ISSN 0534-5391

IICA

AGRICULTURAL RESEARCH IN THE CARIBBEAN:

Some Policy and Organizational Alternatives

Eduardo J. Trigo

CR-007

PROGRAM II: TECHNOLOGY GENERATION AND TRANSFER

Digitized by Google

WHAT IS IICA?

The Inter-American Institute for Cooperation on Agriculture (IICA) is the specialized agency for agriculture of the inter-American system. The Institute was founded on October 7, 1942 when the Council of Directors of the Pan American Union approved the creation of the Inter-American Institute of Agricultural Sciences.

IICA was founded as an institution for agricultural research and graduate training in tropical agriculture. In response to changing needs in the hemisphere, the Institute gradually evolved into an agency for technical cooperation and institutional strengthening in the field of agriculture. These changes were officially recognized through the ratification of a new Convention on December 8, 1980. The Institute's purposes under the new Convention are to encourage, facilitate and support cooperation among the 31 Member States, so as to better promote agricultural development and rural well-being.

With its broader and more flexible mandate and a new structure to facilitate direct participation by the Member States in activities of the Inter-American Board of Agriculture and the Executive Committee, the Institute now has a geographic reach that allows it to respond to needs for technical cooperation in all of its Member States.

The contributions provided by the Member States and the ties IICA maintains with its twelve Permanent Observer Countries and numerous international organizations provide the Institute with channels to direct its human and financial resources in support of agricultural development throughout the Americas.

The 1987-1991 Medium Term Plan, the policy document that sets IICA's priorities, stresses the reactivation of the agricultural sector as the key to economic growth. In support of this policy, the Institute is placing special emphasis on the support and promotion of actions to modernize agricultural technology and strengthen the processes of regional and subregional integration.

In order to attain these goals, the Institute is concentrating its actions on the following five programs: Agricultural Policy Analysis and Planning; Technology Generation and Transfer; Organization and Management for Rural Development; Marketing and Agroindustry; and Animal Health and Plant Protection.

These fields of action reflect the needs and priorities established by the Member States and delimit the areas in which IICA concentrates its efforts and technical capacity. They are the focus of IICA's human and financial resource allocations and shape its relationship with other international organizations.

The Member States of IICA are: Antigua and Barbuda, Argentina, Barbados, Bolivia, Brazil, Canada, Chile, Colombia, Costa Rica, Dominica, the Dominican Republic, Ecuador, El Salvador, Grenada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, St. Lucia, St. Vincent and the Grenadines, Suriname, Trinidad and Tobago, the United States of America, Uruguay and Venezuela.

The Permanent Observer Countries of IICA are: Arab Republic of Egypt, Austria, Belgium, Federal Republic of Germany, France, Israel, Italy, Japan, Netherlands, Portugal, Republic of Korea and Spain.

Digitized by Google

AGRICULTURAL RESEARCH IN THE CARIBBEAN:

Some Policy and Organizational Alternatives

Eduardo J. Trigo

PROGRAM II: TECHNOLOGY GENERATION AND TRANSFER

This One
CT5B-AL9-E7EU
Digitized by Google

COLECCION ESPECIAL
NO SACAR DE LA BIBLIOTECA
IICA - CIDIA

MISCELLANEOUS PUBLICATIONS
SERIES

ISSN-0534-5391
A1/OC-88-07

San Jose, Costa Rica
November, 1988

E11.cr
P41-CR-003
1988

Digitized by Google

AGRICULTURAL RESEARCH IN THE CARIBBEAN: SOME POLICY AND ORGANIZATIONAL ALTERNATIVES 1/ 2/

I. INTRODUCTION

The effective organization of agricultural technology generation and transfer in a small country is a big challenge. In most cases, resources are not sufficient to appropriately fund even small-scale activities; demands on the other side are not totally determined by the size of the country. There are, however, a number of ways in which the impact of this restriction can be lessened, if not completely eliminated. This paper discusses some of the available alternatives, giving particular attention to the potential of networking as an organizational solution providing for the small countries' technological needs. In so doing, the different factors affecting the effectiveness of different types of networks are discussed and some of the experiences available in Latin America and the Caribbean are analyzed.

