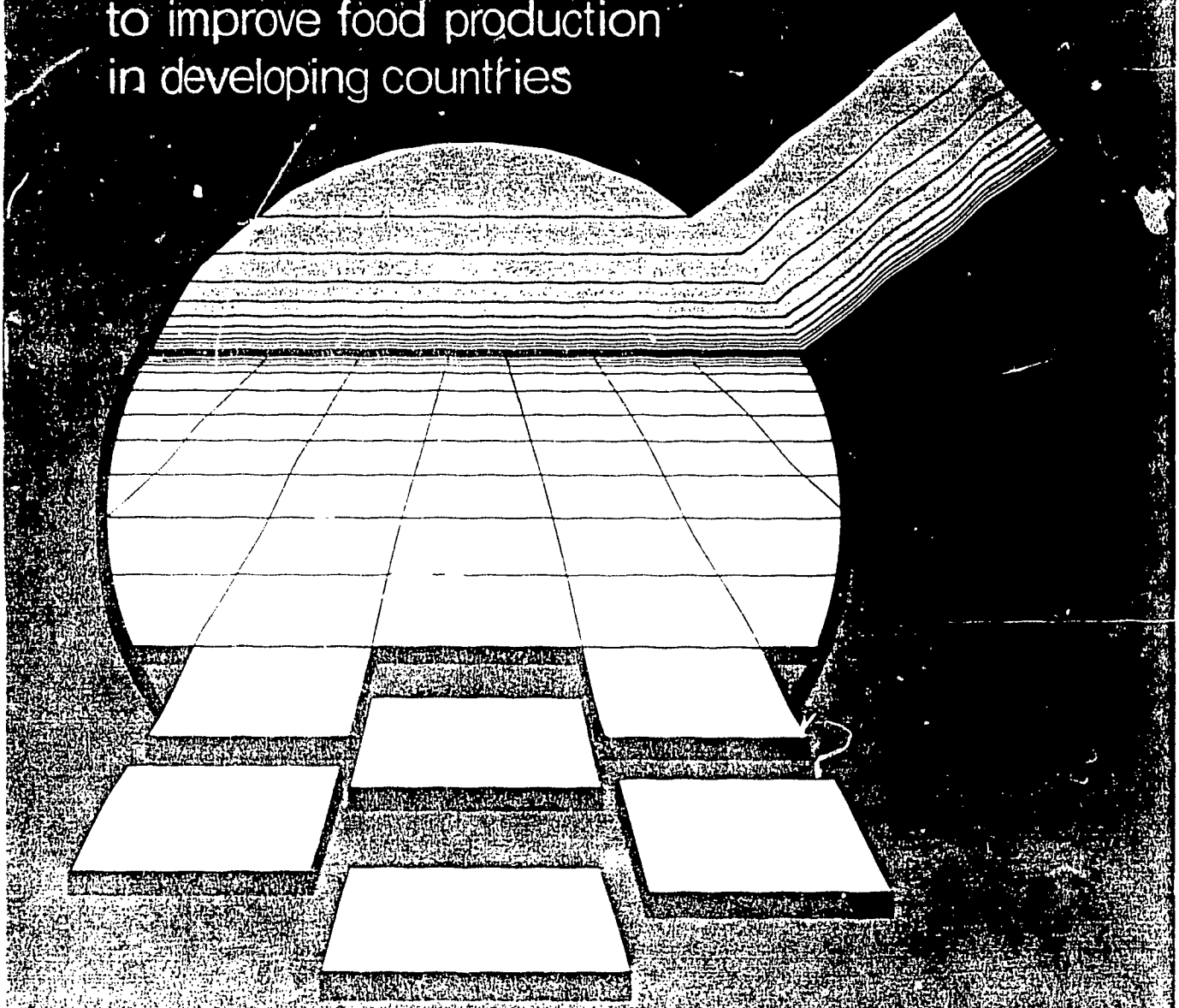
Training in the CGIAR System

Building human resources for research to improve food production in developing countries



Technical Advisory Committee
Consultative Group on International Agricultural Research

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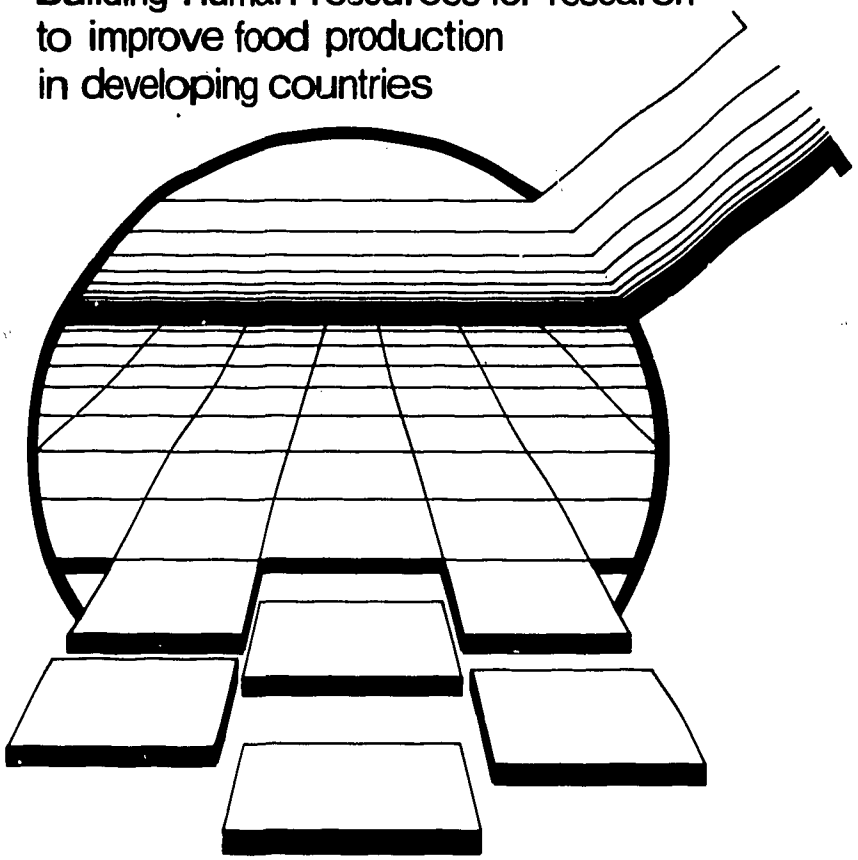

Technical Advisory Committee
Consultative Group on International Agricultural Research

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Foreword

Able people and good research are keys to increasing and improving food production. The Consultative Group on International Agricultural Research (CGIAR) has recognized this tenet from its inception by placing emphasis on training as an essential thrust to generate, promote, and disseminate research results.

Research leads to new knowledge and training promotes good use of that knowledge. The CGIAR and the nations it serves are partners in the endeavour to find new knowledge and to translate it into more and better food from the fields of farmers.

This publication illustrates the efforts to forge and strengthen the partnership. It is based mainly on the report of a study team commissioned by the Technical Advisory Committee (TAC) to the CGIAR to review progress made by the International Agricultural Research Centers and to suggest ways in which this progress can be further enhanced.

The International Rice Research Institute (IRRI) arranged the printing of the publication and is assisting the CGIAR and TAC in its distribution.

People and institutions too numerous to list made important contributions to this publication. TAC wishes to acknowledge in particular contributions of the following persons:

- Professors A. Hugh Bunting and Jose E.G. Araujo — the study team
- Drs. Kazi Badruddoza, Pablo Larrea, Mustapha Lasram, Stachys Muturi, Stanley Wijayagoonewardene, and Moctar Toure — leaders of country studies
- Drs. Manuel Pina and Ronald Knight — consultant coordinators
- Dr. K. Robert Kern — editor.

TAC also wishes to express its appreciation to IRRI for arranging the printing of the book at reasonable cost in the Philippines. This publication was generously supported by Australia, the Federal Republic of Germany, and Sweden.

Finally, we on TAC dedicate this book to the scientific and training staff of the International Centers. Their past and future contributions to human resources development are invaluable for the enduring success of the partnership, 15 years old and still gaining strength, between developing countries and the CGIAR.

Guy Camus
Chairman,
TAC/CGIAR

Photos Supplied By:
CIAT--3, 26, 30, 87; CIMMYT--6, 11, 33, 35, 40, 80; CIP--22; IBPGR--28; ICRISAT--71, 90; IITA--12, 23; ILRAD--32, 44; IRRI--vi, 17, 83; ISNAR--45

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How the Studies Were Carried Out

This appraisal of training as offered by 13 CGIAR international agricultural research centers (IARCs) over a period of more than two decades was led by two world-reputed educators of agricultural scientists -- themselves scientists intimately acquainted with agricultural research and development around the world.

The study was commissioned by the Technical Advisory Committee (TAC) of the Consultative Group on International Agricultural Research (CGIAR). The TAC secretariat provided the backstopping services.

The two leaders of the study were:

Arthur Hugh Bunting, Professor Emeritus of Reading University, U.K. -- an eminent agricultural botanist, scientist, and educator-administrator, who has served as adviser and consultant on agricultural research activities throughout the world.

Professor Jose Emilio G. Araujo then rector of the Federal University of Pelotas in Brazil -- a soil scientist and agronomist with extensive experience as scientist and administrator in national as well as interAmerican agricultural research and development organizations.

Two professional staff of the TAC Secretariat supported and took part in the intensive studies: Senior Agricultural Research Officer *Karl O. Herz*-- a United States citizen, a scientist in food technology, with long international experience in the Food and Agriculture Organization (FAO); and Executive Secretary *Alexander von der Osten*-- an economist with international agricultural experience in FAO, International Service for National Agricultural Research (ISNAR) and in the overseas development program of his native Federal Republic of Germany.

Study Procedure

The study team gathered masses of information with bearings on training in the CGIAR system. They followed two broad collection protocols:

In the most intensive aspect of their work, the team spent many weeks in the field, including visits to each of the 13 centers. They went to 10 developing countries in which IARCs are located, plus 8 other developing countries from which significant numbers of staff have taken part in IARC training programs. On these visits, the team observed facilities and interviewed personally more than 1,300 persons -- 669 former or current participants in IARC training programs, 400 national agricultural leaders, and 260 staff members of the international centers. The latter included the center staffs concerned with training and guidance.

The team also reviewed many documents related to IARC training. This included center annual reports, course announcements and syllabuses, and evaluations and special studies of many aspects of training. The team also assembled a great deal of data concerning the agricultural resources of the countries they visited, including recent trends in performance of the agricultural sector.

Due to a variety of reasons -- especially the small team and short time frame in relation to the large and widely scattered subjects -- this study procedure was not intended to be a scientific sampling of the audience. It was rather a series of intensive case studies conducted under a uniform discipline. Although not designed to provide data that could be generalized to reflect the entire universe, the procedures led to masses of data; and upon rigorous analysis, the data from different sources were found to yield remarkably similar and consistent findings.

A Parallel Study of Six Countries

A parallel study was conducted in six developing countries, with emphasis on personnel who had taken part in IARC training programs. A senior officer in each country was commissioned to carry out the study; each applied a standard analysis to effects in his country of associations in training and cooperation with the IARCs.

The six officers and their countries were: *Dr. Kazi Badruddoza*, chairman of the *Bangladesh*Agricultural Research Council; *Pablo E. Larrea*, who formerly served as Deputy Director of the Instituto Nacional de Investigacion Agropecuaria, *Ecuador*; *Stachys N. Muturi*, Director of Agriculture in the *Kenya* Ministry of Agriculture and Livestock; *Dr. Moctar Toure*, Director of Research for Agriculture and Agroindustrial Products in the Ministry of Scientific Research and Technology, *Senegal*; *Stanley Wijayagoonewardene*, Deputy Director of the Education and Training Division of the Department of Agriculture, *Sri Lanka*, and *Mustapha Lasram*, Director of the National Institute of Agronomic Research in *Tunisia*.

Two other agricultural scientists served as consultants for this study: *Dr. Ronald Knight*, of the University of Adelaide's Waite Agricultural Institute, and *Dr. Manuel Pina*, Communications and Training Officer of Centro Internacional de la Papa (CIP), in Peru.

These country studies were based on the same central procedure, but with considerable initiative left to the officer who supervised each. The link to the central TAC team study was provided at the outset from Professor Bunting and the TAC Secretariat, which also organized these country studies. The latter were designed to provide six case studies, not an integrated, generalizable analysis of training as viewed in all countries.

Two other agricultural scientists served to coordinate the country studies: *Dr. Ronald Knight*, of the University of Adelaide's Waite Agricultural Research Institute, and *Dr. Manuel Pina*, Head, Training and Communications of Centro Internacional de la Papa (CIP), in Peru.

In the overall analysis prepared by the consultants, Dr. Knight and Dr. Pina concluded that the case studies clearly supported the findings by the TAC study team.

A rice production course in 1962 was the first training effort by the first international center in what is now the CGIAR System. Parallel stress on classroom and field aspects in that course continues as a viable principle in most courses today. The practical field experience is rated high by participants and by those with whom they work. IRRI participants here are learning how to establish a dapog seedbed.

1. Introduction to Training in the CGIAR System

First training offered in 1962

It was in 1962 that a group of young agriculturists from developing countries gathered at Los Banos, Philippines, for the first Rice Production Training course offered by the then-two-year-old International Rice Research Institute (IRRI).

In the months that followed, these young people studied both theory and practices to improve rice production, working alongside and under tutelage of some of the world's leading rice scientists. At the end of their training, they took back to their research work at home greater knowledge, skill, and confidence. Most went on to play key roles in what was soon to be termed the Green Revolution in rice production in Asia.

In the next two decades, nearly 4,000 others followed them to undertake training courses at IRRI. Countless stories could be told of achievements by these individuals and, especially, of the institutions they served.

Thousands Trained at 13 Centers

Twelve other international agricultural research centers (IARCs) were organized in the next 18 years. They created training programs that would help developing countries strengthen their capacity to use the output of these unique agricultural research organizations.

(There are more than 13 institutions in the world that can be called "international agricultural research centers"; the 13 referred to here are those whose work is supported by the Consultative Group on International Agricultural Research (CGIAR). The names of those centers and some facts about them are set out in the separate article, *Evolution of International Agricultural Research Centers of CGIAR.*)

More than 19,300 agricultural workers from developing countries, have taken training on various crops, livestock, or farming systems at the 13 CGIAR centers. Some could tell of spectacular achievements when they applied their training back at their home stations.

Dramatic Stories of Achievement

There could be much drama, for example, in stories told by those who helped propel Indonesia from importer of rice just to feed its own large and growing population to a role in many years now of exporter to rice-deficient neighbors. This turn-around, of course, has meant more than food only, it is a net gain to Indonesia in its international trade accounts: instead of using precious foreign exchange to buy rice, now earnings from the exported rice add to the country's foreign exchange credits.

Also dramatic would be accounts of the core group of men and women who helped establish wheat as a significant crop in Bangladesh in an amazingly short time. The data tell the story: wheat tonnage in the year 1972-73 was 89,000 t; in less than a decade it had increased more than 10-fold, to 1,100,000 t in 1980-81. In the vanguard of the group that triggered that change were S. M. Ahmed, M. A. Razzaque, and S. B. Hossain, researchers who took training courses between 1969 and 1972 at the International Center for Improvement of Maize and Wheat (CIMMYT) in Mexico.

Credit for such achievements is properly shared among many. Among those to be credited are the far-sighted leaders in developing country agricultural research systems who sent able people for training and -- of much importance -- provided situations in which that training could be put to use when the people returned home.

Of course, not all accounts of participants in IARC training would be success stories; no wide-ranging effort succeeds in every case. But the failure rate here has been found to be negligble.

A "Precious Fraction"

While 19,000-plus trained at IARCs seems a large number of agricultural scientists, it really is a small fraction of the world population of persons engaged in agricultural research. They are no more than one in five of the total. But the impact of these particular persons, which is in part a reflection of their training, seems to have been far greater than their numbers imply.

Participants themselves speak with conviction of how they benefited personally in knowledge, skill, self-confidence, and motivation. And those who supervise the participants back in their home institutions give high praise for how training at CGIAR centers met the desired purposes; they give praise both on intrinsic merit of the training and also when comparing these participants to others who had taken training through other institutions at home and abroad.

Participants benefited in knowledge, skill, self-confidence, and motivation

These findings are those that came from an appraisal in the mid-1980s of the impact of training programs at 13 international agricultural research centers. (Details about that study procedure, and the experienced world agricultural scientists who performed it, can be found in the short article, *How the Studies were Carried Out,* page iii.)

IARCs in World Agriculture

Thinking that evolved international centers of the type now within CGIAR crystallized over a period of years. By the start of the 1940s, earlier investments to develop agricultural knowledge systems were producing benefits in industrial societies of Europe and North America; rising productivity by farmers was the result. (The concept of *Agricultural Knowledge System* is discussed in the short article by that title, page 4.)

Numerous ideas had been put forward on how these benefits of agricultural knowledge could be spread more widely, especially to serve rapidly growing populations among less developed countries. Some efforts had been mounted by philanthropic organizations and through foreign aid programs of many governments to try to get farmers in developing countries to use the same technology that was proving to be so effective in the West. But ideas based on extending or transfering developed-world technology

After participating in training programs at IARCs, national researchers multiplied usefulness of improved technologies.

Agricultural Knowledge System

One way to view the role of international agricultural research centers of CGIAR -- and other similar efforts as well -- is to consider them as part of national and international agricultural knowledge systems. They do not exist alone; by themselves, they would have little power to adapt their genetic materials and technologies or to get the products used by farmers in many countries with widely varying conditions.

While in one sense the CGIAR centers are themselves knowledge systems, more importantly they relate to other agricultural knowledge systems. For that reason, the TAC study team set its analysis within that broad context.

What is an "Agricultural Knowledge System"?

Knowledge is as much a part of a modern agricultural system as is soil, water, plants, animals, and farmers. (As defined here, knowledge is information, concepts, techniques, and skills.) Knowledge is often necessary for change, but knowledge alone is seldom able to cause change.

An agricultural knowledge system can be described and analyzed in many different ways -- and all may be accurate. Different persons may use different terms and put elements together in different ways. But all are talking about the same system. The depiction here -- which is an important piece of background to the discussion of training -- follows the ideas of Professor A. H. Bunting, one of the leaders of the study.

Five Main Components

Five components make up an agricultural knowledge system -- whether the system applies to a whole nation, to a single farming operation, or to a system that cuts across national boundaries to be truly international.

First, **the stock of knowledge** -- in the minds and memories of men and women (scientists, teachers, but above all, the rural people); also in books, periodicals, libraries, archives, maps, and records. This is the base of knowledge on which agriculture exists at a particular moment in time.

Second, a means of **increasing the stock of knowledge**. Experience is one basic process for increasing knowledge, the experiences of people throughout the system. There are other methods of collecting information to add to the stock of knowledge, ranging from individual observation to surveys to experimental research. The new ideas are generated in this component of the knowledge system.

Third, a means of **testing, evaluating, and developing the knowledge**. This includes what might be called the "engineering stage," finding ways that make it possible to use new pieces of knowledge.

Fourth, a means of **applying the new knowledge**, whether it is a new method, a new material, or a new system. This is the crucial stage in terms of the ultimate value of new knowledge. This is where the effect of the new knowledge is evaluated: does it increase output?; does it decrease the cost?; what adjustments does it call for?; and finally, is it worthwhile -- will producers, handlers, and consumers want to use it?

Fifth, a means of **disseminating knowledge** to and from people who have the knowledge and those who want and can use it. Education is involved here, both in spreading the knowledge itself and in increasing the numbers and professional competence of people who work throughout the knowledge system. The methods are both formal and informal: they include spoken and written communication between individuals; the teaching of schools, colleges, and universities; transactions in conferences, seminars, and workshops; publications of many kinds; information and abstracting services; on-farm testing, demonstrations, field days; extension services; mass media; and more.

Links Among Components

These five components are linked in many formal and especially informal ways to form networks in which knowledge flows in all directions. These networks put scientists, for example, in touch with traditional knowledge and ideas of the people themselves; the scientists can use such knowledge when they formulate and test new ideas. These interactions encourage people throughout the system to identify problems and express them to those who are best placed to search for solutions. The links assure that the end users of new knowledge help to produce it and to feed back their results and effects to those who are trying to create or find new knowledge.

Other Conditions Are Necessary

While they regard knowledge as a necessary component of change, those who know agricultural development emphasize that it is not in itself a sufficient cause for change. A number of other conditions must be satisfactory. These include: sufficient volume of effective demand -- enough consumers who will buy the products; transport, storage, markets, processing, wholesaling, and retailing services -- to deliver output to consumers and users; affordable resources for production, such as land, labor, and power, plus inputs of seeds, water, fertilizer, chemicals, equipment, and credit; and government policies that let users take advantage of new technologies.

IARCs Fit in the System

International research centers are part of the international agricultural knowledge system. They relate primarily to national knowledge systems in many ways. In the minds of their scientific staff and in their libraries, the IARCs have a grasp of the main stock of knowledge on the commodities of their individual mandates -- the first component.

produced little benefit in developing countries: biological and socioeconomic environments there differed markedly from those in which the technologies had been developed.

Emphasis on Research

By the early 1970s, a research-oriented strategy had emerged, based to a large extent on a model developed in the 1940s and 1950s in a collaboration of the Rockefeller Foundation, of the United States, with the Government of Mexico. That collaboration (which is described briefly in the article, *Evolution of International Agricultural Research Centers of the CGIAR*, page 8) resulted in Mexico shifting from wheat importer to exporter. Mexico also gained from work on maize, but results with that crop were less spectacular than with wheat.

