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# How Europe Can Contribute to Nutrition Research for Developing Countries

## Models of Cooperation to Increase the Quantity and Quality of Food Supplies

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### Abstract

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The world food and nutrition situation continues to deteriorate. The number of undernourished persons, with its consequences, is steadily increasing in most developing countries (D.C.). Several factors are responsible: (a) the imbalance between population growth and availability of food; (b) unequal distribution of available resources both between countries and among various sectors within countries; (c) insufficient qualified human resources in D.C. to promote self-development. The technically developed countries, including those of Europe, could participate in the solution of this urgent problem, if they would face their responsibility for the benefit of all humankind, by: (a) a redefinition of world socio-economic policy that would permit more rapid progress for D.C. and allow them a fairer share of existing resources to satisfy at least their primary needs in food, health, housing and clothing; (b) to cooperate with D.C. by offering human, technological and economic resources for them to continue developing while they search for and implement their own solutions. Certain D.C. have formulated their own food and nutrition plans within the framework of a socio-economic policy that provides for a more equitable distribution of primary resources. In order to implement these plans, they need resources that are at present very limited. Practical models for this cooperation will be discussed.

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### Introduction

There has clearly been a deterioration of the world's food and nutritional situation during the last decade. In fact, the *per capita* availability of food has been reduced while undernourished populations have increased, particularly in impoverished countries. This is the result of an increase in population proportionately higher than the increase in food production and other services necessary to satisfy the basic needs of the human race.

### 1. Food and Nutritional Problems in Developing Countries

The current food supply systems in developing countries are inefficient. Food production is in-

sufficient and the marketing systems inadequate. Also, due to diverse environmental factors large quantities of food are lost. The prevalence of poverty among the rural populations in developing countries makes it impossible for these populations to purchase in sufficient quantity the basic necessities of life. Finally, their biological utilization of nutrients is impaired due to poor sanitary conditions which favour the development of infectious diseases.

The simple listing of the different factors which lead to malnutrition reveals that the problem is multifactorial in nature and cannot be easily or unilaterally solved. Most of the basic food in developing countries is produced by individual farmers on small plots of land, often scattered in remote areas. Their productive

capacity is at the subsistence level and their incomes only enough to satisfy their most basic needs. This rural population accounts for between 50 and 80 % of the total population of most developing countries. There is unrest and dissatisfaction in these groups, particularly when they compare their living conditions with those of the relatively small affluent class of their own countries and with those of the majority in the developed countries. Mass communications have awakened these rural populations to these differences.

Because of this situation and because of the lack of hope of improving their own condition or that of their children, these dispossessed majorities are reacting antagonistically to the existing social structure through violence, passive resistance and are, in many cases, fomenting explosive political change.

The only realistic way to improve their standard of living, food supply, health care, housing and education, is to make possible a greater income through an increase in productive capacity. Unfortunately, no government or international institution can offer, free of charge, the means to satisfy these basic needs. Governments can and must, through adequate social legislation, provide for a better and more equitable distribution of net income. These same governments and international institutions must, in addition, provide the means for self-help.

It is widely recognized that in order to resolve this situation a massive effort leading to an increase in the productivity of developing countries will be required. Such an effort would simultaneously result in increased income for millions in the low-income population, particularly in rural areas, and would provide and strengthen health care services and improve environmental conditions.

The urgent need to solve these problems implies the development of programs of direct intervention. As the resources in developing countries are extremely limited, it is of the utmost importance not only to formulate economically oriented development plans, as has been done in the past, but also plans that would operate to give a more equitable share of the basic necessities to these populations and, above all, would concentrate on the dispossessed majorities so that their living conditions can be improved.

As part of national policies, the food and nutrition plans demand programs and projects of direct intervention in the various sectors. It is necessary, therefore, to identify, analyse, compare and evaluate different intervention alternatives which may then be incorporated into national food and nutrition plans.

The development of these plans will require enormous efforts in the fields of both basic and applied research. Many countries and bilateral assistance agencies spend millions of dollars every year on intervention projects which have never been evaluated. These projects have been implemented without feasibility or cost-benefit studies and without any evaluation being made of their direct impact or collateral effects.

