



COOPERATION BETWEEN NATIONAL RESEARCH ORGANIZATIONS AND INTERNATIONAL CENTERS: OPPORTUNITIES AND LIMITATIONS

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PROGRAM IN INTERNATIONAL AGRICULTURE
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Forward and Acknowledgment

This is one of a series of three papers written by Dr. Enrique Ampuero, former Director General of the National Institute for Agricultural Research (INIAP) in Ecuador, during his sabbatical year at Cornell University. Dr. Ampuero served as a Visiting Professor of International Agriculture at Cornell from January - August 1980 under a Rockefeller Foundation fellowship award. Thanks are extended to both institutions for the support and encouragement given to the author during his program. His papers were translated from the original Spanish into English by Dr. Judith Lyman, Visiting Research Fellow, of the Rockefeller Foundation. Appreciation is expressed to her and to Dr. John A. Pino of the Rockefeller Foundation for the contribution of Dr. Lyman's time. Each paper is presented in both Spanish and English in order to assure a wide distribution of these documents.

The titles of the three papers are as follows:

"Organization of Agricultural Research for the Benefit of Small Farmers in Latin America," IA Mimeo #85.

"Organization and Administration of Experiment Stations in Developing Countries," IA Mimeo #86.

"Cooperation between National Research Organizations and International Centers: Opportunities and Limitations," IA Mimeo #87.

Dr. Ampuero is presently working with the Interamerican Development Bank in Washington, D.C.

COOPERATION BETWEEN NATIONAL RESEARCH ORGANIZATIONS
AND INTERNATIONAL CENTERS: OPPORTUNITIES AND LIMITATIONS

Enrique Ampuero*

I. Introduction

The national agricultural research institutions maintain cooperative, technical links with many institutions in the international community. These organizations may be of multilateral nature such as the specialized institutions of the United Nations or may be bilateral technical agencies through agreements between governments or may be private institutions such as development banks or foundations. Some of these organizations have contributed to the establishment of research institutions or have participated in the strengthening of research programs.

Independent efforts of the international community were integrated with the establishment of the Consultative Group for International Agricultural Research (CGIAR). This group is made up of 30 donors of financial resources, including the United Nations, industrialized countries, development banks, and private foundations (2, 3, 10).

A network of 13 international centers located throughout the world operates with the support of the CGIAR. The international centers carry out research to develop the knowledge and technology toward increased production of world food commodities, to contribute to the training of human resources on the national level, and to strengthen the system of research and transfer of technology in the developing countries for the benefit of the rural sector.

The international centers carry out research on basic food crops, cattle, and world food policy and promote the conservation and management of genetic resources. With the recent establishment of the International Service for National Agricultural Research (ISNAR), efforts will be intensified to strengthen national research institutes and to promote

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better coordination with the international centers. The CGIAR system is studying the possibility of establishing new international institutes to investigate other topics relating to food and agriculture (14). It has been indicated that the financial resources provided by the donors in support of the CGIAR system will double in the next five years.

The creation of a network of international institutes endowed with human resources of high scientific caliber, with ample funds, and with administrative flexibility is certainly a rational conception, especially when one recognizes the high rate of return on investment in agricultural research in the developing countries and the outstanding advances that have been achieved (6, 7, 18).

The impressive impact of the improved wheat and rice varieties developed by CIMMYT and IRRI on crop production in Asia and Latin America (8, 12, 13) stimulated the interest of the international community to strengthen its research programs (1, 4, 5). Interrelationships and influence between the international centers and the developing countries are constantly growing as the national programs expand. Therefore, there is greater interest in analyzing the system, recognizing its strengths and weaknesses, examining the role and responsibilities of the national institutes, and suggesting ways in which the interrelationships, strategies, and mechanisms of cooperation could be improved. The intent of the present article is to examine the issues and to make recommendations for better coordination between the institutions.

Some of the questions that arise upon consideration of the subject follow:

- Are the national institutions taking advantage of the technology that is being developed by the international centers? Are these technologies appropriate to the needs of the countries?
- Are the international institutions contributing to the strengthening of the national programs? Are these efforts sufficient?
- Do adequate mechanisms exist for fruitful complementation and liaison?
- Is there an adequate balance between the growth of the international institutions and the growth of the national research institutions?

- Are the activities of the centers and other institutions contributing to an increase in the production of food crops and to the income and welfare of the rural population in the developing countries?

- Are the small farmers benefitting from the technology developed by the international centers? Or are only the large commercial farmers benefitting?