The research-oriented strategy for food crops was fairly simple in concept: identify the several crops and livestock that play the key roles in meeting food needs of fast-growing populations -- and which give farmers, especially the small and economically poor farmers, a chance to improve the family's lot in life; bring together a critical mass of agricultural scientists who can seek out the constraints to improved production and who can devise ways to overcome the constraints; then provide ample funds and facilities to speed them in their work.

As they develop new elements of technology and test them in different situations, they add to the stock of knowledge on their crop or system -- component two and, to a limited extent, component three.

Except through direct cooperative projects with individual countries, the IARC cannot do much in the fourth component, where knowledge is applied to local conditions.

The centers are active in the dissemination component, transmitting knowledge to the systems that serve users in other countries. But not all the nations they try to reach have an agricultural knowledge system that functions effectively. Centers see training as one of the most powerful means of helping nations improve their knowledge system.

Knowledge at the National Level

Few countries can simply import and apply new technology -- farmers and others in scattered parts of the world can give ample testimony to that fact of life.

Technology must be developed to meet local needs, using local environmental and other resources, and it must be tested for local application. Often that means changing and adapting the technology, such as crossing local cultivars with outside material to get improved lines that will meet local needs. Then there are matters of local economic, cultural, and market systems -- often either the new technology or some aspects of the country's systems may have to change. Not all countries have developed enough capability to make these adaptations effectively on their own. Many countries have not developed widespread and effective dissemination channels to speed the flow of knowledge among the scattered elements in their systems.

The components of these systems can be found in any functioning, developing agriculture. The nature and the balance between the components vary a great deal. Different countries organize them in different ways; some have not done much actually to organize components, leaving the system to develop on its own. And a system will indeed develop on its own, although perhaps not as quickly, broadly, or effectively as when it has a guiding strategy.

In the words of the TAC study team, "In most nations the agricultural knowledge system is not sufficiently articulated to work as effectively as it might. . . usually the components of the system are dispersed among many separate authorities and institutions, so that even if the official research component is well organized, it may be isolated from many of the others.

"Indeed, our first recommendation is that nations should be encouraged to put their agricultural knowledge systems into better order. We feel that the centers have a part to play in this."

Of course, the benefits of this strategy would not be attained unless the researchers, the policy-makers, and the farmers of the developing country became partners with the centers in adapting and applying the technology that emerges.

Focus on Food Crops

The people and institutions who framed these ideas emphasized research on food crops. The first international research center was formed to work on rice, the major cereal crop in the world.

Several reasons justified the focus on food crops. First was simply the threatening shortages of food in many of the tropical and arid environments, where populations were expanding rapidly. Little food crops research had been done in these areas, which had only recently achieved political independence -- some good research had been done in some of the regions in colonial periods, but primarily on the cash crops grown there.

Research was emphasized because the scientific process would begin with seeking to identify and understand the problems; then, by experimentation and application of

IARC scientists could take a world-wide perspective on improving food crop production.

Research centers were placed in regions where problems existed

knowledge from world sources, scientists would devise solutions under the localized situation. The research centers were placed in the regions where the problems existed, where they would work in at least some of the problem environments.

These international centers were conceived as independent and autonomous bodies, with two U.S.A. foundations involved in the early ones. Ford and Rockefeller Foundations collaborated on centers for rice, wheat, and maize, plus two centers created to deal with broader food crop and farming system problems in geographical regions, one in Latin America and one in Africa. Numerous other government and foundation sources of support joined in providing funds for these particular centers, as well as in creating similar institutions in a number of research areas.

Enter the CGIAR

The work of the foundations had shown the potency of the strategy of the international centers; however, they could not alone support a world-wide system for all major crops. Also, a broader international base was needed, a base representing more sponsors and, of particular importance, bringing in participation by the developing countries.

By the early 1970s, the organizational idea of the international agricultural research centers had gained credibility with a wide array of organizations that were supporting agricultural improvement in developing countries. Three groups were part of the United Nations establishment: International Bank for Reconstruction and Development (World Bank), Food and Agriculture Organization (FAO), and the United Nations Development Programme (UNDP). The United States Agency for International Development (USAID), the United Kingdom's Overseas Development Administration (ODA), and other government donors to international agricultural development had added their backing to some of these early institutions.

Donor consortium was formed to help integrate the work

Though each donor chose individually to support the centers of its interest, a donor consortium was formed in 1971 to help integrate work that had become widely spread in the world. This consortium took as its name, the Consultative Group on International Agricultural Research (CGIAR), the first and most crucial among its objectives being: "to examine the needs of developing countries for special effort in agricultural research at the international and regional levels in critical subject sectors unlikely otherwise to be adequately covered by existing research facilities, and to consider how these needs could be met."

Main text resumes on page 10

Evolution of International Agricultural Research Centers of the CGIAR

Scientific thought and findings cross most national borders with little difficulty. Thus, the history of many fields of scientific advance is the account of one scientist building on the ideas of others in widely scattered places. That has been true for agriculture, as for many other fields.

Typically, the intellectual traffic has flowed over scientist-to-scientist routes, often helped along by societies of specialized professions and professionals. Deliberate efforts to strengthen agriculture of one place by "export" of genetic materials, knowledge, and scientist expertise from other places is a fairly recent phenomenon. It is the way of the CGIAR centers.

An Innovative Model: In Mexico

Impressive effects came when a model of one part of a national agricultural knowledge system was created in Mexico. It came from a collaboration of the philanthropic Rockefeller Foundation, of New York City, U.S.A, with the Government of Mexico. They focused on wheat production to help Mexico, which was then importing wheat to feed a population expanding by about a million a year. (Maize was involved in the work along with wheat; although international impact was less dramatic, it led to progress in Mexico and some other countries.)

Starting in 1942-43, a small cadre of scientists in plant breeding, plant protection, and agronomy took up stations in Mexico. Drawing on world wheat germplasm sources and scientific knowledge, they set to work to develop lines of wheat adapted to Mexican conditions. They brought in short, stiff-strawed oriental strains, crossing them with North American (including Mexican) lines to develop cultivars that produced high yields when irrigated and fertilized under the conditions found in some large areas of Mexico.

In parallel, the project leaders began to build up scientific resources within Mexico: they trained technicians to support the work of the scientists; they helped to strengthen the nation's agricultural colleges; they sought out promising young talents for further studies, providing scholarships for these people to pursue advanced studies abroad (many joined the wheat improvement work when they came back from overseas studies).

The international group of scientists and developers also counseled with political and administrative leaders in the country about the systems and policies that would help the nation secure the gains possible from harnessing science for wheat production.

Model Tested in Other Places

The Rockefeller Foundation set up similar collaboration for wheat and maize improvement with other nations in Latin America and, later, in Asia. Senior scientists from the program contributed informally to these unilateral national activities. (The stunning success of this persistent effort was told widely when Dr. Norman Borlaug -- one of the original team of wheat scientists -- was chosen for the Nobel Prize.)

The Ford Foundation (U.S.A.), another strong supporter of and donor to agricultural development, was active at the same time in helping developing countries strengthen their institutions and their human resources for scientific agriculture.

At the dawning of the 1960s, the two foundations came together to create a new kind of institution to help developing countries stimulate food production. This collaboration was aimed to do for rice -- the cereal that provides the principal dietary staple for more than half the world's people -- what had been done for wheat in Mexico, India, and several other cooperating countries.

International Rice Research Institute: IRRI

This institution was conceptualized as an international body, one that would concentrate genetic resources and knowledge resources in a search for breakthrough technologies for rice -- technologies that, it was hoped, could be applied widely in rice-producing areas of Asia and the world. Called the International Rice Research Institute, it was established in cooperation with the Government of the Philippines at Los Banos, Philippines in 1960. It soon became known by its acronym, IRRI.

IRRI was amply funded to undertake its international mission. It recruited an international staff of scientists to cover all the specializations in breeding, growing, protecting, and handling rice -- plus scientists to deal with economic, social, and cultural factors that go along with agriculture, food, and farmers.

The breeding strategy that had worked for wheat was soon found to work for rice as well. The strategy was to cross dwarf and local lines and select among the progeny for ability to withstand insect and disease attacks and for responsiveness to intensive fertilization and irrigation. Results were such that some journalists called them "miracle" rices. The new varieties and technologies were made widely available. Within two years, IRRI started a training program that would respond to the needs countries encountered as they used the new rices to their advantage. This meant that countries had opportunity to strengthen their human resources for rice research along with access to the technology coming from center and national cooperation.

Centro Internacional de Mejoramiento de Maiz y Trigo: CIMMYT

With cooperation of the Mexican government, a center was established in that country in 1966 with mandates to work for improvement of wheat and maize worldwide. It was called by its Spanish acronym, CIMMYT (in English the name is the International Center for Im-

provement of Maize and Wheat). Descended from Rockefeller Foundation work with Mexico in the 1940s, 1950s, and 1960s, this center was given world responsibility to work on the two cereals ranked most important after rice in world consumption.

Two institutes of tropical agriculture were organized in 1967, one in Colombia and one in Nigeria. While both used the crop improvement approach that was gaining success in rice and wheat, the center in Colombia was oriented mainly to serve a geographical region and that in Nigeria to address the needs of a broad agroecological zone.

Centro Internacional de Agricultura Tropical: CIAT

The Centro Internacional de Agricultura Topical (CIAT) eventually concentrated on *Phaseolus* beans, cassava, rice, tropical pastures under Latin American conditions, and technology for the seed industry. Located at Cali, Colombia, this International Center of Tropical Agriculture (its English name) was descended in part from Rockefeller Foundation work in that country since the 1950s.

International Institute of Tropical Agriculture: IITA

Also in 1967, the International Institute of Tropical Agriculture (IITA) was established at Ibadan, Nigeria. Its purpose was defined ecologically: to develop systems of farming and land use to replace shifting cultivation in the lowland humid tropics. Its scientific work was organized around four programs -- some confined to Subsaharan Africa: cereals (rice and maize), grain legumes (cowpeas and soybeans), roots and tubers (cassava, yam, cocoyam, and sweet potatoes), and farming systems.

Two other international centers began in 1971. These were organized along commodity lines.

West Africa Rice Development Association: WARDA

Sixteen West African nations in 1971 established the West Africa Rice Development Association (WARDA), with headquarters in Monrovia, Liberia. The purpose was to increase rice production through research and development activities with the member nations. The research part of its work was supported as an IARC under CGIAR.

Centro Internacional de la Papa: CIP

This center (its name in English is the International Potato Center) began to function in Peru in 1971 with a mandate to work world-wide to develop technology that would make potatoes available at low cost in most developing countries. The center evolved from earlier work carried out in Latin America by North Carolina State University (U.S.A.).

International Laboratory for Research on Animal Diseases: ILRAD

The first IARC with a mandate on livestock began work in Nairobi, Kenya in 1972. This International Laboratory for Research on Animal Diseases (ILRAD) has initially given particular attention to Trypanosomiasis and East Coast Fever, two diseases that limit production in vast areas of the African continent.

International Crops Research Institute for the Semi-Arid Tropics: ICRISAT

ICRISAT was established by CGIAR at Hyderabad in India in 1972, with responsibility to work on improved systems of farming under semi-arid tropics conditions. A major part of its mandate was improvement of three grain legumes -- chickpea, pigeonpea, and groundnut -- and two cereals -- sorghum and millet -- when grown in such an environment.

International Board for Plant Genetic Resources: IBPGR

An IARC with a unique mission was created in 1974. The International Board for Plant Genetic Resources (IBPGR) was given the task of stimulating action at national, regional, and international institutions to collect, conserve, evaluate, and document the genetic resources of the world's economic plants and to make those resources available for use in plant breeding and scholarly studies. It was provided headquarters at FAO in Rome.

International Livestock Centre for Africa: ILCA

In 1975, at Addis Ababa, Ethiopia, the International Livestock Centre for Africa (ILCA) was established. Its attention was focused on productivity of systems including livestock (particularly cattle but including small ruminants), animal nutrition, and agronomy of improvement in pasture lands. Its responsibility was confined to Subsaharan Africa.

International Center for Agricultural Research in the Dry Areas: ICARDA

The group's last center with a direct food productivity mandate was established in 1977: The International Center for Agricultural Research in the Dry Areas. With origins of its work in the Arid Lands Agricultural Development program of the Ford Foundation, ICARDA has its headquarters in Aleppo, Syria. Its agroecological terms of reference related it to improving systems of rainfed production in areas with seasonally arid winter rainfall climate. It was given improvement responsibility for durum wheat, barley, faba beans, and lentils, and it shares responsibility with ICRISAT for chickpea. It also works on farming systems for the dry lands.

Two IARCs in the CGIAR system were created to fill specialized roles, based on needs encountered in the work of the other centers.

International Food Policy Research Institute: IFPRI

The International Food Policy Research Institute, based in Washington, D.C., U.S.A., is concerned with the economic and social effects of advanced technical methods on food supplies and nutrition; also with the consequences on food of global and national policies and actions. The institute began work in 1975 and was brought into the Consultative Group system in 1979.

International Service for National Agricultural Research: ISNAR

The International Service for National Agricultural Research (ISNAR) was established in 1980 to help developing countries strengthen their own agricultural research systems through improved organization and management. ISNAR's headquarters is in The Hague, Netherlands.

How CGIAR Operates

Three organizations of the United Nations system that had long been involved in agricultural development served as organizing sponsors of the consortium: *International Bank for Reconstruction and Development* (World Bank), *Food and Agriculture Organization* (FAO), and *United Nations Development Programme* (UNDP).

CGIAR was based on informal principles, and continues to function without constitution or formal procedural documents. It acts on consensus.

Two small units support the activities of the CGIAR.

One is the **Technical Advisory Committee**(TAC), which includes 13 agricultural scientists of world reputation and experience -- one member serves as chairman. The committee is, as its name portrays, advisory to the CGIAR on the many technical and budgetary aspects of center activities and current and projected programs. A secretariat of four professionals plus support staff serves the committee from offices provided by FAO in Rome.

The group itself is served by the **CGIAR Secretariat** of 10 professional officers and support staff, working from headquarters provided by the World Bank in Washington, D.C.

Centers supported by the group now devote their efforts, primarily through agricultural research with related activities and training, to help developing countries in four areas:

1. to increase the productivity of the country's food commodity production system;
2. to achieve long-term stability in food production (through conservation, enhancement, and better management of a nation's natural resource base);
3. to increase country leaders' awareness of the importance of the policy environment for effective agricultural research and application of the results;
4. to strengthen the nation's agricultural research capacities.

Main Outputs of the Centers

Three main outputs began to emerge from those centers concerned with research on food crops: improved germplasm of more productive plants; improved technologies and practices of growing, harvesting, and handling the output; and trained people.

However, improved cultivars and technologies that could mean a Green Revolution in higher crop output in one area didn't necessarily produce as well in all areas. To exploit for itself the advances developed at an IARC,

a nation needed scientific capacity of its own. It needed to be able to test the genetic materials and production practices under its own unique and varied conditions. It needed to evaluate critically the problems and the opportunities offered by its own fixed or slow-to-change natural, human, social, economic, and cultural realities. It needed people able both to identify limitations and to find ways to overcome them.

Few Countries Had Agricultural Scientists or Training Institutions

In the face of these needs, with few exceptions, countries with frightening food-to-population ratios lacked agricultural scientists and also lacked institutions to educate and train their own.

One objective: to develop and educate promising young scientists

One objective stated in the original charge of IRRI, first of the international agricultural research centers, was to "develop and educate promising young scientists . . . through resident training programs under well-trained and distinguished scientists."

Training with Practical Emphasis

At the time the IARCs were started, and still today to a great extent, typical agricultural training available was strong on theoretical concepts but weak on practical applications. That has been true of many developed-world opportunities, and equally or more in training institutions in less-developed nations (LDC).

IARCs stress practical skills in training researchers and technical specialists who support research work.

Participants in IARC training work daily with their crop in the field -- some for the first time ever.

A university graduate might know how to use complex statistics to compare yields of maize, but be unable to plant and manage the maize crop in the field. From earliest days, IARC training emphasized the practical, field-oriented skills essential in agricultural research.

The Record of Training by IARCs

The word "training" covers a wide territory when used to describe that activity in the international centers of the CGIAR. Training can be as limited as one or two weeks in a course on specific techniques sponsored by an IARC. It can be as long and intensive as overseas university education to earn M.Sc. and Ph.D. degrees. It includes visiting scientists (qualified career scientists) who spend weeks to months to become conversant with specific procedures or to work with center scientists on particular problems. It also includes young persons who have just obtained university advanced qualifications and spend one to two years in postdoctoral positions at centers. It includes students from developing countries who do their thesis research under an IARC scientist's supervision. It also includes some without higher academic qualifications who learn technical skills involved in crop or livestock improvement and management.

The number of centers and the variety of training experiences make for a complex summary picture of training in the IARCs. The data can be assembled and examined in several different ways.

Training Has Reached 117 Countries

First, the overall summary. Figs. 1, 2, 3, and 4 show the geographical spread of IARC training to the developing countries, with numbers of participants from each of four regions of the world. These figures were prepared from numerical records of (1) country of origin of participants in training at (2) each of 13 IARCs by (3) the type of training -- that is, postdoctoral, degree-related, visiting scientist, and group course participants. The numerical matrix by countries for the world can be found in table form in the *Statistical Annex (page 93 ff)*.

Fig. 1. Numbers of participations in CGIAR center training per Subsaharan Africa nation, through 1984.

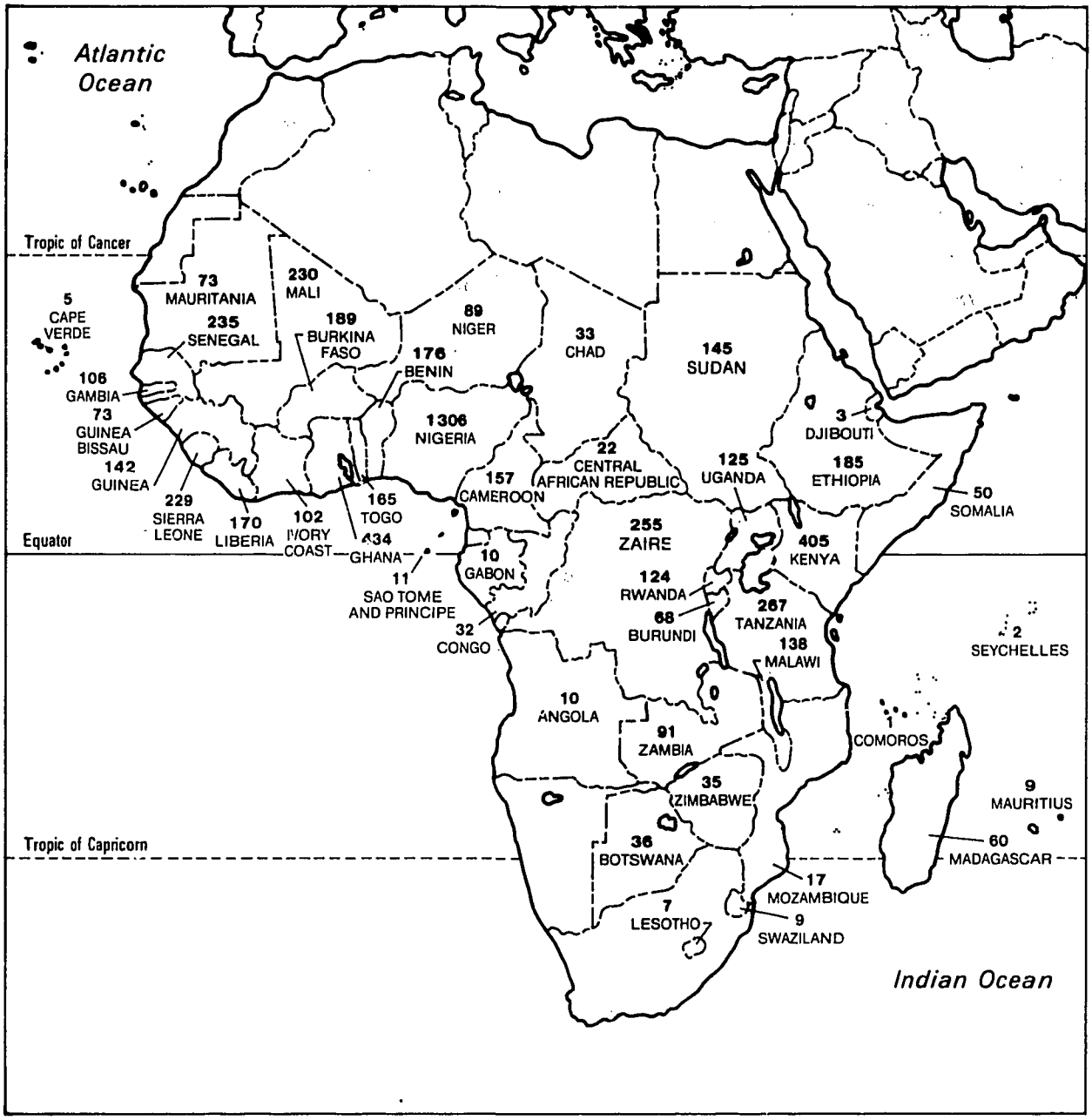


Fig. 2. Numbers of participations in CGIAR center training per Latin American and Caribbean nation, through 1984.

