in industrial countries than most developing countries and they have been exposed to the culture of competition. Furthermore, with the assistance of the World Bank and the Inter-American Development Bank, Embrapa, since the early 1970s has built and *maintained* excellent research facilities. The kinds of problems of disrepair and maintenance of foreign assisted research

facilities noted in many developing countries are not noted in Brazil. This has led the Brazilian SNPA to be a well-equipped and modern agricultural research system among developing countries. Today, Embrapa has a full-time research staff of 2,063 (43% with Ph.Ds) and an annual budget of nearly R$550 million or US$350 million at the current exchange rate. By comparison, the combined state research staff in 1996 amounted to 2,341, with total budgets of the state research and extension systems of over US$300 million. The universities have an additional estimated full-time research equivalent staff of about 1000. There is therefore considerable scope for competition among a large pool of well-trained scientists and extension staff in a way small countries cannot ensure.

Brazil also has had a long history of large well-managed national competitive programs in the areas of science and technology before the current system was established. While these other programs were not addressing the applied needs of the agricultural sector that the current system does, Brazilian agricultural scientists have had the experience in preparing high quality research proposals and competing. In addition to the well established culture of competition and a political will and leadership committed to reforms, since its establishment in the 1970s, the Brazilian SNPA has enjoyed considerable stability of leadership at the top, with a proven track record of well qualified research administrators enjoying the necessary scientific freedom (without excessive political or bureaucratic interference) to initiate, design and implement reforms.

Such a combination of the scientific pool, and the quality and stability of leadership and resources has given the Brazilian SNPA the necessary self confidence to import new science (biotechnology) and modern scientific management concepts (e.g., the staff incentive systems and score card techniques) effectively, while simultaneously contributing many of its own ideas and practices internationally (e.g. in the area of no till technologies, soil management etc.). In short, as the leader of a well-unified SNPA, Embrapa has enjoyed many of the preconditions for the success of a program, some of which even the largest developing countries sadly lack.

Another important feature of the Brazilian system, unlike many, particularly small, poor developing countries, is that less than 5% of the Brazilian national agricultural research investments have come from external loans, mostly from the World Bank and the Inter-American Development Bank. Cooperation with industrial countries in recent years has been largely in the form of research partnerships. Large countries such as Brazil therefore are in a position to initiate and support reforms of their own accord, rather than those being initiated, designed and sometimes, unfortunately, *even implemented* for a long time by technical advisors from donor agencies. Large countries can, if they have the political will and the commitment to reforms, thus ensure the ownership and long term administrative, financial, scientific and institutional sustainability of the competitive grants programs in a way that many poor, small, human resource starved and aid dependent countries are not able to replicate.

Despite these many strengths, some weaknesses in Brazil's SNPA had become evident in recent years. There is a large gap in the research capabilities of the more prosperous and scientifically well-endowed states compared to their poorer counterparts within such a large and diverse country (Table 1). The dominant public research system was becoming overly bureaucratic. It was not sufficiently responsive to the rapidly changing external and internal environment. Although Embrapa's budget increased almost eight-fold in real terms in the two decades since its establishment, year-to-year variations in the financial support to Embrapa and the state research systems remain a problem, due to weak fiscal management. Financing of the state agricultural research and extension systems is generally weaker than at the national level and has become weaker and more unpredictable in the past decade, with greater pressure to mobilize non-budgetary resources. Moreover, the fiscal decentralization introduced by the government in 1988 restricts transfer of resources by Embrapa, a federal agency at the national level, to the weaker state research systems. This form of support now provided by Embrapa mostly in the form of scientific staff amounted to $9 million in 1996.

Table 1: Organizational modernization indices for the state agricultural research organizations

State	Index	State	Index
Alagoas	15.6	São Paulo	41.8
Maranhão	22.5	Mato Grosso do Sul	46.8
Goiás	27.9	Bahia	47.4
Sergipe	29.0	Minas Gerais	48.5
Paraíba	29.4	Santa Catarina	50.3
Mato Grosso	31.3	Rio Grande do Norte	57.3
Tocantins	34.2	Paraná	57.4
Ceará	34.6	Pernambuco	55.6
Espirito Santo	36.1	Rio Grande do Sul	58.9
Rio de Janeiro	41.6		

To address these problems Brazil's new research strategy, which was in place at the time that the World Bank funded program was approved in 1997, featured:

- Performance-based allocation of resources to Embrapa's research centers, central units and programs;
- Closer collaboration with other institutions in the SNPA;
- Establishment of new mechanisms for collaboration with, and the promotion of, the private sector resource mobilization, so that Embrapa can focus on the more strategic, long-term and interdisciplinary research;
- Increasing linkages with other national and international centers undertaking cutting-edge research;
- Establishment of stronger downstream linkages with farmers' organizations, state research and extension services, and other users of research output.

As a Federal agency linked to the Ministry of Agriculture and Food Supply, in a democratic country under a reform minded administration, Embrapa and SNPA are increasingly expected to be accountable, competitive and agile in developing productive partnerships, with the goal of improving the quality of life for all Brazilians.

II. Toward a Competitive Grants Program: PRODETAB

The Government of Brazil (through Embrapa) approached the World Bank in 1996 for the support of the Agricultural Technology Development Project (known in Brazil by its acronym, PRODETAB). Embrapa and the World Bank designed the project jointly in a true partnership mode. The joint nature of the project design and the substantial Brazilian input into its preparation meant that the Government of Brazil and Embrapa were fully committed to the project concept before it was approved by the Bank. The project was designed and appraised in a record time of a little over one year.

The project seeks to increase efficiency and sustainability of resource use in the Brazilian SNPA by: (i) stimulating the transition in the SNPA from its current heavy reliance on public sector research to a more integrated and diversified system of Agricultural Research Technology Development and Transfer (ARTDT); (ii) increasing the role of clients in the definition of research and technology transfer priorities and implementation; (iii) refocusing public sector research on quintessential public goods; and (iv) reorienting the structure of Embrapa to address the decentralization and diversification of the SNPA. PRODETAB focuses on five of Embrapa's thirteen thematic areas: (i) family farm development; (ii) advanced technologies (including biotechnology); (iii) natural resource management; (iv) agribusiness; and (v) previously unanticipated strategic areas of research. The project has a total cost of US$120 million, with 50 percent contribution each by the World Bank and the Government of Brazil (including EMBRAPA and the participants in the grants program). It has three key components (Table 2):

i. The competitive grants program;
ii. Institutional strengthening (including training of Embrapa, state and university scientists; domestic and international partnerships with USDA, and US universities through LABEX and with the CGIAR);
iii. Administration, Management Information Systems, and Monitoring and Evaluation.

Despite its small size, its catalytic role in the reform process is quite large.

Table 2: Project Components and Indicative Costs, PRODETAB

Component	Category	Indicative Cost (US$m)	%of Total
1. Competitive Grants System	Other (Research)	72.0	60.0
2. Institutional Strengthening	Institution/Building	44.7	37.2
3. Administration, Management Information Systems, Monitoring and Evaluation	Project Management	3.3	2.8
	Total	**120.0**	**100.0**

The US$60 million World Bank loan over a five-year period when considered on an annual basis constitutes only 2% of Embrapa's annual budget. Yet, Embrapa has made effective use of the World Bank to advance the reform agenda by overcoming some of the internal bureaucratic and fiscal hurdles. The World Bank support has helped to open up the system and provide legitimacy and professional support for the reform efforts, in addition to the crucial access to free, timely, predictable and flexible financial resources to undertake innovations in research management. Given the unpredictability of the domestic fiscal resources, injection of new resources rather than reallocation of resources from existing programs also minimized the opposition of those - particularly Embrapa scientists and science managers - who, feared competition of non-Embrapa scientists for financial resources. Similarly, non-Embrapa scientists who were concerned that most resources would flow to Embrapa could be convinced through the procedures established under the project for the selection of proposals and the Bank's oversight that the competition would be managed in a fair, open, transparent and accountable fashion. Through the institutional development component which encourages linkages with advanced research systems of OECD countries, the World Bank involvement has also enabled Embrapa to have continued access to external scientific and managerial inputs and international benchmarks for its reform processes. It is also able to address the many difficult issues, such as those related to the funding of research, intellectual property rights in public private partnerships, that reforms of the research system in developing countries typically entail.

The intended targeted beneficiaries of PRODETAB are the producers and consumers of agricultural research. Brazilian scientists and science administrators are being trained in advanced methods of research and technology transfer, Intellectual Property Rights (IPR), plant variety protection legislation, World Trade Organization (WTO) rules, biosafety guidelines, and social and management sciences. This training is increasing their capacity to engage in public-private sector collaborations and accelerate technology transfer. Brazil's relatively developed agribusiness sector is benefiting from a stronger legal and regulatory framework and increased domestic capacity for establishing public/ private partnerships. Some of the nearly 4.3 million family farms, including the resource-poor farmers in Northeast Brazil, are participating in articulating their research demands to the scientists and benefiting from the multiplier effect of the technologies being generated and adopted by producers, processors, retailers and exporters using Embrapa's own research, as well as that of the state research and extension systems and universities. Future generations of Brazilians and global citizens will benefit from improved resource management.

III. Analysis of the PRODETAB Implementation Experience

The bulk of the analyses presented here is the result of a year long World Bank input into the preparation and appraisal of the project and five biannual two-week long supervision missions followed by a midterm review by a variety of World Bank staff and consultants as of May 2000. These activities by the Bank have involved interviews with Embrapa scientists and science managers as well as those of the state research and extension systems, universities and the US scientists involved in the project. Since the project's inception, members of the executive committee, reviewers, project coordinators, subproject coordinators, producer organizations collaborating with scientists as well as the staff responsible for PRODETAB projects at various private foundations that manage research funds for the scientists receiving grants have also been interviewed. All have reported generally satisfactory to highly satisfactory performance of the project, a conclusion confirmed in the midterm review. One of the principal strengths of the project has been its performance indicators linked closely to the project objectives and a reliable base line set of data against which project progress can be assessed. They suggest that indeed, in several areas, the project has

already exceeded performance indicators by a considerable margin (Table 4). Progress has occurred despite a substantial shortfall in the federal government counterpart resources, an issue discussed later. Some highlights from these indicators are presented below:

- The financial contribution of the private sector/beneficiaries is estimated to be 23% of total expenditures against a midterm target of 5%.
- The share of resources allocated through competitive grants to non-Embrapa institutions is 45%, nearly double the amount targeted by project midterm.
- The share of non-Embrapa institutions that are lead institutions for approved projects is 32%, compared with the targeted 10%.
- The number of public-private partnerships has increased to 240.
- The only categories where PRODETAB has not met midterm targets are in the amount of operating budget allocated to the major priority areas (family farms, NRM, agribusiness), due to constrained Federal counterpart funding and the share of operating budget earned through cost recovery.

Other institutional impacts include the improvement of the research quality through the application of a review process in PRODETAB, as well as improvements in research quality prompted by the changes in research procedures within Embrapa based on the PRODETAB experience, and the introduction of PRODETAB-like competitive funding in two Brazilian states. Additional qualitative and quantitative information on institutional change will result from the evaluations of completed PRODETAB projects. Special studies are underway to supplement this information; e.g., a study to estimate extra-budget resources particularly from the private sector and the producer associations mobilized by the competitive grants. Toward the end of the project, an external evaluation would be commissioned to synthesize from these various sources (and from interviews with key decision makers) information on institutional change brought about by PRODETAB. This qualitative information will greatly enrich the quantitative indicators.

Other reasons for the success of the program include the strong administration of PRODETAB. The placement of PRODETAB within

Table 4: Key Quantitative Indicators: Outcomes of PRODETAB

Project Development Objectives	Base period	Mid-term	Actual mid-term	Project end
1a. % of financing for the Competitive Grants System coming from private sector/beneficiaries	0	5	23	15
1b. Number of public/private partnership contracts signed	175	200	239	250
1c. State research contributions to competitive grants in funded projects (R$ million)	0	3	1.1	7
1d. % of Embrapa's non-budget revenues through cost recovery	7	12	7	15
2a. % of resources from Competitive Grants System allocated to institutions other than Embrapa	16	25	45	33
2b. % of projects lead by institutions other than Embrapa through competitive grants	0	10	32	30
2d. Number os collaborating universities with Embrapa	40	48	42	60
2e. Number of international collaborative agreements with Embrapa				
2h. Scientific and extension publications originated from supported grants	0	80	61	400
4a. Annual operating budgets to research on small farm development programs (R$ million) by Embrapa for SNPA over its 1996 allocations for family farm development program	1.2	4.7	1.6	7.2
4b. Annual operating budgets to research on natural resource management (R$ million) by Embrapa for SNPA over its 1996 allocations for biotechnology program	3.0	6.5	5.2	9.6
4c. Annual operating budgets to research on advanced technology development (R$ million) by Embrapa for SNPA over its 1996 allocations for biotechnology program	1.6	4.1	2.9	7.6
5a. % of Embrapa's national operational budget allocated to competitive grants	0	10	7	30
5b. Embrapa's support to state research systems (R$ million)	9	6	1	2
6. Number of different institutions participating in approved grants				
. Embrapa			35	
. State research organizations			13	
. Universities			25	
. NGOs				
. Other private				
. International collaborators				
7. Number of Embrapa staff trained				
. Foreign Ph.D.s	0	0	18+	18
. Local Ph.D.s	0	0	18+	18
. Post Doctorate	0	8	11	15
. Local MS	0	6	13+	13
. Foreign short-term training			139	
8. Number of NRCs supported with infrastructure/equipment	0	5		20
9. Number of individuals given long-term training in IPR	2	4		7
10. Number of scientists placed on long-term assignments in advanced foreign research institutions	0	4		6
11. Number of state staff training				
. Foreign Ph.D.s	0	0	2	5
. Local Ph.D.s	0	4	10	13
. Post Doctorate	0	1	0	2
. Local MS	0	20	4	80
12. Number of SRCs supported with infrastructure/equipment	0	3		10

+ Indicates that training underway.

Embrapa, which has a well-established infrastructure, while it was originally controversial among non-Embrapa scientists, has enabled the development of a credible competitive grants program that has processes and standards in place equivalent to those of other major competitive grants programs in countries such as the US. Embrapa's capacity in financial, administrative, and scientific management is clear, and this capacity has enabled PRODETAB to ensure that the processes are carefully crafted and continuously improved in response to feedback from scientists and beneficiaries of research. The scientists consider the review process, while cumbersome with the various levels of review, as generally fair. Applicants are clear as to the rules and procedures and are confident that submitted proposals are treated in an impartial and professional manner. The World Bank's mid term review mission concluded that:

- The return of review information to the applicants has been beneficial: awardees use reviews to assist in designing the course of research, while applicants whose proposals are declined at the technical stage use peer reviews to improve future proposals.
- PRODETAB has taken a number of steps to improve the application process by changing page limitations and other requirements, to the benefit of the applicants.
- Applicants outside of Embrapa do not feel that Embrapa has an advantage in competition, which was a concern of non-Embrapa scientists when the project was designed.
- The use of foundations to administer PRODETAB projects has reduced administrative burdens for investigators at the application stage and for financial management of awarded grants. Foundations provide for financial and performance reporting while supported researchers are responsible for technical reporting. Whereas the use of foundations has improved flexibility to researchers its by no means an arrangement without its critics.
- Providing an *opportunity* for researchers to participate in the peer review process, as either panelists or *ad hoc* reviewers, has enhanced human capital.

The proposals submitted tend generally to be of high quality. Yet due to limited funds, the share of submitted proposals approved is quite low at 12%. Results of some of the applied research funded by PRODETAB

Box 1: Family Farming: Palma *Forrageira* in the Northeast

The target area of this subproject includes the semi-arid region of Northeast Brazil, where about 400,000 hectares of *palma forrageira* (a type of drought-resistant forage) are cultivated annually, and the northern section of the State of Espírito Santo. At a total subproject cost of R$539,169 (of which PRODETAB financed R$184,841), the subproject contains five components:

1. Cultivation of *Palma Forrageira* and its integration into family farming;
2. Competition of *Palma Forrageira* clones in Pernambuco and Alagoas;
3. Studies of mineral fertilizers for *Palma Forrageira*;
4. Technical studies of *Palma Forrageira* in the semi-arid Northeast; and
5. Introduction and evaluation of *Palma Forrageira* clones as a supplement for cattle during drought periods.

In the subproject area, small producers primarily undertake milk production, with daily output averaging fifty liters. The region is characterized by a dry season as long as six months, with between 400mm and 800mm of rainfall, irregularly distributed, which adversely effect traditional pasture production. Milk production therefore often depends on costly feed supplements and concentrates. With globalization driving the price of milk down, cheaper methods for feeding cattle herds are sought by producers through the use of *Palma Forrageira*, especially given its resistance to drought. Technologies that make greater productivity of *Palma Forrageira* possible at a lower cost can minimize the effect of drought and permit a more stable economy in the Northeast. The subproject seeks to generate these technologies, resulting in an expansion of area under *Palma Forrageira* cultivation, raising productivity and lowering per unit cost from R$0.10 to R$0.07. The subproject is a strong example of how the latest technologies can be brought to bear on smallholder production, thereby significantly impacting both productivity and household incomes.

are already beginning to be adopted in the Brazilian agricultural system through direct collaboration with agricultural practitioners and users of agricultural technology.[2] The strength of supported projects under PRODETAB demonstrates the high quality of the review process, which is designed to support the best projects that will have an immediate impact on agriculture. Central to the PRODETAB mission is to promote collaboration among different types of institutions and organizations, as well as with the beneficiaries, such as producers and rural communities. More counterpart funds appear to be expended on projects than is indicated in the financial reports, an indication that collaborations are even stronger than can yet be documented.

Both supported scientists and their collaborators report that the availability of the PRODETAB funds has been stable and predictable despite the fact that government has not come up with its share of the counterpart funds as agreed during negotiations with the Bank, leading to a reduced level of program implementation. At times when funds have been limited, PRODETAB management has preferred to continue the support of already approved projects rather than committing funds to new projects. The stability is one of the most important aspects of PRODETAB in a country that is recognized for often ending grant programs in midstream. The flexibility of PRODETAB is seen as an important value-added by the supported researchers. Funding primarily provides for equipment, supplies, and materials not otherwise available through other programs. The ability to purchase needed supplies and materials at the onset of projects has helped establish laboratory studies and accelerate others to the point that results are occurring faster than expected.

While requirements of PRODETAB would lead one to believe that all supported research must be at the applied end of the scale, supported projects quite often contain excellent studies based on fundamental science. These studies are contributing to building the knowledge base while at the same time providing the foundation for more applied studies with direct impact. Many PRODETAB projects were up and running before the advent of the Bank-funded competitive grants program. However, the PRODETAB funds have greatly accelerated work and enabled more collaborative studies than prior funding opportunities.

[2] The low approval rate was in part to set high standards at initial stages of the program and in part due to the limitation of resources for the competitive grants program, although as previous supervision missions have reported the quality of proposals has been high so that a higher percentage could have been approved without sacrificing quality. Since the midterm review was completed, another round of proposals was approved in June 2000 and the percentage of projects approved has increased to 25% without sacrificing quality.