- What other strategies could be suggested to improve the effectiveness of the international centers?

To examine the answers to some of these questions, it is useful to analyze the present strategy for cooperation between the centers and the countries.

II. Present Strategy

1. Organization and Mandate

The older centers such as IRRI and CIMMYT are organized with emphasis on a single crop or on a few basic food products. The International Potato Center (CIP) was also founded on this principle. Other centers have been established with a broader mandate. For example, CIAT carries out research on basic tropical crops such as beans and cassava and also has a pastures program. Other centers, such as IITA in Africa, are working with production systems for the small farmers of the humid tropics. Similarly, ICRISAT is studying crops and production systems for semiarid regions. Other institutions, such as ILRAD and ILCA, were established to study cattle diseases and production in Africa, respectively, because of the importance of those factors on the African continent.

The organization of the centers varies not only according to the crops being studied but also in the magnitude of the geographical area of responsibility. Some institutions focus on a region, as CIAT concentrates on Latin America, for example. However, others have a much larger area of responsibility, such as IITA's mandate in Africa.

2. Elements of the Strategy

2.1 Research

Undeniably, the first priority of the centers is to carry out research aimed at the solution of biological problems considered limiting

to the improvement of crop yields. These constraints may be of a genetic nature, may involve inefficient production systems, or may concern the use of environmental resources.

The technology that these centers develop is made available to the national agricultural research institutions for incorporation and adaptation in the respective research programs. According to the mandate from the CGIAR, the clientele of the centers are the national research institutions, to whom the new technology should be transferred. The responsibility of whether or not to use that technology falls on the national institution. The centers vary considerably with respect to criteria and strategies for the transfer of technology from those that concentrate on technology generation only to those that take part in production campaigns.

One of the strengths of the international centers is the availability of a large reserve of genetic material collected worldwide, whether in the form of traditional varieties or wild species in danger of extinction. The collection and preservation of genetic material for use in the breeding programs is one of the most valuable services that the international institutions can offer. For this reason, breeding programs for the incorporation of valuable genes into populations and varietal nurseries are highly important to the countries. The international centers have the scientific resources and facilities necessary to carry out crop genetic-improvement programs; the developing countries do not.

It is hoped that the development of populations adapted to distinct ecological conditions and the incorporation of genes conferring resistance to diseases and pests will increase the stability and adaptability of these genotypes to diverse environmental conditions. However, the difficulty of developing genotypes adapted to a wide variety of environmental conditions is recognized.

The research institutions with strong breeding programs can use segregating materials made available by the centers, from which the national plant breeders can select the lines that they need. Plant breeders in small national programs prefer nurseries containing varieties with the desired characteristics.

The availability of germplasm permits a continuous flow of genes from the centers to the countries for incorporation into national varieties,

especially in the case of varieties susceptible to new races of a pathogen, such as the wheat rusts and rice blast.

Some difficulties arise in countries whose breeding programs are heavily dependent on the genetic material from the centers in the form of regional nurseries. Sometimes the genetic material contains characteristics that are undesirable to a country, such as rice varieties with a long dormancy period or with a high percentage of broken grains. However, some characteristics, such as quality and color of roots and tubers may not be acceptable to local consumers. The centers should avoid sending an excessive amount of genetic material to the countries, since their resources may not be adequate to manage a large number of nurseries. This difficulty undoubtedly can be avoided through previous arrangements.

In summary, it can be concluded that the national institutions are indeed making use of genetic material developed by the centers. The degree of utilization depends upon the state of the local breeding program and the governmental decision to make use of the technology from the national research program. The most well known examples are wheat, rice, and corn. Although the impact of the last crop has not attained the dimension of the first two, nevertheless, the national corn programs have begun using genetic materials developed by CIMMYT with varying degrees of success. Better genotypic environmental combinations must be developed in corn, particularly for tropical regions. Some of the recent advances in the reduction of plant height, improved physiological efficiency, and improved nutritional quality offer attractive incentives to the countries for increasing their corn production and alleviating nutritional deficiencies of the poorest groups of the population.

Certainly a reasonable period of time will be required until the international centers working with grain legumes, roots, and tubers can advance sufficiently in the breeding of these species to make an impact on production. It must be remembered that these species have not been subjected to an intensive breeding program, as the cereals have. Evenson (5) doubts that the success achieved with wheat and rice will be repeated with the other crops, especially in the near future.