II. THE SMALL-COUNTRY PROBLEM: CONFLICT BETWEEN RESOURCES AND NEEDS

The main problem facing the development of an effective agricultural research system in a small country is the potential conflict between research needs and the amount of resources available to meet those needs.

A country's research needs are related to its size, but the relationship is not a direct one. Given the characteristics and location-specificity of agricultural production, some research capacity is essential in support of agricultural development, no matter how small the country may be. Smaller countries do not necessarily have a smaller variety of crops in their agricultural production than larger countries. Quantities produced will be smaller, but not necessarily the number of production alternatives that should be included in agricultural research.

This problem can be confirmed by a cursory look at the situation in a few countries of different size, such as the Dominican Republic, Costa Rica, and Colombia in Latin America, and Sri Lanka, Bangladesh, and India in Asia. There may be differences in the total number of products undergoing research,

---

1/ Some parts of this document draw heavily on previous work by the author and the paper "Establishing Agricultural Research Policy: Problems and Alternatives for Small Countries" by W. K. Gamble and E. J. Trigo, presented at the Agricultural Research Policy and Organization in Small Countries Workshop, Wageningen, The Netherlands, 11-14 September, 1984.

2/ The author is especially indebted to Jorge Ardila and Eduardo Lindarte for their comments and contributions in reference to the development of the analytical framework used to present the Latin American and Caribbean networking experiences.

Digitized by Google

Digitized by Google

but there is little variation in the major components of the research programs other than that due to agroecological differences. Even in the smallest countries, such as the island states in the Caribbean, we find that crops for which research is required is likely to number more than 10.

Another important consideration is the relative indivisibility of research efforts below a certain minimum critical mass. This is a difficult issue to discuss in general terms, but it can be safely stated that there is a minimum research effort below which no relevant results can be expected. This effort, which can be equated to a fixed-cost concept, will be approximately the same throughout a wide range of variation in the area planted to any particular crop. The work and costs required to develop a new variety or a new cultural practice would be about the same, whether a crop is planted on 10,000 or 100,000 hectares. In both cases, the basic core of activities and expertise required will be the same, and includes information on the country's natural resources like soil and water surveys, plus some capacity in a minimum number of areas like agronomy, plant breeding, pest and disease control, physiology, and socioeconomics.

The size of a country's core research effort is also influenced by its climate and other environmental characteristics. Tropical agriculture tends to be more diversified than temperate agriculture and as diversity increases, research needs will also increase, if for no other reason than the need to replicate experiments and to test results in a greater number of different production environments. So environment exacerbates the conflict between research needs and available resources; most small countries in the developing world are located in the tropics.

Consumer demands also have an important impact on research needs, and they are not directly related to country size. Income and climatic factors have an effect, but whether a country is large or small will have little bearing on the numbers and types of products included in its diet. The need to reduce balance-of-payment deficits and the political importance of food self-sufficiency have made meeting food demand through local production a high priority in many, if not most, developing countries. This increases the pressure on the number of products a national research system must include in its program, whether a country is large or small.

Quite apart from research needs, the amount of resources a nation can devote to agricultural research is determined by its size and the importance of agricultural production within its economy. The profitability of investments in agricultural research are clearly related to the actual or potential area planted to a crop. Consequently, the larger the area over which the new technologies resulting from research can be diffused, the larger the economic returns and the larger the economic base to support the research effort.

The quantitative dimension of the small-country conflict between resources and needs is difficult to assess in general terms, because each country is unique. The required minimum capacity will vary depending on both institutional and technical issues. The type of problems requiring research and the possibility of using information generated for other purposes or available internationally will be important factors to consider. This level of analysis is well beyond the scope of this paper. However, a broad estimate of

Digitized by Google

Digitized by Google

the magnitude of the conflict between research needs and potential resources is possible. This is done by comparing the costs of a hypothetical research module for one product against the actual value of production of major food crops in a number of developing countries.