All this reaffirms the necessity for research. It is essential that research be implemented and accelerated in developing countries in order to insure the most rational, adequate and efficient use of their limited economic resources and, above all, to halt the constant decline in the availability of food.

Developed countries can cooperate in this process by offering governments and local institutions of the developing nations financial support, human resources and technical and scientific knowledge for the development of this type of research activity and by providing opportunities for full graduate education for future scientific leaders of developing countries.

## 2. The Need for Research

One of the main difficulties when discussing the topic of research has been, at least for me, the lack of adequate terminology. Figure 1 summarizes this point.

### (a) *Basic research*

This is the development of knowledge *per se* without any predetermined use. It depends exclusively upon the creativity of the investigator and is devoid of directional or institutional policies. It is the foundation upon which, eventually, all applied research depends.

### (b) *Applied research*

This is carried out with a pre-determined goal in mind. Depending on the level of knowledge achieved, this can be sub-divided into:

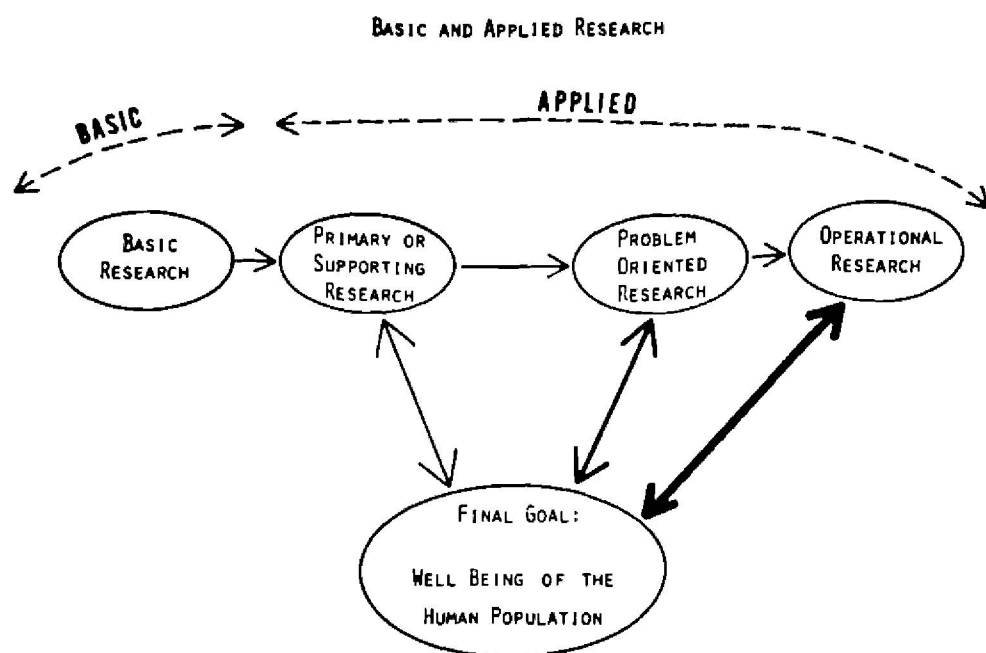


Fig. 1

(i) *Primary or supportive research*. This is when the goal is to obtain information on topics only partially known and not as yet applicable, although with the potential for applicability.

Much of this type of research is carried out in national or international institutions or universities in the developed and in some developing countries.

(ii) *Problem oriented research*. This has as its main objective the search for solutions to specific problems that affect countries or regions of the world. As knowledge and technology are developed, these solutions are put into practice. Logically, it is preferable to carry out this research in the country or region in which the problem exists in order to be able to control the variables that affect the intervention and its evaluation.

(iii) *Operational research*. This research has as its main purpose the identification of the optimum conditions to obtain maximum productivity, feasibility and efficiency of scientific-technological programs that previous research has identified for transfer and application. For this reason, it must be carried out where the intervention is being executed.

