



EMPRESA BRASILEIRA DE PESQUISA AGROPECUÁRIA - EMBRAPA  
Vinculada ao Ministério da Agricultura  
DEPARTAMENTO DE ESTUDOS E PESQUISAS - DEP  
Brasília, DF

INTERNATIONAL CENTERS AND NATIONAL SYSTEMS  
FOR AGRICULTURAL RESEARCH: AN INSTITUTION-BUILDING APPROACH

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DEPARTAMENTO DE ESTUDOS E PESQUISAS  
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INTERNATIONAL CENTERS AND NATIONAL SYSTEMS  
FOR AGRICULTURAL RESEARCH: AN INSTITUTION-BUILDING APPROACH<sup>1/</sup>

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The basic premises of the paper are the following.

(a) Research is locationally specific. There are cases in which it is possible to transfer technology from one country to another. But there are few examples, particularly of transferring technology from the developed countries to the developing ones. In this case, not only the physical environment is different, but the differences in human factors such as literacy, education, culture and others are so deeply ingrained that the possibilities of transfer are drastically reduced.

(b) The modernization of agriculture implies the application of science to the production process, transport, storage and marketing of agricultural products. It requires profound changes of mind and attitudes of society in favour of science. It requires that the "scientific spirit" be encouraged at all levels of government and be accepted by consumers and producers. Foreign institutions do not have much of a chance of producing these changes of attitude. Nevertheless, they can have a powerful effect of inducing change when associated with national institutions for the purpose of bringing about the transformation of traditional agriculture to a modern science-based sector.

In developing countries, scientists have two important roles: to generate knowledge and technology, and to convince society to accept the importance of science and then to support it. The two roles are equally important and interdependent at the same time. A good scientific work is an effective means of motivating society to support science, but it is not sufficient. In the case of the developing countries, the scientists must be much more active in creating a general atmosphere favorable to research. This goes far beyond laboratory work and teaching activities. It involves work with the press, government authorities (on all levels), the church, the army, farm leaders and organizations and other institutions.

The first role can be fulfilled by scientists of developed nations working in developing countries or in the International Centers, or other institutions specialized in research. Even so, the possibilities of success are small, since technology is locationally specific, and its development on the

<sup>1/</sup> The paper expresses the author's views on the role of the International Centers in developing National Agricultural Research System. At no time it is aimed to evaluate the work of these Centers.

<sup>3/</sup> The author works with EMBRAPA.

scale needed by even a small country goes far beyond the possibilities of the institutions of the developed world.

The second role can only be carried out by national scientists. The strong sense of nationalism would not accept foreigners playing an open role in convincing a society of the value of science which would be interpreted as an additional sign of the dominance of the center over the periphery.

If the "scientific spirit" is not accepted as a method of thinking, the modernization of agriculture will not take place as a self-propelled process. There may be examples of isolated progress induced from the outside, but they do not generate a continuous flow of transformation that will eventually encompass the whole agricultural sector.

It is the "scientific spirit" that brings changes in agricultural policy. These changes include the support for research and extension, a commercial and credit policy that fosters growth and productivity and is interested in the well-being of rural people.

Obviously one cannot state that a country either has or does not have a scientific spirit. There is no single day or year that serves as a hallmark for the transformation. We are talking of evolutionary changes. This will not happen all at once.

Being an evolutionary process means that there are forces in favour and against the changes. Hence, a strategy of strengthening the forces favouring modernization and, if possible, weakening those that oppose it, is called for.

The development of strong national institutions for agricultural research is one of the most important weapons in this never ending battle.

(c) Research is a process that never ends, since knowledge brings the need of more knowledge. Every process needs to be accommodated in institutions; in the case of research, permanent institutions of a public and private nature.

Three premises and one consequence: Any global strategy for the agriculture of the developing nations that does not have as its main objective the development of the national research institutions, when lacking, is doomed to failure.

This paper is built around the last statement. However, most of it is focused on International Centers.

Two levels of institution building can be distinguished, looking at the institutions from the outside or from the inside: the marketing of the products and the organization of the factory and of its production processes.