Box 2: Family Farm Agriculture in Southern Brazil: Medicinal Plants in Paraná

The municipalities of Turvo and Guarapuava are characterized by large stands of forest containing *Araucária*. In this environment, there are many naturally occurring species of medicinal plants that are traditionally used by the population. Some of these species have good market potential. In light of the deforestation and the high level of exploitation of forest resources - without criteria to guarantee the sustainability of these practices - the natural occurrence of these medicinal plants is gradually declining. With PRODETAB funding provided to a well-reputed NGO, the project, in collaboration with the state research and extension systems, is attempting to develop management techniques and appropriate agroforestry systems for the sustainable production of medicinal plants. With total financing of R$413,795 (of which R$258,774 comes from PRODETAB and with remainder from counterpart contributions), the project seeks to increase the scope of use for native medicinal plants. Research sponsored by the project looks to stimulate the development of a chain of production for medicinal plants that makes the manufacture of high quality, environmentally friendly products possible, while also significantly increasing the household incomes of small-scale producers in the region. In parallel, herbal therapy, as a complement to traditional medicine, will be implemented in the municipal health system of Guarapuava, as a practical application of the use of medicinal plants. The raw materials for the manufacture of these herbal products are produced by the small-scale producers, processed through a farmers' cooperative facility and sold to large retail chains. The research sponsored through PRODETAB has the potential to have an impact throughout the chain of production, from the small-scale producer to the ultimate consumer, provided that long-term financially sustainable processing and marketing facilities can be developed.

PRODETAB beneficiaries need, and are demanding, new technologies and information that will allow them to maintain and or improve their economic standard and allow their agricultural products to better compete nationally and internationally. Producers involved in supported projects have recognized the changes in interaction between the scientists and the users of science since the PRODETAB funds have become available.

The capacity of the Brazilian research system to provide technology and scientific information is considerably greater than currently tapped by PRODETAB. Scientific research in Brazil is strong and the quality and energy of Brazilian scientists is apparent. But Brazil's research capacity is underutilized due to limited funding for agriculture research. Research potential should be tapped in the short and medium run through the deployment of more Federal counterpart funds for PRODETAB and, in the long run, by the development of a stable source of competitive research funds that will generate quality science while alleviating the constant requirement for scientist to expend excess time and energy on attempting to secure research funding through small grants from a variety of sources. Due to severe budget cuts in other competitive grants programs in Brazil, PRODETAB has become a more important (and some times the only) external source of funding for agricultural research.

Monitoring of projects funded under PRODETAB by EMBRAPA is strong. Members of the Executive Committee with other scientists visit each individual project; coordinators for all projects also come together to exchange experiences on project implementation. Monitoring within the PRODETAB program exceeds monitoring activities within the US agricultural competitive grants system.

PRODETAB is also an example of good practice in monitoring of progress in the competitive grants program, in the uses of funds and of project outcomes according to agreed indicators. During the preparation of PRODETAB, an appropriate and practical series of indicators were developed on institutional outcomes of PRODETAB (Table 4). Measures of most of these indicators have been developed systematically over the course of the project. The use of foundations to channel funds is achieving their institutional development and weeding out the weak ones while enhancing the strong foundations further increasing their activities across states.

Box 3: Resource Management: Agroforestry Systems in Household Agriculture in the Western Amazon

After some two decades of bringing the Western Amazon under agricultural and livestock production, environmental and socio-economic problems have begun to surface, along with the expansion of the agricultural frontier and new land settlement projects, all of which have altered the ground cover. Many factors in the region favor a turn toward migratory agricultural practices: the low fertility of the soils, biological pressures, socio-economic conditions and the low level of technology practiced. These factors contribute to the low productivity of annual monocultural production systems and perpetuate a cycle of progressive deforestation and subsequent expansion of livestock production, typical of the small-scale producers of the region. The magnitude of the problem requires that both the national and international community develop sustainable and improved systems and alternatives for the traditional crops of the region. Considering the advantages that the agroforestry systems present in relation to the typical systems of production described above, there is a need to focus research toward defining alternative models to make traditional crops more viable, both socio-economically and ecologically. With PRODETAB funding of R$178,224 (toward a total budgeted cost of R$1.05 million), the project hopes to raise awareness on the part of smallholders of feasible agroforestry systems that will not only be financially viable but also environmentally sustainable. However, the research support systems in the Amazon are not as strong as those in Southern Brazil - and Embrapa will need to provide stronger support to them.

Box 4: Advanced Technologies

Fusarium spp., especially pathotypes related to *F. soiani*, are responsible for significant losses in soybean and potato crops, both important in Brazil. Major losses in potato are associated with "black eye" and SDS in soybean. The genus *Fusailum* is known for its morphological and cultural variability, and its dependence on environmental factors for disease development, making difficult a precise identification of causal agents for these diseases. Molecular-level studies (e.g., genetic markers) can facilitate the discrimination of the *Fusarium* pathogens for both potato and soybean.

In soybeans, after the registry of SDS in Brazil in 1996, cases of radicular rot became more complex, with drastic increase in losses. While *F. sotaní* f.sp. glycines were considered responsible for this loss, the identity and denomination of *Fusarium* with SDS remains a subject of scientific controversy. In potato, various species of Fusarium cause dry rot, with substantial losses in seed potato during the post-harvest period. Presently, scientific methods are not used to diagnose dry rot, since little is known about the pathogen or disease. The subproject seeks to identify species associated with (i) dry rot and black eye in potato and soybean, respectively and (ii) radicular rot (e.g., SDS) in soybean. This includes the development of simple yet effective methods for the detection of these pathogens in infected plant material. Specifically, the subproject will establish a relationship between the causal factors of SDS and black eye and the other *Fusarium* associated with soybean and potato. These studies will make an understanding of the origin, distribution, survival mechanisms and the spread of these pathogens possible, and lead to methods for their control. Development of diagnostic methods will facilitate the detection of key pathogens in potato and soybean, benefiting certification and quarantine programs as well.

Institutional Development

The importance of institutional development has increased since PRODETAB was initially designed. Despite the current substantial established scientific and technology transfer capacity, the aging scientific personnel both within Embrapa and the state research systems is leading to (or will soon lead to) considerable attrition of scientific capacity through retirements, at a time when rapid scientific advances at the global level require the Brazilian research system to keep up with those changes. This is a potentially serious challenge to the Brazilian research system at a time of little to no new recruitment, shortage of funds and the increased cost of international training, thanks to recent devaluations. PRODETAB's institutional development component has three elements of relevance to this situation:

- Direct support in the form of training and international collaborations to members of the SNPA on a highly selective basis to increase their capacity and enable them to participate effectively in the Competitive Grants Program;
- The development of long-term strategies for a financially and politically stronger SNPA;
- Support to develop international linkages with research institutions in advanced countries (program known as LABEX) and the CGIAR.

The goals and objectives of this component are also largely being achieved by Embrapa centers. The restrictions imposed by the Federal Government regarding the transfer and use of federal financial resources by state institutions in a constitutionally fiscally decentralized system limits transfer of federal funds to the states. Given overall funding shortfalls, PRODETAB has appropriately given major priority to long-term training and the completion of its satellite communication system.

In a period of rapidly changing science and issues of intellectual property, foreign short- and long-term training is performing the important function of upgrading human capital. Embrapa has largely achieved its target of sending sixty-four scientists for long-term training under PRODETAB. Priority has been given to long-term training for postgraduate and postdoctoral studies. A national committee, following

well-specified criteria in accordance with a human resources development plan for the SNPA, has made selection of trainees. To date, forty-five researchers and technicians have been sent for long-term training in graduate programs in Brazil and thirty in programs abroad, including eleven in post-doctorate studies in advanced institutions. A total of one hundred and twenty researchers and technicians (all Embrapa) have also participated in short-term training abroad. However, state institutions have achieved only 16% of the projected one hundred scientists targeted for training.

PRODETAB has also partially supported Brazil's contribution to the CGIAR, resulting in increased collaboration through exchange visits and training. Embrapa also has a large number of collaborative arrangements with advanced research institutes. An innovative and cost-effective program of exchange has been set up with US universities through the GREAN (Global Research for Environmental and Agricultural Nexus) initiative, where Embrapa provides cost of initial travel, but salary costs are paid by the US University. Several collaborative research programs have resulted from these exchanges and some are being funded through the competitive grants program.

Embrapa's LABEX (its External Laboratory) is helping to improve the quality of research in general and the competitive program in particular. It is the result of an agreement based on mutual interests and benefits between the United States Department of Agriculture's Agricultural Research Service (USDA-ARS) and Embrapa signed on April 24, 1998. It is intended to enhance PRODETAB's objective of the diversification of the Brazilian National Agricultural Research System. LABEX's dual aim is to improve agricultural research cooperation between American and Brazilian institutions and to influence prime opportunities and research trends with potential benefits for agribusiness of Brazil and the USA. LABEX started its activities on September 1, 1998 in part by transferring five senior researchers to ARS laboratory locations in Maryland, Ithaca, N.Y. at Cornell University and Lincoln, NE at the University of Nebraska. It emphasizes general areas of interest such as advanced technology, management of natural resources, applied computer and information sciences and new fields of science and interfaces. It conducts analysis and evaluation of the social and economic impact of selected agricultural research projects in areas as intellectual

property rights. Specifically, mutual research projects are being established in precision farming, soil resource management, integrated disease and pest management of plants, integrated control of animal diseases, and intellectual property rights and biotechnology agreements. It is a new experience for both Embrapa and USDA and both are learning a great deal through LABEX.

LABEX is an obvious basis for partnership between two large countries. Both are leaders in the field of agricultural research and technology, are major trading partners; and share many of the same agricultural pests and problems. The mutuality of interest in collaboration recognized by the USDA and Embrapa has greatly reduced the cost of research collaboration for both countries, while increasing access to the scientific and laboratory capacity of each other to solve problems of mutual interest. The year round tropical climate of Brazil affords researchers in the US an opportunity to benefit from the expertise of microbiologists in Brazil working on parasitic solutions. Brazil in turn is able to adapt the new U.S. methods such as precision agriculture and the use of DNA markers to help address the problems of its small farmers, as well as in the areas where disease and pest problems have been actual or potential trade barriers. Current research being conducted in Brazil to combat several diseases - that are already a threat to U.S. cattle and have been the basis of trade restrictions on Brazilian beef - could enable scientists to ward off potential future epidemics in both countries. Brazil is already ahead of the United States in some aspects of insect biocontrol on farms. Technology that is developed in this field and that can be applied in the United States has also been implemented on schedule, and the actions developed by Embrapa's team in the United States (one coordinator and four researchers) is producing results beyond expectations.

Agronomists in both countries are taking advantage of the season reversal between the two continents to double their data collections as they work to improve precision agriculture management systems in both countries. An encouraging feature of the collaboration is that the number of requests for collaboration originating in Brazil have been on par with those originating in the U.S. and involve the participation of Embrapa centers as well as the universities and state research centers of Brazil that form the SNPA. Embrapa and the USDA are currently planning a joint scientific meeting to further expand this collaboration in the context

of their own national priorities including, among other things, through a substantially enhanced USDA sabbatical program of US scientists in Brazil.

Embrapa has conducted strategic studies in support of the development of the SNPA, including on sustainable financing of research and the current and potential role of the states in the agricultural research system, They have provided input into Embrapa's strategic planning.

Shortage of Recurrent Counterpart Funds as a Key Constraint:

Despite these many accomplishments, PRODETAB is hobbled by shortage of counterpart funds. The Bank disbursements by the midterm of the project were only a third of the total loan rather than the half that was expected at the time of appraisal. Because of the IMF agreement, the government of Brazil has imposed tight budget ceilings overall including on all donor-funded projects. A major devaluation of the Real has also meant that Embrapa needs to spend nearly 80% more local currency to draw counterpart funds from the Bank than when the project was designed, and just at the time when the recurrent funds are in short supply. The Bank has assessed that there is substantial underutilization of Brazil's scientific capability due to these budget constraints, understandable as they are on macroeconomic grounds. A project intended to be implemented in five years will require seven years to implement and may have less rapid impact than was intended.

IV. Assessing PRODETAB's Impact

Impact assessment is a critical step for PRODETAB in order to provide feedback on the overall performance of the project, adjust (where needed) program strategies and priorities, and to provide evidence of impacts for future dialogue on consolidation, institutionalization and possibly expansion of PRODETAB as a critical and permanent component of the SNPA.

The evaluation of PRODETAB as a program should be in terms of its institutional objectives of developing a more integrated, diversified and demand-driven SNPA and refocusing public sector research on quintessential public goods. The Competitive Grants program encourages

participatory and partnership approaches to project formulation and execution, and high quality research activities through rigorous screening of projects. Since PRODETAB supports diverse and geographically dispersed projects, it is costly to undertake a rigorous impact assessment of individual projects using baseline information and formal surveys; hence, appropriate cost-effective methods will have to be developed.

Evaluation of Individual Projects: During the next year, many projects will be completed and PRODETAB will have to institutionalize its capacity to undertake *ex post* evaluation. This will be useful as an input into discussions on the mainstreaming of PRODETAB within Embrapa. Evaluation of completed projects should be undertaken at two levels.

- For all projects, a brief end-of-project assessment of scientific, institutional, and any documented socio-economic impacts realized under the project would be completed.

- A more in-depth analysis of socio-economic impacts for a subsample of projects which are working on the very applied side of the research spectrum.

Detailed records of cost of these evaluations should be maintained in order to guide decision-making on the appropriate level of resources to spend on ex post evaluations in a fully institutionalized evaluation system.

Embrapa will also carry out end-of-project assessment, which will require two to four days per project, and will review project documents (especially the final project report) and conduct a site visit to interview key stakeholders, including targeted beneficiaries. Information will be collected on the following:

- Major scientific achievements, including the development of new technologies, new methodologies, or other findings that might be more widely applied, and any indicators of diffusion of project findings in these areas;

- Indicators of institutional impacts at the local level through formation and strengthening of alliances among diverse organizations;

- For applied research producing finished technologies, (i) expected economic benefits (less costs) per unit (human, animal, or farm) from adoption of the project results, (ii) number of units directly targeted by the project, (iii) number of potential beneficiaries that might be influenced through further diffusion of the practice, and (iv) type of beneficiary, defined by a profile of a "typical beneficiary" in terms of average farm size and gender. A variation of the "social balance" methodology already used by Embrapa might be applied to obtain this information;

- For projects in natural resources, indicators of environmental benefits that might be realized;

- Recommendations on next steps for further adjustment and dissemination of the technologies or methodologies produced or tested by the project.

Some projects are already benefiting farmers' fields or will do so shortly. For these projects, a more in-depth assessment should be made of economic benefits in terms of improved productivity in relation to the cost of the projects, with attention also to social benefits in terms of farm size or income level. Depending on the number of such projects, a sampling methodology may have to be employed. Rather than random sampling, it may be more meaningful to evaluate completed projects in a given thematic area(s) as a group, since a common methodology can be employed for each thematic area. Those projects that have demonstrated outstanding impacts might also be purposefully sampled for evaluation, since it is likely that the benefits of these projects will pay the entire program costs.

Methods for estimating economic benefits of research activities are well known and considerable capacity exists in Embrapa and other Brazilian research institutions to apply them. The basic approach will be to select a sample of projects for which benefits and costs will be estimated. One difficulty is pricing projects that are part of a larger program, especially in applied research. For example, PRODETAB sometimes funds marginal costs of testing and adapting technologies produced by several years of previous research. Two approaches are possible in these situations. The first is to evaluate the whole program as

a joint activity and not attempt to separate the effects of PRODETAB. The second is to estimate the increased speed and level of adoption because of PRODETAB activities, compared to the without-project situation.

While it is desirable to conduct formal surveys with randomly selected farmers to estimate adoption and benefits, this would not be cost effective for PRODETAB, given the potential number of projects involved. The bulk of the fieldwork would involve rapid rural appraisal in the area of influence of the project - seven to twenty days per project, depending on the nature of the project. Complementary information should also be collected to estimate the number of beneficiaries and characterize them in terms of farm size and income, gender and tenure status. In addition, beneficiary assessment of the value of the activity should be included as well as changes in attitudes and knowledge.

Finally, fieldwork can be used to quantify, where appropriate, institutional benefits. For example, partnerships developed in some projects are resulting in additional collaborative activities beyond the PRODETAB project. Other spillovers may result from the application of methodologies developed within the PRODETAB project, to related situations.

V. Lessons Learned and Steps Needed to Ensure Long Term Sustainability of PRODETAB

1. **Introduce policy oversight for PRODETAB to increase transparency.** The original project design for PRODETAB proposed that a National Advisory Council (NAC) serve as a policy oversight body for PRODETAB. A National Advisory Council would ensure transparency in PRODETAB policies, bring key stakeholders to the table to ensure stakeholder input, and promote accountability.

2. **Continue to strive for increased transparency and minimal conflict of interest.** Embrapa must be commended for the transparency of the review process that includes rotating members of the technical committee and the prevention of conflicts of interest wherever they might occur. This transparency is also

assured by the rotation of members of the Executive Committee (EC). Rotating the chairmanship would further the appearance ofinclusiveness in the review process, elevate the visibility of all partners in the review process, and reduce any appearance of Embrapa receiving favored status on the EC.

3. **Increase institutional sustainability of the program.** PRODETAB will remain the responsibility of Embrapa, as the leader of the SNPA. It has excellent infrastructure for program administration and therefore Embrapa would also assure long term managerial stability of the PRODETAB program within Embrapa such that both its independence and continuity can be ensured. Institutionalizing the program would require that an appropriate sized staff and resources be available to the program.
   Administrative (indirect) costs will be needed under this scenario. For mature competitive grant programs in other countries, these costs range from three to eight percent of program funds and Embrapa should expect similar levels for PRODETAB.

4. **Undertake study of financing options for PRODETAB to ensure its long term financial sustainability.** Currently Embrapa has absorbed many of the administrative costs of PRODETAB, since the staff of the Secretariat for International Cooperation manages PRODETAB over and above their normal duties.
   However, such arrangement cannot continue without limiting administrative activities that are needed to institutionalize the program in the long term and on a larger scale. Administrative funds should be provided for the program. Embrapa is already focusing its efforts towards determining how to achieve long-term financial stability for the PRODETAB program beyond the stage of World Bank financing. The original agreement for the World Bank Loan set forth terms where Embrapa would designate 30% of its operating funds to competitive programs with broad eligibility that includes researchers outside of Embrapa. Other potential sources of funds include earnings from commodity check?off programs and funds from President Cardoso's new science and technology initiative. Embrapa has already conducted a study of check-off programs of other countries, and it is

represented on a Government Committee looking into the financing of President Cardoso's new science and technology initiative. Yet, a comprehensive study of these and other potential sources will be needed to come up with concrete financing plans.

5. **Broaden program areas to enhance applicability of projects to meet specific regional goals.** Some states, such as Amazonas, have natural and managed systems not typical to production agriculture systems in other states. Consequently, the PRODETAB call for proposals is not viewed by some in the Amazonia region as being inclusive of their region's needs. PRODETAB should work toward creating broadly targeted research that is inclusive of needs in all areas of the country, thus encouraging applications from all regions. One way to accomplish this is to target the strategic studies area toward particular problems of those regions or to craft more general topic areas that are inclusive of most agricultural and natural systems.