Table 1 presents the results of this comparison for the Caribbean countries on the basis of two alternative minimum research modules, one defined at the country level and the other for the region as a whole, and for three different percentages of the value of production of the most important crops being allocated to agricultural research: 0.5%, 1.0%, and 2.0%. The details of the cost structures of each minimum research module are presented in Annexes I and II.

The results of this comparison are revealing and highlight the magnitude of the conflict mentioned above, in as far as in most cases, not even key food crops like rice are large enough to sustain a minimum research effort.

III. SOME POLICY ALTERNATIVES

Even though there may be no adequate solution to the conflict between resources and research needs, there are a number of policy alternatives that can reduce its impact substantially. Through them, a country can effectively increase the resources available for its research effort and can affect the nature of the research needs it must attend to.

Before turning to the discussion of some of these alternatives, it is important to emphasize that none of them will be relevant in all cases. Although small countries share a number of very important common characteristics, they cannot be considered to be homogeneous. Many factors, such as level of economic development, climate, geographical location, as well as historical and cultural factors, will differentiate one country from another and in turn indicate particular policy options. A number of important general considerations can be made, however.

A. Concentration of Efforts to Maximize the Impact of Available Resources

Program dispersion, duplication, and research projects not addressing relevant production constraints are the most frequent causes of resource wastage. These problems are present in both small and large countries, but their impact is much more severe in the smaller ones. Any research alternative requires a certain minimum critical mass of resources if it is to produce results. With fewer total resources to invest in research, priority-setting becomes the cornerstone of a small-country research policy. Program coordination mechanisms and research problem identification, in close contact with the clients of research, are two other important elements for maximizing the impact of available resources.

At the priority-setting level, the issue is concentration of effort, recognizing that with limited resources only a limited number of needs can be addressed effectively. The alternatives to be selected should follow the country's overall national and agricultural development policy objectives. This, however, is not a simple decision-making process, as frequently the appropriate organizational framework is lacking and the criteria for setting

Digitized by Google

Digitized by Google

TABLE 1

CARIBBEAN COUNTRIES: COUNTRY-PRODUCT COMBINATIONS GENERATING SUFFICIENT ECONOMIC VALUE TO SUPPORT A MINIMUM RESEARCH MODULE

	RICE			POTATOES			SWEET POTATOES			CASSAVE			YAMS			BANANA			SUGAR			COCOA BEANS			TOMATOES		
	0.5%	1%	2%	0.5%	1%	2%	0.5%	1%	2%	0.5%	1%	2%	0.5%	1%	2%	0.5%	1%	2%	0.5%	1%	2%	0.5%	1%	2%	0.5%	1%	2%
WHOLE REGION	0	0	0											0			0	0		0	0						
Antigua																											
Bahamas																											
Barbados																											
Bermuda																											
Dominica																											
Grenada																											
Jamaica													X	X		X	X		X	X							
Saint Lucia																	X										
Trinidad & Tobago																											
St.Vincent and the Grenadines																											
St. Kitts and Nevis																											
Suriname	X	X	X																								
Guyana	X	X	X																	X	X						

Where X denotes value greater than US$191.00 (for country)
Where 0 denotes value greater than US$515.714 (for region)

Digitized by Google

Digitized by Google

priorities are unclear. Under these circumstances, it is important for the research system to take the initiative and present the policy decision-making levels with program alternatives for the use of presently available resources, including clear indication of what is being left out and what projects will be brought into program implementation if extra resources become available.

This approach can be an effective tool for improving the links between agricultural research policy-making, economic development planning and budget determination. At the same time, it can generate important information for program monitoring and evaluation and can put the research system in a much stronger position to seek additional resources from both domestic and external sources.