In the case of public research, society finances the production, and buys the product since technology is supplied free of charge to the farmers.

But the government finances research, and its results are appropriated by the farmers. Hence, public research institutions depend on two clients: one that pays for its work, and the other that eventually incorporates the technology generated into its production systems.

One might think that if the results of research are valuable, then the government would support its institutions. Consequently there is just one client: the farmers. One can argue further that in the more industrialized societies the consumers are also very powerful. Thus one has both farmers and consumers as beneficiaries of research. If they accept research as a valuable tool for economic development, then the government follows their judgement. In the long run this is true. But not in the short run. The fact that there is a time lag between investment in research, the generation of technology and its adoption by farmers confuses not only the government but also the farmers and consumers, as to the real value of research. In most of the developing countries it takes time for farmers to support research. They are eager to support extension that brings the results to them and most of the time they believe that the new technology is part of the general knowledge of humanity. They are not able to link it to research efforts. Extension gets the credit and research gets none.

There are also conflicts of interest between consumers and farmers, mainly with the larger farmers who are the ones with a voice in government. In this split, research may be caught in the middle and be criticized instead of being supported.

Even if consumers and farmers are willing to encourage investments in research, the government may not give it full support. In each country there is an intellectual atmosphere, accepted by the government, as to the course of agricultural development. In general, the atmosphere is much more in favor of the expansion of the agricultural frontier than in increasing productivity. Even when it favors increased productivity, it is believed that the problem is one of diffusion of the technology that has already been generated in the country or that can be transferred from the outside.

Yet most developing countries, even when accepting the importance of agricultural research, consider it a luxury rather than essential since the results come only in the long run. Clearly there is a confusion between projects and institutions since a research institution that is reasonably well-administered produces results each year. Some projects may bring results only in the long run.

Consequently, the government tends not to give high priority to investment in research, and it is a real problem to convince the authorities to seriously support research activities.

The first level of problems for institutional building rests upon the need to create a favourable atmosphere for research, with government, consumers and farmers. It is a complicated problem, since each country calls for a specific strategy.

The second level of problems involves the organization of the **research factory** and its production processes that include the organizational chart of the institutions, development of human resources, research priorities, programming techniques, organization of research units, carrying out of research projects, testing of research results, on-farm research, links with extension, private sector research and universities. The objective is to make research more efficient and to make each dollar bring the highest rate of return. For the first level of problems, their solution involves increasing the research budget.

In the long run, the direct route to a larger budget is to obtain research results that are relevant to society, and to keep society well informed as to the results of research obtained and expected.

There is no doubt that even in the short run, research results are important in obtaining a larger budget. But a larger budget is crucial for the realization of research and the development of the institution. Hence, in dealing with institutional development, one has to pay attention to the two levels of problems. The emphasis on one level or on the other depends on the country and on its national research system.

The availability of research results that can be directly and/or easily adapted by the national system is of great importance, since it allows the national system to come out in a smaller span of time with technologies that will give it prestige in the eyes of farmers, consumers and the government. These results in some cases can be generated by international research centers or other institutions.



## Historical Perspective of the International Centers

When the first international centers were created the aim was to generate technology that could be directly transferred to the farmers of the developing countries, mainly in Asia, who were facing a very serious problem of food production. The research institutions of the developing countries received, at best, second rate priority.

It was a correct decision and it was very important to show to the developed world that research was one of the most valuable tools in increasing the supply of food. The success of rice and wheat research made a great contribution to this change of opinion. At that point in time, the developed world was heavily supporting the development of extension activities in the belief that there was enough technology and what was lacking were good extension services.

This change of opinion brought about a substantial increase in money invested by the developed world in research that benefitted developing countries. The International Centers that have been created are an objective answer to the new trend.

In addition, the success of the international centers helped to influence the minds of the authorities of the developing world to give greater support to research activities. This has been under way since the mid-1960's, and has gained momentum since the beginning of the 1980's. Now all emphasis is on research and there may be some exaggeration in this trend.