6. **Assure equity in access to technical assistance.** Embrapa has provided technical assistance through a number of methods including training workshops, seed money, and consultancies for proposal preparation. To the extent that technical assistance provides opportunity and increases likelihood of success in PRODETAB competitions, Embrapa should ensure that weaker institutions and less successful areas of the country receive a fair share of technical assistance funds to strengthen their competitive position.

7. **Provide extensions or supplemental grants for technology transfer, where likely returns to technology transfer are high.** PRODETAB has been successful in promoting research that directly impacts end users. However, because grants are only funded for two or three years, the final steps of technology transfer may not occur during the life of the grant. Small grants that extend funding for one year should be considered in particular cases where infusion of these funds would have an immediate impact on technology transfer.

8. **Pursue options to allow researchers to attend international meetings.** The project offers the flexibility to the recipients of the competitive grants to attend international meetings of relevance to their research topics. Many Brazilian scientists are world leaders in their discipline, and attendance at international meetings is an inexpensive and cost effective method of assuring scientific progress, intellectual stimulation, and worldwide problem solving of agricultural issues.

VI. Conclusions

Political will, and the internal scientific, administrative, institutional and financial capacity make a difference in the design and implementation of a competitive grants program. A country like Brazil with considerable assets can achieve many objectives with a competitive grants program (e.g. it can diversify the SNPA; increase the quality of the proposals and research in general; mobilize additional funding and improve responsiveness of research to clients' needs - to mention only a few of the possible assets. But even in Brazil, budget constraints can hobble the ability of the research system to use its scientific resources fully. Therefore, a competitive grants program must be viewed as one of many instruments in research and not a panacea. Furthermore, due to small share of the total submitted projects that are ultimately funded and their discrete life the competitive grants programs must be considered a part of the larger reform agenda of institutions and finance.

Chapter 12

Characteristics of Successful Agricultural Research Competitive Grants Programs

Howard Elliott and Ruben G. Echeverría [1]

This paper examines the characteristics of successful competitive grant programs (CGPs). Based on the experiences of different countries, it looks at competitive schemes in the overall context of financing agricultural research, their objectives, the attributes and preconditions for successful systems, and managerial issues to improve their implementation.

Competitive Grants Programs in the context of research financing

Echeverría has noted the decline in unrestricted support to public research institutions and the increase of project-based and contract research[2] .This decline may reflect dissatisfaction with the performance of institutions and may itself contribute to an imbalance in funding that hampers performance. Traditional block grant funding is giving way to new mechanisms through which research is becoming more pluralistic in both its financing and execution. This move is conditioned by a change in the perceived role of the state and by a globalization of agriculture and agricultural technology. The state is no longer perceived as the sole developer of technology although it may continue to play an important role in financing research.

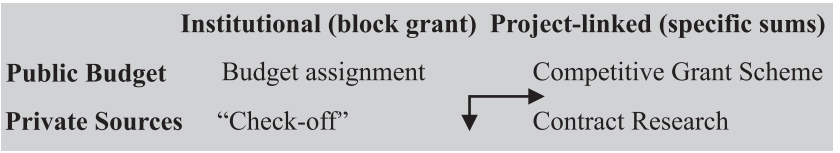
The shift from public to private funding and from institutional to project-linked research is depicted in figure 1[3].

[1] The authors are respectively Deputy Director General of the International Service for National Agricultural Research, The Hague, and Principal Agricultural Specialist, Sustainable Development Department, Inter-American Development Bank, Washington, D.C.

[2] Echeverría, R. (1998). "Will competitive funding improve the performance of agricultural research?" ISNAR, The Hague. Discussion Paper 98-16

[3] Janssen, W. "Alternative Funding Mechanisms: How Changes in the Public Sector Affect Agricultural Research". In Tabor, S., Janssen, W., and H. Bruneau. (1998) Financing Agricultural Research: A Sourcebook. ISNAR, The Hague.

Figure 1: Funding trends in agricultural research during the 1990s.



In spite of the shift of publicly funded research towards CGPs, they remain quantitatively a small portion of the total of research funding. In the U.S., competitive grants under the National Research Initiative account for about 12% of the total research portfolio.

According to the Committee for the National Institute for the Environment (CNIE), the 1999 breakdown of federal support in the US is:[4]

1. Direct support to USDA research agencies	51%
2. Block grants to the states (formula funds)	30%
3. Grants through a competitive peer-review process	12%
4. Special grants in annual appropriations	7%
	100%

The CNIE (now called the National Council for Science and the Environment) noted that the National Research Council recommended that up to 35% of the USDA's total research portfolio be awarded competitively.

The size of the competitive portion of research funding is clearly related to the capacity of the research system. If it is necessary to develop the research capacity, rather than simply mobilize it, institutional block funding is preferable to competitive grants. It is not an either/or situation, but there is a need to find the appropriate mix of competitive and institutional funding for optimal research performance[5].

The Agricultural Research Council of South Africa has expressed concern over the erosion of their parliamentary grant [6]:

[4] Committee for the National Institute for the Environment. "Agricultural Research, Education, and Extension Issues in the 105th Congress II: Competitive Grants". URL http://cnie.org/nle/ ag-32a.html

[5] Echeverría 1998; and V.W. Ruttan 1982. Agricultural research policy. University of Minnesota Press. Minneapolis.

[6] Department of Arts, Culture, Science and Technology (1998). SETI Reviews: ARC (The Agricultural Research Council). p. 22

Competitive bidding is internationally considered to be the most effective way of ensuring efficient use of scarce resources, while allowing equitable opportunities. Given that significant research capacity exists both within the ARC and elsewhere, the parliamentary grant should be used to promote both equity and efficiency whilst maintaining the core capacity of the ARC. Thus, it is recommended that the following changes be made to the structure of the parliamentary grant: first, that one envelope of funding be allocated to specific projects set out and prioritized by the ARC; second, that an envelope be allocated to competitive bidding. International experience shows that if the amount of core funding from government received by an agricultural scientific council drops below 50% of its budget, it is unsustainable.

The requirement of having reliable core support (e.g. a parliamentary grant of around 50% as mentioned by South Africa) may represent a limit below which even countries with established systems might be prepared to go. Countries with less institutional capacity would certainly not be viable candidates for going beyond this threshold.

Objectives of Competitive Grants Programs

Gill and Carney make a clear distinction between "competitive" and "collateral" characteristics of various funds studied by ODI. There are certain outcomes that are implied by the competitive nature of the allocation mechanism [7]:

The fact that researchers have to compete against each other for funding implies certain benefits, at least in theory. These include expanding opportunities for innovative research, improving the scientific and technical quality of research proposals, and allocating funds to higher quality proposals. This in turn should feed into a better end product. These objectives can be achieved simply by introducing competition where previously there was none.

Collateral objectives are those that are not derived from the competitive nature of the funding, but, when included, tend to make the competitive element more effective. Many of these objectives also feed into a better quality and more relevant product. They include improving the adequacy and dependability of funding, drawing upon the comparative advantage of a wide range of institutions, achieving greater synergy by

[7] Gill, Gerard and Diane Carney. 1999. Competitive Agricultural Technology Funds Developing Countries. ODI, London. P 55-56.

enhancing networking and teamwork, and improving management structures by making them more decentralized, flexible, accountable and transparent. Other collateral objectives make the product more relevant and problem-oriented, particularly those that relate to prioritization of the research agenda and the participation of end users at relevant points in the cycle. The latter can be achieved only if they are put into operation through appropriate eligibility, screening and prioritization criteria, and through appropriate management procedures.

Neither competitive nor collateral objectives and the fund characteristics they imply (transparency, accountability stakeholder participation, demand-drive, independent governance, open competition, efficient management, anonymous and independent peer review, diagnostic and action-prompting monitoring and evaluation) have been the traditional hallmarks of agricultural R&D systems, particularly in the least developed countries. Without significant reform in these areas, CGPs are in danger of becoming a temporary, non-sustainable, and expensive means of easing the chronic shortage of operating funds.

Roseboom and Meijerink highlight four different uses of a competitive grant program:

a) Identify the low cost bidder for a given research problem;
b) Stimulate research on a particular problem;
c) Promote collaboration among agencies;
d) Encourage innovative and promising research ideas[8].

The use of competitive funds to stimulate innovative research (d) often interests universities. In this case, the competition is among ideas, not on the basis of cost-effectiveness. At the other end of the scale (a), competition among institutes, universities, NGOs and other partners at the adaptive end of the scale may make research both cheaper and more responsive to user needs. Conditions placed on the grant may promote collaboration (c) and reallocation of effort to new issues (b).

It is a respected principle in economics that if you want to achieve multiple objectives you must have multiple instruments. Competitive grants are often proposed as a way of introducing programs and objectives. However, we should always check their appropriateness

[8] Roseboom, J and Gerdien Meijerink. "Competitive Grants". 2000. ISNAR (photocopy)

against other funding mechanisms in a balanced portfolio of goals and mechanisms. In Table 2, below, we attempt to indicate heuristically the relative effectiveness of alternative funding mechanisms as they relate to different program objectives.

Table 2: Funding mechanisms and objectives for a system

Objective	Formula Funding	Competitive Grant Program	Special Allocations	Government Contracts	Private Sector Funding
Productivity	++	++	+	+	+++
Scientific innovation	++	+++	+	+	++
Scientific quality	++	+++	+	++	++
Client driven research	+	++	+++	+++	+++
Equity by region, target	++	+	+++	++	-
Institutional development	+++	+	++	(+)	+
Institutional collaboration	+	+++	+	++	+
Sustainability	+++	++	+	++	++

The purpose of this table is to illustrate that a portfolio of funding mechanisms is needed to ensure that the multiple objectives are addressed. The subjective weights shown in the table can be debated. It is often argued that a pure CGP will favor wealthier regions and institutions in pursuit of scientific excellence and productivity while formula funding and special allocations may ensure that local equity concerns are addressed. Where government contracts become a funding substitute for direct block grants, they may still have a positive effect on institutional development. Conversely, they may divert resources to *ad hoc* projects and draw down both human and institutional capital. Certainly, every mechanism could be better managed: competitive grants may allocate resources to mission-oriented versus fundamental research and special allocations may introduce both scientific peer review and "merit review" procedures to improve their quality. In the next section,

we introduce some of the "attributes" of successful CGPs, including some "good practices" that enhance their performance as funds and the impact of their interventions.

Attributes of "successful" Competitive Grants Systems

A recent review of the USDA "National Research Initiative Competitive Grants Program"[9] gives four defining attributes of a successful CGP:

- **Quality:** the research is novel, valuable, feasible, technically sound, and (on occasion) "elegant".
- **Fairness:** the proposals are evaluated with strict adherence to a set of criteria relating to quality and relevance; the process is open to independent examination, and each proposal is considered seriously by a well-qualified group of reviewers.
- **Relevance:** the program provides funding for research that will effectively further the *goals of the program and meet national needs*.
- **Flexibility:** the program has the capacity to shift in response to emerging fields of research and can support the intrinsic flexibility in the research enterprise itself.

Kelman and Cook put the quality of the peer review process at the center of the success of the NRICGP[10]. They argue that the acceptance of the use of peer review to identify research proposals of high quality has been one of the major factors in establishing the preeminence of the United States in science, mathematics, and engineering. As a result of the peer review process, investigators get a rigorous review of their plans with suggestions for improvement, reviewers benefit from the flow of new ideas, research evaluation is enhanced, and there is evidence that the quality of proposals is enhanced.

The authors go on to review the standard criticisms of peer review processes: they are reductionist, biased against novel and risky research, involve high transaction costs, do not have a "big perspective", are scientific rather than responsive to society's needs, and they discriminate against young researchers. However, they find that both the scientific and stakeholder communities are satisfied that the rules are fairly applied,

[9] Board on Agriculture. National Research Initiative: A Vital Competitive Grants Program in Food, Fiber, and Natural-Resources Research (2000), the National Academy Press.

[10] Kelman, Arther and R. James Cook. 1996. "The role of a competitive research grants program for agriculture, food and natural resources". BioScience. Vol. 46. No 7 pp 533-540

that research can be seen to contribute to practical uses and address areas where fundamental knowledge is needed to make practical breakthroughs. In this respect, this perspective is representative of the "pipeline" model of research. In one example, they describe how successive NRI competitive grants have supported the fundamental research in molecular genetics that led to cloning of avirulence genes, the cloning of plant genes for disease resistance, and map-based cloning into the target plant. In short, they rebut the charge that decisions are always *ad hoc* and lacking long-term perspective.

They note that it is possible to make a competitive grant program respond to more finely defined objectives. For example, through such measures as "merit reviews by scientific peers" that include relevance to national policy needs as a criterion. The funding agency can raise the portion of "mission-linked" research. In fact, the share of mission-linked research in the NRICGP has risen from 20% to more than 45% of the total. This concerns some researchers, who feel that this diverts resources from the fundamental discoveries that are needed. With respect to equity and institutional development, stakeholder and user group pressure led to a policy whereby 10% of funds are reserved for "agricultural research enhancement awards" to strengthen small and medium sized institutions and in institutions falling at or below the thirty-eighth percentile in previous competitions[11].

Preconditions for successful Competitive Grants Programs

Echeverría analyzed a number of the alleged advantages and disadvantages of CGPs[12]. An examination of these points is pertinent if we are to indicate what must be in place if a CGP is to work well.

Gill and Carney have expressed surprise that CGPs are still in vogue with so many alleged disadvantages.[13] Most of the disadvantages, however, can be overcome through the establishment of proper preconditions and by observing established "good practices". As indicated in Table 2, different funding mechanisms have different strengths and all of them could be improved in their application.

[11] Kelman, Arther and R.James Cook. .1996. "The Role of a Competitive Research Grants Program for Agriculture, Food and Natural Resources". BioScience. Vol. 46. No 7 pp 533-540
[12] Echeverría, R. (1998). "Will Competitive Funding Improve the Performance of Agricultural Research?" ISNAR, The Hague. Discussion Paper 98-16 p 11-12.
[13] Gill, G and Diane Carney. 1999 p 11

Table 3: Advantages and Disadvantages of Competitive Funding Mechanisms

Advantages	Disadvantages
1.Increase research effectiveness by directing resources by merit to the most productive scientists (Improves quality and accountability of research	1.Fund only operation costs, lack of support for core budget (salaries and maintence of research facilities)
2.Increase research efficiency by reducing: costs (via competition and co-financing schemes), duplication of effort, lack of accountability of research resources, and under-utilization of infrastructure by providing operating resources	2.Lack of support for medium to long-term research agenda
3.Promote the identification of and consensus on national research priorities	3.Lack of support for human capital development
4.Increase flexibility to focus on newly emerging national/regional priority issues	4.Lack of support for new research infrastructure
5.Promote a goal-oriented and demand-driven national research system	5.Higher funding uncertainty could affect long-term projects and reduce confidence of reserach staff
6.Strengthen links between research and extension organizations, agricultural production and agricultural policies	6.High transaction costs from grant seeking and implemantation reports, less time for research
7.Strengthen links among national, regional, and international public and private research organizations; promotes spill-ins.	7.Reduce research flexibility to focus on additional issues when researchers discover new research opportunities
8.More diversification of funding by involving scientists from outside traditional organizations, promotes “system”	8. Higher risks involved when research consortia involve less well-known organizations
9.Induce institutional change in the national innovation system	9.Low sustainability of funding when national constituency is weak and external funding sources dry up (unless there is endowment)
10.May mobilize additional funding	10.Need a research system with a minimum number of competitors (larger countries probably best suited)
11.Merit review process provides expert feedback on researcher´s proposals and objectivity of the competitive process	11.Legal, financial, administartive and technical costs of setting up and adminstration
	12.May increase “equity issue” due to lack of competitive capacity of poorer/smaller organizations
	13.Possibility of “rent-seeking” in the research resource allocation process.

It is a judgment to say that something is a "precondition" rather than a "collateral characteristic" that improves the chance of success of a CGP. However, certain elements seem essential for the success and sustainability of the program and may be considered "preconditions"[14]:

- **Focus:** A competitive fund should focus on a subset of the total priorities of the science and technology system. The targeted priorities should be technically sound, feasible, and attainable in the short to medium-term.
- **Existence of research capacity:** Competitive funds require competitors. They may be devices for allocating human and institutional resources to their most productive uses; however, unless they bring additional funds they do not create a capacity that is not already there.
- **Leadership's commitment to institutional reform:** If a program is to facilitate the reform of institutions or priorities, the government must lead the institutional reform initiatives. A fund may change the balance of power among ministries or agencies. If the funding and the pressure for a competitive fund come from outside the country, the fund will not be sustainable.
- **Integrity of proposal reviews:** The process must be transparent, professional, anonymous, and subject to external evaluation. In a pluralistic funding environment, it is possible to have competitive funding that pursues narrow and focused objectives. It need not take on all political objectives of the national system, and other objectives may be pursued with other instruments.
- **The expected value of the grant:** The average size of award and the probability of success in achieving funding must be such that top quality scientists are encouraged to submit proposals. The combination of these factors helps explain the consistently high quality of awards under the NRICGP. From the scientist's point of view, the expected return on the costs of preparing a serious proposal must be adequate and the integrity of the review process must reduce the risk and uncertainty involved. From the society's point of view, transaction costs of the program must also be realistic in terms of administration and review costs and in the costs to applicants in preparing proposals.

[14] Gill, G and Diane Carney. 1999 p 11

A number of "good practices" have also been identified:[15]

- **Governance:** The best home for a competitive fund is in an independent institution that does not itself bid on grants. The governing body should be high profile, pluralistic, and set priorities that are in line with national policy priorities.

- **Priority setting:** Priorities must relate to nationally accepted goals. Clear statements on the size of grant, nature of activities funded, and specific conditions need to be published.
  Transparency argues for stakeholder participation. As with all priority setting, special interests may masquerade as social goals if participation is not sufficiently inclusive. However, farmer participation in the project preparation may be more effective for getting the research right than participation in governing or review bodies.

- **Generating good proposals:** The call for proposals must be public, accessible to all potential applicants, and provide sufficient time for quality proposals to be prepared. In places where experience with competitive grants is limited, special workshops and training in designing good projects are necessary.

- **Quality of peer review:** The integrity and transparency of the review process is a precondition. Each proposal should be evaluated on its own merits but there is need for the review board to have a coherent picture of the activities they are supporting. The review board should have fixed terms with, for example, a rotation of one-third to one-half of its members annually. This balances the need for continuity and memory with the need for new perspectives. Kelman and Cook show how a series of indivi dual awards can take research from the fundamental to the applied level, with each proposal judged on its own merit. Reviewers may be designated on an *ad hoc* basis; payment of reviewers may be required to ensure a prompt response.

- **Program monitoring and evaluation:** The evaluation of the program should focus on the stated outcomes of the program, which may include scientific, social, and institutional goals. Evaluation will be discussed in the next section.

[15] World Bank. AKIS Thematic Group; 1999. "Competitive Research Grant

- **Financial sustainability:** Gill and Carney stress the importance of commitment by authorities. Donor-created funds often bring a strong equity focus that nationally created funds might not promote as strongly. Therefore, national authorities must commit themselves to the equity focus if their future support is to be forthcoming. National funds without this focus often serve clients who can mobilize their own resources and the necessary political influence to sustain future financial inflows.