B. Better Coordination of Research and Technology Transfer Activities

Together with the concentration of effort, the coordination of all potential providers of research and a close relationship between research and technology transfer activities can greatly increase the impact of limited resources. Universities, development projects, and commodity organizations are often overlooked as important potential providers of research support. In many cases, no one of them on its own has the resources required to address given research problems; or, as is often the case with universities, they lack the linkages necessary to give their research efforts a production-problem orientation. Coordinated research projects forcing scientists from different institutions to work together to plan and carry out experiments and other research activities can help in these situations. Close interactions between research, extension, and clients are essential for focusing research projects on significant production problems. On-farm testing as an integral component of the research process can enhance this interaction and can facilitate a rapid diffusion of research results. A successful example of how this can be achieved is the case of the Instituto de Ciencia y Tecnologías Agrícolas (ICTA) in Guatemala, where, through close collaboration with cooperating farmers, the research system has produced a major impact on the country's food production.

C. Increasing National Research Capacities through Donor Assistance

Donor assistance is one of the most important resources available to a small-country research effort. External resources can contribute not only by directly adding to national research budgets, but also indirectly through the need to generate counterpart funding and by broadening the base of political support for agricultural research. In many cases, the possibility of generating much-needed foreign exchange resources through agricultural research projects will bring the support of groups and sectors of government that otherwise would not see the importance of or be interested in agricultural research. There are, however, some hazards in the extensive use of external and donor assistance to support national research programs. Small countries are particularly at risk because of the greater relative importance of external sources in the total available resources.

One problem is the impact of overreliance on external assistance, on program orientation, and the long-term stability of the research effort. External sources tend to rely too heavily on the project approach. Well-defined projects can be very effective in concentrating efforts and producing high-impact results, but, at the same time, the project system may

Digitized by Google

Digitized by Google

produce program fragmentation when many individual projects are independently negotiated with different assistance sources. This is especially so under the weak management conditions of many of the developing countries' research systems. In these circumstances, there is a strong chance that the result will be a collection of loosely-linked efforts with no coherent national strategy.

The effects of abrupt adjustments resulting from changes in donors' priorities are also important for program continuity and long-term system development, especially since domestic support is in many cases highly unstable.

Taking the initiative in the creation of a donor coordination mechanism appears to be an essential element of the agricultural research policy of a small developing country. An alternative is the formation of a country-level research support group bringing together all donor sources interested in assisting the country, with emphasis on long-term needs and goals and on the incremental steps required for implementation. The development of such a group and plan may prove to be a high-pay-off move, both for receiving countries and donors. For the recipient, it can be a very effective way of achieving the needed concentration of efforts, continuity of support, and reduction of administrative costs and management of external-resource workload. For the donor, it can reduce the costs of project searching and increase the return on investments by complementing and supplementing the national program, rather than wastefully competing for "good investment opportunities."

D. Multiplying National Research Capacities through Networking and International Cooperation

Applied agricultural research is highly location-specific. But no country need undertake on its own all of the research needed for meeting the requirements of its agricultural development. Generally, as we move from applied to basic research, location specificity diminishes and, consequently, transferability increases, opening the possibility for a country to benefit from research conducted in other countries or at the international level. Every national agricultural research system should be viewed as part of a world complex of research institutions and activities, all contributing to and benefitting from a common pool of information and knowledge.

The transferability of research results does not imply that a country can do away with all of its research needs. At the very least, a country must have the ability to screen and interpret information from other sources and adapt imported knowledge to local conditions. But transferability does open a number of opportunities for reducing research needs through information exchange and cooperative schemes. The potential, however, is not the same for all countries. Countries in temperate regions will have a larger pool of knowledge and technologies to draw upon than those in the tropics. At the same time, small countries sharing characteristics with larger neighbors, or that are part of relatively homogeneous regions, will benefit more from borrowing and will have better opportunities for information sharing and cooperation than those in relatively isolated geopolitical situations.

The nature of the agricultural product mix will also affect the extent to which a country can benefit from borrowing. In products such as the cereals or those tropical crops, such as cassava, that are studied by the international

Digitized by Google

Digitized by Google

centers, borrowing will be a more relevant strategy than in the case of those products that have received little attention from the international systems, such as plantain, taro, or tropical fruits.

In this context, networking and horizontal cooperation are two very important ways to increase the scope of national agricultural research systems, either through the exchange of information and/or the coordination and promotion of certain types of research. Bringing together countries with common problems and characteristics, these mechanisms help avoid wasteful duplication and allow the specialization of resources and a greater economic base to support certain types of research that no participating country on its own could afford. By pooling the strengths of each national program, a research program of considerable strength can be developed.