Research and time bring about better understanding and new problems. There is a better understanding that the development of the national systems is crucial to the modernization of the agriculture of the developing world. The new problems that emerge are how to help the national systems to accomplish their goals. These problems have been a great puzzle to the donor community and to the various agencies of the developed world. The question that comes to mind is how to make the International Centers more effective in dealing with the problems of the National Systems?

In my opinion, there are two lines of thought. One is that of the International Center and the donor community. The best way for the International Centers to help the development of the National Systems is to concentrate on the development of the technology that is relevant to the developing world, to create new methods of carrying out research and to build relationships with the National

Systems around research problems, most of them of a biological nature. So the idea is to take the factory as given, and try to improve its production processes. It was felt that this idea was very restrictive. It neglects the organizational problems of the factory and the first level of problems of creating a favourable atmosphere for research. ISNAR was created to correct this situation.

The second line of thought is more radical. According to it, each International Center should aim towards the development of the National Systems. The idea of ISNAR is not rejected. There is room for specialization in the two-level problems already discussed.

Two questions come to mind: are the two lines of thought not the same? If they are different, which one is better?

Certainly the two lines of thought are not equivalent. If the second one had been the guide for the organization of research of the International Centers, their research priorities and the multidisciplinary teams would have been very different. The second line of thought requires that the definition of problems starts at the level of the national systems, and then comes back to the International Centers. It would require of the International Centers a level of knowledge of the National Systems far more complete than they now have.

Today an International Center searches for the problems that are relevant to the farmers of the region covered by its mandate, and build the research program around these problems. Clearly there are discussions with the national research leaders, but not to the point where the developing countries may have a strong voice in establishing research priorities. And the discussion of research priorities is never put in the frame of reference as to the development of the National Systems. It attempts to get the opinion of knowledgeable scientists concerning the problems of the countries they represent. And these scientists do not always have experience with institutional development but rather they are very good specialists in a restricted field of knowledge.

It is then generally accepted that the true role of the International Centers is to create technology for the developing world. The development of National Systems is a secondary issue except for ISNAR.

The second question (which line of thought is the better one) has already been answered. The development of the national systems should be the first priority of the International Centers.

The second line of thought was rejected for two reasons. First, because it is very difficult to bring about drastic changes in the philosophy of the International Centers. They have been operating as such for a long time; secondly because it is believed that many developing countries cannot afford to have respectable national systems. This however is equivalent to accepting the idea that they would not be able to develop their agriculture if one believes that science matters. Maybe what one should try is to develop research systems the country can afford to support. To my knowledge this has not been tried. There is no doubt that the models of research in operation are very expensive for a poor and small country. However, is it impossible to conceive other models that are equally efficient and less expensive to operate?

I don't believe that the second line of thought will ever be completely accepted by the donors and the International Centers Community. Pragmatically, one should call for a strategy that would make the present situation conform to what was thought as ideal. One should set in motion forces that would make the International Centers consider as their first priority the development of the National Systems. The rest of the paper is devoted to this problem. ISNAR will be separately discussed because of its strategical importance.

### The Role of ISNAR

It is envisaged that ISNAR will take charge of designing the strategies and will help to carry them to completion in order that the system (CGIAR's system) may fulfill the goals of cooperating with the development of national system.

ISNAR will have to study the countries, to evaluate their potential for supporting agricultural research, to evaluate the national systems to see how well they can be responsive to the demand for research and to study the International Centers to see how they can be better used to foster institutional development of the national system. The task is a formidable one, but ISNAR may draw on the work of the International Center family and of other Institutions. For economic problems, for example, IFPRI may be of great help.

The basic idea is to divide the countries selected for the program of institutional building into groups. One strategy would be designed for each group. And each group would have ISNAR and some International Centers responsible for the application of the strategy. Clearly some national systems might be involved with the International Centers and the same is true for various research institutions of the developed countries, and agencies such as the World Bank, FAO, etc.