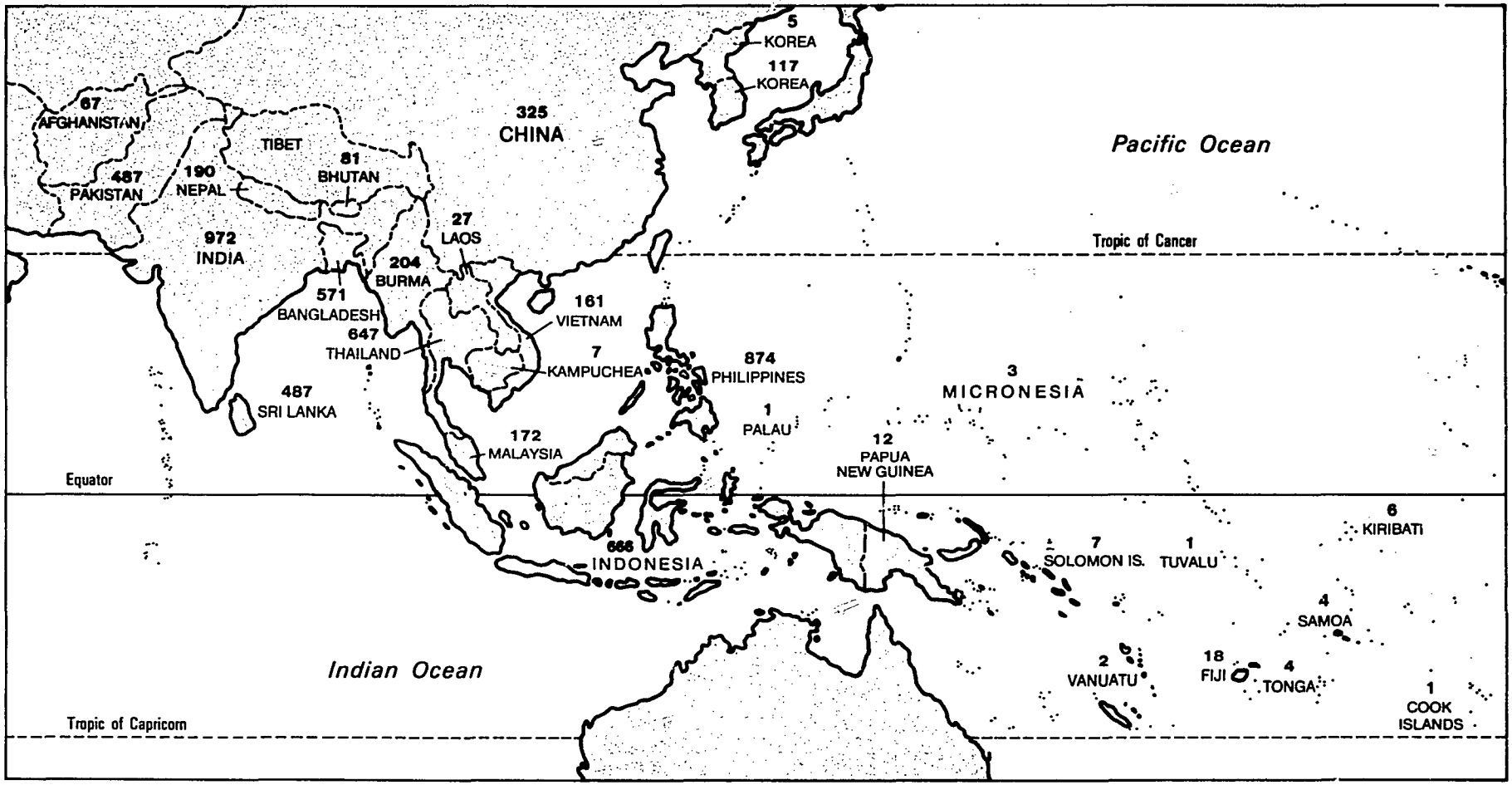


Fig. 3. Numbers of participations in CGIAR center training per Asian and Pacific nation, through 1984.

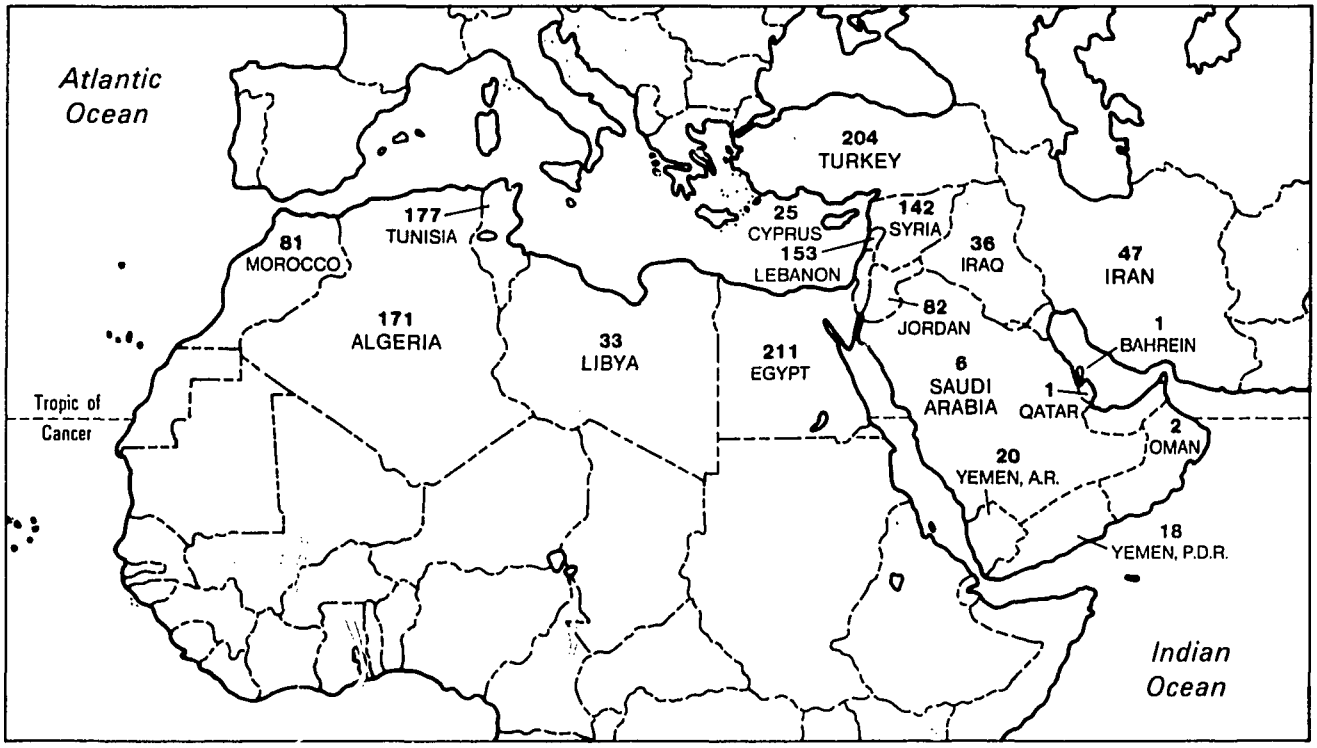


Fig. 4. Numbers of participations in CGIAR center training per Near Eastern and North African nation, through 1984.

The Kinds of Training

With 13 CGIAR centers and 117 participating countries, programs that resulted are predictably varied. Different kinds of training have been created to meet national needs; and sites for training have varied. Following are the broad and general categories in which IARCs have offered training:

Degree-related training mainly takes place at a college or university -- sometimes with practical training and thesis research carried out at or in collaboration with the sponsoring research center. As IARCs worked in early years to help countries build cadres to cooperate with center research, some sponsored participants for studies in agricultural universities in the industrial societies, where they completed all requirements. Although centers sponsor few today, many participants still go abroad with aid from other sources; increasingly, however, they go to institutions in other developing countries. (As one example, IRRI has sponsored 559 for M.Sc. or Ph.D. studies; 419 attended a university in a developing country.) Centers cooperate with many now at the student's thesis research stage. More than 2,000 degree-related participants have been associated with these IARCs.

Postdoctoral appointments bring to the IARC men and women who have recently completed the Ph.D.

A postdoctoral fellow from India prepares root samples for measurement in IRRI's root length scanner.

degree. For a period of one or two years usually, these participants work within the center's research program. They gain experience alongside senior scientists and contribute their own expertise to the center's program. Some subsequently join the IARC research staff; some renew relationships as visiting scientists. More than 600 persons have held postdoctoral appointments at IARCs.

Visiting scientist appointments, which may range from a few weeks to several months, accommodate a variety of arrangements that benefit both the visitor and the host IARC. Collaborative research activities may be either the reason for a visit or a result of such a training experience. Although a precise number for visiting scientists is elusive, the total for all centers would exceed 2,700.

Special courses cover as wide a range as the research interests of the 13 centers, plus special topics that emerge as centers and national programs adapt and apply the research outputs. Popular courses over the years have been those focused on application of research to production of the mandate commodities plus a broad range of related topics that support the main thrust of research. The total number of such courses offered each year among all the centers number 100 or more. Well over 14,000 participants have undertaken courses at these IARCs.

Training at Headquarters and In Countries

Early in the work of IARCs, most training was conducted at headquarters and on centers' experimental farms in the host country. This is still true today for most training categories, but a growing trend is for appropriate courses to be taken to the developing countries in national and regional events.

Growing trend for courses to be taken to developing countries

The Costs of Training

Training national staffs for their tasks in agricultural research and development is a costly business. Since the CGIAR centers began offering formalized training more than 20 years ago, contributions from their own core budgets have totaled about US$90 million (without adjustment for inflation rates). And that is only one element of the cost picture.

In addition to expenditures from their training budget, the centers devote teaching and advisory resources from scientists and support staff that would add up to about twice as much as that from core budget.

Donors put much financial support behind training through special projects sponsored in the centers and also through their direct program relations with individual countries. Some nations pay from their own resources for IARC training for some personnel.

Donors support training by centers through special projects

Of course, there is another massive "cost": the time participants spend away from their usual jobs in countries where there are great scarcities of persons with the level of ability necessary to undertake IARC training!

If all the costs were found and summed (an impossible task), the total would certainly run into several hundreds of millions of dollars. And as the demand for IARC training increases each year, needs for financial support grow apace.

What About Results?

This introduction has set out a background of the origin and activities of 13 international agricultural research centers, with emphasis on their work in training. It has identified the major kinds of training made available, indicated numbers of participants over the last 22 years, and mentioned overall costs.

Only general statements were made about results and outcomes of all this training. Those crucial subjects come next in the findings from the study of training effects, along with some detail on the individual training programs of the 13 centers.

2. Effects of Training

The approach to training by the international agricultural research centers of the CGIAR evolved from the philosophical base of the Rockefeller Foundations' program of education for development through research. The cooperative work of the foundation and the Government of Mexico had shown that research alone was not enough: it was essential to improve national capacity through training.

Development of human resources in agricultural research has thus accompanied development of genetic materials and technologies. And many of the CGIAR centers' resources have gone to support training; annual budgets for training have totaled US$90 million in a little more than 20 years (in dollars expended, not adjusted to reflect changes in value of the dollar).

Results of center investment to improve germplasm and technology of a given crop can be measured in the research plots and on farmers' fields. Effects on human resources are not as easy to estimate.

Team talked to 669 IARC training participants

Still, there are observation points and criteria to apply in evaluation. That was the province of the experienced agricultural scientist-educators who led this study of effects of IARC training programs.

The People Who Participated

One relevant measure of impact remains in the people who took part in such training. The study team concentrated much of its effort on exploring the effect of training on the participants. They talked personally to 669 persons who had themselves been or were then involved in IARC training. The participants thus had opportunity to speak for themselves.

The team got reflected evaluations by others. They interviewed about 400 officials in 18 country visits; many of those officials had supervised participants after their return from IARC training. And the team also got views from about 230 staff members at the IARCs' headquarters or regional offices, professional who have worked directly with the training participants.

The studies in six countries, carried out by senior national officers, also included surveys of participant reactions.

"A person comes back as a changed person"

Effects on Participants

The effects of training at CGIAR international centers on most participants are profound. The participants themselves spoke of advances in their own knowledge and technical skills. They spoke also -- with what team members described as almost religious conviction -- of a heightened dedication to both intellectual and physical work, motivation, determination, purpose, and confidence.

"A person comes back from IARC training as a changed person," many participants said of themselves. And this was said about many former trainees by persons who had seen them at their subsequent work.

Observations that bear on this matter of effect of the IARC training on individuals can be drawn from various other sources.

Individuals Declare Value of Training

The six national collaborators asked former participants for their reactions to their own training at IARCs. High proportions of them had strongly positive reactions. Almost all (97%) of the Senegalese respondents, as one example, said their training experience at IARCs had improved their knowledge and strengthened their scientific ability.

In a 1983 survey of CIMMYT participants in wheat, maize, and economics training, large majorities gave favorable evaluations of their training experiences: More than three out of four rated their training as "very useful" within their national programs after returning -- only 1% found it "not very useful"; 78% agreed with CIMMYT's balance between field and classroom -- which strongly emphasized field work; almost nine out of ten considered the level of training to be "about right"; and when asked how much of the CIMMYT training they were still able to make use of, 47% said "most," 34% said "moderate amount," 15% said "little," and 2% said "none". The time between the training they were rating and the time of rating, 1983, was many years for some.

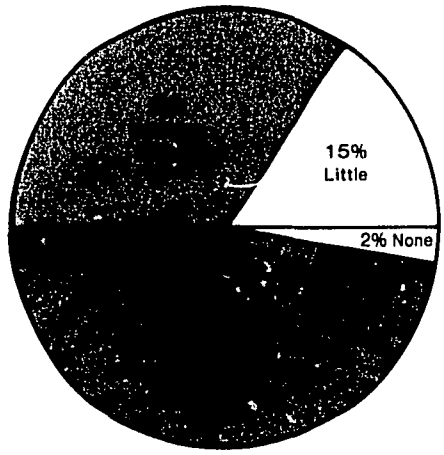


Fig. 5. Amount of CIMMYT training still useful to participant since his or her training.

Positive consequence: credibility gained among colleagues

Dr. E. Bortei-Doku, then a professor at the University of Ghana, surveyed IITA training participants in 1977. He reported "largely positive" responses from that group at that time.

In one of the most extensive evaluations carried out by any center, CIAT contacted a large sample of former participants. The leader of the study, Dr. Jairo A. Cano Gallego, made this statement: "By far the most positive consequences of CIAT training were reported to be the credibility the participants gained among their colleagues, and a greater appreciation for their work on the part of the institutions they have worked for after training."

Influence on Later Career

IARC training can't be given full credit for all that its participants do in their later careers. But it can be cited as one powerful influence among many.

A case in point came from a 1981 survey by IRRI of its many participants over nearly 20 years: Twenty-seven of its "alumni" had gone on to become directors of rice institutes in their home countries; 98 had received national recognition awards from their governments.

Many officers now in posts of leadership in agricultural research and development have IARC training in their backgrounds. The study team found that most of the in-service training supervisors in the countries visited in Africa had participated in training at IITA. And most of the staffs in potato improvement programs in Latin America were found to have participated in CIP programs. Many key professionals in the growing seed industry throughout Latin America had been prepared, at least in part, by their training at CIAT.

And to cite just three more examples: Most of the professionals working to improve cassava in Zaire, rice in Sierra Leone, and cowpeas in Burkino Faso had included IARC training in their backgrounds.

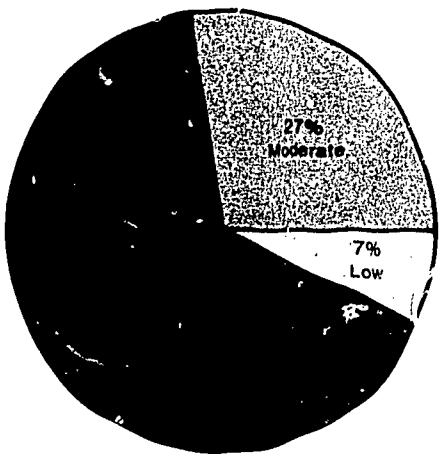


Fig. 6. Degree of subsequent utilization of training reported by CIAT participants.

Positive Ratings by Supervisors

Supervisors in national programs see the performance of IARC trainees when the latter return. Thus they qualify as a relevant group to comment on the effects of IARC training. Many persons among the 400 national officers interviewed by the study team were in such supervisory positions. They expressed consistently positive appraisals of most of the participants who were under their supervision.

On-the-job Performance Better

Many went on to say that on-the-job performance by IARC participants was notably better than that of staff in

similar posts who had taken part in other programs intended to impart similar training.

A recent evaluative survey by IRRI obtained reactions of 149 persons in national supervisory positions over former IRRI participants. They rated the participants who had been through training at IRRI as "more responsible, committed, competent, and technically knowledgeable."

Participants rated more responsible, committed, competent, and technically knowledgeable

Each of the leaders of the six country studies was in a position to make statements about the effects of IARC training. Each had direct personal knowledge of the work of some participants, and each examined and summarized data gathered from many participants in his country. Here are some of their comments:

Country Comment: Senegal

Dr. Moctar Toure highlighted effects of IARC training on Senegalese participants, saying, "They improved their scientific and practical knowledge, they assumed greater technical responsibility at home; motivation of research workers increased greatly and relations with farmers improved; they cooperated more among themselves."

"Training lifted general professional spirit"

The training "lifted general professional spirit," he added.

Country Comment: Kenya

Stachys N. Muturi reported similar observations about Kenyan participants: "Returned trainees are highly motivated and confident and work with little supervision, especially those who attended longer courses".

Participant and social scientist learn from farmers as part of a CIP training program.

Participants trained at IARCs (IITA in this case) are known for their ability to carry out field practices.

Country Comment: Tunisia

Tunisian collaborator Mustapha Lasram pointed out benefits in his country of the exchanges of information at the centers, with participants becoming aware of the work in other countries and establishing working relationships across international lines. The training had considerable impact on specialization of staff, he said.

Country Comment: Bangladesh

Dr. Kazi M. Badruddoza commented on the comparison of participants in IARC training and those who had taken training at other outside sites. He found the IARC alumni more field oriented and especially more able to handle technical production problems.

Other national study collaborators independently offered similar comments on comparison of training at IARCs and other sites:

Dr. Toure, Senegal, said, "The quality of relations and support from IARCs is superior to that of any other training institutions."

Pablo E. Larrea, Ecuador collaborator, also called IARCs "the best source of training for professionals in their fields of interest."

Tunisia's Lasram noted the stability offered by IARCs: "Hardly any cooperating agencies are as good as IARCs in follow-up and evaluation of the trainees," he said.

IARC alumni more field-oriented, able to handle technical production problems

Effects in National Programs

The ultimate test of IARC training, of course, is whether it helps a country make gains in food productivity from an improved capacity in agricultural research and development. Objective tests for that proposition are virtually impossible, because the variables are many and the time requirement long. Subjective tests call for a great deal of knowledge over time and intimate understanding of many elements of the country's knowledge system as well as its production system.

Collaborators in the case studies cited progress in production of commodities under CGIAR mandates, recognizing that no one could claim a direct cause-effect tie to IARC training. Several commented on their data; several suggested some effects by former IARC trainees, though none attempted a precise measure of that effect.

Bangladesh

The Bangladesh story of improvement in rice and wheat production has been reported widely -- and referred to above. The contrast is evident in these yield figures for rice and wheat: The yield of rice in 1971 was 1.681 t/ha; by 1981, the average yield had increased to 1.967 t/ha. Wheat yields climbed even faster, from 0.854 t/ha in 1971 to 1.871 in 1983.

Regarding the wheat (in which total output jumped from less than 60,000 tonnes in 1971 to 1.4 million in 1983), Dr. Badruddoza gave much credit to a few dedicated scientists trained at CIMMYT. Key factors in the rice story, he declared, were the number of scientists trained at IRRI and his country's continuing collaboration with the center.

Senegal

Senegal's national collaborator portrayed his country's agricultural production situation as stagnant or very modest in growth. Dr. Toure pointed out that various climatic and structural constraints have limited impact of IARC technologies. Although rice is a relatively minor crop there, acceptance of improved rice varieties has been reflected in a doubling of the mean annual yield of rice -- from 1 to 2 t/ha in the years between 1963 and 1983. But strong efforts in research and development, involving officers with IARC training, have not achieved similar advances in other cereals and grain legumes. Nor in meat and milk production, he added.

Ecuador

Ecuador has seen yields increase in the 20 years after 1964 for the crops in which IARCs have cooperated.

Pablo E. Larrea, the collaborator for the study, gave considerable credit to IARCs as responsible for creating and helping develop scientific capabilities in Ecuador's present research organization, INIAP. Advances he reported have occurred in programs under INIAP.

Yields of selected crops in Ecuador between 1964 and 1983.

	Yield in (t/ha)		
Crop	1964	1975	1983
Rice	0.8	1.7	2.9
Barley	0.5	0.8	1.0
Wheat	0.9	0.9	1.0
Hard maize	0.9	1.2	1.3
Soft maize	0.4	0.8	0.9
Beans	0.5	0.4	0.6
Potatoes	8.2	12.6	13.3

Kenya

Stachys N. Muturi, collaborator for the study in Kenya, provided estimated annual rates of growth in his country for food crops in which Kenyans participated in IARC training courses: All have shown increases, averaging annually: maize 4%, wheat 2.2%, rice 8.4%, sorghum and millet 2%, potatoes 5%, pulses 5%, and root crops 2 %.

"Significant proportion of increase . . . in rice yield attributable to IRRI training"

Sri Lanka

IARC training participants have had a hand in some of the major advances in food production in Sri Lanka, reported Stanley Wijayagoonewardene, national collaborator for this study.