In order to select the most appropriate networking and horizontal cooperation mechanisms, the critical issue is: what research should be done domestically, and what research should rely on cooperation, that is, the degree of integration among the cooperating parties. At the same time, the coverage in terms of products and activities and the level of institutional participation in the network's decisions are also critical issues affecting the effectiveness of different cooperation mechanisms and the ways in which they contribute to national research capacities and meet a small country's technological needs.

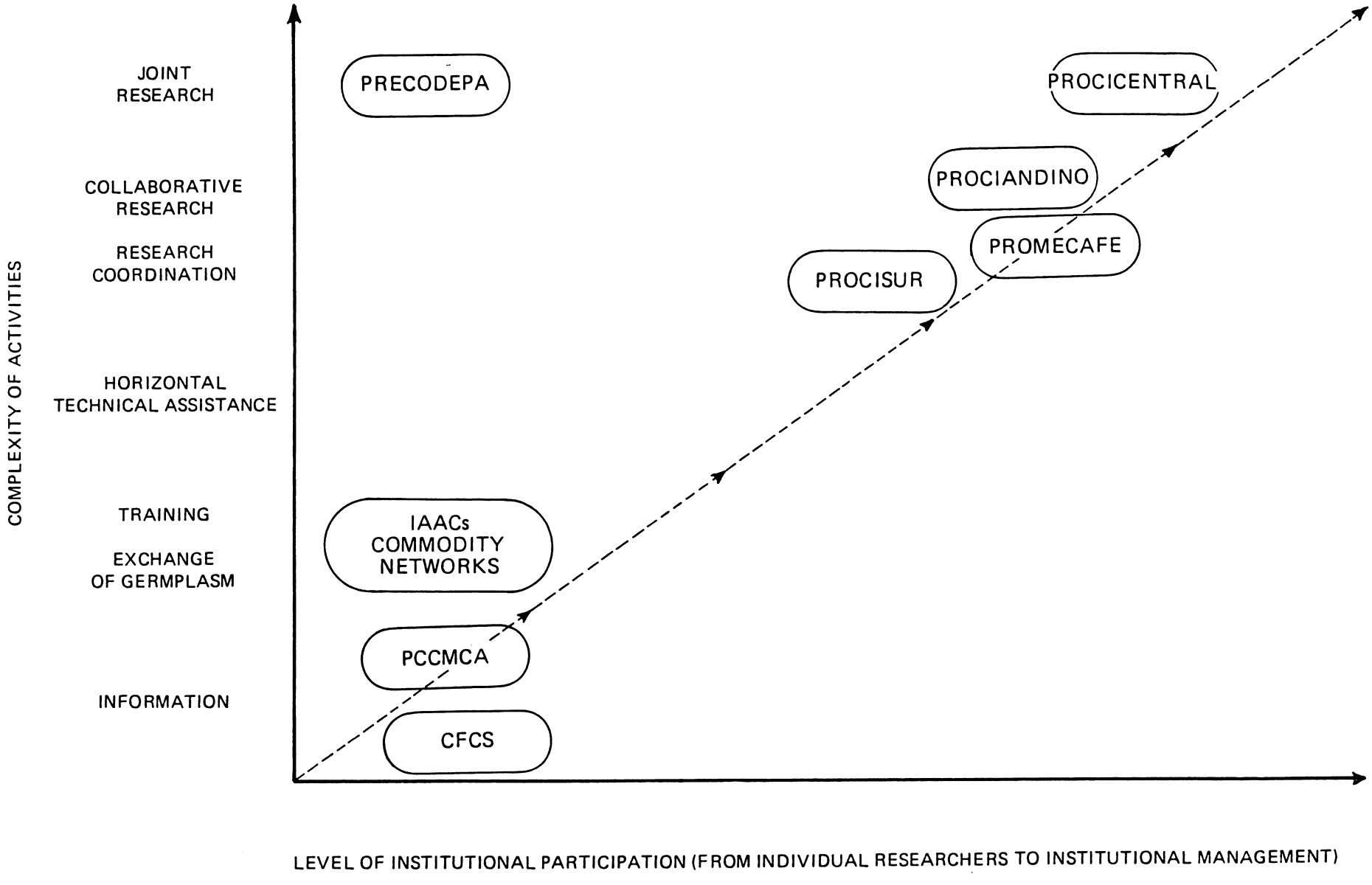
Figure 1 graphically summarizes how the degree of complexity of the activities undertaken and the coverage and level of institutional participation interact in defining different types of networks and horizontal cooperation schemes, placing some of the experiences available in Latin America and the Caribbean in a context of ever-increasing integration and institutional complexity. The vertical axis runs from the exchange of information, the simplest form of cooperation implying the lowest level of involvement and commitment, to joint research where the parties agree to combine their resources for the solution of a common problem. The horizontal axis measures the level of institutional control over network activities. At first, participation and decision-making are essentially in the hands of participating researchers, but as we move away from the origin there is an increasing level of institutional control and participation; usually product coverage also increases with institutional control, but that is not always the case (PCCMCA, CFCS, and PROMECAFE).