*Basic research* can be carried out at any place convenient to the investigator where a favorable environment exists, particularly in developed countries where there are institutions and universities which encourage this type of activity. Financial support comes from the country or institutions sponsoring the research.

*Primary or supportive research* is carried out

not only in the institutions of the developed countries, but also in international, regional and national centres, many of which work in collaboration with institutions from the developed countries. These same centres are those which, at the national level, support the investigation of problems and offer operational and training assistance whenever requested.

Some examples in the agricultural field are international agricultural research institutions such as: rice (IRRI) in the Philippines, corn and wheat (CIMMYT) in Mexico, tropical agriculture (CIAT and IITA) in Colombia and Nigeria, potato (CIP) in Peru, semi-arid tropical agriculture (ICRISAT) in India, etc. All of these are supported by foundations which are members of the Consultative Group on International Agricultural Research.

In the field of food and nutrition there are also subregional or national institutions in locations such as the Caribbean (CFNI), in Central America and Panama (INCAP), in Hyderabad, India; in the Philippines; in Recife, Brazil, and others. These institutions receive partial financial support from national, international and bilateral institutions, as well as from private foundations. Unfortunately, as is the case of the agricultural institutions previously mentioned, a consortium of foundations that guarantees a basic budget on a permanent basis is totally non-existent. Consequently there is a constant economic crisis in these institutions which impedes the continuation of their developmental work and the stability of the scientific staff.

*Problem oriented and operational research* is carried out in the countries themselves in ac-



cordance with programs and projects in the field of food and nutrition which the countries have defined in their development plans. Unfortunately, there are many gaps which must be filled so that these developing countries can reach a research level adequate to satisfy basic necessities. Among these gaps, perhaps the most important are:

(i) *The necessity and utility of research.* Many of the high officials in the governments of these developing countries are not convinced of the usefulness of and need for research. They criticize and even oppose adequate research for reasons such as: "we are poor countries and should not devote scarce resources to research", or "we should leave research to the wealthy countries", or "we must concentrate on feeding our people and cannot be bothered with research". It is necessary, therefore, to convince these decision-making officials of the importance and practical advantages of research.

(ii) *The political decision versus the practical and scientific decision.* Under political pressure the decision-makers ignore research and the possibility of testing various alternatives before reaching a decision. The decision is taken for political convenience, not because it is the best alternative available.

(iii) *A lack of communication between the research scientist and the transfer agent.* The transfer agent is usually a government employee. This separation of resources blocks integration efforts and frequently results in the development of antagonism between the two parties.

(iv) *The imposition of inadequately evaluated programs.* The imposition by certain foreign institutions of inadequately evaluated aid programs has sometimes caused delays in the search for viable alternatives adapted to the local environment.

(v) *The lack of adequately trained personnel.* Developing countries lack adequately trained human resources which would enable them to develop, at the local level, the applied research, especially that which is operational or problem oriented. The multidisciplinary characteristic of the nutrition field makes obligatory the training of scientists in different disciplines. They must have in common, however, a clear concept of nutrition and the capacity to understand the multisectorial characteristic of the problem and

the activities to be developed. Some institutions involved in nutrition and food science research have, through the years, been able to achieve this capacity by incorporating into their staffs professionals of different disciplines who constantly interact among themselves through involvement in the research being carried out.

Unfortunately, the national universities which could carry out this research do not offer, due to their internal structure of faculties and departments, the appropriate framework within which to develop this type of multisectorial research. It is therefore imperative to reinforce those research institutions where multisectorial investigation can be carried out and to collaborate with the universities so that they can coordinate the activities of their faculties and departments in order to achieve the desired results.

### 3. How Can the Developed Countries Cooperate in Scientific Research?

The developed countries can contribute in two ways.

(a) By creating new science and technology which may be useful on either a short or a long-term basis in improving the living conditions of all mankind. The results of the basic or applied research will produce knowledge and technology which could eventually be utilized in the developing countries.