2.2 Training

The training of personnel is one of the highest priorities for the developing countries. Each country must train hundreds of professionals in every area of research and agricultural development. The efforts made by some countries with the help of international institutions are remarkable; nevertheless, even these are insufficient for the needs of agricultural development. The international centers are making a good contribution in the training of human resources in short-term in-service programs, some postgraduate scholarships, and pre- or postdoctoral training for those countries requiring that level of training. However, it should be noted that training programs vary from one center to another. CIMMYT emphasizes the training of scientists to strengthen the breeding program. Other centers also offer training in production practices. Nevertheless, there are very few training programs offered to national professionals for the study of small-farmer problems through research. Training must continue to receive the highest priority; otherwise, there will never be national programs with high-level scientists to assume responsibility for the generation and transfer of technology.

2.3 Regional Programs

Another important element in the strategy of the international centers are the regional programs located throughout the world (15). The centers assign scientists to different regions with the following objectives:

- a) To obtain genetic material and information at the national or regional level to orient the research of the center.
- b) To carry out certain types of research away from the headquarters, when the central experiment station does not possess the required environmental conditions. For example, one research project of IRRI concerns "floating rice in flooded areas of Thailand." Another example is the evaluation of genetic material in areas of high disease incidence.
- c) To validate the technology developed at the center and transfer it to the countries, at the same time establishing a feedback mechanism to the headquarters, with information on the behavior of the genetic material or new problems that need attention.

- d) To promote regional cooperation and to strengthen the ties to the program.

Within the general context of these objectives, the centers differ in their points of view. For example, CIAT and CIP prefer not to become involved in cooperative projects of a bilateral nature, favoring projects in regions encompassing several countries. In contrast, CIMMYT, IRRI, IITA, and ICRISAT are active in national programs that include institutional development and the training of human resources. The older centers have pursued more direct participation in production campaigns in India, Pakistan, and the Philippines.

A theme for discussion within the CGIAR system is whether the centers should participate in production campaigns. Undeniably an international institution should not substitute for national efforts in accelerating the rate of increase in its production. However, the institution should be ready to respond to a request from a country that wishes to plan a campaign, assisting it to organize the training of personnel, exchanging experiences regarding alternative strategies that could be followed, or assisting it to organize a massive seed-production program.

Other aspects of regional strategy concern the transfer of scientific information from the center to the countries. It can be concluded that the regional programs constitute an adequate mechanism for linkage between the centers and the countries. For this reason, it should be considered an important element of the strategy for the transfer of technology in various directions, not only between the centers and the countries, but also between other international institutions in the region.

2.4 Development of Methodologies

The availability of highly competent scientific personnel permits the centers to study new methodologies that could contribute to increased agricultural productivity. Examples include: (a) to develop new plant-breeding techniques and better genotypic environmental combinations; (b) to study production systems, in cooperation with the countries, that optimize available resources and reduce the risk; (c) to study factors that limit the transfer and adoption of technology, particularly on the part of the small farmers; (d) to determine the impact of technological

innovations on rural society. These and other important issues must be dealt with by the international centers, concentrating on the problems of small farmers in such a way that alternative technologies that are appropriate for their needs and resources can be offered to them.

III. Present State of the National Institutions

The national research institutions in the developing countries are found in different stages of evolution, from newly formed institutions in Latin America and Africa to reasonably mature research institutions. Evenson (5) classifies the research institutions of the developing countries according to the following evolutionary stages:

- a) The "pioneer" stage, in which there are few well-trained scientists. The governments allocate very few resources to develop the necessary infrastructure. National scientists receive low salaries and professional incentives to make a career in this field. The institutions of many developing countries fall in this category.
- b) The "adaptive" stage of research. Evenson describes an initial phase characterized by heavy dependency on external financial aid to acquire equipment, machinery, and postgraduate training. Generally, training at this level is obtained abroad with external funds. The number of experimental stations begins to increase. Usually this phase exploits the potential of technology existing in the region.

At the most advanced level, this stage is characterized by more elaborate infrastructure with central experiment stations distributing technological information to regional substations. The central stations receive continuous demands for the latest scientific results, which Evenson calls the "potential capacity for technological development." To meet this demand for technology requires ample resources, both internal and external, and, above all, administrative capacity.

A large number of Latin American institutions can be considered as examples of the adaptive stage, such as ICA of Colombia, INIAP of Ecuador, EMBRAPA of Brazil, and INIA of Mexico, among others. At the most advanced level, the institutions have strong research teams of highly qualified scientists who generate new knowledge in the agricultural sciences,

possess the necessary infrastructure, and can train their own national personnel at the doctoral level. Examples of this evolutionary stage would be India and possibly Brazil and Mexico.