He cited specifically the gain in rice yields, the most important food crop. Yields went from 2.63 t/ha in 1970 to 3.65 t/ha in 1983. "A significant proportion of that increase in rice output is attributable to IRRI training," he said.

Wijayagoonewardene also declared that IARC training had been reflected in improvements in potatoes, especially storage of seed tubers; in use of new varieties of maize, soybeans, and cowpeas; and in cropping systems.

Tunisia

Mustapha Lasram, national study collaborator for Tunisia, found it difficult to estimate a level of contribution of IARC training in his country. However, he noted that crops under IARC mandates, such as cereals and potatoes, "have shown important improvements in yield during the last 10 years. This is the result of new policies as well as of technical measures."

Big Impact by Few Persons

Dr. Ronald Knight, of the University of Adelaide's Waite Agricultural Research Institute, served as one of two consultants who backed up work by the national officials in the six country studies. Based on joint review of the six studies -- with the second consultant, Dr. Manuel Pina -- Knight made this overall statement:

"The training provided by the IARCs is highly regarded by those whose opinions were canvassed in the preparation of the country studies. About 1,700 people from the six countries have attended IARC courses -- a small proportion of the countries' trained manpower. Despite this, the training is regarded as having had a very great impact."

National officers trained in rice production at CIAT have made a difference in their home nations.

Why Are Effects So Positive?

The weight of the evidence on training effects was strongly positive. The international agricultural research centers seem to have been doing some things right in their training programs.

One of the most general reasons showing through has been that much of the experience was practical, particularly in production and breeding courses.

Many participants echoed the ideas said in these words by one: "To work with a crop in the field from sowing to postharvest, or to learn a specialized technique in the field or laboratory, turns theoretical knowledge acquired from reading and listening into practical confidence and understanding."

"To work with a crop in the field . . . turns theoretical knowledge . . . into practical confidence"

There appeared to the study team to be a host of factors that make for the kind of positive experience that most participants found in their IARC training:

* The participants experience, often for the first time, travel to another developing country, living and working for a period in a situation that may differ a great deal from what he or she has known.

* The participant has the opportunity for a time to concentrate his or her effort away from the usual pressures of an official service post.

* The international environment provides for exchanges with participants from different backgrounds and disciplines.

* The multidisciplinary and interdisciplinary character of work of the center as a whole is a new and broadening experience for many participants who may have been in narrowly defined working roles.

* Many find it satisfying to work long hours in the field at practical, usually hands-on, tasks alongside their own peers, as well as with senior scientists from the center who hold advanced degrees and often have international reputations -- and who treat them as colleagues rather than as subordinates.

* The participants are exposed to advanced ideas, modern facilities, latest equipment, and uptodate scientific literature and libraries.

* Participants see the origin and flow of research results that succeed in the real world, both on the experiment

stations and on fields of farmers with whom they have contact -- for some this may be the first time they have ever worked directly with a farmer.

* And when the training ends, a warm bond continues with the center and some of its people. Most participants feel related to a successful institution, which confers individual prestige on them. By making the participant feel himself or herself to be a valued part of a worldwide effort, the center counters the tendency to professional isolation, which affects so many agricultural scientists in developing countries. To an extent, many former participants feel that they are now citizens of their professional world.

* Centers make an effort to maintain a flow of current information to the former trainees -- through individual correspondence, newsletters and annual and special reports, through visits by IARC staff, in conferences, return visits to the center for some, and other ways.

When the training ends, the relationship continues

The gathering, preserving, and creative use of genetic resources has been central to IARC crops programs. Through IBPGR, hundreds have been trained so this expertise will be present in most developing countries.

3. A Closer Look at Training

Each of the international centers of the CGIAR is an autonomous organization. It pursues its mandate in terms of certain commodities or systems of farming. Still, its central actions are keyed to individual developing countries, and the needs of the countries guide both the center's research efforts and the nature of training programs it conducts.

Each center cooperates with many countries, each of which may be at a different stage of development with different needs and options. Thus training that is responsive to country needs must cover a wide range.

While each center's training programs have been developed to meet its goals and the needs of its cooperating national systems, common patterns have evolved. Most centers provide training that ranges from technical workshops or seminars, as short as one to two weeks, to graduate-degree programs (often associated with attendance at a nearby university) in which the participant may be engaged for one, two, or more years.

The greatest amount of training falls between those two extremes. It typically involves efforts that build specialized skills.

Some highlight facts about IARC training were presented in the first chapter. This chapter looks more closely at the kinds of training and where training is carried out. Also, it will set out in some detail the training programs of each of the 13 centers.

Many Kinds of IARC Training

With 13 CGIAR centers and many developing countries, resulting programs are predictably varied. The total environment and short history of training by the IARCs can be divided and analyzed along different dimensions. One dimension is the various kinds of training that are made available.

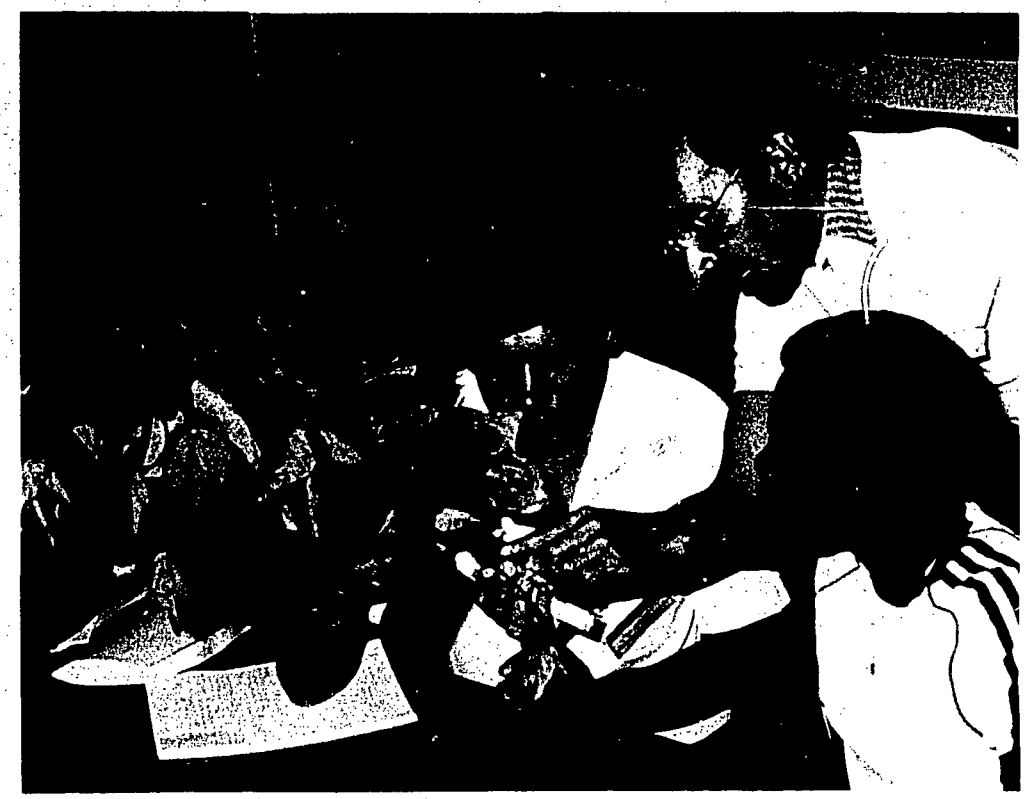
Degree-related Training

Degree-related study mainly takes place at a college or university -- in the IARC's host country, in a nearby developing country, or in an overseas institution. The centers have reported just over 2,000 participants engaged in this type of training between 1962 and 1984.

In the early years of some centers, developing-country people, particularly in an IARC's host country, were sponsored for undergraduate-level training. Centers today directly support few such participants from core budgets.

Trends in this area of training now generally provide support for a limited number who are in graduate studies for higher degree qualifications. Their thesis research may be carried at or in collaboration with an international center on a topic important to agriculture in the degree candidate's country.

IARC training is mainly training for research. Participants learn directly from IARC researchers.



Centers typically located near an agricultural university

The CGIAR centers were typically located near an agricultural university. The founders knew that a university would be important to the center, and they foresaw that the center could be complementary to a developing university.

Several centers have helped directly to build and strengthen educational institutions in their host country and others with special needs in relation to the center's mandate. Examples include: the University of the Philippines at Los Banos (UPLB) -- IRRI was developed on university land, and many of IRRI's top scientists hold appointments on the UPLB faculty and vice versa; the Post Graduate College of Mexico's National School of Agriculture, at Chapingo, has cooperated over the years with nearby CIMMYT to the benefit of both; ICARDA has played a supporting role in helping to enlarge and strengthen the agriculture faculty of the University of Aleppo, in Syria.

Similar relationships have involved IITA and three Nigerian universities; ILRAD and some faculties of the University of Nairobi; ILCA with the University of Addis Ababa; ICRISAT with several Indian universities; CIAT with several Colombian faculties; and CIP with Peru's National University of Agriculture at La Molina.

Many highly reputed agricultural universities in Europe, North America, and Oceania have long records of association with participants sponsored by IARCs. As examples: IRRI records show that scores of research scholars have been assisted towards M.Sc. and Ph.D. degrees at 40 universities in developed countries; participants in IBPGR's M.Sc. programs have so far attended Birmingham University, U.K.; IITA's degree-related training has involved links with 45 universities, 35 of them outside Subsahara Africa; and all of WARDA's sponsored candidates for higher degrees worked for them at universities in Europe.

Training to Develop Research Skills

The most popular training sites over the past two decades are the headquarters and research farm sites of the IARCs. And the largest groups of participants are those who have spent from a few weeks to more than a year in residential programs aimed toward building research skills. The nature of participation has been varried.

Postdoctoral Appointments

Postdoctoral appointment offers a source of creative research for the center and at the same time provides elements of training for the participant. Over the years of operations of the 13 centers, nearly 640 postdoctoral appointments have been reported.

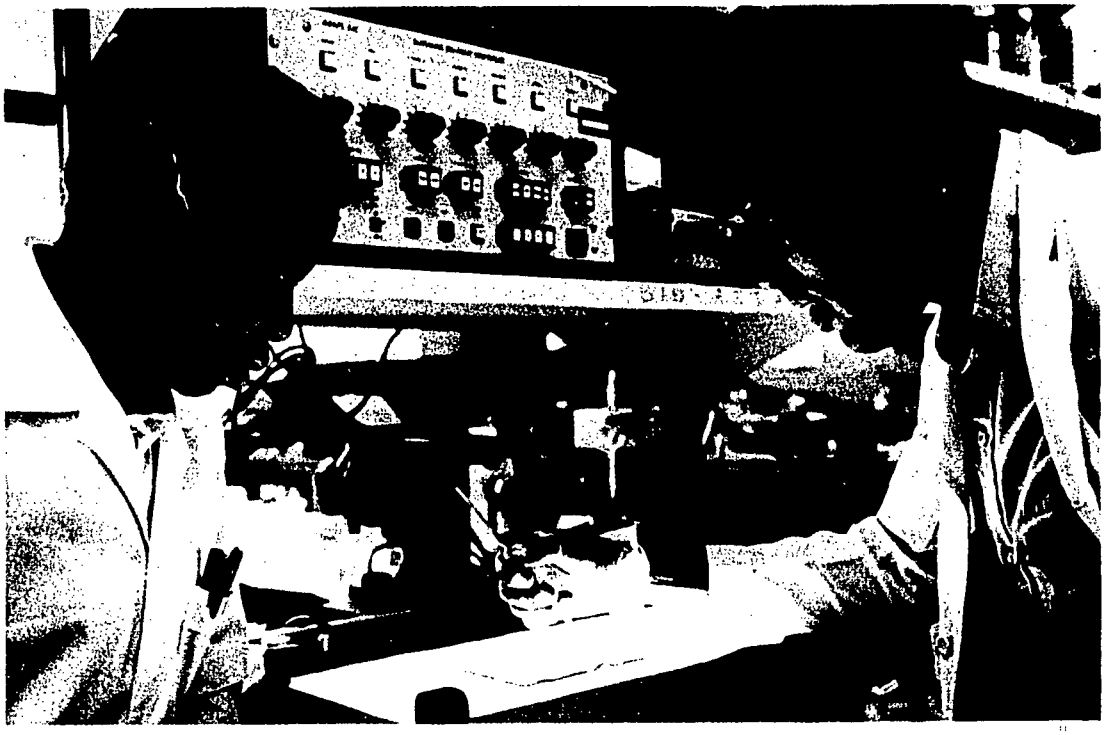
The postdoctoral fellow usually comes on the scene shortly after completing graduate studies -- as a well-qualified scientist, though perhaps not an experienced one. One or two years of work with a center's senior scientists provides for powerful interaction: center scientists embody a wealth of knowledge and experience with the commodity and the constraints faced throughout the world; the postdoctoral scientist comes from fresh exposure to the exciting ideas in current world literature related to the commodity or farming system.

In the early years of CGIAR centers, most postdoctoral participants came from graduate programs in Western universities -- though some nationals of the developing countries had been awarded such appointments. The ratio of developing-country nationals as postdoctoral appointees has increased as Third World institutions have increased the supply of qualified participants.

Visiting Scientists

Most centers have provided grants to enable researchers and scholars from cooperating countries to spend from

A research fellow from Burkina Faso and an ILRAD scientist use advanced methods to study trypanosomes.



weeks to months at center headquarters. Sometimes the visitors have come to study certain specialized research procedures; sometimes they have simply come to get better acquainted with the work and methods in use by the center. Joint research activities may be either a reason for the visit or a tangible outcome. Center staff learn from the visitors, just as the visitors learn from interaction with center scientists. The centers had received a combined total of over 2,800 visiting scientists through 1984.

Group Courses

Nearly 14,000 of the participations in IARC training were in group courses, which may range from a few days to six or more months. A variety of training experiences have been included. The typical array of group courses for commodity centers includes:

Production-oriented Courses

Most centers launched their training programs with a production course based on a full growing cycle of the crop. Such courses stressed the use and value of research

Production and many breeding courses, as in the CIMMYT wheat program, include working with the crop through a full growth cycle.

on the commodity or subject. The usual participant was a young man or woman who had B.Sc. or equivalent qualification; many, however, had never worked in the field with the crop under study.

The production course pattern set with rice at IRRI lasted over a period of about six months. Participants worked through a balanced curriculum of theory and principles in lecture and laboratory -- accounting for about one-third of their time in this pursuit. But the larger share of time was spent in the field.

People who might never before have waded in the mud and water of rice paddies followed their instructors (some of IRRI's most distinguished scientists) into the fields. They related research to the farming methods of IRRI's improved "package of practices" -- hands-on -- from land preparation, fertilization, irrigation, through seeding and transplanting, crop protection, and other practices, and on to harvesting, threshing, and storage of the crop.

Intellectual content combined with hands-on training

Commodity Improvement Course

Participants in the breeding courses also worked with a combination of intellectual and hands-on learning. They practiced the painstaking techniques of crossing, and they spent hours in the fields to make observations and records of performance of thousands of progeny from the crosses. They, too, frequently worked through a full crop cycle to have first-hand experience with the scientist's work in breeding for better germplasm.

Specialized Courses

Especially in their early work, commodity centers focused their efforts towards their primary client, the national agricultural research system in a developing country. Often there was little expertise to be found there in research on the food crops under center mandates. While many countries lacked breeding or production researchers on the food crops, most also lacked the cadre of needed supporting specialties.

IARCs found themselves, of necessity, helping nations strengthen their supporting services. Specialized courses they offered covered a wide spectrum: agronomy, entomology, pathology, engineering, seed technology, postharvest technology, irrigation, farm management, economic analysis, experiment station operations, etc.

The learning approach of principles-plus-practice has spread through most IARC production-oriented courses. The merits of the approach have been cited by large

Many participants have trained for the pathologist's critical role in wheat breeding through the CIMMYT wheat pathology course.

numbers of participants themselves, as well as by the senior officers with whom they returned to work in their home countries.

A Closer Look at Numbers

Training on Research Skills at or by IARCs

To the end of 1984, there had been about 19,450 cases of persons participating in training at IARCs since the first IRRI course was offered in 1962. (That number does not include more than 8,500 in courses offered in developing countries.) National origins of the more than 19,000 were shown graphically in Figs. 1, 2, 3, and 4 in the first chapter, and more detailed information has been tabulated in the Statistical Annex (page 93 ff).

The following two tables offer some further breakdown of this large total figure. Table 1 divides among all the centers, by four regions, 19,450 cases of persons who have taken part in skills development training at IARC headquarters. Table 2 divides the same totals for regions according to the type of training involving these 19,450 participations.

Table 1. Total participations in training and technical skill development activities of CGIAR centers through 1984. (In-country training not included.)

Center	Total	Latin America and Caribbean	Subsahara Africa	Near East and North Africa	Asia and Pacific	Developed Countries
CIAT	2,619	2,396	35	6	90	92
CIMMYT	3,110	1,280	477	490	794	69
CIP	2,500	850	477	395	746	32
IBPGR	879	201	147	109	363	59
ICARDA	444	3	40	326	64	11
ICRISAT	957	52	453	12	395	45
IFPRI	70	6	10	4	50	
IITA	2,938	55	2,606	7	143	127
ILCA	278	1	260	4	1	12
ILRAD	351	10	280	6	19	36
IRRI	3,943	67	128	32	3,612	104
ISNAR	147		147			
WARDA	1,128		1,128			
Total	19,364	4,921	6,188	1,391	6,277	587

Table 2. Total participations in training and technical skill development activities of CGIAR centers through 1984 according to type of training. (In-country training not included.)

Center	Total	Latin America and Caribbean	Subsahara Africa	Near East and North Africa	Asia and Pacific	Developed Countries
Post doctoral	638	43	69	12	273	241
Degree related	2,057	446	410	70	785	346
Visiting scientist	3,072	1,712	548	186	626	
Courses	13,597	2,720	5,161	1,123	4,593	
Total	19,364	4,921	6,188	1,391	6,277	587

Training at Regional or National Sites

Many of the centers have conducted, sponsored, or otherwise assisted in regional or national training on their subjects. These are also part of the big picture of training by these IARCs. Table 3 shows the participations in these training programs, in which IARC participation may vary from full to partial responsibility in funding and running the given course.

The centers have also been involved in many other kinds of programs that have training benefits. These are mostly

Table 3. Participations in training and technical skill development activities in developing countries run or assisted by CGIAR centers in cooperation with national or regional institutions through 1984.

Center	Total	Latin America and Caribbean	Subsahara Africa	Near East and North Africa	Asia and Pacific
CIAT	2,294	2,294			
CIMMYT	2,431	1,443	328	333	327
CIP	1,429	426	356	45	602
IBPGR	*				
ICARDA	210		24	186	
ICRISAT	972	108	369		495
IFPRI	674	57	95	38	484
IITA	382		382		
ILCA					
ILRAD	11		11		
IRRI	118				118
ISNAR	*				
WARDA	*				
Total	8,521	4,328	1,565	602	2,026

*Some participations listed for this center in Table 1 were conducted away from its headquarters: included were all of ISNAR's 147 and IBPGR's 879 (27 of 41 IBPGR courses were held in developing countries); 211 of WARDA's 1,128 attended courses held in member states.

Table 4. Participations in conferences, symposia, seminars, and workshops conducted by CGIAR centers through 1984.

	Conferences and symposia		Seminars and workshops	
Center	Number	Participations	Number	Participations
CIAT	1	220	8	249
CIMMYT	30	3,394	74	1,861
CIP			14	389
IBPGR	3	420	4	161
ICARDA			24	916
ICRISAT	6	730	49	2,624
IFPRI	5	130	2	37
IITA	34	3,266	24	840
ILCA	6	292	27	1,302
ILRAD	1	70		
IRRI	46	4,977	55	2,857
ISNAR	11	585	7	177
WARDA			3	60
Total		14,084		11,473

shorter term events, including conferences, symposia, seminars, and workshops. Table 4 gives a summary of these activities for 13 centers. More than 25,000 participations are represented.

A Closer Look at Costs

Various costs go into training programs such as those in the CGIAR centers. Some costs are obvious, others may be indirect or partly hidden in other activities.

National Costs

One set of costs falls on the national system from which participants come. These costs usually involve at least part of the trainee's salary (for family maintenance, for example) as well as time lost from his or her usual post. (The latter "opportunity costs" -- the value of services lost while the participant is away for training -- can be significant costs to a country that may have few people with the participant's qualifications.)

There are also costs for international travel and the participant's sustenance for a long period. In relatively few cases, however, does the national system have to pay for training from its local revenue funds, since numerous donors support such activity. The country still has costs of raising and administering even grant funds.

Costs to the Center

The center that conducts training bears another set of costs -- from its own core budget as well as from outside sponsors and donors which have an interest in supporting the purposes of IARC training. The center's training unit has high and visible costs for its trainers, facilities, training materials, in-country transport, and more.

CGIAR centers expend a varying percentage (averaging about eight percent) of their core budgets to meet direct costs of training. Here are the records for core-budget funds for training among the centers that were doing training in the years reported. Table 5 gives the total for all IARCs for each year since 1971. Table 6 gives the individual budget allocations to training by each center for the years 1983 and 1984.

More Than the Eight Percent

The average figure of eight percent underestimates the total investment in training by the centers. For one thing, it does not account for the time of many center scientists and support staff, who are funded for other principal work but who play big roles in the training of these participants.