(b) By collaborating with international, regional, subregional and national research institutions and universities which already exist in developing countries. These institutions, by virtue of having very close contact with the developing countries, possess an in-depth knowledge of their food and nutrition problems and the economic, social, cultural, political and scientific environment in which the results of their research must be implemented. In addition, the institutions receive all pertinent information which serves as a basis in planning their own research policies.

Furthermore, the results of their investigations are much more relevant since they are oriented towards the solution of their own needs. This will also facilitate the application of the results of the research in other countries facing similar problems.

Finally, these institutions are, in most cases,

leaders on the local level and have the capacity to develop the necessary human resources to carry out subsequent operational research and/or to transfer technology and serve as multiplier or change agents.

In the specific field of food and nutrition, the European countries could encourage the development of a consortium similar to the one created in the case of the international centres of agriculture (Consultative Group on International Agricultural Research), for the specific purpose of offering to existing institutes of food and nutrition the technical, scientific and financial support necessary to help them develop adequately and to attain the objectives for which they were created.

#### **4. Areas Urgently Needing Research in Order to Increase the Availability of Foods**

During the last few decades, food technology in developing countries has broadened its objectives and research activities. Formerly, it concentrated on such traditional activities as the processing of canned foods, the preserving of tropical fruits and their conversion to juices, pastes, etc. Although these activities must be continued to foster further economic development in the developing countries, food technology is now being directed towards the solution of more relevant problems and towards the improvement of the food and nutritional status of the populations of these countries. In other words, traditional food technology has entered into symbiosis with food and nutrition sciences. The food scientist and technologist, therefore, must have a firm background in nutrition with the final goal of improving human nutrition.

Based upon this, it is felt that research in the areas listed below would be most productive. The developed countries could cooperate by offering technical assistance, financing and training.

##### *(a) The development of indigenous food preparations*

There is a need to have better knowledge of the nutritional value of certain basic foods which make up the autochthonous diet of developing countries. These include *tortillas*, *arepas*, *tamales* and the like, as well as other grains

which are utilized as gruels and porridges for consumption. It is also necessary to investigate how their nutritional value can be improved and to develop technological alternatives for their preparation in the home and on the semi-industrial and industrial level.

##### *(b) Cooperation with agricultural research centres in the evaluation of the nutritional and technological quality of basic agricultural food crops*

Agricultural researchers have concentrated their efforts on increasing the yield per unit area. However, this concept of productivity, from a nutritional point of view, is incomplete and it is necessary to consider also the technological and nutritive components. This implies the need for collaborative investigations by food scientists, food technologists, agronomists and plant breeders.

The nutritional value and technological value of plants and their by-products must also be considered. In other words, it is not enough to consider only the quantitative aspect but the qualitative and nutritional aspects must also be evaluated, as well as the utilization of the plant and the efficiency with which it can be processed.

##### *(c) Utilization of industrial and agricultural wastes*

Developing countries have an enormous potential if, through research, they can develop the technology necessary to utilize industrial and agricultural waste products which have hitherto been discarded and are, in many cases, responsible for environmental pollution. The available by-products originate in many agro-industries, for example, coffee, sugar cane, bananas, rubber, African palm, and other sources of oleaginous seeds, etc.

##### *(d) New sources of nutrients*

In developing countries there exist a great variety of vegetables, foods, seeds and tuberous roots which are used in limited fashion by the native populations or as a source of foodstuffs. All of these products could, if they were better analysed, provide additional sources of nutrients for local consumption and possibly even for export. Many of these products grow in abundance

under natural conditions in the lateritic soils of humid tropical areas or on arid, or semi-arid land which has no other agricultural potential. Some of them could partially replace basic common foods and provide a much more varied diet for the population. They might also be used as nutritional supplements or as feeds, thus reducing the competition between man and animal for limited food supplies.

The use of natural resources and their agricultural and industrial by-products, which is common practice in the developed countries, is still very limited in the developing countries because the necessary research has not been carried out.

*(e) Studies on enrichment, or combinations of nutrient sources*

Many of the basic foods consumed daily by the populations of developing countries could serve as vehicles to provide nutrients that are deficient in the diets of these populations. For example, an appropriate protein supplement could enhance the nutritional value of certain native foods, such as the *tortilla*, bread, etc. Additionally, these foods could also serve as a base for fortification with other nutrients which are lacking in the diets of the developing countries, such as riboflavin, thiamin, vitamin A, iron and other minerals.