Evaluating the performance of Competitive Grants Programs

Echeverría put forward four criteria for measuring the performance of a CGP[16] : increased effectiveness, increased efficiency, the promotion of favorable institutional change, and observance of accepted public finance criteria.

The performance of the CGP itself must be judged primarily on its impact on the goals of the program. That is why clear goals are essential from the outset. Where the goals are scientific, we need to look for indicators of research effectiveness (impact on factor productivity, rate of return to research, adoption of results, poverty) and research efficiency. The task becomes complex when there are multiple goals that are different in nature; e.g. scientific, economic, political, or institutional. It then becomes necessary to establish indicators for the political and institutional objectives and a way of weighting these objectives against the efficiency and effectiveness objectives. Finally, the CGP can be judged in the same way we would judge any other public finance mechanism, i.e. by its revenue implications (additionality), allocative efficiency (distortion of expenditure), and administrative burden (costs of collection and disbursement). These criteria and their indicators are summarized following.

The criteria are relatively uncontroversial. Everyone recognizes the importance of documenting the impact of research on productivity-related goals and/or the impact on science for more fundamental research. An attempt has been made to express these criteria through indicators that can be made explicit.

[16] Programs: Good Practice for Design and Management. AKIS Good Practice Note. Echeverría, R. (1998) p 16-17.

Table 4. Criteria and Indicators for Measuring Performance of Competitive Grants

Criterion	Indicator (benchmark)
Impact of research results (effectiveness) attributed to research projects financed by competitive grants	.Factor productivity (crop yields, labor productivity) .Trend in natural resource degradation (soil erosion rates) .Social rate of return to research (percentage) .Absolute and relative poverty rates (percentage) .Scientific quality and spillover benefits (publications, citations, peer evaluation)
Costs of doing research (efficiency) attributed to research project financed by competitive grants	.Outsourcing for efficiency: Share of contacted research within project activities (% of total) .Delivery: Number of projects terminated within a year after the planned date .Success rate: Number of projects that have achieved the planned milestones .Punctuality: Ratio of realized and planned time for project execution .Lenght of project cycle (number of months)
Institutional change	.Partnerships: National, regional and international research joint ventures in a given year .Importance: Trend of national research budget allocated to CGs and to direct institutional funding (% over time) .Confidence: Share of private sector funding in total research expenditure (%) and number of joint ventures .Ownership: Stakeholder participation in governance, priority setting, and program planning events (numbers, share in total, level of responsibility) .Institutional capacity: staff qualification index; annual turnover rate
Public Finance Criteria	.Additionality of resources attracted by mechanism: from clients, government, private sector and partners .Allocative efficiency of resources and impact on research priorities in relation to national goals (change in resource allocation to new goals) .Administrative costs of collection and disbursement of funds relative to total grant activity .Transaction costs and preparation costs for applicants, reviewers and for the panel

Conclusions

In conclusion, the following points about CGPs should be highlighted:

· They are mechanisms to allocate resources in a given system, not a panacea; and if they are developed, the needs and challenges of each particular situation must be taken into consideration.

- They can be an effective component in a portfolio of funding mechanisms; they must complement rather than substitute long term public funding for strategic research through block grants. Experience with advanced systems suggests that when institutional block grants fall below 40-50% of the funding portfolio, the viability of long-term research is compromised.
- A necessary condition for CGPs to function is the existence of a market for technological services where competition can actually take place. Moreover, a basic research capacity is essential if competition is to solicit a range of innovative ideas.
- Because CGPs could be effective instruments to redirect research priorities, a transparent system of identifying national priorities and a clear indication of the subset of national priorities addressed by the CGP are necessary. Lack of clarity may mean that the "demand driven system" will be driven by the demand of the executing agencies not those of the intended beneficiaries.
- Success may breed success. CGPs that are well designed may help reverse the trend towards underinvestment in developing countries. If the program gets a deserved reputation for quality, fairness, relevance, and flexibility - and if it demonstrates the desired impact on efficiency, effectiveness, institutional development and fiscal goals - it will become sustainable. As the experience of advanced systems demonstrates, stakeholders will call for an increase in the share of research that is competitively determined if the system is seen as effective and fair. This share could rise progressively over 10-20 years to perhaps a third of the research portfolio.

Different authors have highlighted different principles and practices with respect to the structure and governance of CGPs, the separation of the financing and executing sides of research, the involvement of stakeholders at different levels, the power and responsibility that rests with different stakeholders, and on ensuring autonomy of the program. We believe that if a competitive grant system is needed, each country should design one that is specifically tailored to its capacity and circumstances. This must be compatible with the size of the research system, the human and financial resources available, and the sources of support needed for sustainability so that the attributes of successful systems (fairness, quality, relevance and flexibility) are ensured. Furthermore, if successful, the system may expect the competitive share to grow over time with the support of all stakeholders.

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Chapter 13

Some Experiences from Financing Competitive Funds for Agricultural Research in Latin America

Adriana Delgado, Hugo Villarroel, Francisco Basilio Souza and Ruben G. Echeverría [1]

Competitive grants are increasingly being used in Latin America to fund agricultural research. Policymakers and donors see competitive funding mechanisms as effective tools to redirect priorities and strengthen the participation of universities and other nonpublic and private sector research organizations. Research managers, in turn, see competitive grants as an additional source of scarce operating funds and as devices to develop joint ventures with other public and private sector research organizations.

The paper describes several on-going agricultural research competitive mechanisms co-funded by the Inter-American Development Bank. All of these experiences are relatively new, and hence it is too early to be able to extract concrete ex post results. Emerging lessons learned from the use of competitive mechanisms show that this type of funding is just one of several instruments to fund research and that they have the potential to improve research performance when they complement but not substitute institutional funding. Block grants for research and for strengthening institutional capacity will provide the basis for competition.

Preliminary results indicate that the introduction of new funding mechanisms is a process that takes time. In this sense, a traditional five-year project could provide the first step for the trial and gradually increase of the share of total funds allocated competitively. This initial learning stage would be the basis for further adjustments and refining of the administration and implementation of a competitive scheme.

[1] Staff from the Regional Operations Departments 1 & 2 and from Sustainable Development Department of the Inter-American Development Bank, Washington DC. The interpretations and conclusions presented are those of the authors and should not be attributed to the IDB. The background for this paper draws on: Echeverría 1998. Will Competitive Funding Improve the Performance of Agricultural Research? ISNAR Discussion Paper No. 98-16. The Hague, The Netherlands.

Background

Worldwide public funding for agricultural research increased at a slower rate in the 1990s than it did in the 70s and 80s, and in many cases it has decreased. Unrestricted support to public research institutions is declining while an increasing share of public support is taking on new forms such as project-based or contract research. As a result, competition among institutions for available public funds has grown. This has led to increased efforts by research organizations to find alternative sources of research funds and by funding agencies to find new mechanisms to effectively allocate these funds. In recent years, public research organizations have been faced with greater demands on their research capacity, but at the same time they are confronted with increasingly tight budgets. That is, with fewer resources, many research organizations are requested to do more. This may have a negative effect on research performance and, in turn, attract less funding.

In Latin America, where the decline in public funding first became apparent, new approaches for funding and organizing research (such as joint public/private-sector ventures, commercialization of research results, competitive schemes, and farmer-managed levies on agricultural production) have developed over the past two decades. There is a growing feeling that the traditional public block grant funding to centralized suppliers of technology should be used more efficiently. As a consequence, future national research systems may exhibit considerable diversity in both funding sources and institutional plurality in conducting research.[2]

While the private sector may expand its role in developing agricultural technology, the public sector is still the main source of funding for agricultural research in developing countries. However, the more traditional form of direct appropriations for research institutes is changing, and other instruments for funding research are being created. This paper focuses on one such mechanism: competitive grant programs (CGPs). It assumes that the trend to competitively allocate research resources will continue and that research organizations will have to acquire a greater share of their funding through competition in the foreseeable future. Therefore, a brief look at the lessons from the use of CGPs is timely.

[2] Echeverría, R.G., E. Trigo, and D. Byerlee. Institutional change and effective financing of agricultural research in Latin America. World Bank Technical Paper no.330. The World Bank. Washington D.C. 1996.

At the request of several of its member countries in Latin America and the Caribbean, the IDB has supported the preparation of a number of projects including CGP mechanisms for agricultural research in the past five years (Bolivia, Mexico, Peru, Paraguay, Ecuador, Colombia, Uruguay, Panama and Honduras). It has also funded several sizeable loans for science and technology CGP during the past twenty years. Directly and/or indirectly, these may have had an effect in the development of agriculture technology.

This paper presents a brief review of ongoing (IDB funded) CG mechanisms for national agricultural research in Bolivia, Uruguay, Honduras and Panama; and of the Regional Fund for Agricultural Technology for Latin America and the Caribbean. All of these experiences are relatively new, and hence it is too early to extract concrete ex post results.

Bolivia

Bolivia has one of the lowest public agricultural research investment levels in Latin America (0,1% of agr. GDP). Until recently, public agricultural research and technology transfer was led by the Bolivian Institute of Agricultural Technology (IBTA) and the Tropical Agricultural Research Center (CIAT) based in Santa Cruz. In 1997, the Bolivian Government closed IBTA and decentralized the responsibility for agricultural research to the Departmental Prefectures. The Prefectures have so far demonstrated little interest in financing agricultural research. The Government of Bolivia agreed with several bilateral donors to create a system of research and transfer of technology and has requested IDB financing to organize a technology system according to the country's political, institutional, environmental, and financial restrictions.

A new agricultural technology project, financed in part by the IDB, has been prepared taking into account the need to maintain a decentralized system and to facilitate public, private sector and donor contributions in each region of specific interest. The project's strategy was to develop a system in which each part could survive somewhat independently, in order to avoid problems of former projects. The aim of the project is to create a Bolivian system of agricultural technology, headed by a national committee that acts as a wide forum to facilitate dialogue and with four Foundations for Agricultural Technology Development.

The Regional Foundations are private agencies funded initially by the Government of Bolivia (with IDB loan resources), bilateral agencies and beneficiaries. They are located in the four agro-ecologic zones (altiplano, valleys, humid tropics and Chaco) of Bolivia. It is expected that they would become financially independent of public funding after a pilot phase of five years. Applied research projects of specific regional interest will be funded by the foundations on a competitive basis and assessed by independent peer-review according to: scientific-technical, economic-financial and environmental-social criteria; including type of beneficiaries and the possibilities of transfer, diffusion and adoption of results. The foundations will then review and prepare a final list of approved projects that will be co-financed with national public funds. Each regional foundation will organize independent call for proposals. The financial sustainability of the foundation's CGP after the Government support ends will depend on the effectiveness of the foundations to obtain resources from several sources and maintain a competitive scheme.

In addition to the four foundations, a national fund focusing on strategic research is also being implemented. These research projects will aim to public good type activities, with territorial and sectorial dimensions from themes identified from a national innovation technology plan. All research projects (applied and strategic) will be executed by public and private organizations at national and internationally recognized centers. The five-year program is expected to increase research investments to a total (both public and private) of 1% of agricultural GDP, by financing 10 strategic and 160 applied projects for a total amount of US$12 million.

Uruguay

The National Agricultural Research Institute (INIA), the nucleus of the Uruguayan agricultural research system, has operated a CGP system with IDB funding since 1990. The competitive mechanism administered by INIA during the 1990s was based on a Fund for the Promotion of Agricultural Technology (FPTA), with a total budget of 10% of total INIA resources (about US$10 million annually). During its first years of operation, allocation of the fund's resources was based on the advice of regional counselors, with the final approval of INIA's Board of Directors. The counselors proposed which projects should be executed by INIA

and which ones would be executed by other organizations depending on their capacities or infrastructure. Projects not executed by INIA were assigned directly or through a bidding process.

In 1998, IDB financed a new operation, introducing several features that had as a goal to incorporate more competition and transparency into the system. The objective is to diversify the structure of financing that depended heavily on public resources and to strengthen the overall innovation technology system by increasing the participation of beneficiaries. All proposed research projects were classified into strategic and applied projects. Strategic projects were funded via block grants but reviewed by panels composed of national and international members, and approved to be executed by INIA. In addition, an independent CGP for technology transfer was also established. This fund is executed by the Ministry of Agriculture.

The applied research projects are implemented under a CGP. INIA cannot compete for these projects. This is an important difference from the original mechanism established a decade ago. A minimum of 30% of IDB lending was assigned to the competitive fund. This share could be increased depending on the mid-term evaluation to be undertaken in 2003. Under the CGP, funding has increased for applied research from US$1 million to US$2 million. Funds are allocated in accordance with demand from producers and pursuant to the program's operational regulations. The applied research projects are executed by universities, private and public organizations and quasi-governmental organizations (national or international) in which the potential beneficiaries of the technologies being developed have a strong participatory presence. Funds are granted to the executing agencies with the results belonging in the public domain.

Research proposals are submitted to an eligibility evaluation in terms of prerequisites and a technical evaluation (anticipated impact, level of co-financing, capacity of the executing agency) with final assessment ranking. Expected impact evaluation and technical quality is done by independent consultants. The program has a goal of funding a total of thirty applied research projects to be executed by public and private institutions for an amount of about US$5 million. It is expected to increase producer's gross revenues by about 5%.

Important characteristics of the Uruguayan CGP include: (i) a maximum of 50% of the funds will be allocated for areas that have been identified in advance, and a minimum of 50% of the funds will be allocated for new areas that could be identified during the execution of the five-year program; (ii) 30% of the total funds will go to projects submitted directly by producers; (iii) in the selection process, more weight will be given to adaptive research projects submitted by specialized entities when they are supported by the potential beneficiaries; (iv) there will be at least ten competitive bids on projects; (v) projects will be executed through at least ten different beneficiary organizations, of which five (50%) will come from the private sector; and (vi) at least five projects will be executed by specialized international organizations.

Based on the two bids for project's proposals already done, some preliminary conclusions can be drawn. The impact of the research projects depends on whether the proposals adequately focus on the demand and the new opportunities for the agricultural sector. It must be recognized that the demand of final beneficiaries is not represented in all cases by research project executors, who don't always have the knowledge and the information to fulfill this role. On the other hand, it is important to have a strategic long-term vision in order to be able to call for proposals that will have an overall impact avoiding the dispersion of proposals among a large variety of unconnected themes.

The adequate functioning of the system also depends upon the transparency of its operative instruments, such as: (i) clarity in the rules for co-financing, the degree of reimbursements and the rules covering intellectual property rights; (ii) detailed agreement covering the project's execution; and (iii) limitations in the acceptable level of professional salaries - and in the percentage applied to salaries - in order to avoid that the resources are oriented primarily to finance the increases of the executor's personnel.

For the next call for proposals more participation of organizations from others countries is expected, since INIA has included more strategic information through the Internet. Another strategy that is being considered is to invite partners from two or three countries in the LAC region, and together pursue additional financing from sources like FONTAGRO that encourages the contribution of recognized regional and extra-regional research centers.

Honduras

Since 1975 the Secretariat of Agriculture and Livestock (SAG) has been responsible for agricultural technology generation and transfer, employing 3,800 people in its most active year, including over 1,000 staff members involved in technological activities. These activities have been subject to large budget fluctuations. Specific projects with limited duration financed by external funds have proliferated which now face serious sustainability restrictions.

The public agricultural technology system has not fully responded to the needs of producers. Its services are weak, costly, and dependant on public budgets and external donors, who all together do not, provided an incentive for private providers to participate. The market for technology services has not operated efficiently and there is no national plan for allocating resources or coordinating the activities of the public sector. The private technology system has mainly focused on bananas and plantains, and to a lesser extent coffee and other export crops. In general the service is linked to crop production and marketing. According to the 1993 agricultural census, just 7% of all farms received technical assistance, and of these, just 1% paid for the services. Only 5% of farms less than five hectares used technical assistance and less than 1% paid for it. For farms over 1,000 hectares, 36% used technical assistance, mainly veterinary services.

In 1994, an Agricultural Research and Technology Directorate (DICTA) was created as a decentralized agency of the SAG. Its mandate was to promote private technology generation and transfer services and to regulate the technology market. A national system for agricultural research and technology transfer (SNITTA) was established to coordinate public and private actions for the provision of agricultural and forestry technology generation and transfer services, which will allow private companies and farmers to play a larger role, under a market?driven approach. SAG's national agricultural and livestock offices that operated technology services were eliminated.

Currently, over eighty non-public institutions, including sixty nongovernmental organizations, cooperatives, trade associations, academic institutions, and specific projects are participating as

contractors or beneficiaries of programs, projects, and transfers. Most of these institutions receive financing from external sources under conditions defined by the donor agencies, and offer highly subsidized or free services, chiefly targeted to subsistence farmers. Coordination among these projects has been poor owing to the absence of a national research system that efficiently allocates resources to ensure the continuity of medium- and long-term policies.

Since 1996 the IDB is co-financing an Agricultural Technology Program to develop the competitive potential of Honduran agricultural production by boosting the sector's productivity and improving the quality of its products. The project aims to build up the agricultural technology generation and transfer services market in response to demand by producers, and to promote the services offered by private entities, promote diversification into nontraditional export crops, and increase the productivity of the staple grains sub-sector. At the end of the project, it is expected that a significant increase should be achieved in value added per hectare in "other crops", which include nontraditional farm exports, from 8% at present to over 10%. Increases in the current yield of staple grains of over 50% are also expected.

The first component of the project seeks to strengthen the national system for agricultural research and technologic transfer (SNITTA), consolidating the functions of DICTA to enable it to support technology activities under a structure in which promotion, regulation, and supervision of the services market, the operating and administrative functions as well as those involving technical project supervision will be performed by the private sector. This component also includes an information, dissemination, and promotion campaign; and training for researchers and extension agents.

The second component of the project establishes a competitive fund for financing agricultural research and technology transfer projects (for a total of US$14 million). The fund is SNITTA's main financing mechanism, bringing together several technology institutions and acting as a catalyst for public and private funding. It is expected that the fund will be the instrument for establishing a system that responds to producers' demands through services delivered competitively by private agents. The resources may be used to finance proposals for technology generation, technology transfers, and training for researchers and extension agents.

A board of directors, which includes members from the public and private sectors assisted by a support unit, is responsible for the operations of the fund.

After a slow start, a recent evaluation of the program identified the following constraints for the execution of the project: (i) weakness in the preparation of the project proposals by the service providers; (ii) existence of only a few specialized companies or individual consultants with sufficient experience in providing specialized services in research, technology transfer and training; (iii) unwillingness by the service providers to change to the new way of delivering technical assistance and the producers to accept paying for the services previously received at no cost; (iv) the proposals presented for assessment by the service providers are most of the time overpriced making the process of approval longer and more complicated; (v) inadequate counterpart contribution by the government.

The evaluation highlighted the following achievements of the project: (i) all the entities for the execution of the program (the private administrative unit, the council for the administration of funds integrated by members of the private and public sectors, including representatives of professional organizations, schools and service providers) have been established and are fully operational bodies; (ii) completion of technical instruments to implement the project, including guidelines for the presentation of project proposals; (iii) approved fifteen projects of generation and technology transfer for its financing, which are being executed by private providers with expected benefits for fifteen hundred families (six additional projects are currently under negotiations for future execution); and (iv) a revision of the operating regulations was completed to suit farmers needs and facilitate the execution of the program.