More specifically one expects of ISNAR the following:

1. To carry out studies for the classification of the developing countries as to their potential for the development of research. The idea is to appraise the demand for research and the capabilities of the countries to meet it. The following points may be selected to be studied:

(a) the economic capacity of the country to support research institutions of the size deemed appropriate;

(b) the willingness to finance research: how society is reacting to the "scientific spirit". It includes the farmers, consumers and other groups considered important;

(c) the structure and quality of the agriculture universities or of the faculty of agronomy;

(d) the potential for a food crisis, its nature and location. It may be located in urban or rural areas; it may be due to the lack of employment opportunities, coupled with a poor standard of income distribution, or it may be the consequence of lack of production to meet the nutritional standards. In this respect it is relevant to analyse the pattern of food imports and exports and its evolution through time. Note that a food crisis can be made a powerful engine to mobilize the energies of the country to support agriculture and research, and also to obtain financial support from the developed countries;

(e) the urbanization process: size and velocity; its causes. Note that urbanization brings about profound changes in the power structure in favour of the urban consumers, consumption habits, etc. Urban societies more readily accept investments in research, and also a very different strategy is required to convince them of the value of science;

(f) the power structure needs to be dissected for the purpose of the motivational strategy to be employed to get support for research. It is very important to see which sector dominates the power structure;

(g) the size location and quality of natural resources of the agricultural frontier as related to the need for increasing the food supply. It is well known that countries with an agricultural frontier that is sufficiently large to be able to fulfill the needs of an increased food supply and which is easy to bring into production, are not the best supporters of agricultural research. This is true because it is believed that the rate of return on investment on expansion of the frontier is higher than on increase of productivity.

(h) economic and agricultural policy for the purpose of verifying how they favour or discriminate against agriculture, and against the growth of productivity of agriculture. It is also important to examine the export and import policies, and the price policy for the internal market. The agricultural policy may be expansionist in the sense of bringing more areas under cultivation as opposed to an increase of productivity. It may favour the growth of productivity, which is a rare event among the developing countries. In many respects the economic and agriculture policies give an excellent clue as to how the country perceives the value of research or reacts to the "scientific spirit".

As a result of the studies, the countries will be classified into the following categories:

(\*) able to develop research needing only technical support they can pay for.

(\*) able to develop researched but needing technical and financial support.

(\*) Unable to maintain research institutions that would fit their needs.

This classification has a built-in time dimension, let us say, of five or ten years.

For the third group the International Centers would have to develop technologies that would be directly carried to farmers by the extension service, which in all probability is very primitive. For the other two groups, the principal role of the international Centers is to help the national systems to be more effective.

In the study of the ability of the country to meet the demand for research, a close look must be given to the existing research institutions. The idea is to classify them as follow:

(\*) Able to go by themselves and to cooperate with countries that are in a worse or equivalent situation;

(\*) Unable to go by themselves, needing strong help both of a financial and technical nature;

(\*) Needing fundamental reform which is almost equivalent to building another institution.

The last group needs special attention. If the country is not prepared to accept the fundamental reform, to work with it may be a waste of time and money.

The principal factors that should be studied for this classification relate to:

(a) budget: size, composition (personnel; operational costs, investment) and cash flow during the year;

(b) wage scale;

(c) human resources development;

(d) quality of management at all levels;

(e) buildings and laboratory facilities;

(f) entrance, requirements how employees are promoted, wage scale, tenure;

(g) Scientists age, level of training and numbers compared to the needs of the country and to the total number of employees.

(h) political support of the institution and how it is held accountable.

2. Based upon existing knowledge or on knowledge developed by ISNAR, the strategies to help the national systems will be designed. One can distinguish the following levels:

(a) Promotion of the institution among consumers, farmers, government and other groups. Here the goal is to get more political and financial support. In other words, one seeks to create or to increase the market for the products of the institutions;

(b) for improving the efficiency of the institution, looking into its structure and modes of operation;

(c) for expanding the relationships of the institution with other research systems, outside of the country, not only for receiving financial and technical support but also for cooperating with other countries. The strategies would encompass each group of countries and how each International Center and other institutions would fit into the scheme.