Eight percent underestimates total center investment

Table 5. Total expenditures from CGIAR center core budgets for the years 1971-1984. (Dollar values not adjusted for inflation.)

Budget year	Training budget (US dollars)
1971	764,000
1972	1,025,000
1973	1,708,000
1974	2,300,000
1975	2,806,000
1976	3,317,000
1977	4,325,000
1978	5,613,000
1979	6,587,000
1980	7,504,000
1981	8,755,000
1982	8,155,000
1983	9,896,000
1984	13,840,000
	US $76,595,000

Table 6. Training allocations from core budgets of CGIAR centers in 1983-84. (Dollar values not adjusted for inflation.)

	Thousands of US$ in Core Budget	
Center	1983	1984
IRRI	1,458	2,656
CIMMYT	2,478	3,551
CIAT	1,035	1,582
IITA	480	448
CIP	1,093	1,250
WARDA	129	129
ICRISAT	525	567
IBPGR	645	600
ILCA	338	656
IFPRI	111	323
ILRAD	695	974
ICARDA	319	435
ISNAR	354	439
Totals	US$9,896	US$13,840

Center's top scientists get involved in training

Time of Scientists Adds Quality

Participants credit the shoulder-to-shoulder work with a center's principal scientists as one of the great benefits they gained from their work at a center. This requires a lot of time of scientists, but it can be most important.

Careers of hundreds of young wheat breeders carry the mark of days spent walking plots with the men at CIMMYT who were central in bringing on the Green

Dr. Norman Borlaug stressed field work in wheat improvement courses. He and participants practiced the philosophy day after day.

Revolution in wheat, Dr. Norman Borlaug and the late Dr. Glenn Anderson. Both imbued for life in their co-workers the value of close field "acquaintance" with the growing progeny of their efforts. The young people also came to know the inherent dignity of work in sweating together with these distinguished scientists under the hot spring sun of Mexico's Ciudad Obregon. The same could be said of the influence of scientists in all commodities at all the centers.

Participants value close contact with the center scientists, who do much of the training. The main job of the scientists, however, is research rather than training. Still, training relies much on the ability of the scientists to impart their understanding and techniques. Centers thus have a stake in making the scientists' training as effective as possible -- this means providing supporting materials and perhaps assistance of professional trainers.

Observers have estimated that a center may well devote twice as many core resources to training as are accounted for in its budget figures.

Training with Extra-core Funding

Many other resources go into the training matrix; for some centers the major training resources come from outside those provided for operations through the annual

budget. Centers obtain what they call extra-core funding to allow them to provide certain training that is critical to their cooperative activities with developing countries, but which can't be squeezed out of their own core resources.

Special courses developed to meet special needs

Among many possible examples is a collaboration of CIMMYT with the International Agricultural Centre (IAC), Wageningen, Netherlands.

One set of skills needed by a wheat breeding team relates to diseases: progeny from a breeder's crosses have to be exposed to prevalent diseases so the breeder can assess their resistance or susceptibility. That means deliberately spreading known levels of inoculum over the plots at certain times. That, in turn, requires special skills for collecting spores of the disease, building up and storing a supply of the disease inoculum, then exposing the plants. Training was needed to build these skills in the countries cooperating with CIMMYT in wheat breeding. A Dutch unit had the expertise to train personnel to do such work. After workshops held jointly with CIMMYT in different regions -- each about two weeks in duration -- countries had developed small cadres of technicians with the skill to back up this critical part of the breeding program. Besides providing training, in this case the Dutch government provided funding to sponsor participants to the workshops and to send them home with basic equipment necessary to do their work properly. CIMMYT's core contribution was in its personnel who helped plan and conduct the workshops.

Regional and In-country Training

Training at IARC headquarters has been the most popular in the IARCs first two decades. It carries real benefits, both to participants and to the centers. Many of the positive outcomes of training cited by participants and their supervisors occurred because participants were living and working at a center.

Some constraints apply to training at headquarters

Limitations at Headquarters

Headquarters training has limitations, including relatively high cost for travel and subsistence of participants. There are other constraints that apply to training at headquarters. One is the limited number of participants who can be accepted for each course cycle -- due to limits of funding and the center's capacity to conduct effective training for larger numbers. There are also limits to how many visitors a center can accommodate in living quarters.

So a center will typically invite only a few persons from each country. If a country can send only one, two, or three, per year to a given center, that means a long period to build up a number of people with research-related expertise to gain the needed "critical mass" for a certain crop.

Another constraint that surprises some is that some developing countries have such limited numbers qualified to take courses designed for participants with B.Sc. background. Many developing countries are still in early years of building their own educational system, and of sending large numbers of students to university studies abroad. The result is that relatively few of their people have mastered the subjects on which technical agriculture education is based. Needs for these few people with technical and scientific qualifications rise throughout the country; demand exceeds the supply. Those who go to a long IARC training program -- sometimes up to one year -- are seen to be "lost" to their countries for that time.

National leaders want more training in their country

Desire for In-country Training

As one way to take the sharp edge off cost and time constraints, centers have taken training courses away from their headquarters and host-country sites to the home countries of participants.

The Latin American centers have pioneered in offering training in regional or national courses. Among more than 8,500 reached by such IARC courses, over 6,000 were accounted for by CIAT (2,294), CIMMYT (2,431), and CIP (1,429).

The courses have followed different patterns. Some were offered in-country, with the IARC in the lead -- much as if it simply moved its own course from headquarters to the field. In other instances, the center cooperated with national institutions to organize courses, sharing the teaching role with nationals. This latter pattern has sometimes meant more to the country: in addition to benefits for participants, some institutions gained capacity to offer such training on their own.

In-country training came up in the present study as a strongly stated want by the developing countries. Their wants included eventual development of their own capacity to meet their training needs. The leaders talked of need for IARCs to help in determining what courses to develop, planning curricula, preparing training materials, and training nationals in how to teach the courses -- "train the trainers," some call it.

In-country training in which IARCs had a role has been part of the national scene for a decade and more

among some of the countries. Such training has in some cases helped develop or support national capabilities.

Of course a number of countries now cover many or all of their needs. India's training institutions, for example, have built their own capacity to handle most national research-related needs in agriculture. And such nations as Indonesia, Philippines, Thailand, Mexico, Colombia, Peru, and perhaps others -- which were early cooperators with IARCs -- have developed their own training abilities in key areas, with varying degrees of help from the centers.

In some cases, the national capabilities have been developed within universities, in some cases within other units of the nation's agricultural establishment. Programs that have strengthened universities have been doubly beneficial: a university that has become a source of technical training needed within the country to support research in certain commodities generally has also become a stronger element in the agricultural knowledge system.

Benefits

Main benefits of in-country training cluster around lower cost, greater numbers who can take part within a country, greater specificity of problems addressed, and shorter time of staff away from regular work. (The shorter time, of course, is a drawback as well, because in-country courses tend not to have as much field-oriented, hands-on work as that which earned praise from alumni of IARC headquarters training.) When in-country capacity to train is spun off from these efforts, the country gains that as an important extra benefit.

When training is carried out within the country, the focus can be largely directed by the needs of the country. Where extension and development have equal or greater needs than research, the courses can be slanted accordingly. The country can seek trainers who can deal with subjects that fall outside those on which the center has the comparative advantage of its own work.

Outside funding necessary for countries to develop own training capacity

Limitations

From the country viewpoint, financial limitations appear -- although costs are lower for training in-country than at IARC headquarters. Some country leaders told the TAC study team that outside funding would be necessary for them to develop their own training capacity.

For many national leaders who aspire to offer in-country training, access to capable trainers can be another limitation. Centers are helping overcome this through close ties for planning courses as well as teaching in areas where the country can't provide competent instructors. Some in-country trainers take IARC courses as part of

their preparation, and some participants said they'd like more attention given at IARCs to how to teach to others what they were learning. Many IARCs now make their teaching materials, autotutorial programs, and lesson plans available to those who are teaching others at home.

From the centers' viewpoint, finance is also a problem. The center's costs for travel and subsistence climb when trainers spend weeks away from base; and the quality of their training may decline when trainers don't have their usual access to the support facilities of the center.

Leaders on both sides recognized problems of maintaining the quality of the courses. For example, the centers' crop-cycle approach to training, with its combination of intellectual and physical practice, is hard to duplicate in shorter versions offered in-country. That may mean a serious drop in overall learning.

The CIMMYT "call system" in training is one approach to help deal with this problem. In this system, participants are "called" in for work on a specific problem or stage when it occurs in the crop cycle. Otherwise, they stay in their regular posts.

Some centers furnish training aids to help the nation's trainers

Regional Training

Two categories of regional training have appeared in the relationships of IARCs with developing countries. In one category, regional groupings of countries have formed

Staff of the regional ILCA/ILRAD Trypanotolerance Network see post-mortem evidence from an infected animal.

Regional training appropriate in some instances

around a common interest -- in potato, for example. In some of these instances, the interest-group has undertaken to plan and conduct training on a regional basis, typically with backup from CIP, if needed.

In another category, a center has used regional training to concentrate on certain regional conditions or situations. Training carried out by ILRAD and ILCA to service the Trypanotolerance Network is such a case. (This network of 13 African countries seeks a solution to tsetse fly-spread disease through finding and testing cattle that appear tolerant to the infecting organism.) There have been numerous cases where a center has carried out a regional seminar, workshop, or conference to deal with some problem that is region-bound. ISNAR, for example, has collaborated with the Commonwealth Development Corporation's Mananga Agricultural Management Centre in Swaziland to offer research management training keyed to the situations in Eastern and Southern Africa.

Centers Keep in Contact

Former IARC training participants spoke of the importance to them of the continuing relationship with the center and with participants from other areas, which had been carried on after the training was finished. This may be the most important single factor related to the strong performance of these persons when they returned home.

The continuing link counters the tendency to professional isolation which affects so many agricultural scientists in the developing world, especially those who return to

Cooperation of ISNAR with an institution in Swaziland has provided research management training for the African region.

isolated posts after stimulating exchanges with peers in other parts of the world.

The centers clearly make efforts to keep in touch with their "alumni". Centers differ in the range and depth of effort and in the specific means. But they share a sense of need to maintain contact.

Centers make efforts to keep in touch with "alumni"

Contact by Post

All the centers take what may be the minimal step to keep in touch: They add participants' names and addresses to their mailing lists. And they use the lists with varying intensities, tending now to give them growing attention as centers computerize information about their clients and audiences.

The most frequent type of a center's contact with participants is through printed materials. Center newsletters mean several contacts each year. The typical letter carries news of events and activities in the programs and by scientists and staff the participants got to know during their training time.

Some of the letters, such as IRRI's *Rice Production Newsletter*, offer a two-way communication link: participants send in their news and, especially, observations and results from their own work; the newsletter diffuses such information among its several thousand readers world-wide.

Most technical publications of the centers typically go out to former training participants. For some of them, who may be located far from sources of current publications, these reports provide the main continuing contact with the world community of science in their field.

Staff Visits

Aside from training, most centers have cooperative programs with many countries; and staff members visit these countries from time to time. The usual traveler departs headquarters with lists of former training participants. When the itinerary includes the stations of participants, the traveler stops to visit.

CIP, for example, maintains an index-card information system on its participants. Subsequent contacts become part of the record of continuing association of CIP with each person.

Senior staff in many centers report such visits on their written trip reports, which are circulated among their center colleagues. The late Dr. Glenn Anderson of CIMMYT was renowned among colleagues and training participants for both the number of alumni he could contact in a brief country visit and for the amount of news and information he shared in both directions.

Almost 6 out of every 10 of the IARC participants in Bangladesh reported that they had been visited by IARC staff.

In Kenya such visits were commended especially for their role in identification of problems faced by former participants and national programs in general. In some cases, the collaborator reported, visits resulted in direct assistance offered to overcome constraints that had blocked the returned staff member in carrying out his program.

Tunisians attested to the value of having IARC staff based in their country. They said this enhances follow-up with training participants as well as contributes to cooperative programs in other ways. Both CIP and ICARDA are represented by staff based in Tunisia. Such opportunity for close continuing contact is available in many other countries, where center staff live and work on national or regional assignments.

Participants and centers value return visits

Return Visits to Center

Highly valued by both centers and participants are the return visits to the center after the participant has done further work in his or her home country. Some go back as visiting scientists, some to take part in workshops or conferences, some on professional tours.

This kind of contact provides an effective way to close the feedback loop. It's true that a center representative brings back a lot of information from contacts with participants at their home stations. But when a participant returns to the center, the range of contacts is much wider, and the value of word from the field often reaches deeper into the center staff.

Cooperative Programs

Participants may relate even closer when they are involved in direct cooperative programs with the center. Most crop improvement centers have extensive international nurseries, and many former participants use them.

Many participants have brought home seeds for a nursery from their training visit, and they carry on with the nurseries in succeeding years. The participant reports results from his or her trials each year; these become part of overall annual reports of performance circulated to all parts of the world -- also coming back to the cooperator, of course.

In many special instances, a training participant may be directly involved in field trials with a center where he or she trained. These relationships are especially frequent where a nation has a continuing cooperative project with a center. This may be the most powerful follow-up possible for the IARC participant.

Initiative for these continuing links seems to rest mainly with the center. At the end of training, participants scatter to the far reaches of the world, often to posts with little contact with other IARC participants. But the center continues to pursue its mandate that includes training, as well as dissemination of its materials and technologies. And it needs the feedback and cooperation of the participant.

Priority for Follow-up

The priority given to follow-up with training participants may differ between centers, just as resources available for follow-up differ. Some centers have done no systematic follow-up, either to evaluate their training or to assure a certain amount of continuing contact. Several others, however, have devoted much effort.

IRRI has been training longer than other CGIAR IARCs, and its contacts with alumni appear to be more extensive. For example, it has produced two IRRI Alumni Books. The most recent edition included more than 700 pages of photographs and professional biographical sketches, showing most of the nearly 4,000 persons who have been in IRRI training programs since 1962.

Dr. Kazi Badruddoza, who managed the case study of Bangladesh, asked his respondents specifically about their continuing contacts. And he found the following: 74% of the Bangladeshi IARC training participants had maintained contact with the center where they took training; 57% had been visited by a staff member from the IARC; and 9% had themselves been back to the center.

Other Kinds of Follow-up

The centers do not generate all the significant follow-up that reaches IARC training participants. Perhaps the most scholarly of studies of training by a single IARC was the extensive project in which CIAT training was evaluated by Dr. Jairo A. Cano Gallego.

In those studies, he found and mapped 22 specific research networks, in which about half the members were former CIAT training participants. Yet, CIAT did not form these networks, nor has CIAT played a leadership role in their continuing activities. However, participants credit CIAT training experiences and relationships as the factor that caused them to be formed. Half the networks were self-contained within countries; half crossed national boundaries and functioned internationally. The networks were thus providing a participant's main contact with scientific literature and interaction with other scientists working in the field.

Training at the CGIAR Centers

The 13 international agricultural research centers in the CGIAR system represent a wide range of research mandates. They reflect in general the range of commodities that are especially important to agricultural systems in the poorer countries. Some have delimited and specific geographic or agroecological responsibilities, while others with worldwide responsibility take account of such variables in their work with a single crop. Two of the centers do not have commodity or geographic targets, dealing with broad topics of policy and research management.

All the centers are involved in some way with diffusing their materials, methodologies, and knowledge to the agricultural systems where their contributions can be used. Training is a key method.

The centers together expend many millions of dollars each year to make training in dozens of topics available to more than 2,000 participants in the developing countries. Much of the diversity is due to the variety of needs by countries that represent wide differences in their stage of development and their status of agricultural research.

In total, the magnitude can be confusing and imposing. And communication, on center-by-center initiatives, may be sporadic and incomplete from the viewpoint of potential users who may not receive announcements from all the centers or who get only word-of-mouth and second-hand information.

Facts about Each IARC Training Program

The section that follows brings together the essential facts about the training programs of each of these 13 centers. This information, gathered by the TAC study team, permits a reader to build either composite or specially focused pictures of the content of training by the centers.

For a prospective participant, this section provides information that can narrow the search for specific training. A single matrix, shown on pages 50 and 51, summarizes the principal types of training conducted by each of the 13 centers.

Specific information follows about each center and its training programs. And with each center there are communications leads: mailing address, telephone, and telex numbers.

	CIAT	CIMMYT	CIP	ICARDA
Crops in mandate of commodity centers	rice beans cassava tropical pasture	wheat maize triticale barley	potato	barley wheat lentils broad bean chickpea
Training topics				
Production research	●	●	●	●
Breeding	●	●	●	●
Genetics resources	●	●	●	●
Farming systems	●	●	●	●
On-farm research and testing	◔	●	●	●
Management of experiment farms		●		●
SPECIAL COURSES				
Pathology		● wheat	●	
Integrated pest management			●	
Tissue culture (roots, tubers)	●		●	
Seed technology	●		●	
Postharvest technology	● cassava	● wheat	●	
Analytical techniques		● maize protein	● viruses	
Soil fertility				
GENERAL COURSES				
Statistics, data management				●
Management of environmental resources				
Agricultural engineering and field mechanization				●
SPECIAL MANDATES				
Research management				
Food policy research				
Animal diseases and control				

ICRISAT	IITA	ILCA	IRRI	Other IARC	Cross-Reference
millet sorghum pigeonpea chickpea groundnut	rice maize cowpea soybean cassava sweet potato	forage legumes pastures	rice	IBPGR all plants	cereals grain legumes oil seeds roots, tubers forage and pasture crops
●	●	●	●	WARDA: rice	
●	●	●	●	IBPGR	Crop improvement
	●		●	IBPGR	Collection, management of germplasm
●	●	●	●		Economics, social sciences
●	●	●	●		Research methods
			●		
			●		Diseases, fungal, bacterial, nematodal
	● weeds		●	WARDA	Entomology
	●				Rapid multiplication
	●		●	IBPGR, WARDA	Seed production
			●	WARDA	Processing, storage
	● soil plants	● Animal nutrition		IBPGR	
	●		●		Fertilizer, nitrogen fixation
		● livestock	●	IBPGR ILRAD WARDA	Design and analysis of experiments and projects
	●				Soil and water conservation
	●		●		Farm mechanization
				ISNAR	National research system level
		● livestock		IFPRI	Producer, consumer economics, nutrition
		● trypano-tolerance		ILRAD	Trypanosomiasis, theileriosis in subsaharan Africa

Centro Internacional de Agricultura Tropical

Cali, Colombia

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CIAT was established in Colombia in 1967, descended in part from more than 15 years of collaboration of the Rockefeller Foundation and Colombia. The mandate of CIAT was focused on some of the food commodities of major importance in Latin America. Where IRRI and CIMMYT, its predecessors, were given international responsibilities, CIAT was initially dedicated to Latin American matters. But not all important food crops there were within its mandate. From the time of its first recorded training in 1969 through 1983, 2,692 persons took part in various categories of training at CIAT; 2,603 were from 49 developing countries, with more than 2,450 of the participants from Latin American nations.

Subjects of Focus

Three food crops dominate CIAT's scientific responsibility: rice for Latin America; cassava; and *Phaseolus* beans. Its work on rice was developed with collaboration of IRRI, and on cassava with IITA only in Africa. Two non-food subjects were included in CIAT's mandate, the first such placed within an IARC: tropical pastures, especially those on marginal lands; and technology and industry of seeds. Relatively little previous work had been done on cassava and pastures on tropical soil, so CIAT undertook long-range studies on those subjects, and new work was necessary on beans. CIAT was largely concerned otherwise with adapting knowledge from other areas to the conditions of its cooperating nations.

Training Conducted by CIAT

Research-oriented Training

* Postdoctoral fellows. Participation at this level was increased in the early 1980s; there were 17 in 1983.
* Degree-related. Nearly all M.Sc. participants came from developing countries, with fewer than one-third of those continuing study for the Ph.D. Few studied at Colombian universities. In all 21 institutions in 12 countries were involved -- in North America, Europe, Africa, as well as in Latin America.
* Visiting researchers. These graduates have typically come to CIAT to pursue individual investigations, often involving new procedures and techniques.

Commodity Training Programs

In early years, CIAT's commodity training courses lasted as long as a year. Now such non-degree courses average about four months. Most participants are qualified professionals with an average of 3 1/2 years of work experience. Most are from Latin American countries.

A commodity training course begins with 4 to 10 weeks of multidisciplinary study of the present state of knowledge. About half is lectures and the rest laboratory and field work. Many participants then move on for a period of specialized individual work in a single discipline related to the commodity. The participant works alongside experienced researchers, usually through a cycle of the crop.

* Cassava course -- includes postharvest topics of processing, marketing, and utilization -- 10 months
* Tropical pastures -- nine months
* *Phaseolus* beans -- five months
* Rice -- five months

Short Intensive Courses

Courses of three to eight weeks duration are offered alone as short, intensive training programs. These include:

* Seed technology
* Basic seed production
* Genetic resources
* Multidisciplinary introduction to commodity training programs

In-country Training

Many of CIAT's courses have been presented in countries throughout the Latin America and Caribbean region. Well over 2,000 have received this training, in which former CIAT participants take a lead role. CIAT provides about one-fifth of instruction for the first course, also providing written and auto-tutorial materials.

The Training Staff

One senior administrative officer serves as coordinator of training and conferences for CIAT. Eight associates comprise the list of training staff, although each works within a program area: beans, 2; cassava, 2; rice, 2; seeds, 1; and tropical pastures, 1. As an average overall, about 15% of research staff time is devoted to CIAT's training program.