Panama

Agricultural sector modernization in Panama was hindered by several factors in the early 1990s, some of them deriving from protectionist policies, others from the incipient capacity of private operators to meet the farmers' demand for services, and others from deficiencies of production support services. Low productivity, high production costs, and high domestic prices have lowered the sector's competitive edge in important traditional product lines, such as rice and corn. Technology

generation and transfer was not well articulated, technology was being generated with very little coordination among the participating institutions, there was no precise definition of research priorities, which hampered the efficient use of financial, and human resources and results in repetition of some work. The extension service, which includes public and private institutions, operated under diverse and uncoordinated arrangements and procedures, poorly connected with research, without a defined target population to meet the effective demand.

An IDB-financed agricultural technology program operating since 1996 seeks to achieve greater diversification of production, improve the yields and quality of the final products and bring down their unit costs of production using technology that ensures environmental sustainability. The program includes technology generation and transfer components for about US$20 million of external funding. The first one aims at generating broad impact agricultural technologies with public good characteristics. Research projects are funded on open competition between the public and private entities, national research organizations, including the Agricultural Research Institute (IDIAP), the National Directorate for Aquaculture (DINAC), universities, NGOs and the private sector. Emphasis is placed on practical results for commercial application, especially in competitive lines of production. In addition, there is block grant funding to upgrade public research capacity at IDIAP and DINAC.

Support to IDIAP focuses on research conducted on competitive crops for operators of small and medium-sized farms and on the sustainability of natural resources. DINAC research focuses on fish and crustacean species for the benefit of small and medium-sized producers. Public funding for these organizations includes training in short and graduate courses to build up a small corps of research specialists, the hiring of local scientists for specific tasks, the procurement of equipment and vehicles, and the rehabilitation of laboratories and libraries.

Competitive funding resources for research are allocated to encourage participation by private entities as well as public agencies in the execution of technology development projects, and promote strategic arrangements between domestic and foreign research institutions. Research resources are allocated by a private specialized agency, in response to demand on the part of producers and to items selected on the basis of standards of

competitiveness on the world market, focusing on technology adaptation trials, profitable export crops, and the testing of inputs and varieties. Producers are expected to finance at least 30% of the total cost of the research projects.

The program includes a technology transfer component that restructures the public agricultural extension system to a system in which private professionals, NGOs and enterprises operating in the private sector, provide services, co-financed with public and producers funds. Farmers are expected to progressively take on the costs of the assistance, to 30% and 100% for operators of small and medium-sized farms respectively, by the end of the Program. Private agents are selected on a competitive basis to provide extension services, hired by a specialized agency.

A quick assessment of the Program shows the following achievements: (i) a real demand for technology has been identified in regards to the most important lines of agricultural production in the country; (ii) beneficiaries are participating in the identification of research priorities; (iii) the service providers are compelled to undertake research of the economically important subjects rather than the interesting ones; (iv) the probability of research success has increased, because the beneficiaries demand results due to the fact that they are co-financing research and transfer activities; (v) an increase in efficiency in the use of available human and financial resources by promoting joint public private activities; and (vi) the preparation of proposals is cost efficient.

However, the following weaknesses were also identified: (i) slow progress with the government run process of privatization of the agricultural technological services; (ii) lack of knowledge of the concepts and regulations of the Program at the national level, creating uncertainty in the process of implementation of actions; and (iii) lack of communication between the service providers, the administrative commission, the government and the beneficiaries.

Regional Fund for Agricultural Technology (FONTAGRO)

Financed principally by a growing endowment fund with investments by the countries of Latin America and the Caribbean, and managed directly by the same countries, the Regional Fund's goal is to promote

agricultural competitiveness in ways that contribute to poverty reduction and the sustainable management of the resource base. Specific approaches being taken by the fund to support this goal are to:

- Add a permanent flow of new resources for regional agricultural research, promoting quality and innovation in research through competitive funding of projects of cross-country interests in areas defined in the fund's medium-term plan;
- Accelerate applied research at the national level by developing public goods-type technologies of cross-country relevance;
- Increase the ability of the region to meet research challenges through cooperation, especially where the necessary scale of operations and skills are not easily available in one country;
- Promote research collaboration among organizations at the national, regional and international level;
- Strengthen the participation of the region in decision-making forums where international agricultural research is planned and financed.

The fund is set to finance its research grants from the annual income earned by its endowment fund. It allocates resources on a competitive basis according to the procedures laid out in its manual of operations. The manual includes operational criteria for evaluation of proposals based on technical, economic and financial, institutional and environmental indicators. In addition to these criteria, decision-making is guided by the following principles:

Ownership: The fund is owned and directed by its member countries and development organizations contributing to its capital endowment. All subscribing countries from LAC have a voice in its decisions, with additional weight in voting conferred by the size of contributions. Besides all of the LAC countries as potential members, four development organizations have joined the fund as sponsors, providing various types of support: the Inter-American Development Bank (IDB), the International Development Research Centre (IDRC, member as well), the Rockefeller Foundation, and the Inter-American Institute for Cooperation on Agriculture (IICA).

Inclusiveness. Membership is open to all countries and development organizations, which subscribe to its basic principles.

Transparency. The decisions of the fund are guided by transparent criteria relating to its mission and objectives.

Universal Access. The fund supports research leading to the production of public goods that are freely available to all, including potential beneficiaries outside of membership in the fund. The fund may protect the intellectual property arising from its research in order to ensure free and fair use by others.

Integration. Through its activities, the fund aims to a greater integration of research among countries in the region. Because regional research has not been sufficiently developed, the fund may engage in limited capacity building where needed in order to achieve greater regional collaboration.

Quality and Relevance. A formal process for the review of research proposals ensures their scientific quality and relevance to the goals of the fund. There is no pre-established allocation of the fund's resources to countries, political regions, or areas of investigation.

Focus. The Fund focuses on a subset of the agricultural research priorities of the region as defined in the medium-term plan.

Created in March 1998, under the umbrella of the IDB until the end of 2002, the fund has been directed by its thirteen member Board and an Executive Secretary. Twelve LAC countries (their governments) pledged US$70 million for FONTAGRO's endowment (US$15 million have been realized), targeted at US$200 million (to generate up to US$15 million annually for competitive research grants of up to three years duration; each project capped at US$500,000). By the end of the consolidation stage, all the countries of LAC are expected to become members, plus the U.S. and Canada.

A medium-term plan 1998-2000 outlining priorities and regional and sub-regional research domains, and a Manual of Operations specifying conditions for the acceptance, financing, and monitoring of projects, have been prepared.[3] Two rounds of annual competitions have been launched, 1998 and 1999. From the 1998 call, twelve projects are actually under execution for a total of US$3.0 million. Additionally, twelve await

[3] Reference: *www.fontagro.org*

funding from the 1999 call. Strategies for collaboration with the U.S., Canada and Europe have been developed and launched. Funding from FONTAGRO leverages resources from the participant institutions in each consortium, through the co-funding of specific items within each budget's proposals.

The Regional Fund is a cooperative program. It does not possess juridical personality. Two of its sponsors, the IDB and IICA provide FONTAGRO with the needed institutional procedures and legal frame to operate. Member countries can make their contributions to the capital endowment as components of IDB loans related to the rural sector. The IDB has provided grant resources for the initial annual call for proposals. Project proposals are developed and submitted to FONTAGRO by research organizations (research institutes, research networks, universities, NGOs, and private entities) from two or more member countries. Independent panels evaluate and rank proposals according to weighted criteria of four indicators (technical, economic and financial, institutional and environmental).

Besides sharing common characteristics of other CGP mechanisms, FONTAGRO's uniqueness is due to: its endowment, which ensures sustainable availability of resources for regional research; the fact that the member countries are able to borrow from the IDB in order to invest in the fund's capital (and that their investments are only utilized to generate rents); and the fact that that it is "bureaucracy free", since it operates (with only one staff member) as a cooperative program relying on its sponsors for needed administrative and legal procedures.

Chapter 14

Cooperation and Competition in Competitive Grants - Is "Coopetition" Being Achieved?

Maurício Antônio Lopes

Introduction

It has been well accepted that competition is one of the key forces that keeps industry competitive and dynamic. However, Adam Brandenburger of the Harvard Business School and Barry Nalebuff of the Yale School of Management challenged this view. They developed a concept that businesses can benefit from a rational mixture of competition and cooperation that leads to development of complementary products and expansion of markets, with formation of new business relationships or even new forms of enterprise (Brandenburger and Nalebuff, 1997). Increasingly, the same is becoming true for research and development organizations that can benefit from working with partners, whose abilities make their own abilities more attractive in the eyes of clients. Faced with growing complexity in all branches of science, increasing competition from industry and increasing pressures and demands from all sides, R&D institutions must look at ways to do more with fewer resources. Collaboration through "teamnets" and networking has the potential to reduce costs, add value and promote their capacity to respond quickly to changes. Also, with the new tools of information technology, collaboration can be accessed from any part of the world, since it enables information and other resource sharing without the need for geographic proximity.

How should an R&D institution behave in these complex relationships, when partners can be also competitors? Organizations that enter competitive collaboration never forget that their partners may eventually disable them. This dilemma has been faced by a growing

number of organizations that rapidly understand that effectiveness will be more and more a product of recognizing and using interdependence. With networks and interdependent teams, cooperation must be designed in the name of mutual needs with a clear sense of sharing risks to reach objectives that are common to all partners.

In this ever-changing scenario, new forms of financing, like competitive grants, have arisen for agricultural R&D institutions worldwide. Their criteria generally imply a greater connection between products and services supplied by R&D organizations and the necessities and challenges of the sector. Many public organizations look for these new sources as means to complement official financial support, which have been in steep decline for many years.

With increasingly constrained resources, the changes may be happening too quickly for slow, bureaucratic organizations to cope well. These passive, compartmentalized organizations, unable to act quickly and flexibly, face growing difficulties to attract partners and raise new resources to support R&D. To attract new partners and compete for new funds, organizations will need to use innovative approaches to human resources management. This will help improve their workforce and retain their critical capability to maintain quality, relevance and excellence, which ensure advantage and complementarity for anyone looking for productive collaboration. Also, the quality of its infrastructure directly affects the ability of any organization to accomplish its mission objectives and projects and to attract collaborators.

Is "Coopetition" Being Achieved?

In Latin America, competitive funding systems for agricultural R&D assume growing importance as new force for cooperation among universities, R&D institutes and the private sector, allowing for collaboration even among institutions that are traditional competitors. Competitive funding systems are usually based on formal procedures of support to R&D projects selected through widely publicized procedures, predefined rules, with wide participation and transparent analysis (George, 1999). They can be tailored to accomplish numerous objectives, including:

- Mobilizing the best available scientific expertise for work on specific high-priority projects;
- Promoting research partnerships and collaboration by researchers from different institutions, disciplines and countries;
- Introducing more demand-driven research that specifically involves clients in setting research priorities, providing funding, and executing and evaluating research;
- Making research more cost-effective by channeling funds to under utilized scientists or facilities and thereby making them more productive;
- Increasing total funding for research by mobilizing funds from farmers, industry, and other sources for research topics of interest to the financier;
- Redirecting research toward high-priority areas in accordance with funding-agency priorities, client needs, and new technological opportunities;
- Improving research quality and innovation by basing funding for projects on rigorous technical review of scientific merit, work plan soundness and milestone effectiveness;
- Drawing a wide range of participants into the research system, including non-governmental organizations and the private sector.

Although the rules and procedures governing the competitive granting system indicate the need for partnership, little information on resulting collaborations is available, both because the competitive grant systems are still recent and were not yet evaluated from this perspective or because the evaluations do not consider in-depth analysis of resulting cooperation and networking. An exception is the case study on the Fondo Nacional de Desarrollo Científico y Tecnológico (FONDECYT) (National Fund for Scientific and Technological Development), which was established in 1981 as an instrument for promoting national scientific and technological development in Chile (Berdegue and Escobar, 1999). The fund, which is financed by government resources in the form of a fixed annual fiscal allocation, supports national scientific and technological research in all fields of knowledge. The main criterion for evaluating projects in the FONDECYT competition is the quality of the research. In this specific fund, whether a single institution or a group of institutions sponsors a proposal has no influence on the evaluation. Between 1988 and 1998, 77% of the proposals approved in forestry, farming and cattle

production came from a single institution, 18% from two institutions, and only 5% came from three or more institutions. Also, the size of the research team is not a determining factor in project approval. Table 1 shows that 4% of projects have one researcher and about half (49%) have teams with two or three researchers. (Table 1).

Table 1. National Fund for Scientific and Technological Development - FONDECYT/Chile - Size of project teams, 1988-98. From Berdegue and Escobar (1999). *http://www.rimisp.cl/odiprinc.html*

Size of team	N°. of projects	%	Cumulative %
1	12	4	4
2	76	26	30
3	63	23	53
4	53	18	71
5	44	15	86
6 and more	41	14	100
Total	**289**	**100**	

The conclusion of the case study on the item networking were twofold: a) FONDECYT projects are the fruit of personal initiatives by researchers, rather than the work of research teams from the same institution, and b) there is no integration among the institutions because the researchers prefer to have one institution appearing as the executor of the project, and professionals from other institutions are incorporated into the project as technical support personnel.

The conclusions of this study are presented to illustrate a general perception that institutions and scientists working on agricultural R&D traditionally prefer to work by themselves and projects are frequently the fruits of personal initiatives. Factors like shortage of researchers, few researchers and teams in key themes, high fragmentation of research initiatives, high isolation of research teams, low mobility of researchers and low emphasis on cooperation by managers and leaders certainly contribute to the lack of true cooperation among research teams and institutions.

This scenario may change since in many competitive grant systems networking is a clearly defined objective as the program attempts to

achieve the association of research organizations (universities, research institutes, etc.) with private enterprises interested in technological innovation (George, 1999). For many of them, no proposal can be approved without associations, because in its formulation, the project must ensure a technological transfer to production areas. For example, the Agricultural Technology Development Project for Brazil - PRODETAB, coordinated by Embrapa, explicitly calls for multi-institutional partnerships and gives priority to partnerships with the private sector (Secretariat for International Cooperation, 2000).

Although the rules and procedures governing several granting systems already indicate the need for partnerships and networking, experience has shown that cooperation succeeds only if it is founded on trust and understanding and the promise of mutual benefits. The approach to ownership and use of the results, a sensitive issue in collaboration, although partially regulated through many funding systems, has been non-mandatory and based upon the levels and nature of input by the partners. For example, the technical and financial cooperation agreement referring to the Agricultural Technology Development Project for Brazil - PRODETAB, states that "any technological inventions, improvements or innovations, under the terms of the industrial property law, as well as any process or product, including lineages and cultivars, covered by the cultivar law, whether privileged or not, purchased, produced, transformed, constructed or under construction, arising from the execution of this agreement, shall belong to Embrapa and to the CONTRACTEE, in the proportion of fifty percent for each" (Secretariat for International Cooperation, 2000). This is a provision that does not specify any criteria for division of ownership among the partners represented by the contractee. Therefore, the successful experiences will have to be based in clear recognition of objectives and partners' contributions and well-structured management to deal with sensitive issues.

Structuring Partnerships

Many organizations and research groups still understand cooperation as non-committal contacts, with one organization or group telling the other what kind of research they are interested in or with organizations offering the fruits of their research to anyone that is interested. Actually, cooperation means that each partner makes a long-term commitment to

the mutual benefit of both parties. Therefore, effective committees and good communication are essential to the success of a partnership, whether it is one mandated by the funding system or one developed through the free will of its members. Usually, the funding systems do not establish a mandatory need for project committees or criteria for communication and reports that indicate effective interactions among the partners. Although partnerships of institutions located close to each other seem to work better, the moment seems favorable for broader alliances, using the tools of information technology to form virtual collaborations.

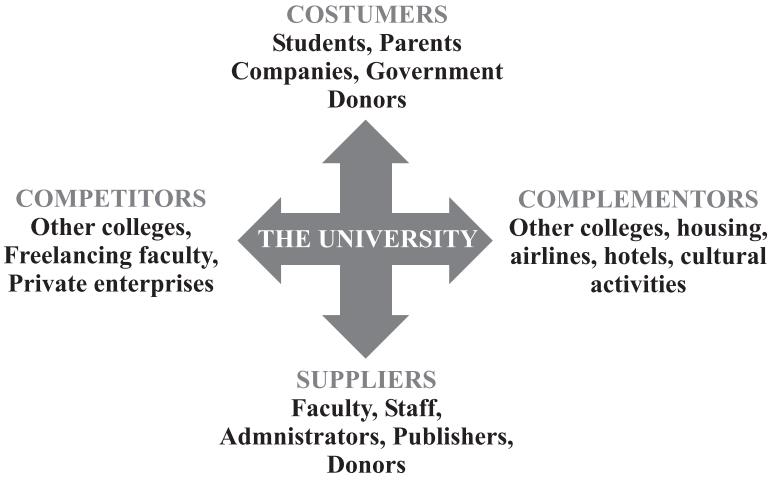
The concepts of "teamnets" and networking described by Lipnack and Stamps (1993) are interesting tools to guide efforts of collaboration and effective cooperation. They have identified a few principles that must be exercised to hold teams together. They are: a) unifying purpose - "teamnets" achieve success by being clear on their purpose. The purpose needs to be simple, and everyone involved needs to understand it and, if possible, participate in its development; b) independent members - joining a network doesn't mean one has to give up independence. Individuals in teams, or teams amongst other teams, all retain and usually enhance their independence; c) voluntary links - a network has many links, connections and relationships. The links cross boundaries and are not hierarchical or regulated; d) multiple leaders - everyone is a leader at the time when his or her unique experience and knowledge adds to the group's intelligence. Leadership in a network is not a matter of acquired status or ownership. Natural networkers are coordinators and catalysts who constantly develop matches between people's needs and resources. e) Networks aren't just two-dimensional and homogenous. They clump into sub-groups, interest groups and teams of different sizes and make-ups, continuously forming or re-forming. Groups naturally gather into groups of groups, or sub-divide into smaller groups.

Knowing complementors and competitors

The basic idea of "coopetition" is that business is a game where one is sometimes competing and sometimes cooperating with other players. Cooperation generally leads to an expansion of business and competition to a slicing up of opportunities. Both cooperation and competition are necessary and desirable aspects of an enterprise. An exclusive focus on competition (which is the predominant mindset) largely ignores the potential for changing or creating new forms of interactions and enterprises. Brandenburger and Nalebuff (1997) introduced the concept

of the "Value Net", which is a way of looking at a business situation that recognizes that an organization operates in an environment having four main groups that influence the course of its activities, as illustrated in Figure 1.

Figure 1. An example of a Value Net (Costumer/Complementor/ Supplier/Competitor network). Adapted from Brandenburger and Nalebuff (1997).