The commodity networks of the IARCs represent the typical research-based cooperation mechanisms. These schemes are essentially focused on germplasm and information exchange under the Centers' coordination; they have a low level of intensity of activities and a minimum of formalization, but represent an important resource for small country participation in the IARCs' networking activities and effective use of the centers' national research support services. They represent practical alternatives for allowing national programs to concentrate their limited resources on the technology application end of the research chain. A policy of interaction of national scientists with international center personnel, in the countries themselves and at the centers through their training programs, can greatly contribute to the flow of relevant information.

Digitized by Google

Digitized by Google

FIGURE 1: TYPES OF NETWORKS ACCORDING TO COMPLEXITY OF ACTIVITIES AND LEVEL OF INSTITUTIONAL PARTICIPATION.



Digitized by Google

Digitized by Google

PRECODEPA (Programa Cooperativo de la Papa) is a significantly different mechanism. Although (as in the case of the Centers' networks) it concentrates on just one product -potatoes; full program coordination and promotion of research is the main strategy of the program. Participants are Panama, Costa Rica, Nicaragua, Honduras, El Salvador, Guatemala, Mexico, Cuba, the Dominican Republic, and the International Potato Center (CIP). The program is financed by the Swiss Development Cooperation Program and the participating countries. Administrative responsibilities lie with CIP and the countries themselves. Of the group, only Mexico has the ability to support a full research program. Through a common program and selective leadership, with each country assuming responsibility for a particular research area, the handicap of size has been removed, and progress has been made in crucial areas like seed production and plant protection.

PROCISUR (Programa Cooperativo de Investigación Agrícola del Cono Sur), PROCIANDINO (Programa Cooperativo de Investigación Agrícola para la Subregión Andina), and PROCICENTRAL (Programa Cooperativo de Investigación para la Región Central) 1/ represent additional levels of networking complexity, as they are multiple product mechanisms based on full institutional participation.

1/ PROCISUR is a cooperative networking program focused on five commodities: wheat, maize, sorghum, soybean, and beef cattle, covering the six countries of the southern cone of South America: Chile, Argentina, Uruguay, Brazil, Paraguay, and Bolivia. Its main components are a crop research information system, training, and staff exchange. Leadership for the different program components is divided among the countries, according to their relative strengths. Budget support comes from the countries and the Interamerican Development Bank (IDB). Administrative responsibilities lie with the Interamerican Institute for Cooperation on Agriculture (IICA). The program has completed a first phase of operation and has been renewed for a second term.
PROCIANDINO is a program with similar characteristics covering potatoes, oil crops, food legumes and maize for the five countries in the Andean Zone: Bolivia, Peru, Ecuador, Colombia and Venezuela. The program was implemented in 1976.
PROCICENTRAL is still in the planning stage and is expected to operate in the countries of Central America, Panama, and the Dominican Republic. Product coverage is still undecided, but it will most likely cover the basic grains, plus cocoa, bananas, and plantains, important export crops. It is expected to start operations in 1988.