3. ISNAR should also supervise the implementation of the strategies.

There is a great danger that these ideas may lead to a bureaucratic structure, unmanageable and very expensive. To avoid this, ISNAR must reduce the countries that will be helped, for each period of five years, and must rely on the International Centers and other institutions, including the ones of the more advanced developing countries. It is also advisable that ISNAR have three groups of specialists: to study the countries, to design strategies and to supervise their implementation. Some specialists may be located in International Centers other than ISNAR or in the countries selected for the program.

To be effective the strategies need the participation of all International Centers in all their phases.

It is also possible to give a more prominent role in the development of the institutions of a region to a determined International Center. In this case specialists and resources would be allocated to the particular Center, which also would play a coordinating role as to the work of the other International Centers within the region.

The managers and scientists of national programs must receive adequate training to become able to work with society at large to get its support for the research institutions. It is also advisable to have specialists in the national system that help the managers in the work of creating a good image for the institution. It is important to recognize that every activity of research could be explored for that purpose, from the selection of priorities (Alves, 1984) to the dissemination of research results. Institution building in the case of public institutions requires a strong determination to construct a good image on both fronts: the internal and the external. It requires scientists and employees that believe in the relevance of their work for society, that love their organization and that are always ready to defend and to promote it. But it also requires that society consider the work as important. When society and the employees support the institution, one can say that it has reached a mature state.

### The Role of International Centers

The role of ISNAR has already been discussed. IFPRI deserves special discussion. It should stimulate and work towards the development of a department of social sciences in the national systems. The department of social sciences can be a powerful link between the institution and top-level government decision makers. Researchers that demonstrate the economic and social value of research are crucial for the purpose of establishing strong links with the government. The analyses of the implications of existing agricultural policies, the design of new policies and the reformulation of old ones are also helpful to top-level administrators, and the department of social sciences may have substantial participation in their creation bringing prestige to the agricultural research institution. Yet the work of social scientists is very important in establishing priorities and in the evaluation of the impact of the new technology on farmers and society. The department has a role in generating the guidelines for institution building and in training scientists located at the experimental stations.

No less important are the specialists in the area of mass communication and public relations. They should be provided with good facilities for their work and have free access to the top-level administration of the research institution.

The countries will be divided into three groups and the role of the international center discussed for each group. One can enlarge the recommendations that are put forward, since there was no interest in being exhaustive. Furthermore, there are many research activities that are the same for every research institution no matter what its purpose and location. In addition, there are research activities that are relevant for the three groups, and they are not discussed, if mentioned only for the purpose of emphasis. Examples are: research on methods of the



introduction of genes of wide application, germoplasm collection, conservation, etc. There is some rephrasing as to the groups of countries we have mentioned already.

(1) The ones that need only technical assistance, and to some extent can pay for it. They are supporting research, and their national systems are capable of facing the needs of agriculture.

For this group of countries, the classical model of Institutional Centers fits very well. This group of countries would like to see the International Centers doing research that is complementary to what they are doing, as well as the more sophisticated research and those projects which demand a long period of maturation and are risky; research on methods, germoplasm collection and conservation, breeding programs for complicated problems, specialized training, information and documentation, etc.

The relationship between the national systems and international centers must be cooperative, and never one way. Whenever possible, each part should pay its own expenses. Joint-venture projects are recommended, and the network model is also highly desirable. It is important to establish rules for cooperation in written documents.

One can foresee and increasing competition among national systems and the International Centers. Carefull planning of the relationship is needed to avoid clashes of interests. It is important to realize that this group of countries can cooperate with the International Centers in assisting other countries research needs.

(2) Countries that cannot afford the support of research institutions capable of facing the needs of agriculture. The national systems are of poor quality and hard to recuperate. Many countries do not have research institutions that are worthy of the name. This group of countries is at the opposite end of the scale as they have a very small capacity to absorb new technology of a more sophisticated nature. The new systems proposed for their agriculture must be of the low-input type and must count more on the resources of nature. The modern input industry is very primitive, and their participation in the international market as exporters is small, not allowing the imports of modern inputs. Extension service is also of very poor quality, although present. They lack adequate schools of agronomy.