*(f) Development of infant and weaning foods*

For many years the developed countries through their bilateral aid programs and international organizations have made donations of food, especially those based on milk, in order to develop supplementary feeding programs directed, in particular, to mothers, infants, pre-school and school-age children. These programs have been criticized because they have caused in the developing countries a dependence upon external sources and because many of these foods are not readily available in the consumer market and therefore could not be associated with food education programs.

A great deal of research has already been done in this respect. However, the need for additional research exists since many governments face the obligation of continuing these supplementary feeding programs. Now they must confront the sad reality that these foreign aid food programs are being discontinued but the demand and need

created by the same programs still continues and the future trend is to expand them.

These foods, logically, should be developed from locally available raw materials and should be made available to all citizens, not just those enrolled in the supplementary feeding programs.

*(g) Development of appropriate technologies to implement small agro-industries*

The majority of the rural agricultural populations in developing countries have not been incorporated into national economic-industrial systems, in spite of the fact that in the developing countries that population produces the major part of the locally consumed foods. It is necessary, therefore, to organize numerous small agro-industries to process these foods as well as to establish an efficient system for the marketing of their products. This would lead to an improvement in economic status and eventually in the standard of living for these rural agricultural populations.

The technology for processing such products is already well known and the necessary equipment is being produced both in developed and in many developing countries. However, it is necessary to adapt the technology and equipment to the local conditions under which these agro-industries will operate. This implies:

(i) Simplicity of equipment as well as locally available repair facilities and spare parts.

(ii) Automation conditioned partially by the hoped-for level of efficiency, but above all upon the availability of labour, which generally is abundant and under-utilized in developing countries.

(iii) Reducing the cost of processing to a minimum so that the end product can be sold at the lowest possible price so as to be within reach of the low-income consumer.

In collaboration with a foundation (FAN-CAP), INCAP is developing a food industry system whose basic goals are:

(i) To modify existing technology and available machinery to meet the needs of the region.

(ii) To develop an integrated production system in order to be able to advise rural agricultural groups interested in the development of similar enterprises; incorporating into the technological package such aspects as availability

ty of local products, marketing, economic feasibility, etc.

(iii) To serve as a training centre for future employees and/or co-owners of such enterprises.

(iv) To assist in the preparation of feasibility studies and to help to obtain financial backing.

Food industry systems of this type could serve as catalytic elements in the developing countries and, at the same time, as transfer and modifying agents for the technology contributed by the developed countries.

*(h) Transfer, application and implementation of appropriate post-harvest technology*

A great deal of innovative appropriate technology which could be applied immediately and which has already been published exists in the developed as well as in the developing countries. However, for various reasons, which for the most part are not completely valid, this technology is not being utilized.

Much of this technology could be incorporated and utilized by the rural agricultural populations as it stands or with only slight modifications to adapt it to local conditions. It is necessary then, to study the mechanisms for the implementation of this type of technology. Perhaps one means might be the development of small transfer units which in the initial phase would analyse and evaluate the technological process in order to modify it and render it better suited to local conditions. In the second phase, equipment and machinery could be produced and a system of demonstration developed. Finally, these units could serve as training centres for multiplier and change agents who could then transfer their knowledge of the technology to other potential recipient populations.

Through these units, technology could be imparted to rural populations in several areas, such as preservation of perishable foods, storage systems for basic food grains, utilization of different non-conventional sources of energy, forms of improving present systems, etc.

Obviously, there are other areas which also require research. However, efforts should concentrate on that research which will permit an increase in the availability of foods of high nutritive value which will reduce either directly or

indirectly, the degree of poverty of the rural agricultural populations.

The twentieth century has been defined as the century of the 'homogeneity' of mankind. Efforts made by scientists throughout the world to achieve this 'homogenization' will hopefully permit us to view the future more optimistically and, above all, with a greater sense of humanity.