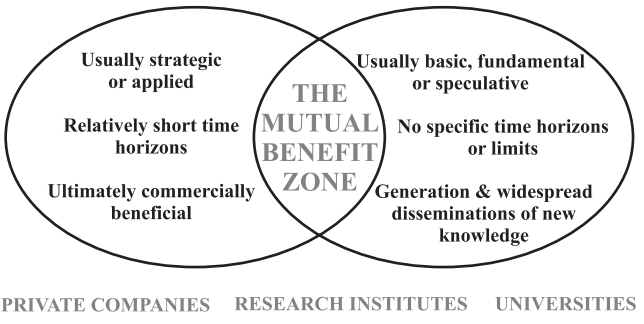
Suppliers and customers are obvious parts of any production process. Competitors influence the environment within which the organization operates. However, Brandenburger and Nalebuff (1997) indicate that commonly overlooked players are the complementors - organizations with whom reciprocal and mutually advantageous relationships exist. A complement to one product or service is any other product or service that makes the first one more attractive. Hot dogs and mustard, cars and auto loans, televisions and videocassette recorders, fax machines and phone lines, are examples of complementary products and services. In the example below, a player is your complementor if costumers value your product more when they have the other player's product than when they have your product alone. A player is your competitor if costumers value your product less when they have the other player's product than when they have your product alone. Recognizing the competitors and complementors is an essential step that leads to the development of complementary products and the expansion of markets, with formation of new business relationships or even new forms of enterprise.

Understanding differences in objectives & nature of research

Not only is the cost of conducting research escalating, but also the complexity of science needed for research is increasing. Research in most fields requires not only specialized equipment and facilities, but also highly trained technical support. The professional expertise needed may have to be accessed in many different places. Increasingly, multidisciplinary teams of scientists will be required to address the complex issues facing agriculture. The main problem in collaboration is the difficulty to recognize that different institutions, people and groups of people have different general interests and norms. The challenge is therefore to find ways to bring people together when they have some common or complementary purposes, discuss and negotiate how they relate and how to achieve synergy.

The challenges and opportunities for publicly supported agricultural research are not in duplicating the private sector's research agenda but in building unique private/public partnerships or perhaps even jointly supported consortia for agricultural research (Council for Agricultural Science and Technology, 1994). Increasingly, agricultural research will be conducted in partnerships among private companies, public research institutes and universities. In forming such alliances, these organizations must recognize that developing productive relationships involves noncompetitive dialogue and understanding of each other's abilities and limitations. Partnerships will flourish only if they are founded on trust and understanding and if differences in drivers and objectives are recognized and accommodated in initiatives that promise mutual benefits (Figure 2).

Figure 2. Types of research affecting partnerships among industry, research institutes and universities. Adapted from Laider (1998).



Organizing Research & Development Agendas

Today, agricultural research agendas are being established not only by farmers but also by consumers. Changes in the research agenda reflect the increased direct involvement of state and federal regulatory and service agencies, commodity and consumer organizations, advocacy groups, and industries associated with agriculture. Groups with diverse interests participate actively in debates concerning sustainability, organic farming, genetically modified organisms, food production and processing, chemical and pesticide use, agriculture's environmental effects among other important themes. Societal interest in the environmental impact of agricultural production practices has compelled agricultural scientists to focus beyond efficient, effective, and economical production and processing to the environment and to health (Council for Agricultural Science and Technology, 1994). To be able to attract new partners and compete for new funds, agricultural R&D organizations will need to use innovative approaches to improve their workforce and retain critical capability to maintain quality, relevance and excellence towards the resolution of problems related to the main priorities of society.

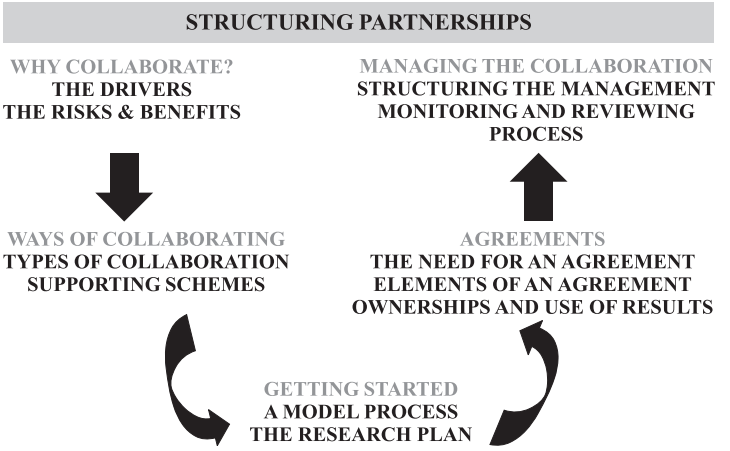
Figure 3. Developing Agricultural Research and Development Agendas. Multidisciplinary collaboration in the form of research teams and networks will become the mode of operation as the cost and complexity of conducting research escalates. Designing objective research agendas will help organizations to respond to an increasingly diverse and complex portfolio of priorities.

As the number of stakeholders in the agricultural decision-making process has increased and the agricultural research agenda has expanded, organizations must be able to respond to an increasingly diverse and complex portfolio of priorities, strengthening interactions within the

system and developing links and partnerships with groups traditionally outside the system. Innovative ways of determining current and future needs and opportunities in agricultural research must be connected with modern management. The organizations must develop the ability to design plans and policies that help nurture the definition of objective R&D agendas to guide scientists and teams towards integrated, synergistic involvement (Figure 3).

In addition to objective agendas, effective management procedures (Figure 4) with establishment of committees, reporting and communication are essential to the success of any partnership. Any organization entering into cooperation must decide what needs to be managed at strategic, technical and administrative levels, assigning roles and overall leadership judiciously and developing appropriate structure and procedures. The approach to ownership and use of the results must be based upon the levels and nature of inputs by each of the partners. Also, agreements governing how the partners conduct themselves - particularly regarding the responsibilities towards each other - are a must. Agreements may cover issues like the management structure and processes of the partnership, decision making, financial matters, the duration of the partnership, confidentiality, the contribution and use of background information, the ownership and use of results, publications, publicity and dissemination of results, defaults and remedies, the settlement of disputes, among other subjects (Laider, 1999).

Figure 4. Guidelines to Structure Partnerships. Adapted from Laider (1998).



Conclusions

Research and Development organizations are facing increasing competition, crescent pressures and demands and must look at new ways to do more with fewer resources. In this scenario, competitive funding systems for agricultural R&D assume growing importance as new drivers for cooperation among universities, R&D institutes and the private sector, allowing in many cases collaboration even among institutions that are traditional competitors. Cooperation induced by these systems has the potential to reduce costs, add value and promote the capacity to respond quickly to changes. However, many organizations still understand cooperation as non-committal contacts and many scientists still prefer to work by themselves on projects that are frequently fruits of personal initiatives. Organizations that work on these modes are outdated in a world of "coopetition", where both cooperation and competition are necessary and desirable aspects of an enterprise. An exclusive focus on competition largely ignores the potential for changing or creating new forms of interactions. Recognizing the competitors and complementors is an essential exercise that can lead to development of complementary products and expansion of markets, with formation of new relationships.

These new concepts are very useful as research in most fields requires not only specialized equipment and facilities but also highly trained technical support, and the professional expertise needed may have to be accessed in many different places. Increasingly, multidisciplinary teams of scientists will be required to address the complex issues facing agriculture. The main problem in collaboration is the difficulty to recognize that different institutions, people and groups of people have different general interests and norms. The challenge is therefore to find ways to bring people together when they have common or complementary purposes, discuss and negotiate how they relate and how to achieve synergy.

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Chapter 15

Competitive Funding of Agricultural Research in the World Bank: Lessons and Challenges

Derek R. Byerlee

Introduction

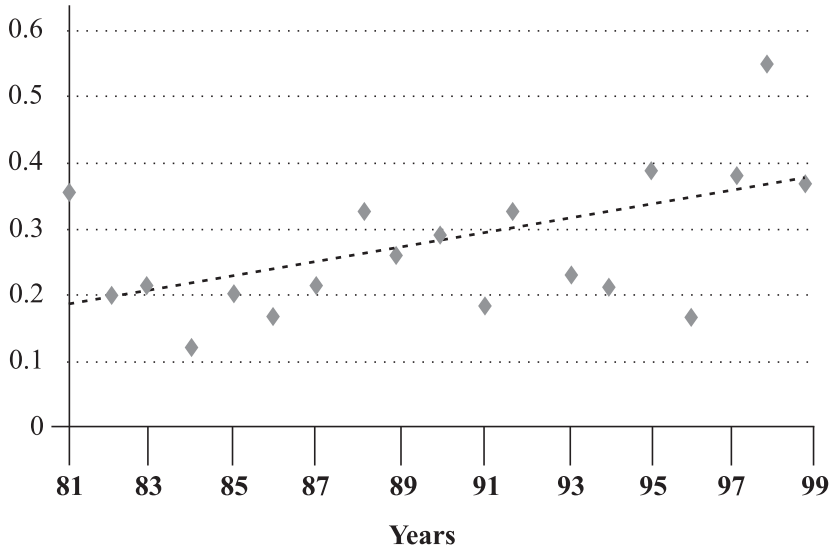
Competitive funding emerged in the late 1990s as an important component of World Bank support to agricultural research systems. This paper outlines the role of competitive funding against a background of changing strategies for financing agricultural research. The bulk of the paper is devoted to a synthesis of lessons learned, and ongoing challenges in successful use of competitive funding. The paper concludes that competitive funding can be an important mechanism for financing agricultural research and stimulating institutional reform. However, it should complement but not substitute sustained long-term core funding of public research organizations.

The World Bank and Agricultural Research

Investment by both governments and donors in agricultural research in developing countries grew rapidly from about 1970. However, since 1985 there has been a sharp drop in public funding in many countries, especially in Latin America and Africa. Meanwhile, the size of research systems, measured by the number of scientists, has continued to expand, resulting in reduced expenditures per scientist and a critical shortage of operating funds for research. This acute scarcity of public funding for research combined with the poor performance of many national agricultural research institutes (NARIs) led to a search for new paradigms for funding and execution of research in the 1990s (McMahon, 1992; Byerlee and Alex, 1998).

Since 1980, agricultural research has been considered a priority in the Bank's lending portfolio. At a time of overall reduced support for agricultural and rural development, the share of Bank lending for research has increased. Over the past twenty years, it has provided over US$ 5 billion to agricultural research in about one hundred countries. In recent years, annual commitments have averaged about $450 million (Figure 1). The Bank's lending for agricultural research now accounts for a large share of all external support for agricultural research in developing countries. Many countries have had sequential agricultural research projects: in some cases, the Bank has supported agricultural research continuously for fifteen years or longer.

Figure 1: Trends in World Bank Lending to Agricultural Research



Africa, Latin America, and East and South Asia each account for 25 percent or more of the total funding. Europe and Central Asia (ECA) and West Asia/North Africa have received only about 5 percent of total lending for agricultural research, although activity in ECA has recently increased (Table 1). Over the past two decades, there has been a major geographical shift in the share of lending from Latin America and East Asia to Africa and South Asia (Table 1), although lending to Latin America again jumped sharply in the late 1990s.

Table 1. Regional shares of World Bank loans for agricultural research (percent) [a]

Region	1981-1984	1993-1996	1997-1999
South Asia	15	27	16
Southeast and East Asia	39	9	12
West Asia / North Africa and Europe / Central Asia	4	6	1
Latin America	36	8	27
Africa	6	50	42
Total	**100**	**100**	**100**

The focus of World Bank support to agricultural research has evolved over time. The emphasis in these projects can be broadly classified into three periods:

1. A period of expansion up to the early 1980s - the "bricks and mortars" phase - when the main emphasis was on increasing the size of public-sector research organizations through investment in experiment station and laboratory infrastructure, equipment, and human resource development.

2. A period of transition from the mid 1980s when more emphasis was placed on improving the management of existing research resources in the public-sector research institutes through better planning, improved financial management, greater accountabiliy, and attention to increasing the relevance of the research program to its immediate clients, the farmers. However, as in the first period, most resources in project loans for agricultural research were provided for further expansion and rehabilitation of research infrastructure.

3. A period from the mid 1990s, when Bank projects began to emphasize measures to enhance the institutional sustainability of agricultural research systems, defined to include not only the governmental national agricultural research institutes (the NARIs) targeted earlier, but also universities, the private sector, research foundations, and some rural-based nongovernmental organizations (NGOs). In this period, there has been little emphasis on expansion: in many cases, the Bank has supported downsizing and consolidation of public research institutions.

[a] AKIS data files, World Bank

Box 1: Common problems identified in reviews of World Bank support to agricultural research

- Lack of a consensus in-country on a strategic vision for public sector research institutions and the evolution of the NARS.
- Ineffective national leadership for many research institutions, resulting in both internal management problems, as well as lack of political support, especially for funding research.
- Continued emphasis on building NARIs, at the expense of fostering a more pluralistic system.
- Difficulties in establishing institutional autonomy for research institutions to provide needed flexibility in management of financial, physical and human resources.
- Weak links between NARIs and other research providers, with clients and with technology transfer and developmental organizations.
- Inadequate attention to sustainability - both financial and institutional - of research organizations.
- Weak monitoring and evaluation systems for both research programs and assessing institutional changes.

Responding to recommendations from various internal reviews (Box 1), emphasis has now shifted to a focus on the quality dimensions of agricultural research, especially management, incentive systems, and accountability, with conscious efforts in most cases to avoid further creation or expansion of public research organizations. The focus is now on building a more diverse NARS that incorporates a range of institutional options for conducting agricultural research and development (R&D) and a diversity of funding mechanisms that foster competition and improved articulation among the various participants in the expanded system (McMahon 1992). Lending for research also increasingly

recognizes that the appropriate focus is the "agricultural knowledge system" or "innovation system," terms that explicitly recognize that extension, educational systems and user involvement are associated with effective research institutions.

Current Status of Competitive Funding in Bank Lending

Against this background of mixed success in supporting agricultural research, competitive funding offers a number of attractions in Bank lending support for research. Beginning in the mid-1990s, the use of competitive funding expanded rapidly within the research lending portfolio. Objectives for using competitive funding mechanisms have varied from project to project but have usually included one or more of the following:

- To foster institutional pluralism by funding research providers, other than NARIs, such as universities, private firms, and NGOs.
- To provide much needed operating costs to better utilize the substantial investment in scientists and research infrastructure.
- To foster partnerships among research providers, by requiring that proposals be jointly prepared and executed.
- To promote reform of NARIs, by requiring them to compete for funding.
- To upgrade quality of research efforts through rigorous screening of research proposals and monitoring of implementation.
- To promote a more demand-driven agenda by requiring that users and beneficiaries participate in proposal preparation and execution.
- To quickly address new and important research priorities.
- To attract new sources of funding though establishment of research funds set up on a competitive basis.

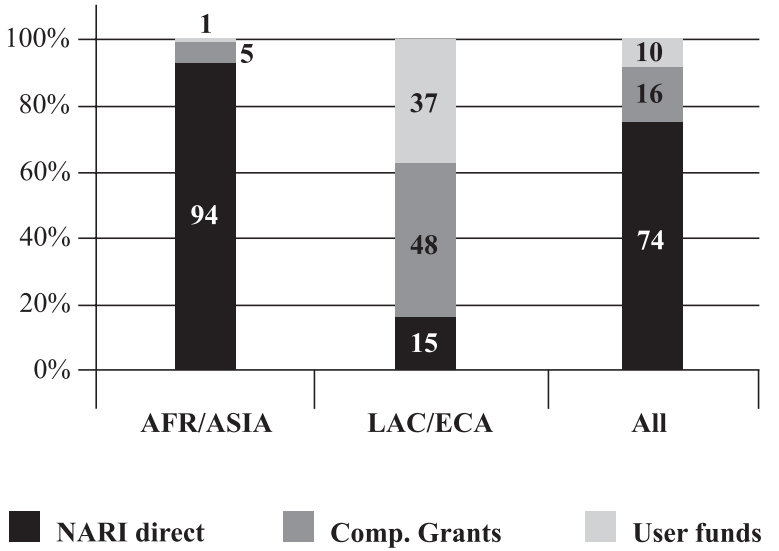
At present, the Bank provides significant support to agricultural research in thirty ongoing lending programs totaling nearly $2 billion.

Some nineteen of these projects include, or have plans to include, a competitive funding component. In aggregate, total support through competitive funding amounts to about $60 million per year.

However, the use of competitive funding varies substantially by region. It is most advanced in Latin America, where some projects now have up to five years of experience in using competitive funding, and several projects are largely based on competitive funding. Competitive funding is also beginning to be widely used in Eastern Europe and Central Asia (ECA) as the main mechanism to support reform of research systems, although the experience is still in its infancy. In other regions, competitive funding is usually only a small component of the total project loan.

These regional differences are very evident in Figure 2. In Latin America and ECA, 45 percent of support for agricultural research is channeled through competitive funding, compared to only 5 percent in other regions. The differences reflect the varying levels of infrastructure and human resource development, as well as the availability of a range of potential research suppliers. Latin America has also generally been a leader in implementing reforms to increase competitiveness and performance of the public sector.

Figure2. Support to Agricultural Research in the World Bank Portfolio



The orientation and focus of the competitive funds also vary significantly from country to country and region to region. Many of the earlier funds were largely oriented to funding research in universities, especially more basic research. More recently established funds, especially in Latin America and ECA, have had a strong orientation toward applied and adaptive research, where funds flow directly to users, who may then contract an appropriate research provider. There has also been a growing trend toward the establishment of 'technology funds', which finance both research and extension activities.

Finally, there have been important variations in the institutional framework within which the fund is established. In one model (Figure 3a), most widely used in Latin America and ECA, funding of research is divorced from research execution. Funds are administered by an apex board or research council established as part of the project in order to administer the funds, or sometimes by an *ad hoc* arrangement such as a project management unit. The challenge for this model is to find a sustainable "institutional home" for the fund. In the second model (Figure 3b), most widely used in Africa, the fund is connected to the NARI, although usually with some independence in terms of governance and screening of proposals. This model has the disadvantage of giving the appearance of conflict of interest (the NARI that administers the fund also receives funds), but avoids the establishment of new institutional structures. It is still too early to evaluate the relative success of these models, and in any event, success often depends on specific details on how the fund is established, rather than its ultimate institutional home.

Emerging Lessons for Success

The past five years of supporting competitive funding has been a learning experience for both the borrowers and the Bank. Some of the funds have now been operating for several years, and lessons are now emerging on key ingredients for their success. These can be summarized as follows:

1. *Ensure broad-based and independent governance*: Competitive research funds (CGFs) should be governed by an umbrella council, board or steering committee with strong private and non-governmental participation. The selection of competent and

committed initial members of this council is critical. Members should be selected based on outstanding professional skills and experience rather than on the organizations or sectors that they represent. Orientation workshops and study tours can allow council or board members to see how established funds operate in other countries.