Facilities and Resources

With grant funds provided by the Kellogg Foundation, U.S.A., CIAT has built facilities dedicated to conferences and training. These include conference, meeting, and class rooms, an autotutorial laboratory, and a library. Eighty participants can be accommodated in the dormitory. Fields and laboratories of the different program units are used in training on commodities.

Language

The principal language at CIAT is Spanish. Staff members who did not originally speak the language gain proficiency for formal teaching. Simultaneous interpretation

facilities are available, but not needed in most training situations. Language becomes more a problem for participants from Africa, Asia, and parts of the Caribbean.

Associations in Training

In Colombia

CIAT staff members teach and supervise dissertations of final-year students at the Palmira Campus of the National University of Colombia; cooperation is beginning for graduate work in soils. CIAT collaborates in training with national commodity associations and with the main research-extension institution, Instituto Colombiana Agropecuaria.

In Other Nations

Regional associations play significant roles in agricultural research in both Latin America and in Southeast Asia. CIAT cooperates with those whose interests intersect with CIAT: IICA and CATIE in Latin America, and SEARCA in Southeast Asia. CIAT research facilities have been used for thesis research by students of universities in 20 countries other than Colombia -- including several in the United States of America and in Europe.

A three-year study by Dr. Jairo A. Cano Gallego found 22 major agricultural science networks linking persons working with CIAT commodities. These networks grew spontaneously, to a considerable extent sparked by the contact and enthusiasm among individuals who shared training at CIAT. CIAT now participates in the networks, which quicken the diffusion of information through the region.

With Other IARCs

CIAT's training on research in farming systems began in collaboration with CIMMYT. CIMMYT's training on seeds began in collaboration with CIAT. The center provided facilities for a joint course involving CATIE and IICA, also supporting regional training by IBPGR. CIAT cooperates with IRRI and IITA on rice training, and works with IITA and CIP in root crop and tubers training carried out under a grant from the United Nations Development Programme.

Centro Internacional de Mejoramiento de Maiz y Trigo

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Although CIMMYT was the second of the institutes to be developed as an autonomous international organization, it evolved from work started in the 1940s by Rockefeller Foundation with the Government of Mexico. Training had been part of the program from the early beginnings. Its international character was established in 1966, and that is the focus of this report.

Subjects of Focus

Work from which CIMMYT evolved was focused on wheat (both bread wheats and durums) and maize. Two related small grains, barley and the man-made triticale, had also come under its attention. In recent years, leadership for barley has been shifted to ICARDA, which serves areas where the crop fills a major place in the food scheme; ICARDA cooperates on wheat and triticale research for North Africa and the Middle East. CIMMYT has world-wide responsibility for maize. For some parts of the world, it shares responsibility for maize improvement with IITA. In addition, CIMMYT is host to ICRISAT scientists who do research and training on sorghum for Latin America.

Training Conducted by CIMMYT

CIMMYT training programs are organized separately, primarily under one program for wheat, one for maize, and one for economics. Between 1966 and 1983, CIMMYT supported training for 3,110 participants in the three programs -- 3,041 from developing countries.

Research-oriented Training

* Postdoctoral. Participants are employed mainly in existing programs, with some pursuing independent projects.
* Degree-related. About half of these persons come from and return to developing countries with which CIMMYT collaborates. Many have studied at the nearby Colegio de Postgraduados, at Chapingo.
* Visiting scientists. More than half of these short-term visitors come from developing countries. Associate scientists come for longer terms (six months to two years), often having worked in one of CIMMYT's programs in the field.

In-service Training Courses

CIMMYT conducts courses, at least annually, in production and breeding/improvement for its major crops. About 80% of the participants hold college or university degrees; some are accepted with lesser qualifications. Generally, about one-fifth of the training time is spent in the classroom, with about one-fifth on demonstrations; the rest is spent in the field. Participants raise a crop from seedbed to harvest -- many for the first time in their lives.

Both wheat and maize programs offer training on other topics within their crop specialization. An annual training course is offered by the economics program, one dealing with on-farm survey methods.

Most of CIMMYT's training courses on its Mexican stations are keyed to a crop cycle, thus lasting from four to six months. The courses conducted each year in wheat, maize, and economics are as follow.

* Wheat production
* Wheat improvement
* Wheat pathology
* Cereal technology
* Experiment stations operations for wheat
* Maize production
* Maize improvement
* Maize protein quality
* Experiment stations operations for maize
* Economics on-farm survey course

CIMMYT also conducts a significant amount of training away from its Mexican headquarters. This takes the forms of seminars and short courses in breeding and production, with planning and teaching often shared among CIMMYT's headquarters and regional staffs and with scientists in national systems. (CIMMYT has regional teams in three zones of Latin America, also North Africa, Eastern and Southern Africa, Middle East, and Southeast Asia; in some cases, it has staff posted to handle a cooperative program with a single country.)

More participants in economics training are reached by regional or national programs than by courses held in Mexico. Much of the training is based on the "call" system, in which training may be mounted quickly to deal with or take advantage of circumstances that arise in a regional or national programs in wheat or maize.

The Training Staff

Each of CIMMYT's three program units has training specialists within its headquarters staff. Three each serve maize and wheat programs, with one in economics. Two staff members in the experiment stations group handle training courses in that area. A senior member of the administrative staff acts as coordinator of training programs. Scientists in all program areas take teaching roles in the courses.

Facilities and Resources

CIMMYT's residential facilities at El Batan accommodate 60 in-service participants and 15 visiting scientists at one time. Teaching and laboratory facilities are adequate for those numbers. Communications staff support production of print and audio-visual teaching materials. The library is adequate to meet training program needs.

Language

English and Spanish languages predominate at CIMMYT. Most scientists are more proficient in English, although many have some mastery of Spanish. However, some of the countries that need training in wheat and maize may have few qualified participants who can work in either of the two languages. Some courses have been served by interpreters for a third language -- typically French.

Associations in Training

In Mexico

In earlier years, CIMMYT and its predecessor cooperated closely with several universities in training the expanding agricultural staffs in Mexico. Now its main collaboration is with Colegio de Postgraduados at Chapingo, where the two groups work together in teaching advanced students and in research.

In Other nations

Especially through its staff outposted to regional and national sites, CIMMYT makes many contributions to training in other nations. The relationships include work with the national research systems, which have been especially close in Latin America. Through its economics training program, CIMMYT has involved leaders of many developing nations in discussions of national policies affecting wheat and maize.

With Other IARCs

ICRISAT trainers use CIMMYT facilities for Latin American training on sorghum. CIMMYT uses CIAT land for training in Colombia, ICRISAT facilities for training in India, and ILRAD as a base for training in Eastern and Southern Africa.

Centro Internacional de la Papa

Lima, Peru

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CIP was established in 1967. It began operations in 1971 and joined the CGIAR system a year later. The University of North Carolina, U.S.A., originated an earlier program, also in Peru; it was from that basic work that CIP was evolved. Participation in CIP training programs totaled 2,474 from 83 countries through 1984; 2,442 were from developing countries.

Subject Focus

CIP works solely on *Solanum* potatoes. Its goal is to develop technology that will make potatoes available as a low-cost and nutritious food in some climates of most developing countries. The center holds a collection of some 6,000 clones of "traditional" cultivated and wild forms of potatoes. The Andean region, where CIP is located, is the center of variation of both the crop and its wild relatives.

Research at CIP has been organized in 10 main sections: maintaining and using genetic resources of tuber-bearing *Solanums*; producing and distributing advanced breeding material; bacterial and fungal diseases; potato

virus research; integrated pest management; warm-climate potato production; cool-climate potato production; post-harvest technology; seed technology; and potatoes in developing country food systems. Research in Peru is conducted at four sites: coastal at Lima, 238 m; highland at Huancayo, 3,280 m; high tropical at San Ramon, 800 m; and low tropical at Yurimaguas, 180 m.

Training Conducted by CIP

CIP carries out the major share of its training away from its headquarters, through seven regional programs plus a number of national programs. CIP has gone further than other IARCs in shifting the locations of training to regions and to cooperating nations themselves. National institutions often have responsibility to conduct training, calling on CIP for specialists as teachers in areas where needed.

Most training through CIP is short-term, two to three weeks. Regional and national staffs do much of the training in their geographic areas -- among 138 instructors of production courses in 1983, 79% were local and 21 international staff; 55% of the 122 staff for specialized courses that year were local.

Research-oriented Training

* Degree-related. Although numerous scholarships were granted in the past for degree-related studies, such awards presently are generally related to special cases and carried out under special-project funding.

CIP also provides several categories of individual training. These include one similar to visiting scientists at other IARCs, mid-career activities, assistantships, scholarships (for M.Sc. and Ph.D. students), and practicants (for undergraduates).

Short-term Courses

Contents of particular courses depend on the needs of the individual countries at particular times.

* Production training. The bulk of production-oriented training is conducted in national or regional courses. The extent of CIP's involvement varies from course to course, depending on needs of the particular instance.

An international potato production course, with emphasis on potato seed production, is the responsibility of the Universidad Nacional Agraria, La Molina, Peru.

* Specialized training. Most specialized training is research-oriented and occurs in regional and national courses, usually from one to four weeks in duration. Group training in recent years has dealt with these topics:
* Germplasm management
* True potato seed
* Postharvest (storage)
* Rapid multiplication
* Seed production
* Viruses, fungi, and bacteria
* Nematology
* Entomology
* Potatoes in warm climates
* On-farm research
* Social sciences

The Training Staff

Four professionals on the headquarters staff coordinate the training program, instruct within their own field, prepare materials for training at headquarters and regional and national locations, and evaluate the training program.

Officers in the seven regions and CIP's liaison officers in individual nations carry major roles in training.

Facilities and Resources

Within Peru, CIP has residential facilities for 18 persons at the Lima headquarters and facilities for another 19 at its Huancayo site.

Language

The principal operating language of CIP is English, although the headquarters staff in Peru and outposted staff in Latin America have proficiency in Spanish. Some staff can train in Portuguese. French or English is used in francophone Africa, according to abilities of instructors and needs of participants.

Associations in Training

Within Peru

Throughout its development, CIP has maintained close relations with the nearby Universidad Nacional Agraria, at La Molina. CIP provides facilities on which UNA candidates for Ingeniero agronomo can do work for their dissertations.

With Other Nations

CIP is closely associated with the national potato programs in many developing countries. These relationships often embrace both research and extension, and may also have private sector links related to storage and processing. CIP has contractual links with many universities through scholarships and research assistantships; it may also provide assistantships for students whose research CIP supervises, in collaboration with universities in developing countries.

CIP has cooperated extensively with IICA and CATIE in Latin America. Also, CIP has helped develop intergovernmental networks for potato research and training in five regions: PRECODEPA (Mexico, five Central American nations, Dominican Republic, and Cuba), PRACIPA (five Andean countries), PROCIPA (four countries in the Southern Cone of South America), PRAPAC (Rwanda, Burundi, and Zaire in Africa), and SAPPRAD (Philippines, Indonesia, Thailand, Sri Lanka, and Papua New Guinea).

With Other IARCs

CIP has conducted joint training on root and tuber crops with two other IARCs, CIAT and IITA -- under a project funded by the United Nations Development Programme. Other joint training activities have associated CIP with CIAT, IITA, and ILRAD.

International Board for Plant Genetic Resources
Rome, Italy

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IBPGR was established in 1974 to build a worldwide network, based on other IARCs and national and regional organizations, that would be concerned with collecting and conserving the world's plant genetic resources. Its function is mainly catalytic, with most of the resources provided by the cooperating nations, centers, and donors. The board's secretariat has its headquarters in the Food and Agricultural Organization of the United Nations, Rome. Training has been central to its efforts, with 879 persons from 90 countries taking part in training activities between 1974 and 1984; 820 participants were from developing countries.

Subjects of Focus

Plant genetic resources are the focal point of IBPGR's work. Its mandate calls on it to promote a cooperative world-wide network whose activities are to collect, conserve, evaluate, document, and make available for use in plant breeding and scholarly studies the genetic resources of economic plants. IBPGR does not conduct research on its own; its work is more in areas of promotion and facilitation. IBPGR has fostered networks among national and regional bodies also concerned with genetic resources.

Training Conducted by IBPGR

The lack of personnel trained in genetic resources work has been a major obstacle to progress in this area. IBPGR has encouraged expansion of training opportunities (only the University of Birmingham, U.K., offered degree studies when IBPGR began its work). One-year graduate courses are now available at several institutions, and the number presenting short courses has increased in the decade.

Research-related Training

* Degree-related. IBPGR supports a number of developing country students for M.Sc. studies. A degree course has been available at the University of Birmingham, U.K., and more recently at the University of the Philippines, Los Banos, and the Universidad Nacional Agraria, La Molina, Peru, which offered the first such course in Spanish.
* Intern program. A small number of interns are supported for work with institutes that take part in the IBPGR global network of activities.

Specialized Courses

IBPGR supports specialized training courses, with the courses taught by various institutions that have expertise in the subjects. The courses last from two to five weeks.

* Exploration, characterization, conservation, evaluation, and utilization of genetic resources
* Training for specific crops: maize, wheat, forages, legumes, root and tuber crops
* Seed physiology and seed technology
* Documentation and genetic information systems
* Genebank management
* Plant tissue culture
* Use of wild germplasm
* Training for extension workers
* Study tours. The board has sponsored some study tours.

Training Staff

IBPGR does not have a training officer or separate staff serving the training program.

Facilities and Resources

No physical facilities are reserved for training at the headquarters of IBPGR. The board supports training through other institutions, which supply facilities, staff, and other needed resources.

Language

The working language of IBPGR is English. Training is given in the language of the teaching institution or, in the case of regionally organized courses, the appropriate language for the participants.

Associations in Training

With Other Nations

IBPGR has staff outposted to work with other nations in eight regional programs: East Africa (Nairobi, Kenya); West Africa (Ouagadougou, Burkina Faso); Latin America (Cali, Colombia); Mediterranean and Southwest Asia (Nicosia, Cyprus); Southeast Asia (Bangkok, Thailand); South Asia, Pacific, and Europe, which are served from the headquarters secretariat. A rice collector, sponsored by IBPGR and IRRI, is stationed at IRRI.

It has also working relationships with numerous national programs and universities.

With Other IARCs

IBPGR has jointly sponsored training with IITA, CIAT, and ICARDA. All centers dealing with crops have genetic resources activities of their own, which include training.

International Center for Agricultural Research in the Dry Areas

Aleppo, Syria

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ICARDA was brought into existence in 1977, evolving from work of the Ford Foundation's Arid Lands Agricultural Development program, based in the Beka'a Valley of Lebanon. In 1981 the headquarters was moved to Aleppo, Syria, with a farm site developed about 30 km away at Tel Hadya. It continues work on two small stations in the Beka'a Valley and has staff posted in Tunisia and Morocco. While it has a global concern for seasonally arid winter rainfall climates, ICARDA now works mainly in a geographic area covering 22 countries, from Morocco in the west to Pakistan in the east. From the time of ICARDA's first training in 1978 through 1984, 444 participants have come from 31 countries; 433 were from developing countries, most from the region.

Subjects of Focus

ICARDA was given responsibility both for improving systems of rainfed agriculture in its region and for improving certain cereals, food legumes, and pastures and forages. ICARDA has lead responsibility for crop improvement of durum wheat and barley, and for the food legumes, faba beans and lentils, plus it shares responsibility for chickpea with ICRISAT. ICARDA is host to CIMMYT staff for the latter's work on bread wheat in the Middle East and Africa. ICARDA is concerned also with such animals as sheep, goats, and camels as they fit into farming systems of the dry areas.

Training Conducted by ICARDA

ICARDA's charter for training is broad, pointing its efforts towards improving research and production capabilities in the region. Extension, management, and private sector personnel -- as well as those oriented to research -- may be its participants.

Research-oriented Training

* Degree-related. Two appointment arrangements are used for candidates for advanced degrees: research training fellow, for Ph.D. candidates; research training scholar, for M.Sc. candidates.
* Non-degree related. Training situations are also provided for a number of postdoctoral fellows, senior research fellows, and less-senior research training associates.

Residential Courses.

ICARDA annually conducts courses of about six months duration, extending from January through June. Thirty to 40% of the time is devoted to language and classroom studies, with the larger share of time in the field; the final months may including individual experiments carried out in the field.

(The article, *A Case Example in Training*, page 67, describes one of these courses in some detail.) The annual courses are:

* Food legume crops
* Cereal crops
* Pasture, forage, and livestock
* Farming systems

Short-term Courses

ICARDA conducts two- to four-week courses on many topics related to its mandated crops and farming systems. Past short courses have included these topics:

* Wheat and barley germplasm
* Legume germplasm
* Genetic resources
* Seeds
* Cereal pathology
* Hay making
* Farming systems
* Farm operations
* Research machinery

In-country Training

ICARDA trainers mount courses for individual countries on topics of special importance to the country. Such courses are seen as supplements, not substitutes, for courses offered at headquarters.

The Training Staff

An administrative head of training and a service unit manage logistical support of training, prepare teaching materials, and coordinate the work. Training scientists in each of the four programs plan, develop, and implement the training courses, with the collaboration of researchers and other staff of the programs.

Facilities and Resources

With no residential accommodations at headquarters, ICARDA training participants live in furnished apartments in Aleppo. This requires daily commuting to and from Tel Hayda during the months of their field work at the farm site. A building program will provide teaching and laboratory space and farm facilities for training. More adequate and convenient space will also become available for the small library of about 2,000 books and 100 journals.

Language

Training at ICARDA headquarters is offered in English with Arabic interpretation. French speakers are required for training in Western North African countries.

Associations in Training

Within Syria

ICARDA works with four faculties of agriculture in Syrian universities. It has an especially close working relationship with the University of Aleppo: some ICARDA staff take part in teaching at the university; some university faculty teach in ICARDA programs. ICARDA trained staff for the National Seed Bureau.

With Other Nations

ICARDA has working relations for higher-degree training with universities throughout its region, as well as with universities in Europe and the United States of America.

With Other IARCs

IBPGR and ICARDA have organized joint training on germplasm evaluation.

International Crops Research Institute for the Semi-Arid Tropics

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Established in 1972, ICRISAT was the first IARC set up by the CGIAR. It received its first training participants in 1974. In 1975, ICRISAT set up its Sahelian Center in Niger, where its staff works with both research and training. It also has staff working from a number of national centers in Africa. A total of 946 persons from 63 countries -- 901 from developing countries -- had participated in ICRISAT training between 1974 and 1984.

Subjects of Focus

ICRISAT was created to develop farming systems for an agroclimatic zone, the semi-arid tropics; the zone covers countries with combined population of half a billion, including many of the world's poorest peoples. Five crops were placed within its mandate: the cereals sorghum and pearl millet; the grain legumes pigeonpea, chickpea, and groundnut (peanut). Farming systems research and economics were also within its mandate.

Training Conducted by ICRISAT

Economic conditions and educational and research standards range over a wide spectrum in the developing countries that ICRISAT serves. India has large and well-developed agricultural services at the national level as well as in the states, including agricultural universities. At the other extreme are small, recently independent nations in Africa, where research and higher education services are young and inexperienced. ICRISAT's training programs cover a wide range of activities.

Research-oriented Training

* International intern. These are postdoctoral appointees, who serve one or two years. Most have come from developed countries.
* Research fellow. Holders of Ph.D. or M.Sc. degrees, these participants have come from developing countries -- about half from India.
* In-service fellow. These mid-level scientists from developing countries come to ICRISAT to learn techniques and take part in research. Most have the Ph.D. or M.Sc. and have worked a year or more in their own country.
* Research scholar. Higher-degree students registerd at a university -- most in developing countries -- may be sponsored for thesis research at ICRISAT. Their university supervisor makes one or more visits to ICRISAT in connection with the student's work.

In-service Training

The pattern of in-service training at ICRISAT has the students begin with up to eight weeks in group training, taught by the full-time training officers. After this group training, individual students work in separate program areas of ICRISAT. This longer period of the participant's course lasts six months. In addition to the main subject of training, participants are taught topics in economics, extension, training methods, research techniques, and management. The primary areas for specialized study are:

* Crop improvement
* Crop production
* Farming systems

In-service training groups in economics participate in a two-month course conducted separately by staff in the economics program.

ICRISAT also accommodates two other types of in-service training:

* Special groups. These courses, with topics planned and fitted to needs of specific groups, may run from a few days to four weeks.
* Apprentices. These undergraduate students may work at ICRISAT for one to two months, pursuing subjects related to ICRISAT's work. They pay their own way.

In-country Training

An ICRISAT cereals scientist, stationed at CIMMYT in Mexico, trains up to four Latin American scientists each year.

The Training Staff

A principal training officer, 4 training officers (all with Ph.D.s), and 10 support personnel comprise the training

staff. Training officers provide about half the training, with staff of research programs and services providing half.

Facilities and Resources

Dormitories at ICRISAT headquarters have 120 rooms, with training program participants having first call. The training program has part of one headquarters building, which houses its staff offices, classroom, and a room for autotutorial preparation. The unit has 12 ha of land assigned to it for field work and experimentation; other program units provide laboratory facilities required for their training. The well-stocked library has 18,000 volumes and access to computer-readable literature sources.

Language

ICRISAT conducts training in English. Through nearby Osmania University, a two-month course in English is available, mainly for participants from Latin America and Africa.

Associations in Training

Within India

The center maintains contact and training liaison with the Indian Council of Agricultural Research and the national Department of Agricultural Research and Education. It has close relations with several Indian universities, especially two located in its vicinity, Osmania University and the Andhra Pradesh Agricultural University.