Digitized by Google

Digitized by Google

As one moves from larger to smaller countries, the nature and characteristics of cooperative programs and of the networking efforts involved differ. The main consideration is that in smaller countries the common or core component of the cooperative program becomes larger. This happens because single country capabilities for both funding research and capturing a significant share of its benefits decrease. In turn, this produces two consequences. First, the networking design becomes more complex in small, rather than larger, countries. Second, and related to the above, the necessary integration of efforts expands in the same direction, with a tighter coupling of network components imposing stricter planning, balancing and coordinating requirements.

PROCISUR, a cooperative program among essentially large countries, each having a fairly developed and autonomous agricultural research system, has focused mostly on complementary exchanges of research information, results and germplasm. The principle involved here has been mainly one of sharing among peers in areas of common interest. The fact that several of the participating countries are notoriously weaker in their scientific and technological capabilities does not invalidate the above. Networks should build on a commodity or multicommodity orientation, with loose coupling of components and efforts carried out mostly on a national basis.

PROCIANDINO brings together research efforts of a range of medium-sized countries at an intermediate state of development of both their agriculture and research facilities. In this cooperative program, networking involves system or collective goals which, however, are subject to independent implementation by each participating country. These system or regional goals distinguish the program from PROCISUR. Likewise, such goals recognize the difficulty for each country "to go it alone," as well as the need for joint coordination and goal-setting. This increases both the complexity of the whole network and its integration and planning requirements.

PROCICENTRAL represents still another variation. It encompasses countries essentially too small to sustain on their own a critical mass of resources for research on key crops; nevertheless, they maintain capabilities for the adaptive research component. Research efforts here would no longer depend on each country providing individual solutions to its problems. Rather, the weakness of participating countries and the relative costs of necessary efforts call for a regional identification of problems and the formulation of joint research bearing on them. This would involve a division of labor among countries for all activities not strictly at the adaptive level. Implementation of efforts, however, would still remain a country responsibility, within the framework of regional planning. At this level, research begins to acquire a more flexible and diverse nature-not just ? restricted to specific crops.

An important difference between PRECODEPA and the cases of PROCISUR, PROCIANDINO, and PROCICENTRAL is that the last three have an overall coordinating committee integrated by the country Directors of Research which acts as the maximum program authority with responsibility for promptly setting priorities among commodities as well as overall program monitoring, follow-up and evaluation. This characteristic is of particular importance in networking efforts involving collaborative or joint research activities and more than one product in the smaller countries. Research-based networks lacking the broader

Digitized by Google

Digitized by Google

institutional context and checks have a strong tendency to distort national priorities. In the situation of highly restricted budgets that usually confronts the smaller countries, relatively small amounts of resources can have big impacts on the selection of research projects. If network participation is at the researcher level, there is a strong chance that the scientific interests of the participating individuals will carry more weight than overall priorities in defining in-country network activities. In the case of PROCODEPA, one could raise the question whether the level of human resources --probably the most limiting factor to successful research in the Central American countries-- being allocated to potatoes is fully justified given the relatively small importance of the crop in the participating countries. In the cases of PROCISUR, PROCIANDINO and PROCICENTRAL, the participation of the Directors of Research in the networks' decision-making process assure that product selection and resource allocation fully reflect national priorities.

IV. SUMMARY AND FINAL CONSIDERATIONS

We have attempted to describe the principal components of a national agricultural research policy and relate them to the situation of the small developing countries. In doing so, the importance of properly defined objectives, the nature of the issues, the process behind determining how much to invest in research, and the research system's institutional priority-setting and planning mechanisms were discussed in the context of their role as agricultural research policy instruments. Wherever relevant, alternative approaches and the factors affecting them were also presented.

The small developing country's conflict between needs and available resources was brought into focus, the basic point being that research needs in general are not directly related to country size, while resources usually are. Pressure on resources comes from two sources: the diversity of needs the research system must consider and the "minimum critical mass" requirements of research.