In general, the majority of the developing countries do not have strong research institutions nor adequate human resources to meet their needs. Budgetary funds allocated to research and development are too few to cope with the responsibilities of the countries. The national research institutions are overloaded with responsibilities for many crops and even animal science programs, when they possess very limited resources. Thus, an inequality between the developmental stage of the international centers and the national institutions becomes evident. The former are well equipped with facilities, scientific resources, funds, and operational flexibility, whereas the majority of the latter are only recently formed and heavily dependent upon external financial resources, as well as external scientists and technologists. Under those conditions the process of technology transfer and validation is difficult and slow until the national institutions are strengthened and the personnel needed by the countries are trained.

To achieve these objectives, the international lending institutions and particularly the governments must allocate more resources to the research and development institutions, supplying incentives to retain specialized personnel and the operative flexibility that scientific research requires. Postgraduate education in each of the developing countries must receive the necessary attention and support to train the professionals needed in the research systems.

Many research institutions, particularly in Latin America, have gone through expansive periods with ample governmental support and then have suffered a period of decline, sometimes caused by political intervention. The fact that agricultural research programs in Latin America have not participated actively in rural development programs has been pointed out as another possible cause of this phenomenon. It has been charged that the technology developed has not had an impact on agricultural production and has not been appropriate for the needs of the small farmers (17). These criticisms may be well founded in certain cases. However, it must be considered that many countries have not given the required attention to the rural sector. The potential that research can offer for rural

development has not been fully realized as in the developed countries. Finally, technology generated by research is not the only factor needed to achieve rural development (11, 18). If agricultural development is not accelerated and the necessary investments are not made, the developing countries will not be able to emerge from their present state of stagnation.

IV. Suggestions for Strengthening Interinstitutional Coordination

It is obvious that the mechanisms for linkage and cooperation between the international and the national research institutions must be improved. With this purpose in mind, the following points are suggested for consideration:

1. Ties between the centers and the countries must be increased at the regional level. Presently the centers differ in policy with regard to regional activities. It is not clear to what extent the centers wish to become involved in regional activities, even for centers that have vigorous regional programs. The question is whether the scientists should carry out research and technology transfer at the regional level only, or whether other tasks should be included, such as -

- a) to identify the needs of the countries,
- b) to respond to requests for consultation,
- c) to organize regional training, and
- d) to encourage research and the utilization of technology developed by the centers in the countries.

Presently, regional scientists carry out these functions with varying orders of priority, depending on the mandate of each center.

If there were a mechanism of coordination between the international institutions that operate in a region, it would be easier to define the role of the regional scientists, since some of these activities could be taken up by one of the international institutions.

2. The organization of regional programs to achieve self-sufficiency with their own resources is an excellent initiative that should be encouraged and supported by the international institutions. Examples of regional organizations are the Central American food program; the Cooperative Potato Program in Central America (PROCODEPA), recently

established; and the Andean pact, in which the countries of the region plan their food production together. Only those countries that are conscious of their problems and responsible for them can improve the quality of their basic institutions and, with greater perspicuity, request international aid, which must be complemented by national efforts in all cases.

3. The most highly qualified scientists and researchers of the developing countries must take a stronger role in the planning, determination of priorities, and evaluation of the international centers by TAC and the Consultative Group, in such a way that the system and the centers have a better perception of the needs of the developing countries. Perhaps increasing the representation of the developing countries in the system could be considered.

4. Coordination between the international centers has improved in recent years. Nevertheless, strong mechanisms of interinstitutional linkage still have not been defined or established. The developing countries are interested in learning about the taking advantage of scientific advances in centers located at great distances. Quarantine problems prevent the direct importation of genetic material from a center located on another continent. Therefore, stronger linkage between the centers would permit the use of the system to greater advantage.

5. The centers must clearly define their respective roles at the national level, so that the countries know what to expect from the centers. Each center has established its own policy, which is often different from that of the other centers (16).

In conclusion, the international centers have an important role to fill, generating the knowledge and technology that permits the developing countries to accelerate the rate of increase of their agricultural production. This role must be a complementary one of assistance to the national programs. If these programs do not grow and mature with sufficient levels of financial and scientific resources, the work of the centers will have very little impact on food production (9).

Only the national research and development institutions can generate the appropriate technologies for each of the variable agro-climatic conditions. Therefore, it is urgent that the national development

institutions be strengthened- Governments must take advantage of the potential of research to impel their development programs, must support them and permit them the continuity and stability necessary to better achieve their aims.

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