With Other Nations

ICRISAT cooperates for research and trains participants from many nations. Cooperative relationships for training have mainly been carried through universities. With aid of the Canadian International Development Research Centre, it has links that include training with the Centre Ivoirien de Recherche Economique et Sociale of the University of Ivory Coast.

With Other IARCs

ICRISAT assists or cooperates in training with ILCA, CIMMYT, and ICARDA, although little joint training has been offered.

International Food Policy Research Institute

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IFPRI was established in 1975 and became part of CGIAR in 1979. The institute studies economic and social effects of the use of advanced technical production methods on food supplies, nutrition, and the consequences for policy and action at national and global levels.

Subjects of Focus

IFPRI assembles data, through surveys and utilization of data collected by others, and examines the effects of past policy decisions -- or of policy options for the future -- on the economic and social circumstances of nations, producers, and consumers.

Training Conducted by IFPRI

IFPRI does not have a formal training program. Hence, direct comparison of its training activities with those labeled as training at most other CGIAR centers is not appropriate.

Training to enhance national capabilities in food policy analysis and research is nonetheless of primary importance to the work of IFPRI under its mandate. To a large extent, that work is carried out in collaboration with professionals from developing countries who interact with IFPRI staff at the headquarters and in the field. The collaborative mode ensures thorough training in selection and use of methods of policy analysis and gives staff of national institutions valuable experience in policy research related to food and agriculture.

In this way, with training intimately linked to research, IFPRI has evolved into an "invisible college" of professional peers; about 80 have had working associations with IFPRI since 1979.

There are elements of training in some of the conferences, seminars, and workshops organized by IFPRI. Its numerous publications are disseminated throughout the world, and they frequently serve as teaching or research raw materials in universities and food policy research institutes.

International Institute of Tropical Agriculture

Ibadan, Nigeria

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Telex: 31417 or 20311 TDS IBA NG ATTN IITA BOX 015
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Alternative mailing address:
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c/o Mr. Andrew Connelly, Manager
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The first IARC to be established in Africa, IITA began its work in 1967. Its main purpose was defined ecologi-

cally, in terms of developing permanent farming systems to replace shifting cultivation in the lowland humid tropics. Its training activities were started in 1970. By 1984, 2,938 participants had come to IITA from 76 countries -- 2,811 from developing countries. Nearly 90% of the participants had come from 40 nations of Africa.

Subjects of Focus

IITA has sole responsibility for certain crops within the CGIAR system -- cowpeas, sweet potatoes, yams and aroids; and it is responsible for work in Africa on crops for which others take leadership -- rice, maize, and cassava. IITA organizes its scientific work into four programs: cereals, grain legumes, roots and tubers, and farming systems.

Training Conducted at IITA

Research-oriented Training

* Postdoctoral. Senior research fellowships of up to six months, for recent doctoral graduates, help start young scientists on independent research careers. Junior scientist posts of one to two years have the character of in-service training for doctoral workers.
* Degree-related. Two main categories of advanced-degree students may be accommodated in IITA programs: Research scholars, students working for the master's degree; and research fellows, who are working for the doctorate. Those in both groups follow the course program of their university, and many carry out thesis research under supervision of IITA staff. Many have been students at the University of Ibadan, and at least two other Nigerian universities have been involved.
* University-related. Through cooperation of IITA and the University of Ibadan, final-year students of the National University of Benin prepared theses required for the Ingenieur agronomo degree. IITA has provided similar assistance to the University of Ouagadougou, Burkina Faso. University students were accommodated for work at IITA during the long vacation period at the end of their third year -- many have returned to IITA to conduct research for higher degrees.
* Research training associate. Professionally qualified persons come to IITA for individual work and study programs of two weeks to nine months. Participants come from agriculture ministries and departments, international organizations, universities, and private agencies.

Group Courses

Each IITA research program offers one main training course each year and proposes others. Choices made by countries with training needs thus determine which courses are provided in a given year.

Production training courses (including plant breeding) are offered on several commodities. Duration depends on length of crop cycle -- from three to eight months.

* Maize
* Rice
* Root and tuber crops
* Plantains
* Grain legumes

Other training courses have been offered at different times, including:

* Research and management in soil and water conservation
* Fertilizer use in the tropics
* Nitrogen fixation and legume production
* Mixed production of maize and cowpea
* Postharvest engineering
* Soil and plant analysis
* Genetic resources conservation
* Genebank management
* Reduced tillage systems
* Weed control
* Soil management
* On-farm research
* Communication
* Research planning, organization, and management

In-country Courses

The IITA staff has prepared and taught courses away from the headquarters. Examples include five held in Cameroon in 1983 and 1984 courses in Burkina Faso, Cameroon, and Nigeria.

The Training Staff

The assistant director for training, two training officers, and two translators/interpreters comprise the training staff. Scientists from the research programs play lead roles in designing and teaching individual courses. In some cases, one or two former participants are appointed as temporary assistant training officers to provide additional teaching input.

Facilities and Resources

IITA has physical facilities dedicated to training and conference uses, including two classrooms equipped for simultaneous translations, general purpose workspace, administrative and tutorial offices, dormitory for 100 residents, and flatlets for longer-stay participants. Laboratory and field space are provided by the program units. An extensive library serves training needs fully.

Language

IITA works as a bilingual institute in French and English.

Associations in Training

In Nigeria

IITA has cooperated extensively within its host country, including cooperation on training with the Uni-

versity of Ibadan, Ife, Nsukka, Ahmadu Bello, and others.

In Other Nations

As a result of its role in training the foundation staff of the University of Benin, cooperation is expected to develop in training, particularly for French-speaking participants. Similar relationships may develop with the University of Ouagadougou. A cooperation agreement is also under consideration with the University of Dar-es-Salaam at Morogoro, Tanzania.

With Other IARCs

IITA, CIP, and CIAT have cooperated since 1982 for training programs on root and tuber crops, under a grant by the United Nations Development Programme. IITA has also cooperated on training with CIMMYT, IRRI, WARDA, ILCA, and ISNAR.

International Laboratory for Research on Animal Diseases

Nairobi, Kenya

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ILRAD was included in the CGIAR in 1972, having origins in the Rockefeller Foundation's work in the late 1960s to develop research to support animal production in Africa. Its major attention is devoted to livestock diseases in Africa, but it also provides training and information to programs and institutions in all parts of the world. Although separate institutions, ILRAD and ILCA (in Ethiopia) cooperate closely to deal with livestock production constraints in Africa. Between 1978 and 1984, ILRAD trained 341 participants from 47 countries in its several categories of training -- 305 participants came from developing countries.

Subjects of Focus

ILRAD gives first priority to research, experimentation, and field-testing related to trypanosomiasis and East Coast Fever (one of the *Theilerioses*). Its mandate does not restrict it to work on those diseases, however. In carrying out its work, ILRAD applies the most advanced concepts and methods in parasitology, cell biology, pathology, immunology and immunobiology, molecular genetics, and biochemistry. It maintains facilities for work with large animals and for rearing tsetse flies and ticks; it has introduced the trypanotolerant N'dama cattle from West Africa (as fertilized eggs implanted in Kenyan cows). ILRAD's mandate includes responsibilty for training and cooperation with countries in using and applying its results. Already its work has led to more effective diagnostic tools for veterinarian's working in the field.

Training Conducted by ILRAD

As a leading institution and innovator in its research areas, ILRAD has had the preliminary training task of qualifying technicians to sustain its own work. It has also provided training for others over a range of subjects.

Research-oriented Training

* Postdoctoral fellows. Working on appointments of two years, normally, these persons contribute to ILRAD's research program and assist in training degree-related participants.
* Degree-related. Selected M.Sc. and Ph.D. candidates work closely with ILRAD scientists for from one to three years. The majority come from African universities, with many enrolled at the University of Nairobi. Some students have been sponsored for training elsewhere.
* Visiting scientists and technicians. These participants come to ILRAD to learn specific techniques, generally for up to 10 months. Most come from Africa.

Courses

Up to five training courses are held at ILRAD each year, usually for as many as 12 participants each. Most courses last up to six weeks. Emphasis is on training in basic animal health and diagnostic procedures for hemoprotozoan diseases. Among the following courses, some are offered annually, some less frequently:

* ILCA/ILRAD network course. This 7- to 8-week course trains field staff of the Trypanotolerance Network. One course is conducted in English and another in French.
* Preparation of antigens -- 10 weeks
* East Coast Fever diagnostics course -- three weeks
* Theileriosis workshop -- three days
* Tryps diagnostics course -- four weeks

Facilities and Resources

In addition to its small teaching laboratory (accommodating 15 persons), the training program uses the center's conference and meeting rooms and research laboratories and fields. Residential accommodations are available for a small number of participants. The library is small -- 2,500 volumes and 196 journals in ILRAD's fields -- but it obtains material through interlibrary loans and from international data bases, such as Commonwealth Agricultural Bureaux.

Language

The principal language at ILRAD is English. Some courses are conducted in French.

Associations in Training

Within Kenya

The center has close associations with the University of Nairobi and the International Centre of Insect Physiology and Ecology, both in Nairobi; it cooperates with the Kenyan Ministry of Agriculture in areas of livestock diseases.

With Other Nations

There is considerable interaction of ILRAD with other African nations through its training and its staff visits. It relates to field programs in several African countries through the Trypanotolerance Network. Less intensive contacts occur with Latin American and Asian nations. There are programs with other universities, in which advanced-degree candidates do research at ILRAD. ILRAD staff have lectured in several African universities.

With Other IARCs

ILRAD has close continuing links with ILCA, including the annual course for field staff of the Trypanotolerance Network.

International Livestock Centre for Africa

Addis Ababa, Ethiopia

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Telex: 21207 ILCA ADDIS
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This center was approved by CGIAR in 1973, and arrangements for its establishment near Addis Ababa, Ethiopia, brought it into physical being in 1976. Its mission calls for research attention to technical and socioeconomic aspects of existing livestock systems, with a goal of lessening constraints on productivity of African systems that involve livestock. ILCA conducts field work in seven locations in four agroecological zones in Africa: highlands (central Ethiopia); humid (Ibadan, Nigeria); subhumid (Kaduna, Nigeria); and arid and semiarid (Mali, southern Ethiopia, Kenya's Masailand, and Botswana). Between 1975 and 1984, ILCA provided training for 277 persons from 40 countries; 265 came from developing countries.

Subjects of Focus

Research programs in the field relate ILCA to the entire production system of people in a region, including crops and trees, water, power (including animal traction), and processing. The central research unit at headquarters supports field programs with work on livestock productivity (with special concern for trypanotolerance), agronomy of legumes in pasture lands, animal nutrition, small ruminants and camels, aerial survey and cartography, economics and social sciences, plus a computer unit.

Training Conducted by ILCA

Research-oriented Training

* Postdoctoral. Recent Ph.D. graduates work under ILCA staff guidance for one to two years.
* Visiting scientist. These participants are mostly senior African scientists who work for up to a year with considerable independence. They are usually on sabbatical leave from their professional post.
* Research fellow. Scientists at any level come to ILCA to work for up to six months to learn certain research methods.
* Postgraduate. These university students may work for one to two years under supervision of an ILCA scientist to do thesis work.
* Technician. These participants carry out programs similar to those of a research fellow, but they typically don't have the same formal professional standing.

Short-term Courses

A number of basic courses are offered repeatedly, although not each on an every-year basis. The courses vary from 2 to 12 weeks in duration, and most involve from 10 to 25 persons. Frequent subjects include:

* Trypanotolerance
* Epidemiology and economics of disease control
* Animal nutrition and methods of forage evaluation
* Forage production
* Livestock systems research
* Design and analysis of livestock development projects
* Research management and administration
* Statistics and data management
* Library

In-country Training

Courses have been offered by headquarters and project staff at Kaduna and Nsukka, Nigeria.

The Training Staff

One half-time training director leads a small staff at headquarters, namely one animal scientist, another professional staff member, and secretaries. Half to three-fourths of the teaching is done by ILCA staff, with the rest done by visiting trainers -- including faculty from Addis Ababa University and its College of Agriculture at Alemaya.

Facilities and Resources

ILCA provides residential accommodations for about 30 participants. No physical facilities are set aside solely for training, and the training is conducted in ILCA's laboratories and conference and seminar rooms. With assistance from Canada's International

Development Research Centre, ILCA has developed a library of some 15,000 volumes, 940 serial publications, and 24,300 microfiches. The library and other staff are involved in searches of the unpublished literature of African nations on health and production of livestock, collecting and circulating materials that have use in other nations.

Language

Training programs utilize French for West Africa, with headquarters courses given in both English and French.

Associations in Training

Within Ethiopia

ILCA works closely with Addis Ababa University and its College of Agriculture: university staff aid in ILCA training programs, and ILCA scientists teach, advise, and examine students at the university. ILCA has sponsored some higher-degree students from the university for studies in Nigeria and Togo.

With Other Nations

Many Nigerians have taken training at ILCA, although there have been no formal links with national institutions there or elsewhere in Africa. The center has cooperated with numerous organizations in other countries: universities in Hohenheim, Federal Republic of Germany, and Reading, U.K.; with other international program units in FAO, UNESCO, World Bank, and Commonwealth Secretariat; and with the professionally related Association for the Advancement of Agricultural Sciences in Africa and International Foundation for Science; with Canada's International Development Research Centre and the International Center for Aerial Survey and Earth Sciences, the Netherlands; as well as with universities and government departments in Nigeria and Kenya.

With Other IARCs

ILCA shares interests with IITA in mixed production systems that include shrubs and trees, and it bases its humid-zone program at the IITA headquarters. ILCA has an agreement with CIAT concerning work on tropical pastures in which CIAT scientists will collect Brachiarias in Africa, and ILCA will have CIAT assistance in training on seed technology. CIP has conducted training on potatoes in ILCA facilities. There are two cooperative programs with ICRISAT, one at the latter's Sahelian center in Niger and the other in East Africa.

ILCA and ILRAD have related closely from their beginnings, with major cooperation embodied in the Trypanotolerance Network. The two have shared in training, along with the International Centre of Insect Physiology and Ecology.

International Rice Research Institute

Los Banos, The Philippines

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IRRI was the first established of the international agricultural resesearch centers now under CGIAR. It was started in 1960. In many ways it was an evolution of agricultural research and development innovations being applied by Rockefeller and Ford Foundations in cooperation with national programs in Latin America and Asia. Training was begun in a formal way at IRRI in 1962. Through 1984, 3,956 persons had been part of its training programs -- 3,726 came from developing countries.

Subject Focus

As its name implied, IRRI was created to work on rice, to conduct research on production, distribution, and utilization of rice. Its work has been multidisciplinary, embracing all areas of science related to growing, distributing, and using rice -- including social and economic considerations, as well as biological, ecological, and mechanical. Although its early work was mainly concerned with irrigated rice -- where there was more potential for high, secure yields -- IRRI has also developed programs on upland, rainfed, lowland, and deep-water rice.

Three other IARCs share responsibility with IRRI to provide research and training for rice production: CIAT for Latin America and IITA and WARDA for Africa.

Training Conducted by IRRI

IRRI conducts three types of training: research-oriented programs, short-term courses, and special training courses.

Research-oriented Training

* Postdoctoral fellows. Persons who have recently completed advanced-degree work are appointed to work for one to two years as independent researchers with nominal guidance from IRRI staff.
* Degree-related participants. These graduates come to IRRI to conduct research for thesis work, fulfilling other requirements at universities. Many study at nearby University of the Philippines at Los Banos, although they may come from other universities in developing or developed countries.

* Non-degree fellows. These B.Sc.- or M.Sc.-holders come to IRRI to work for six months to a year on special topics.
* Visiting scientists. These working scientists typically come from developed countries; they pursue a program focused on a particular topic of interest to both themselves and IRRI.

Short-term Courses

IRRI's six-month rice production course was the first of this type offered, beginning in 1964. Other courses were added in following years, many becoming regular offerings. Current courses are:

* Rice Production Training Program. This five-month course is aimed to upgrade professionals who already know something about the crop. Participants raise a crop of rice from seed to harvest, conduct experiments, and analyze results. Offered every year.

  A condensed version of this course -- known also by name Rice Production Training Program -- is presented in a two-week period. It is designed mainly for junior researchers and extension workers; when space is available, a few selected farmers are accepted.
* Cropping Systems Training Program. Participants learn to carry out adaptive and applied research on cropping systems based on rice. The five-month course emphasizes working with cropping systems of the participant's own region. The course was started in 1969 and is offered every year.
* Genetic Evaluation and Utilization Training Program. This four-month course teaches methods of crossing, evaluating, and selecting progeny; there is emphasis also on techniques of screening for varietal tolerance and resistance. Participants study different types of rice culture and locations that offer particular problems. The course was begun in 1975.
* International Network on Soil Fertility and Fertilizer Evaluation in Rice. Participants learn theoretical and practical aspects of fertilizer use on rice. The four-month course includes fertilizer experiments and an intensive short course on azolla and soil microbiology. A collaborative project among national programs, IRRI, and the International Fertilizer Development Center (U.S.A.), the program was started in 1979.
* Integrated Pest Management Training Course. This course of 3 1/2 months duration trains participants in how to design and carry out pest management programs that reduce damage to the crop, maximize profit, and protect the environment. It was introduced in 1981.
* Upland Rice Training Course. The four-month course was designed to train on principles of rice production under rainfed upland conditions. Management of crop and soils is emphasized, along with weed control, conservation, pest management, harvesting, and varietal improvement. It was first offered in 1983.

Shorter Courses Offered Each Year

* Irrigation water management -- six weeks
* Agroeconomic methods -- one month
* Agricultural engineering -- concerned mainly with farm machines developed at IRRI -- three weeks

Occasional Short Courses

* Farm managers course
* Nitrogen studies
* Varietal improvement for upland crops
* Insect pest management
* Plant disease management
* Library and documentation

New Courses

* Statistical Procedures and Computer Applications in Agricultural Research Training Course -- two months
* Agricultural Communications Training Course -- four months
* Orientation-cum-training Program on Improving the Income and Employment Potential of Rice Farming Systems -- 10 days
* Rice Genetic Resources Conservation and Utilization Training Course -- one-year diploma associateship course
* Training Course on Systems Analysis and Simulation in Rice Production and Its Use in Research Technology Transfer. Three parts: 8 weeks at University of Wageningen, Netherlands; 9 months in home country; 2 weeks in workshop at IRRI.

The Training Staff

Five senior staff members and 19 assistants comprise the IRRI training staff. Four additional staff with training responsibilities are posted in other countries. A recent report indicated that more than 100 IRRI scientists taught in training courses during one year.

Facilities and Resources

IRRI has residential accommodations for up to 200 participants at one time. The institute's seminar and lecture rooms are used for training, as well as for other purposes. A large and active unit produces instructional materials mainly to support training programs. A large, well-managed library also serves training programs; participants use it and may secure other materials through its access to world-wide literature sources.

Language

The operational language of IRRI is English, although about half the participants in training lack full proficiency in the language when they arrive.

Associations in Training

In The Philippines

IRRI's training programs have been involved in cooperation with most Philippines institutions that are re-

lated to rice. Staffs of these institutions have been upgraded through IRRI training; IRRI also played a notable part in training for the Philippines' powerful Masagana 99 program. There have been especially close relationships with the University of The Philippines at Los Banos: 60 IRRI scientists are faculty members of UPLB, and UPLB staff are honorary researchers at IRRI. The institute has also worked with Ateneo de Manila University and Central Luzon State University.

In Other Nations

Training program relationships reach between IRRI and many parts of the world. It has formal training agreements with: Cairo University, Egypt; Institute Pertanian Bogor, Indonesia; Universiti Pertanian, Malaysia; Postgraduate Institute of Agriculture, Sri Lanka; Kasetsart University and the Asian Institute of Technology, Thailand; Bangladesh Agricultural University; and Cornell University, U.S.A.

With Other IARCs

IRRI cooperates with three other IARCs which offer rice training: IITA and WARDA in Africa, and CIAT in Latin America.

International Service for National Agricultural Research

The Hague, Netherlands

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Cable: ISNAR The Hague

ISNAR began work in 1980, with a mission of helping developing countries to strengthen their national agricultural research systems through improved organization and management. More than 700 persons have participated in ISNAR workshops, symposia, conferences, and seminars with training components.

Subject Focus

The ISNAR mandate embraces work with national research programs on planning and setting priorities, manpower development, improving organization, infrastructure, financial management, and program management. It is mainly an analytical and service institution. However, it assimilates knowledge, from its own experience and from other sources, to delineate principles and develop greater understanding of the management of agricultural research systems.

Training Conducted by ISNAR

Training by ISNAR deals with making participants aware of management -- how it works and what it can do -- and with teaching some concepts and skills of management of agricultural research. Much of ISNAR's training emphasis has been expressed in regional or international conferences and seminars -- most held away from its headquarters. Short courses of four weeks duration have been held for research managers in African locations, in cooperation with local training institutions and with IITA.

Facilities and Resources

ISNAR has conference and meeting rooms in its headquarters at The Hague, although no facilities are specifically allocated to training. It has no residential accommodations. In most cases, facilities are obtained at or through a cooperating institution at the site of a conference, seminar, workshop, or short course.

Language

ISNAR's operational language is English. However, its training activities are presented in the principal language of the area: English, French, Spanish, Arabic. It uses simultaneous interpretation in some cases.

Associations in Training

Within the Netherlands

ISNAR has cooperated in training programs with the International Agricultural Centre and the Agricultural University at Wageningen.