Because of the nature of agricultural production, environmental characteristics, consumer demands, and political considerations, small countries face research needs quite similar to those of larger countries. But, if research is to be successful, certain minimum standards of professional expertise must be met. Without them, useful results are unlikely and resources are wasted.

Finally, several policy alternatives were discussed. Small countries must make the best use of national and international resources. Research efforts must be brought into focus and more closely tied to extension, so as to increase the relevance and applicability of research results. Donor assistance must be coordinated. But the most significant and potentially useful alternative for small countries is better and more effective use of international cooperation.

Bringing countries together enlarges the economic support base, offers hope for otherwise insoluble problems, and makes the most of each small nation's particular research strength.

The policy alternatives mentioned above have been presented in general. The issues discussed do not represent an exhaustive view for each particular

Digitized by Google

Digitized by Google

situation; it would be necessary to reconsider their validity. In this sense, how to concentrate efforts without losing political suppport; the viability of establishing donor coordination schemes; and how to prevent international cooperation from distorting national priorities appear to be relevant areas of inquiry.

Digitized by Google

Digitized by Google

ANNEX I

ESTIMATED COSTS OF A MINIMUM RESEARCH MODULE FOR ONE PRODUCT AT THE COUNTRY LEVEL 1/ (IN US$)

I. DIRECT COSTS			134,000
A. Personnel		108,000	
1. 1 Principal Researcher, M.S. or Ph.D. (plant breeding or agronomy) Total cost per person/year US$30.000	30,000		
2. 4 Specialists, university graduates Total cost per person/year US$18.000	72,000		
3. Training (annual)	6,000		
B. Services and materials Calculated as 12.5% of direct costs		16,000	
C. Equipment Calculated as 7.5% of direct costs		10,000	
II. COSTOS GENERALES Y ADMINISTRATIVOS			57,300
A. Personnel 60% of general and administrative costs	34,380		
B. Services and materials 25% of general and administrative costs	14,325		
C. Investments and equipment 15% of general and administrative costs	8,595		
TOTAL BUDGET			191,000

Percent summary by broad budgetary items:

A. Personnel	74.54%
B. Services and materials	15.87%
C. Equipment	9.73%

1/ Estimated using the budgetary structure of the International Agricultural Research Centers as a guideline for determining the percentage of each item of expenditures.

Digitized by Google

Digitized by Google

ANNEX II

ESTIMATED COST OF A MINIMUM RESEARCH MODULE FOR ONE PRODUCT FOR THE WHOLE REGION

I. DIRECT COST			361,000
A. Personnel		289,000	
1. 4 chief researchers, M.S. or Ph.D. 3 person/years in plant breeding, agronomy, and pest & disease control, and 1 person/year equivalent in socioeconomics and other specializations, according to requirements (soils, physiology, etc.) Total cost per person/year US$30.000	120,000		
2. 8 specialists, university graduates. Total cost per person/year US$18.000	144,000		
3. Training Calculated on the basis of 2x1 rate of retention; total rotation every 20 years: cost of US$70.000 per Ph.D. 8 M.S. (60%) Total annual cost for a permanent team of 2 Ph.D. and 2 M.S. (approximately). Also includes short-term training.	25,000		
B. Services and materials Calculated as 12.5% of direct costs.		45,000	
C. Equipment Calculated as 7.5% of direct costs.		27,000	
II. GENERAL COSTS AND ADMINISTRATION (30% of total budget) Includes direction, support and services (administration, laboratories, library, communications, field, etc.)			154,714
A. Personnel 60% of general and administrative costs.	92,828		
B. Services and materials 25% of general and administrative costs.	38,678		
C. Investments and equipment 15% of general and administrative costs.	23,208		
TOTAL BUDGET			515,714

Percent summary by broad budgetary items:

A. Personnel	74.03%
B. Services and materials	16.22%
C. Equipment	9.73%

Digitized by Google

COLECCION ESPECIAL
NO SACAR DE LA BIBLIOTECA
IICA - CIDIA

Digitized by Google