For this group of countries, the following is required from the international centers:

- (a) The international centers must finish the development of technology, so that it is ready for dissemination to the farmers;
  - (b) They should concentrate on research of primitive systems, of the low-input category;
  - (c) It is necessary to place scientists in the countries to test the technologies developed;
  - (d) The training of extensionists and of people able to test technologies is very important;
  - (e) An association of the countries may be tried, when they belong to the same ecological zone, to finance a research institution that would serve them all. The international centers can work with the countries for this purpose.<sup>4</sup> But one should realize that this is a very complicated political problem.
  - (f) Training activities are very important to develop some research capacity, even if within the extension service.
  - (g) Again, research on methods, germoplasm and conservation, are important. But the nature of the research is different. Complementarity does not exist and everything needs to be very simple;
  - (h) Research results of the more advanced countries may also be transferred to this group of countries, and the international centers must seek agreements that would facilitate the transfer of technology;
  - (i) The international centers should stimulate agreements with the national system of the first group of countries for the purpose of training, and other activities;
  - (j) With the help of ISNAR, the design alternative models of institutions and of carrying out research that would fit the possibilities of the countries, should be attempted.
- (3) Countries that can afford the support of research systems that can face their needs, but that necessitate strong financial and technical assistance. The research systems are only of fair quality, and not consolidated with government and public opinion. They need strong assistance of the institutional building type. They don't have a powerful urban sector. Society is still dominated by the rural sector but transformations are underway.

The role of the international centers is the following:

- (a) Institutional building at all levels, as discussed, is the most important task. One should consider the creation of a public image,

the organization of the institution, its research programs, etc.

(b) The division of the countries into groups is recommended and some international centers should be assigned to each group for the purpose of working under coordination of ISNAR.

(c) Training activities of a non-degree nature are crucial;

(d) The research program of International Centers must contemplate production systems of intermediate level, but tending more to the low-level input category;

(e) In designing the research program of the International Centers, a stronger participation of the national systems would be most desirable as well as a division of the program so that a part would be carried out by the International Centers and a part by the countries.

(f) It is very important to provide facilities for meetings that would congregate representations of the national systems and of the International Centers family at the programming and management level; and also of representatives of this group of the national system with the first group.

(g) The reports of the International Centers must have a chapter dealing with the subject of institutional building, presenting the results that were achieved. In the Center's week, one morning (or afternoon) should be dedicated to this theme. This recommendation applies to all groups of countries.

(h) Since financial support of research is a crucial problem for this group of countries, they need strong help in preparing projects that would allow an increase in their budget. In these projects a very special attention should be given to training and consultants. It is very important to balance the graduate and short-term training: there is a tendency to disregard the graduate training on the basis that it is very demanding in time and resources. Without some top level scientists, research enters the kingdom of fantasy!

(i) It is desirable to find routes of research that save costs for the national systems. This subject should be strongly addressed by the International Centers.

#### Concluding Comments

To conclude the paper we would like to stress the following points:

(1) Institutional building should be the main goal of the International Centers. Their evaluation must ask the question: what have they done to

strengthen the National Systems and how are they working to achieve this goal. Weak national systems are a signal of failure of the International Centers.

(2) It is important to divide countries into groups and to have a work strategy for each group;

(3) We should contemplate the possibility of giving to some International Centers the responsibility of working with a particular group of countries, with ISNAR doing the planning and coordination;

(4) It is very important to draw on the experience of the developing countries that have succeeded in building their National Systems. We strongly recommended that the International Centers find ways to associate with these countries for the purpose of assisting the ones that have lagged behind in supporting research;

(5) The subject of building national systems for agricultural research must be stimulated in the universities of developed and developing countries, and also deserves being discussed at the level of the International Agencies that are connected with agriculture. We recommend that a discussion paper should be prepared on the subject.

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