Figure 3a: Competitive Funding with Separation of Funding and Execution of Research

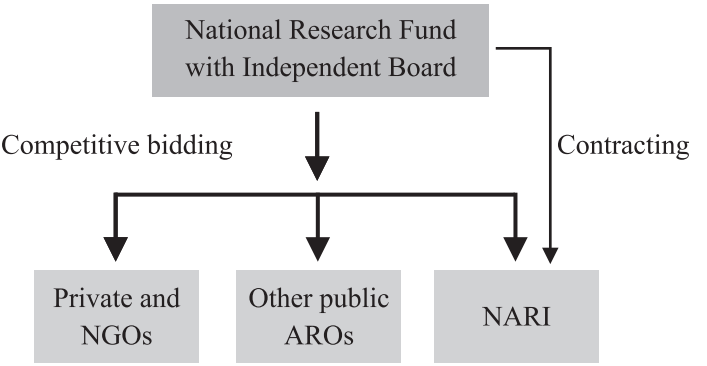
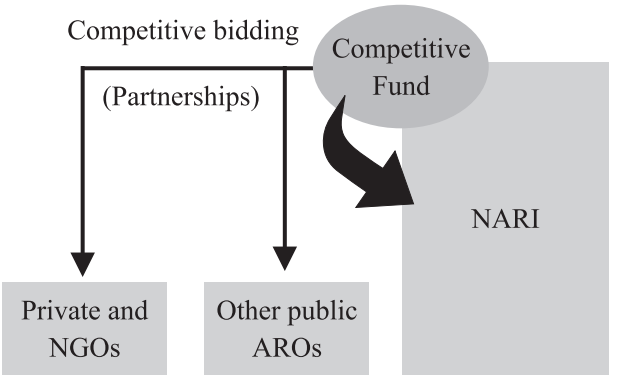


Figure 3b: Competitive Funding Attached to the NARI



2. *Develop very specific priorities*: It is essential to identify specific priorities for initial funding to avoid a dispersed portfolio. These priorities should be based on a combination of 'top down' versus 'bottom up' approaches (see below). Specific priorities also avoid the problem of receiving a large number of proposals on a wide range of topics that are costly to evaluate.

3. *Be pro-active in the development of proposals*: In order to ensure good quality proposals that address high priority farmer problems, considerable resources should be invested up front in capacity building in on-farm diagnosis, problem definition, socio-economic evaluation of potential solutions, and development of proposals. This may include workshops, field exercises and the establishment of local networks with farmer organizations and extension.

4. *Implement rigorous and transparent review procedures from the start:* It is critical to establish rigorous standards and review mechanisms right from the beginning. An objective and anonymous panel of peer reviewers should be appointed to screen proposals against a set of criteria. The introduction of a CGF system should be accompanied by a detailed manual and appropriate training programs on procedures for soliciting, preparing and evaluating proposals, criteria for selecting proposals, and guidelines for monitoring and evaluation (see George, 2000).

5. *Start small and internalize initial experiences*: Even with the most careful planning, establishing a CGF involves a lot of learning on the job. After one or two rounds, the CGF should be able to operate at full capacity. The approval rate should be low for the first rounds to ensure rigor and to allow the program to build experience.

6. *Establish ceiling on awards to a single institution*: In small- and medium-sized countries, often a single institution may dominate CGF awards. In order to encourage participation of others, a provision should be included that no more that one half (or two thirds) of the proposals can be awarded to a single institution.

7. *Be explicit about plans for technology transfer*: For applied and adaptive research, proposals should specifically request the

identification of the target farm population and plans for technology transfer, and this should be included as a criterion for evaluating proposals.

8. *Design and implement monitoring and evaluation (M&E) from the beginning*: Monitoring and evaluation need to be established not only to track progress and impacts of individual projects that are funded, but also to track progress in reaching institutional development objectives of the fund. Given objectives for establishing the fund, criteria need to be agreed for assessing overall performance before implementation, and data collection initiated from the beginning.

Major Challenges and Tensions

While much has been learned, there are also a number of continuing challenges and tensions inherent in establishing an effective fund.

Local ownership versus political independence

A recurring theme is the tension between providing the fund maximum protection from political interference in order to ensure rigor and transparency in allocating funds, and developing local ownership in the political process to ensure sustainable public funding. Governments who finance competitive funds rightly need to ensure that funds are productively and efficiently used to address national priorities. However, they also have to understand that once priorities are set - a political process - the choice of the most efficient research provider is a technical decision that should be divorced from the political process. At the same time, managers of competitive funds must recognize that government ministries are accountable to the funds that they provide, and fund managers must be willing and able to show how funds are addressing national priorities in an effective manner.

Balancing competitive funding and block grants

Some enthusiasts for competitive funding, both within the Bank and within borrowing countries, have seen competitive funding as the panacea for the deficiencies that so often plague public research organizations.

Rather than seeing competitive funding as complementary to core funding, they would like to see all or most public financing pass through competitive mechanisms. Experience in Bank projects and in industrialized countries suggests that competitive funding should be seen as a complement, rather than the main means for funding research. Many core research activities require long-term sustained support, which is difficult to provide through competitive funding (Echeverría, 1998). Core funding also facilitates the development of integrated research programs to address major problems, commodity needs, or geographical areas. Finally, for many core research activities, such as plant breeding, there is often only one research provider, so that competition for funding is not possible.

One compromise that is now being used (e.g., Australia and Senegal) is to move core funding to negotiated contracts, where the funding agency contracts with a specific research provider to produce agreed research products. This system embraces some of the strengths of competitive funding by focussing on results and enhancing accountability.

Bottom-up versus national priorities

Several programs have moved toward very demand-driven and open approaches to soliciting proposals through farmer organizations and user groups. This creates two difficulties. First, there is a tendency to arrive at widely dispersed research efforts - both thematically and geographically - made up of independent projects that do not exploit potential complementarities. Second, there is no guarantee that national priorities and strategic objectives will be addressed by such an approach. Important technological or market opportunities may be missed because of lack of information about the supply side. Also farmers, especially when they are co-financing the activity, understandably tend to focus on activities with short-term payoffs, at the expense of needed long-term research, or research aimed at reducing negative external environmental effects.

There is therefore a good case for setting specific priorities based on national priorities and strategies and then requesting proposals based on bottom-up approaches (i.e., involving users). The setting of priorities will lead, of course, to some tension between demands being expressed from below, and national and regional priorities set from above.

The challenge is to set priorities firmly enough to limit the scope of the competitive funding (and the number of proposals submitted), and at the same time allow for innovative demand-driven proposals.

Other mechanisms have been used to reduce fragmentation and arrive at a more integrated portfolio:

1. Work at the grass roots level to develop a coherent set of proposals through networks and workshops before proposal submission. The networks can also be employed to enhance quality through prescreening exercises (e.g., Colombia).
2. Decentralize proposal screening to the regional level to enable regional bodies to set priorities relevant to their regions (e.g., Colombia).
3. Fund larger more integrated project that give special priority to collaboration among two or more complementary organizations; e.g. a research organization and an NGO with a good farmer base (e.g., Brazil).
4. Request that technical screening panels be pro-active in requesting changes to proposals that enhance their integration and complementarity with other selected proposals.

The small country problem

Competitive funding has proven to be more difficult to implement in small countries where there is a relatively small pool of scientists and a very few research providers. Problems arise because of the difficulty of ensuring objective peer reviews, and in receiving quality proposals, especially when priorities are tightly defined. Some programs have moved toward using international peer reviews, although this depends on either having a widely used language (e.g., French, Arabic, Spanish or English), or entails the considerable costs of translating proposals. The relevance of competitive funding for small countries is still very much an open question.

Cost effectiveness

The overhead costs of administering the fund vary widely in Bank projects from about 3 percent to over 20 percent, against an international norm of about 5 percent. The high costs of some funds reflect in part

the start up costs as well as significant expenditures on institutional development to ensure quality proposals. Contracted staff, recruited at competitive salaries, also largely staffs some funds. While there is clearly a need to ensure high quality staff, the sustainability of this strategy is open to question.

One area where competitive funding tends to be high cost is in monitoring and evaluation. The geographic dispersion and disciplinary fragmentation of some program portfolios greatly adds to the cost of onsite visits. In addition, impact evaluation is complicated by the relatively high cost of detailed field evaluation relative to the size of individual projects. This is being addressed in some programs through funding of larger multi-component projects, as well as through conducting impact evaluation jointly for a set of projects, grouped by theme or geographic area.

Sustainability

Last but not least is the issue of sustainability - both institutional and financial. Institutional sustainability relates to the need to find a stable well managed and governed "institutional home" that will guarantee its integrity and political independence, provide for continued high quality technical reviews and efficient fund management, and at the same time be responsive to key stakeholders, especially users. This is a tall order, especially given the often-disappointing record of public research organizations in the recent past.

Institutional sustainability is a prerequisite for financial sustainability. At present, most funds are largely being financed from Bank loans and government grants, but it is clear that over the longer run, sustainability will require "buy in" from other potential funding sources, both public and private.

The experience in Bank-supported programs is still too short to evaluate longer run sustainability. However, it is clear, that a sustained effort will be required over many years to build a suitable institutional home, and seek diversified stable funding sources. The recent move toward adjustable program lending in several phases over a ten to fifteen year period is an important step in this direction.

Conclusions

Competitive grant funds (CGFs) have become popular in recent years in many NARSs, in part due to popularity among donors, including the World Bank. However, CGFs should not be the sole or even main mechanism for funding, but should be used to complement core funds from regular budget appropriations. Long-term research requiring continuity and integration, as well as the building and maintenance of research infrastructure are best funded through annual budget appropriations.

In countries with an under-used research capacity, CGFs can be an efficient means for financing research, especially new research areas, demand-driven research reflecting user perspectives, and research and development that requires collaboration, such as public-private partnerships. They are most appropriate in mature and larger NARSs seeking to widen participation in the research process and provide incentives for increasing productivity. In small NARSs (less than 100 scientists), the high administrative costs and limited potential for competition reduces their value.

Management of a CGF scheme must have maximum flexibility and independence from political and bureaucratic interference. However, CGF programs may become less effective over time, if research infrastructure (both human and physical) depreciates and if grant managers and recipients become "entrenched" so that the programs are less competitive.

Experience to date suggests that CGFs should be introduced on a pilot basis to fund selected priority areas, and then be evaluated for effectiveness to guide any expansion of the program and to refine procedures and institutional arrangements. More work is needed to define appropriate performance indicators for different types of funds, and more time will be needed to undertake a more in-depth evaluation of experiences to date and to build long-term institutional and financial sustainability.

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Biographical Sketches

ALBERTO DUQUE PORTUGAL

Embrapa's President

Agricultural engineer, researcher at the Brazilian Corporation of Agricultural Research, Embrapa, he completed his higher education at the Universidade Federal Rural do Rio de Janeiro.

He obtained his Ph.D. in Agricultural Systems, at the University of Reading, England. He specialized in administration of research and rural development, in Brazil and abroad.

He acted as agricultural engineer, and extensionist in the states of Minas Gerais and Goiás. He was named head of the Department of Zoology and later technical operations director of the Minas Gerais Corporation of Agricultural Research, Epamig. He became coordinator of Diffusion of Technology and after that, general director of Embrapa Dairy Cattle. He has experience in the private sector as a rural producer and was elected president of the Association of Rural Producers of the Rio Preto Valley, in Minas Gerais. In March 1993, he became director of the Brazilian Agricultural Research Corporation, Embrapa. Between September 1993 and February 1994, he was named executive secretary (vice-minister), and interim minister of Agriculture and Food Supply - MA. In March 1994, he reassumed Embrapa´s Directorship and in May 1995 was named Embrapa's president.

DEREK R. BYERLEE

Principal Economist, Rural Development Department of the World Bank

Dr. Derek Byerlee is a specialist in agricultural research policy and management, and currently provides technical support to World Bank

lending for agricultural research in about ten countries. Several of these projects include a competitive grant element. Prior to joining the World Bank in 1994, he was director of Economics at CIMMYT, Mexico.

DERICK BRINKERHOFF

Technical assistance director for the Sustainable Financing Initiative - SFI since 1995

Dr. Brinkerhoff is a senior social scientist at Abt Associates, a private sector research and consulting firm, where he has been for seven years. For the previous ten years, he was associate director for research at an international center at the University of Maryland, attached to the College of Agriculture. The SFI was jointly funded by the U.S. Agency for International Development and the Special Program for African Agriculture Research, which has its Secretariat located in the World Bank.

EDWARD BRESNYAN

Consultant at the World Bank

Bresnyan worked as a peace corps volunteer in Honduras, has a Ph.D. in Food and Resource Economics from the University of Florida, and served as the Carter Center Representative in Guyana while working on President Carter's Global Development Initiative.

EMMANUEL OWUSU-BENNOAH

Deputy director-general of the Council for Scientific and Industrial Research (CSIR-Ghana)

Dr. Owusu-Bennoah obtained his Ph.D. in Soil Science at the University of Reading, England. Until his current appointment, he was an associate professor in the Department of Soil Science at the University of Ghana. Dr. Owusu-Bennoah is a specialist in tropical soils, having published extensively in highly reputable journals on a wide range of topics on tropical soils. He was consulted frequently during the implementation of World Bank sponsored Ghana National Agricultural Research Project (NARP). He has attended several important international conferences worldwide. He joined CSIR-Ghana in 1999 and serves as the deputy director-general responsible for agriculture, forestry and fishery research in Ghana. The important manuals he has put together include: Research Governance in Ghana, Competitive Research Grants and Research-Extension.

FRANCISCO BASÍLIO DE SOUZA

Senior Natural Resources Specialist, Environment Division, Region 1, since August 1994, Inter-American Development Bank (IADB)

Senior agricultural specialist, Agriculture Division, Nov. 1991- August 1994.

Agricultural technology secretary, Ministry of Agriculture, Brazil, June 1986- March 1991.

Consultant for the Inter-American Development Bank, Washington D.C. and the Inter-American Institute for Agricultural Cooperation, San Jose, Costa Rica in several agricultural investment project studies.

Staff, Basic Seeds Service, Brazilian Agricultural Research Corporation - EMBRAPA, January 1975-June 1986.

Staff of the Ministry of Agriculture, working on the implementation of the National Seed Plan (IDB/Ministry of Agriculture Contract), Sep. 1973 - Dec. 1974.

Junior engineer/staff member of the USAID/Ministry of Agriculture of Brazil, contracted as a designer of seed processing facilities, March 1970 to August 1972.

FRANCISCO JOSÉ BECKER REIFSCHNEIDER

Head of the Secretariat for International Cooperation - SCI, Embrapa

Dr. Reifschneider is a plant pathologist by training and has worked at Embrapa Vegetables from 1975 to 1990, initially as a researcher breeding for disease resistance and later as the center's director general. From 1991 to 1995, he was an agricultural officer with the FAO/World Bank Cooperative Program in Rome, responsible for the preparation of several investment projects in agriculture. In 1995, he returned to Brazil as head of Embrapa´s Secretariat for International Cooperation.

He has done consulting work for the World Bank, Inter-American Development Bank, governments, research institutions and the private sector. He presently holds appointments as adjunct professor of the University of Brasilia, Brazil and Cornell University, USA.

Dr. Reifschneider´s major contributions include the publication of books, the release of several vegetable varieties and hybrids, and the establishment of a competitive grants system for the agricultural sector in Brazil. In 1989, he received the F.M.Veiga Prize, highest Brazilian award for major contributions to the development of agriculture.

GOBIND NANKANI

Director of the World Bank in Brazil

Dr. Nankani, a Ph.D. in economics at Harvard University, is a citizen of Ghana. He joined the World Bank in 1976, and has held several positions as a department head inside the institution. From 1987 to 1989, he was the head of the Brazilian Operations Division, and from 1990 to 1991, he was the head of the Division for Infrastructure for Brazil, Peru e Venezuela. From 1992 to 1994, he was the chief-economist for the South-Asian region vice-presidency. From 1994 to 1997, he was the director of the Department for Brazil, the Southern Cone of Latin America and the Caribbean. In the early 1980's, he was invited by the Government of Ghana to be a special economic consultant for the government, and due to this invitation he took a leave of absence from the World Bank for two years.

HOWARD ELLIOTT

Deputy director general of ISNAR (International Service for National Agricultural Research) - The Hague, The Netherlands

After completing his BA (Hon) in Economics at the University of Manitoba (Canada), he studied at Princeton University (USA), where he received a Ph.D. in Economics with a specialization in development economics, industrial organization and labor economics.

His early research on agricultural planning in Côte d'Ivoire dealt with export tree crop policies (coffee, cocoa, and oilpalm). He then taught development economics and planning at Makerere University, Kampala (Uganda). His experience in both francophone and anglophone Africa led him to the University of Michigan, where he set up a program of collaboration with four francophone universities in West and Central Africa. In addition, with the University of Michigan, he carried out field studies for resettlement planning associated with the Pa Mong Dam in Laos.

He then served in the field programs of the Ford and Rockefeller Foundations. As assistant representative for the Ford Foundation in West Africa (based in Abidjan), he promoted academic exchange between francophone and anglophone countries. As representative for the Rockefeller Foundation in Zaire, he taught agricultural economics and served a period as director general of the Faculty of Agronomic Studies in Yangambi. Still with the Rockefeller Foundation, he went as representative and visiting Professor of Economics in Brazil at the

Federal University of Bahia.
He joined ISNAR in 1984 and has served as deputy director general for fourteen years. His work at ISNAR has dealt with agricultural knowledge systems, research policy and financing of research.

HUGO VILLARROEL
M. Sc. in Plant Breeding

He initiated his career at the Bolivian Institute of Agricultural Technology (IBTA) as a researcher and subsequently held positions as director of the Chinoli Agricultural Experimental Station and as national coordinator for the Bolivian Wheat Program.

In 1981, he joined the Inter-American Development Bank and currently he is a natural resources - agriculture specialist in the Environment and Natural Resources Division, region two. During these years, he participated in the design and execution of various research and technology transfer projects. Some of the most recent ones in which he participated, either as a task manager or team member, include the following: Agricultural Development in the San Juan Valley (RD-0019), Program for the Modernization of Agricultural Services in Panama (PN-0032), Modernization of Agricultural Services in Honduras (HO-0119) and Retooling Agro-Enterprise (ES-0119). All of these projects include a technology component (research and technology transfer). Additionally, these projects conceptually follow the competitive grants approach in response to farmers' demand.

JASMINA LUKAC HAVRANEK
Ph.D. in Agricultural Sciences, Faculty of Agronomy of the University of Zagreb

Dr. Havranek holds a MSc. in animal nutrition and animal food technology and a Ph.D. in the area of cheese production - Faculty of Agronomy of the University of Zagreb, where she is a professor in the Dairy Department. She is also the executive secretary of the Agricultural Research Council (ARC), established within the Ministry of Agriculture and Forestry under the Farmer Support Services Project. She has coordinated several projects in the Croatian Dairy industry, and is the president of IDF (International Dairy Federation) Committee for Croatia, a member of the Codex Alimentarius Committee for Milk (Alps-Adriatic) - FAO, Rome, of the Milk Institute in Thienne, among other international organizations.

JOHN ABINGTON

Agricultural research and development specialist

Mr. Abington is an agricultural research and development expert with thirty-six years of experience in developing countries. This has encompassed rain fed agriculture in the dry and humid tropics, and in mountain environments. His initial expertise and experience was in developing and implementing plant breeding and crop agronomy programs in Africa between 1964 and 1985, where he worked as a maize breeder in Zambia from 1964 to 1970, and as a tobacco breeder and research coordinator with the Government of Malawi and the Malawi Tobacco Research Institute from 1971 to 1985. For the past fourteen years, he has been involved in agricultural research strategy and planning, project management and implementation, and facilitating institutional change in the Pacific Region and South Asia.

He was chief agricultural research officer for the Solomon Islands from 1986 to 1989, and was director of the Lumle Agricultural Research Centre in Nepal from 1990 to 1994. Since March 1996, he has been director of the Hill Agriculture Research Project, based in Katmandu, Nepal.

JONATHAN WOOLLEY

Executive director of the Competitive Fund Management Unit in Ecuador since 1999

Originally, he was a researcher in national, regional and international institutions for sixteen years, specializing in on-farm research (in Nigeria, CATIE, CIMMYT and CIAT).

For seven years, he worked in the design and evaluation of research and extension projects for the World Bank, FAO, IFAD and others. He is now the team leader for Natural Resources International in Ecuador.

Jonathan Woolley has undergraduate and graduate degrees from the University of Cambridge. He conducted his doctoral thesis on plant breeding for insect resistance in northern Nigeria but inspired by what he saw there, soon moved to cropping systems agronomy and then methodology of research with farmers. As a researcher and trainer, he worked from 1974 to 1992 with national research centers (IAR Nigeria), regional institutions (CATIE) and international institutions (CIMMYT, CIAT). From 1992 to 1998, he contributed, as a consultant to the World Bank, FAO Investment Centre, IFAD, NR International, the European Development Fund, CIMMYT, ICRISAT and others, to the design, implementation and evaluation of research and extension projects in

thirty-four countries of Latin America, Africa, Asia and Oceania. His special emphases were increased beneficiary participation in design and implementation of projects, links between researchers and extensionists, training for sustainable systems research, and competitive funding mechanisms. British by birth but resident in Latin America for the last twenty-three years, Dr. Woolley started his present work in 1999.

LUIS ERNESTO VILLEGAS

General Coordinator, Unit Coordinating PRONATTA

Dr. Villegas is an agricultural engineer with a degree from the USA. He has worked in the private agricultural sector managing crops and at food processing factories. Recently, he has coordinated the Agricultural Technology Development Program for the Colombian Ministry of Agriculture.

MAURÍCIO ANTÔNIO LOPES

Head of Embrapa's Research and Development Department

Dr. Lopes, a geneticist by training, joined Embrapa in 1986 as a member of the maize breeding team of the Embrapa Maize and Sorghum Research Center. He received his MSc. in Genetics (1989) from Purdue University and his Ph.D. in Molecular Genetics (1993) from the University of Arizona. He was head of the Maize Breeding Program (1993-1995) and head of Research and Development (1995-1999) in the Maize and Sorghum Center. In January 2000, he became the head of the Research and Development Department of Embrapa. Dr. Lopes´ major contributions include the development and release of several maize varieties and hybrids, adaptation of molecular marker technology to aid plant breeding, development of experimental transgenic maize plants with improved nutritional quality and aluminum tolerance, patents and many research papers and book chapters. He has been a member of a number of national and international committees related to science and technology and R&D management.

MINA DORDEVIC

Technical secretary at the Agricultural Research Council (ARC) of the Ministry of Agriculture and Forestry of the Republic of Croatia

Miss Dordevic holds a MSc. in Agricultural Sciences, Faculty of Agronomy of the University of Zagreb, she has been working at the World Bank Farmer Support Services Project since 1998.

MIROSLAV BO•IC

Assistant Minister at the Department for Agricultural Policy and Rural Development of the Ministry of Agriculture and Forestry of the Republic of Croatia

Mr. Bo•ic holds a MSc. in Agricultural Sciences, Faculty of Agronomy of the University of Zagreb, and is the head of Farmer Support Services Project.

ORLANDO MENESES PEÑA

Coordinator of the Technology Development Component of PRONATTA

Dr. Peña is a veterinarian, zoologist, and M.Sc. in Rural Development. He has worked in research on rural and environmental development studies at the Javeriana University in Colombia. Currently, he is working at PRONATTA.

PAMELA GEORGE

Pamela George, Consultant to the World Bank

Over the past two years, Ms. George has assisted in the design of competitive funding programs in several countries, using World Bank assistance. During this time, she has produced several working documents on competitive programs, including a "good practice" paper, an implementation handbook, a regional training manual for countries of Eastern Europe and Central Asia, and a methodology for the performance assessment of competitive programs. Ms George has recently completed a master's thesis exploring the role of competitive programs in institutional reform initiatives. Her interest in competitive programs was influenced through coordinating an international competitive grants program for four years on behalf of the Bank. Ms George is currently contracted to the National Centre for Development Studies at the Australian National University, where she is involved in training programs for international students at postgraduate level in infrastructure management.

RUBEN ECHEVERRÍA

Principal agricultural specialist in the Sustainable Development Department at the Inter-American Development Bank (IDB) in Washington, DC.

Ruben Echeverría studied agriculture in Uruguay and the United States during the 1970s. He worked on a small farm in Minnesota for two years. He has worked on diverse activities linked to Latin American rural development for the past thirty years. His first professional position was with Uruguay's National Colonization Institute. He earned a Masters and Doctorate in agricultural economics at the University of Minnesota. He was a researcher at ISNAR, an international center for agricultural research headquartered in Holland dedicated to strengthening agricultural technology innovation systems in developing countries. From there, he worked in Latin America, Africa and Asia.

At IDB, he has collaborated in: the preparation of loans to promote agricultural development in the region; the creation of the Regional Fund for Agricultural Technology (FONTAGRO); the preparation of bank strategies to reduce rural poverty and to develop the food and agriculture sector; and the creation of an inter-agency working group for rural development to improve services which these agencies and IDB provide to the region's countries.

SARAH J. ROCKEY

Deputy administrator for the Competitive Research Grants and Award Management Unit of the Cooperative State Research, Education, and Extension Service CSREES /USA since 1996

Dr. Sally Rockey has spent her career in the area of research administration. She received her Ph.D. in Entomology (1985) from Ohio State University and held a postdoctoral appointment at the University of Wisconsin. In 1986, she joined the USDA Competitive Research Grants Office of Cooperative State Research Service (CSRS) as program director for two entomological programs. In 1991, she became division director for the plants division of the National Research Initiative Competitive Grants Program (NRI), CSRS, USDA. Dr. Rockey oversees the competitive portion of the research portfolio within CSREES as well as the financial and administrative management of all CSREES grants and agreements. As research administration and science policy have been central to her career, Dr. Rockey has given over a hundred presentations on agricultural research, grantsmanship, the competitive

peer review process, and ethics in the federal grants process. She is active on a number of federal intergovernmental committees related to science and research and is the USDA representative to many science?related groups outside the federal government. She actively participates in the science education of young children by giving presentations on insects to local elementary schools and is known in the Baltimore/Washington area as the "Bug Lady".

UMA LELE

Advisor in the Operations Evaluation Department of the World Bank in charge of the assessment of the Bank's Global Public Policies and Programs.

The first woman to obtain a Ph.D. from Cornell University's Agricultural Economics Department, she was elected fellow of the American Agricultural Economic Association and fellow of India's National Academy of Agricultural Sciences. She has held various managerial positions in the World Bank including chief of the Development Strategy Division in the Development Economics Department and manager of Agricultural Policy in Africa. She was graduate research professor and director of International Studies at the University of Florida and founding director of President Carter's Global Development Initiative (GDI). She was also a founding member of the board of directors of CGIAR's Center for International Forestry Research (CIFOR) and has served on the CGIAR's Technical Advisory Committee. She has consulted widely for the McArthur, Rockefeller and Ford Foundations, UN agencies and bilateral donors. Uma Lele comes from India.

WAIS KABIR

Bangladesh Agricultural Research Council

Principal scientific officer at the Bangladesh Agricultural Research Council - BARC, has worked with contract research schemes financed by the World Bank and the USAID since 1980.

WALDEMAR WIRSIG

Representative of the Inter-American Development Bank for Brazil

He joined the bank in 1990 as deputy manager of the Environment and Natural Resources Management Division of the Project Analysis Department.

From 1994 to March 2000, he served the bank as manager of the Sustainable Development and Social Programs Department, and, since April of this year, in his present position as IDB Representative for Brazil.

Prior to his employment with the bank, from 1976 to 1990, Mr. Wirsig held important positions with the German Agency for Technical Cooperation - GTZ, including that of Advisor to the Director General from 1980 to 1981, Chief of the Infrastructure and Regional Development Division, from 1981 to 1984, and Country Coordinator for Equador from 1984 to 1990.

From 1971 to 1975, Mr. Wirsig was employed with the German consulting firm Agrar und Hydrotechnik GMBH, Essen, Germany, where he served as Bilateral Project coordinator with assignments in Brazil to METROPLAN, in Porto Alegre and CNDU in Brasilia.

Mr. Wirsig graduated from the University of Barcelona, Spain with a degree in Economics (1964). He holds a Masters Degree in Economics from St.Gall's University, Switzerland (1967), and, in 1968, he completed further post-graduate studies in Development Policy and Regional Planning at the University of Zurich in Switzerland.

Annexes

List of Participants

Albert Chalabesa - *Mt. Makulu Research Station/Zambia*
Alberto Duque Portugal - *Embrapa*
Alberto Vildoso - *IDB*
Alfredo de Souza Mendes - *Ministry of Science and Technology/Brazil*
Ana Maria Gonçalves - Embrapa
Antônio Augusto Rossotto Ioris - Ministry of Science and Technology/ *Brazil*
Benard Darnel - *IDB*
Bhola Ram Pradhan - *NARC/Nepal*
Carlos Aragón - *Ministry of Environment/ Brazil*
Carlos Barrios - *Ministry of Agriculture and Forestry Nicaragua*
Clayton Campanhola - *Embrapa*
Dante Scolari - *Embrapa*
Demóstenes Alves de Moraes
Derek Byerlee - *World Bank*
Derik Brinkerhoff - *SFI/USA*
Dhurva Joshi - *NARC/Nepal*
E. Owusu-Bennoah - *Council for Scientific and Industrial Research/ Ghana*
Eduardo Canales - *Proyecto Biodiversidad de Areas Prioritarias/ Honduras*
Elísio Contini - *Embrapa*
Elke U. Costanti - *Ministry of Environment/Brazil*
Ernani Pilla - *USAID/Brazil*
Eva Zamora - *Fundación para el Desarrollo de Tecnología - Altiplano/ Bolivia*

Fernando Rodriguez Schuller - *World Bank*
Francisco Basílio de Souza - *IDB*
Francisco J. B. Reifschneider - *Embrapa*
Georgia Patrício Pessoa - *FUNBIO/Brazil*
Gil Nhamtubo - *CTIAP/Mozambique*
Gilvan Fernandes Marcelino - *Ministry of Science and Technology/Brazil*
Gobind Nankani - *World Bank*
Guillermo Ribera Cuellar - *Programa de Servicios Agropecuários/Bolivia*
Hélio Tollini - *ISNAR*
Howard Elliott - *ISNAR*
Hugo Villarroel - *IDB*
John B. Abington - *HARP/Nepal*
Jonathan Woolley - *PROMSA/Ecuador*
Jorge Palma - *Programa El Cajón /Honduras*
Jorge Ramón Laínez - *PAAR/Honduras*
Leila Bijos - *IICA/Brazil*
Luiz Antonio Barreto de Castro - *Embrapa*
Luis Ernesto Villegas - *PRONATTA/Colombia*
Luiz Carlos Ros - *Ministry of Environment/Brazil*
Marco Vinicio Arias Brito - *National Forestry Administration/Honduras*
Maurício Antônio Lopes - *Embrapa*
Mohamed Harun - *CTIAP/Mozambique*
Neila Soares - *World Bank*
Nienke Beintema - *IFPRI*
Orlando Meneses Peña - *PRONATTA/Colombia*
Pamela George - *World Bank*
Rafael Posada - *CIAT/Colombia*
Raimunda Monteiro - *Ministry of Environment/Brazil*
Renato Argôllo de Souza - *Embrapa*
Ricardo Arias Brito - *PAAR/Honduras*
Ricardo Caldas - *Political Science Department, University of Brasília*
Roger Paguaga - *Ministryof Agriculture and Forestry/Nicaragua*
Rogério Domingues Raposo - *CESAR/Brazil*
Ruben G. Echeverría - *IDB*
Sally Rockey - *NRI/USA*
Sílvio Romero de Lemos Meira - *CESAR/Brazil*
Uma Lele - *World Bank*
Waldemar Wirsig - *IDB*

Waldo Espinoza - *IICA*
Wais Kabir - *BARC/Bangladesh*
Willy Soria - *Fundación para el Desarrollo de Tecnología Agropecuaria - Valle/Bolivia*

Competitive Grants in the New Millennium: A Global Workshop for Designers and Practitioners

16-18 May, 2000
Brasília, Brazil

Organizer: Brazilian Ministry of Agriculture and Food Supply through Embrapa

Sponsors: World Bank, IDB, Brazilian Ministry of Agriculture and Food Supply through Embrapa

Language: English

Venue: Carlton Hotel, Brasília - Brazil

Objective:

The objective of the workshop is to provide a forum for the exchange of experiences, and identification of common issues, constraints, and solutions during the design, establishment and implementation of competitive grants programs. Participants will benefit from their increased awareness of the potential of competitive grants, and be better informed when making a realistic assessment of the ability of their national system in supporting and adapting to competition.

Participants will also leave the meeting with many contacts who are similarly concerned with ensuring the most positive results are obtained from their investments in competitive funding of research and extension.

A set of background papers will provide the basis for discussions, followed by concurrent thematic groups formed around the key issues. A proceeding based on the papers and discussions will be published as an operational working document for designers and practitioners.

Outputs:

A. Increased awareness of issues and solutions by designers and implementers
B. Publication containing:
   1. Key characteristics for successful competitive grants as seen by designers and implementers
   2. Lessons learned by implementers
   3. Papers presented

May 16, 2000
Session I - Opening
Venue: Carlton Hotel
Chair: Alberto Duque Portugal - EMBRAPA

08:30 - 08:50	Welcome and opening remarks *(Alberto Duque Portugal, on behalf of H. E. Marcus Vinicius Pratini de Moraes - Brazilian Minister of Agriculture and Food Supply)* *Almiro Blumenschein - CNPq's director, on behalf of H. E. Ronaldo Mota Sardenberg - Brazilian Minister of Science and Technology)*
08:50 - 09:10	Introduction to the Workshop *(Gobind Nankani - Director of the World Bank in Brazil; Waldemar Wirsig - IDB's Representative in Brazil and Alberto Duque Portugal - President of Embrapa)*
09:10 - 09:35	World Bank views on Competitive Grants *(Derek Byerlee - World Bank)*
09:35 - 10:00	IDB views on Competitive Grants *(Francisco B. de Souza and Ruben G. Echeverría - IDB)*

10:00 - 10:15 Comments and questions on presentations
10:15 - 10:30 Coffee break

Session II - Countries Presentation / Achievements and Constrains Part 1

Chair: *Derek Byerlee - World Bank*

10:30 - 10:40 Session Opening (*Chair*)
10:40 - 11:10 Characteristics of successful systems (*Howard Elliott - ISNAR*)
11:10 - 11:40 Nepal (*John B. Abington - HARP*)
11:40 - 12:00 USA (*Sally Rockey - NRI*)
12:00 - 14:00 Lunch

Session III - Countries Presentation / Achievements and Constrains Part 2

Chair: *Francisco Basílio de Souza - IDB*

14:00 - 14:10 Session Opening (*Chair*)
14:10 - 14:30 Brazil (*Francisco Reifschneider - Embrapa*)
14:30 - 14:50 Chile (*Fernando Rodriguez-Schuller*)
14:50 - 15: 10 Ecuador (*Jonathan Woolley - UEFC-PROMSA*)
15:10 - 15:25 Bangladesh (*Wais Kabir - BARC*)
15:25 - 15:40 African Countries (*Derick Brinkerhoff - SFI/USA*)
15:40 - 16:30 Questions and answers on countries presentations
16:30 - 17:00 Coffee Break

Session IV - Concurrent Sessions - Part 1

17:00 - 18:00 Three Concurrent Sessions on the following subjects:

1. Culture of Competitive Systems (Quality of proposals, priority setting and governance) and Technology Transfer (Taking the results to the users)

Chair: *Sally Rockey*
Rapporteur: *Pamela George*

2. Financial Issues (Availability, access, and flexibility)

Chair: *Ruben G. Echeverría*
Rapporteur: *Hélio Tollini*

3. Technical Monitoring and Evaluation, Secretariat and Personnel Issues (*Keeping the record straight*)

Chair: *John Abington (HARP, Nepal)*
Rapporteur: *Maurício A. Lopes*

18:00 - Cocktail

May 17, 2000
Session V - Reports on Concurrent Sessions
Venue: Carlton Hotel
Chair: *Uma Lele - World Bank*

08:30 - 08:40	Session Opening (*Chair*)
08:40 - 08:50	Rapporteur 1: *Pamela George*
08:50 - 09:00	Rapporteur 2: *Hélio Tollini*
09:00 - 09:10	Rapporteur 3: *Maurício A. Lopes*
09:10 - 09:30	Discussion
09:30 - 09:50	Ghana (*E.Owusu-Bennoah*)
09:50 - 10:10	Colombia (*Luis Ernesto Villegas - PRONATTA*)
10:10 - 10:40	Coffee Break

Session VI - Presentations on Competitive Grant Issues
Chair: *Ruben G. Echeverría - IDB*

10:40 - 10:45	Session Opening (*Chair*)
10:45 - 11:00	Evolution and major issues on Prodetab's competitive process (*Francisco Reifschneider - Embrapa*)
11:00 - 11:20	Cooperation and Competition in Competitive Grants - is coopetition being achieved? (*Maurício A. Lopes - Embrapa*)
11:20 - 12:00	Computerized Management of Information Systems for Competitive Grants - PDCT/CESAR System (*Silvio Romero de Lemos Meira*)
12:00 - 14:00	Lunch

Session VII - Concurrent Sessions - Part 2

14:00 - 15:00	Two concurrent sessions, each with a rapporteur and a chair based on morning presentations:

1. *Cooperation and Competition in Competitive Grants - is coopetition being achieved?*

Chair: *Maurício Lopes*
Rapporteur: *Fernando Schuller*

2. Computerized Management of Information Systems for Competitive Grants

Chair: *Silvio Romero de Lemos Meira*
Rapporteur: *Elke Costanti*

Chair: *Mohamed Harun*

15:00 - 15:15 Rapporteur 1: *Fernando Schuller*
15:15 - 15:30 Rapporteur 2: *Elke Costanti*
15:30 - 16:00 Discussion
16:00 - 16:30 Coffee Break

Session VIII - Conclusions

16:30 - 17:00 Overview of the workshop's key findings (Howard Elliott - ISNAR)
17:00 - 18:00 Final remarks by participants and next steps
20:00 - 22:30 *Dinner offered by the Brazilian Ministry of Agriculture, H. E. Marcus Vinícius Pratini de Moraes* (please refer to enclosed invitation)

May 18, 2000
Venue: Embrapa Headquarters

08:30 - 09:30 Presentation on Embrapa's planning, monitoring and evaluation - relationship with its competitive grants project *(Alberto Duque Portugal - President of Embrapa)* - At Embrapa Headquarters
09:30 - 12:00 Visit to Embrapa's Research Centers located in Brasília (Headquarters, Genetic Resources & Biotechnology, Vegetables or *Cerrados*).
12:00 - 13:00 Trip back to Carlton Hotel

Graphic Arts:

JUNG COBBE