With Other Nations

Most ISNAR training activities have been collaborative with nations, institutions, agencies, or other organizations. Collaborators have included: The World Bank; Ford and Rockefeller Foundations: Eastern and Southern African Management Institute, Tanzania; Mananga Agricultural Management Centre, Swaziland; Governments of Rwanda, Kenya, Indonesia, Spain, Federal Republic of Germany, United Kingdom, Netherlands, Canada, and United States of America; International Federation of Agricultural Research Systems for Development; Southeast Asian Regional Center for Graduate Study and Research in Agriculture; Instituto Interamericano de Cooperacion para la Agricultura.

With Other IARCs

ISNAR and CIMMYT, with funding by the United Nations Development Programme, have produced management training cases for use in workshops and national training. ISNAR has also cooperated with IITA, IRRI, and ICARDA in conducting research management training.

West Africa Rice Development Association

Monrovia, Liberia

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WARDA is an intergovernmental association of 16 West Africa countries, established in 1971. The research activities are supported as a unit under CGIAR. The member nations are: Benin, Burkina Faso, Chad, Gambia, Ghana, Guinea, Guinea Bissau, Ivory Coast, Liberia, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone, and Togo. Some of the member countries are small and without resources to conduct their own research and training on rice production; WARDA exists to assist them. It maintains headquarters in Monrovia and training facilities on the grounds of the University of Liberia at Fendall, near Monrovia. In the decade following its first training in 1973, 1,128 persons from the West Africa region took part in WARDA training activities.

Subject Focus

Rice is the subject of WARDA's mandate. It supports special research projects on mangrove rice, deepwater rice, upland rice, and irrigated rice. It screens and tests many varieties from many sources in the member countries and from outside. WARDA conducts work on fertilizers, water management, and machinery, and seeks to improve seed production, storage, and postharvest methods. WARDA links its rice research program with two other IARCs concerned with rice, IITA and IRRI -- IITA has a liaison officer posted at WARDA headquarters.

Training Conducted by WARDA

Most of the WARDA training courses have dealt with rice production. Each member country is entitled annually to send two of its staff to each course offered by WARDA, although not all use all their allotted places.

Research-oriented Training

* Degree-related. A total of 47 persons, mostly supported by outside donors, had obtained advanced degrees at overseas institutions to the end of 1984.

Short-term Courses

* Rice production specialist training. This six-month course is conducted each year from May to October at the WARDA training site in Fendall, Liberia. Content is similar to the IRRI rice production course.

Specialized Courses

A number of courses of varied durations are repeated periodically, although each is not necessarily available each year:

* Training for field assistants -- six weeks
* Training for research assistants -- eight weeks
* Water management -- six weeks
* Integrated pest management -- six weeks
* Seed multiplication and certification -- six weeks
* Postharvest technology -- six weeks
* Management of rice projects -- six weeks
* Refresher course on rice milling -- three weeks
* Course for rice scientists and extension workers -- two weeks

WARDA has also provided courses especially designed for certain individuals or groups as requested by member states. These have been on such topics as control of small vertebrates, azolla, seed laboratory technician training, library sciences, mechanization, extension and audio-visual communication, and language training.

The Training Staff

Two professional staff at headquarters support training at Fendall and in the subregions. A chief, three training officers, and two interpreters make up the training staff at Fendall. Scientists from WARDA projects or from member countries do much of the technical instruction. Guest lecturers are brought in as required.

Facilities and Resources

Residental space will accommodate 32 persons at the Fendall training center, where there is also space for some of the staff and one room with equipment for simultaneous interpretation. A few hectares of land are available for training use, as are some workshops and seed technology and storage facilities of the development department and research department. The library at Fendall is limited, and access is not easy to the larger library at headquarters, which has 12,000 volumes, 1,550 monographs, and 800 periodicals.

Language

Bilingual capability -- for French and English -- is needed for rice improvement work in West Africa. The training staff includes two translators/interpreters, and the training program can accommodate participants with either English or French proficiency. However, the same staff of two has not been able to keep up also with the growing demand for translation to provide printed materials in the two languages.

Associations in Training

WARDA's mandate sets out its associations with member countries. While it is closely involved with the rice programs of these countries, it has few links with universities, except those in which it has placed persons for higher-degree studies. The training center at Fendall is located on the campus of the University of Liberia, but stands apart on its own.

With Other IARCs

Research links exist between WARDA and two other CGIAR centers with responsibility for rice: IRRI and IITA. It also cooperates with the French research agency, Institut de Recherche Agronomique Tropicale (IRAT).

A Case Example of Training

Training courses and processes of selection and participation vary from center to center -- even between programs or courses within a given center. Yet there is a thread of similarity that runs throughout the training programs of CGIAR centers.

Here is one example, using what is called the long residential training course in ICARDA's cereal crops improvement program. While based on a specific course at one center, the case describes generally the process from the point of view of a person in a developing country.

Cereal Crops Improvement Course at ICARDA

ICARDA starts a new group of participants through its cereal crops course in January of each year. The steps that lead to nomination, selection, and participation begin earlier in the preceding year.

Announcements

ICARDA, and most centers, maintain mailing lists that include top officers in agricultural ministries and research bodies in the developing countries. Also on the lists are many key leaders in agricultural faculties or universities, public service offices, manpower development and training units; there may also be individuals, such as former training participants, in-country or regional donor representatives, and others. Donor organizations with interests in certain crops and certain areas may also be on the lists.

From six months to a year ahead of the start of a course, centers send out their announcements. Each center sends its own announcements; and in some cases, different units within the same center proceed about it on their own. (This was a frequent criticsm voiced by national officers in these studies. Many asked instead for a publication that would announce all CGIAR center training programs for all centers at one time -- and that at least a year in advance! Centers training officers agreed to work toward such a joint announcement.)

Other personal means spread the word about training courses. In this example, ICARDA staff in their travels carry the message; so do representatives of the many organizations that are in touch with agricultural research and development projects in the developing countries.

Nomination

When a training opportunity becomes known within a developing country, action may occur at two opposite ends. An individual who wants a particular type of training may initiate a request -- which would move up through his country's channels for approval and appointment. At the other end of the line, high officials may learn of specific courses and refer them down the hierarchy for nominations from subordinates.

By either route -- or many alternate routes between these two -- and after some processing time, the country makes its selection and sends in its nominations. This is less a process of chance and coincidence where a country works from a manpower plan for its agricultural research and development needs. That country knows its needs and may already have identified candidates with qualifications for different kinds of training.

None of the countries visited by the study team had such a written manpower development plan; Indonesia, Kenya, and Bangladesh had made important progress toward such a plan, the team reported.

This nomination process may be shortened in those countries where a center has outposted staff; in this case, where ICARDA has staff living and working in a country. Such staff typically play a role both in informing the country of training opportunities and in helping to identify nominees. Sometimes there is also an external donor involved in supporting a project, and the donor representative may propose and approve nominations.

Selection

Then the IARC conducting the training -- ICARDA in this example -- makes the final selections among all nominations tendered for a given course. Its choices may be influenced by a number of factors, including needs its staff has identified in cooperative programs in a given country. A center usually wants diversity in a training group, since part of the benefit is that participants from different countries get to know something of the agriculture and some of the people working in agriculture in other nations.

Residence at the IARC

After exchanges of much paper, including documentation, instructions, tickets, etc., the participant sets off for Aleppo and ICARDA. The study team, which talked to 669 training participants, summed up that experience from the participant's view:

"Many new participants at centers come for the first time, after a long and difficult journey, to a foreign country, a strange language, a different culture, and a dauntingly large, prestigious, well-equipped and well-organized multidisciplinary international institution. They leave their families behind, and they are separated from their accustomed work environment. They meet very senior people in their disciplines, many of whom have international reputations.

"All this is difficult at first, but the difficulties seem to be overcome surprisingly soon, particularly if the courses are not too short. The material conditions appear generally to be acceptable to all but the most senior participants, who may find it unusual to share accommodation with a stranger."

The Course Begins: January

In this example, the participant arrives at ICARDA in early January, and the training course begins. Each day the group goes from accommodations in ICARDA's rented apartments in Aleppo to the headquarters via the center's bus.

During the first month, there is an intensive course in English language, along with lectures on background technical subjects in genetics, pathology, entomology, and statistics. At ICARDA, participants in its three long residential courses are at the center at the same time, and they attend these lectures together.

In February, the scene shifts to ICARDA's farm site at Tel Hadya, where participants separate into their specific training groups. This means a long bus ride twice daily, since Tel Hadya is 30 km from Aleppo, where the participants continue their residence.

Emphasis on Field Work

February and March bring some field activity along with continuation of classroom lectures and study. April and May bring a shift of emphasis toward the field. Some of the program involves all the cereals crops participants together; some focuses each participant toward his or her individually assigned project.

Common activities occupy about 30% of the participants' time, covering entomology; pathology; selection of barley, durum and bread wheat; cereal crops for high elevation; weed control, agronomy, mechanization; field verification trials, and field days for cereal and food legume crops.

Within the 70% of time devoted to specific activities, the participants get intensive training related to their assigned projects, working much of the time with senior ICARDA scientists. This is hands-on work with plants, soil, and machines. The concentration is on cereal improvement, including training on hybridization, disease scoring, agronomic scoring, selection, and harvesting. And for both lectures and actual work in the fields, they are taught by ICARDA's research staff, including its most senior scientists and others across its scientific spectrum.

Summary of Time Allotment

Records from a recent cereal crops improvement course summarized the subjects and time commitments of its participants.

Lectures in the classroom and field included: 54 hours on genetics and breeding; 36 hours on physiology and agronomy; 25 hours on pathology and entomology; and 31 hours on statistics and field plot techniques. A total of 41 lecture hours were devoted to related topics: ICARDA programs, 9; communication, 8; farming systems, 6; germplasm, 6; seed production, 4; computer use, 4; field verification trials, 2; and seminar, 2.

Individual projects in that same cycle included three on barley breeding (seed production, early vs. late planting, and barley for grazing), two on durum breeding (North African germplasm and Syrian germplasm), one on durum agronomy (seed rate and spacing), one on bread wheat breeding (yield trials), and one on bread wheat agronomy (seed rate and spacing). Each participant wrote a project report a few days before the end of the course.

End of the Course: June

And with the end of June, the course ends. The only break is a one-week recess in April. The participants are tested upon arrival, as the course proceeds, and at the end of the course. They leave to return to their home with a certificate and with increased knowledge, practical ability, initiative, confidence, plus ability to formulate programs and use statistical methods, communicate information, and train others.

Keeping in Touch

ICARDA will keep in touch with these participants through its newsletter and reports coming out of its continuing research, and through individual correspondence. Also, as ICARDA staff travel throughout the region, many will stop in to renew professional and personal acquaintances. And if this group is as many other similar ones, some of the participants will keep in touch with others on their own.

Many will continue a close association with ICARDA research in their subject area. Some will obtain ICARDA international nurseries of barley, durum wheat, or bread wheat for dry lands; they will grow them under their local conditions, maintaining contact through exchanges of results. Some may cooperate with projects directly related to ICARDA research efforts.

The TAC study team had found that many of the participants see themselves afterwards as members of a wider agricultural community -- feeling in this case a part of ICARDA. They are no longer single individuals isolated by distance and lack of contact with others working toward similar goals.

4. Review and Points of View

Both phases of this extensive study of CGIAR training by the Technical Advisory Committee focused on the end product of training: effects on the individuals and the national agricultural research systems from which participants came and to which they went back to work. The study team of Professors Araujo and Bunting, with TAC staff members Herz and von der Osten, saw and discussed effects in 18 different countries representing all regions. In addition, senior national officers in six countries carried out single-country analyses.

Significant Benefits

The overriding finding was that IARC training programs have provided significant benefits to the participants and to the national agricultural systems they work in. These training programs were generally regarded as more effective for both participant and nation than comparable programs provided elsewhere.

They have technical competence and morale to do outstanding work

Professor Bunting summarized findings and significance in these words:

"When we started the study I did not expect to find so potent an effect of training -- for arithmetic reasons: so few people had been through the centers compared to the total number of persons who are in the systems. I wondered how this small number could have the impact

they have -- but they have done it." He went on to say:

"Among the reasons: First, they have been chosen by their own government and by the centers for good reasons. Second, is the continuing support for them, particularly through continuing collaboration of the center with the national program -- and that gives these people advantages they might not otherwise have. Also, they come back from the centers changed inside themselves, more confident -- they feel themselves part of an invisible college; they have both the technical competence and the morale to do outstanding work."

The six national studies obtained similar evidence. The two parts of the study showed clearly that production courses have been extremely successful; participation in them helped to increase output of a number of crops for which centers have responsibilities. Perhaps the most spectacular examples are rice in Asian and Latin American countries and wheat in Asia, especially in India, Turkey, Pakistan, and Bangladesh.

National leaders value specialist courses and consider them to have great potential to improve their countries' research and extension systems.

Degree-related programs are in great demand as countries realize the benefit to be gained when their nationals undertake the research component of higher degrees at an IARC instead of in a developed country.

Weaknesses, Problems, and Points of View

Behind these solid and widespread endorsements of IARC training, there were some problems, of course. These problems did not negate the overall findings. They did, however, reflect real or expected constraints on the benefits of training. Some of the comments reflected incomplete understanding of what the centers can do, influenced perhaps by the wants or needs of individual nations; some may have reflected habitual attitudes; some indicated needs for changes in procedure and for innovations in the nations as well as in the centers. Several centers have already responded by changing at least some of the programs.

National and IARC Goals

The goals of an IARC that offers training and a country that sends participants to a center do not exactly overlap.

Needs of one or other may not be fully served

Each has its primary needs. There are gaps where the needs of one or the other may not be served fully.

The CGIAR system supports international centers as a means of strengthening research on the mandated subjects. Part of the overall strategy calls for improved capacity in countries to utilize IARC research results through their own testing, adaptation, and further research. Such needs as these motivate the IARCs to provide training for developing countries.

Developing countries aspire to that same goal of research capability. They, too, want to apply research findings as a means to improve performance of their agriculture -- often the primary economic sector in the country. But a country's need may go beyond research in commodities presently under IARC mandates. Most of the key food crops around the world are to be found under IARC attention, but many countries rely on other crops to contribute to the agricultural sector -- especially cash crops that can be exported. They need research capabilities for those crops as well, but IARCs haven't the expertise or comparative advantage to offer courses on them.

Countries need an agricultural sector policy as well as an overall food policy. While not in a position to give leadership here, the centers can provide some help within their mandates, based on their understanding of potential

Mali agriculturists study sorghum at ICRISAT. But they know research alone is not enough to gain full advantage of improvements.

contributions of improved cultivars, better practices, and well-trained staffs. And one center, IFPRI, can study policy options that take into account the likely impact of adoption of improved technology from centers, as well as such factors as consumer habits and nutrition, purchasing power, and domestic markets plus the roles of cash and export crops.

Additional National Goals

National officials have additional goals that aren't high on the list of priorities within the CGIAR system. They know that research alone will not serve all the needs they identify in their nation's agricultural knowledge system. They have needs beyond research. For example, they may want to see their other system segments develop; to have extension and technical manpower improved in the same way they have seen research workers come back "changed" by training experience at an IARC.

"They came back hand-in-hand . . ."

A senior Indonesian official described the benefit when research and extension staff plus regional administrators went together to an IRRI rice production course. "Neither knew much about the other, either as a person or as a professional colleague, when they went away. But they came back hand-in-hand!"

Increasing Mutual Awareness

The reviewers who took both a national and a system perspective in this study noted that IARC and national officials are getting to know each other, to understand how they can improve their mutual support. Reviewers came upon instances where national officials have brought centers together to help them find ways to meet the nation's needs -- Bangladesh is one case in point. Centers have aided national programs by referring them to agencies and donors that could deal with needs beyond the center's capability.

Also, as center programs have become more interdisciplinary, the perspective seems to be broadening from a strictly commodity science-based mode to a mode that relates more readily to development-based concern of the national systems -- without detracting from the center's primary commitment to excellence in research on its target commodities.

Point of View: Extent and Orientation of Training

More training wanted

Developing-country officers ask for considerably larger training contributions from IARCs. They want centers to

Staffs, facilities, and budgets limit numbers who can be trained

train greater numbers of their agricultural staffs in more subjects and with orientations broader than research on a single crop.

Limited IARC Capacity to Respond

There are limits to an IARC's capacity to respond, both in course content and in numbers of participants accepted. Created as research centers, their comparative advantage in training is based in research. As centers pursue research on a single-crop basis, they do so now with more of a farming-system philosophy, placing that crop within the broader schemes of farmers who grow it. Still, few have developed comfortable expertise in using knowledge of their crop within a still wider national development context, and unless their mandates are altered, centers are generally not expected to play a significant training role for in-country extension. They may contribute by showing extension workers what research can do to improve production, for example, but not by teaching organization and methods of diffusing that knowledge.

IARC staffs, facilities, and budgets limit the numbers of persons who can be trained. Original objectives of IARCs related to research, and research continues to hold highest priority. As funding has tightened within the system, centers have not had resources available to enlarge their commitment to training.

Need Earlier Announcements

Developing-country respondents expressed their need to know sooner about center training programs that would be available to them -- to have more planning time. And steps have been taken within CGIAR to try to get information on training at all IARCs to countries well ahead of time.

Setting Training Agenda

Others noted their wish to have a voice in forming the training agenda -- both with the IARC on subjects important to the country and in terms of in-country training. There are many cases of this kind of interaction now, especially at informal levels.

IRRI has taken a formal step by creating an "academic council" with representatives from cooperating countries. This council, which includes both educators and national research leaders, helps IRRI planners get outside views in determining future training programs and also in evaluating ongoing programs.

Point of View: National Role in In-country Training

Although the specific role envisioned varied, country leaders stated their desire for a role in in-country training.

This was stated by the six senior collaborators and also by many among the 400 national officers interviewed by the team. They want to develop a system to meet their needs, a program of in-service training which they direct and in which centers provide support and help.

At present, in-country training is typically conceived on a center-by-center basis, then developed with country input. An alternative view is to consider in-country training as essentially in-country business: the country must decide what training it wants and how to organize it, discussing with the centers because they can help. Then the centers come in to play their roles within the larger context of the country's priorities in manpower development.

The countries need continuing contact with training at the IARCs, especially for the benefits to national trainers who visit the centers to strengthen their ability to plan and conduct training within the country.

More Training is In-country

In-country training is generally less expensive -- often less intensive and thorough -- than training at IARC headquarters. Centers have cooperated in this shift of focus in some countries; in fact, CIP and others have been prime initiators of this approach.

In an increasing number of cases, an IARC's past work has helped a country develop capacity to do more of its own production-oriented training. Bangladesh, Thailand, and Indonesia are notable examples where national institutes have taken over most in-country training for certain crops.

Where universities have been strengthened, in part from IARC collaboration, some have become in-country sources of training -- such as Peru's National Agricultural University at La Molina, as a result of collaboration with CIP and IBPGR. In addition to training for nationals, that university now offers an annual international potato production course attended by people from many countries; it also offers a master's degree program in plant genetic resources (in Spanish).

Some universities have become in-country sources of training

More Funding Needed

Some national leaders propose that international funding support be shifted more toward in-country training in appropriate topics; that a country with training capability be provided outside funding to set up its own training. Such a step could be taken in a number of developing countries. However, a number of other countries lack the critical mass in either their agricultural system or universities to develop their own training -- even if money were available. These countries generally want IARC training to continue.

Well-equipped IARCs can help agricultural faculties keep abreast of techniques in the centers' subjects.

Even countries further along the development path, and who want more of their own role in in-country training, think IARCs should continue both production-oriented and specialized training, in part to train the persons they need in their own systems as trainers.

Point of View: Centers' Interaction with the National System

One of the countries reviewed in these studies interacts with all of the 13 CGIAR centers -- not with equal intensity. The country least involved with IARCs worked with four. The average among all 18 visited was relations with seven centers per cooperating country.

Many centers working independently in the same country

Although the different centers base their training programs on subjects of their mandates, different centers may include the same subjects. Many deal with aspects of the farming systems in which their mandated commodities are produced. Certain principles of pest control are basic to that element of training for various crops, for example. Some national officers wonder whether their participants are taught the same basic information when different persons take similar courses at the different centers.

Altogether, however, more concern collected around the range of contacts and consultation time involved to respond individually when each center brings in its own separate program.

The centers are independent and relatively autonomous in their operations. But when this situation is viewed from the side of the individual countries, the need for better articulation of centers' training activities at country level is apparent. This can be accomplished best, perhaps, if the country's agricultural knowledge institutions know and agree on the needs. An alternative approach is for the centers to articulate more fully, and perhaps jointly, their programs, their training courses and dissemination activities, and their cooperation with individual nations.

Articulation of centers' training activities wanted

Point Of View: Languages

Language was frequently cited as posing problems for participants. From the national side, language proficiency becomes a principal qualification; it may determine at which center and on what subject a country can take up a training opportunity. To the IARC, it can mean extra time for participants to gain proficiency, or costly translation/interpretation, as well as problems in interaction among participants and teachers, and more.

The CGIAR system is essentially anglophone, with many centers also working in another language -- some with Spanish or French as their first language and English second.

English has emerged as the principal language in the "international world of agricultural science." That world has become more and more available to developing countries as their agricultural scientists have mastered English.

Problems of language remain constraints to participants and to the centers. One recommendation that has been advanced would have centers increase their own staff proficiency in languages important in their regions: Spanish in Latin America, French, Arabic, and Portuguese in parts of Africa, for example. Along with that, centers could help participants who wish to master spoken English. Self-teaching language instructional tapes, using modern equipment already available in some centers, offer one means to give this kind of help.

The two scientist-educators who led this study added another dimension to the concern about language, helping participants move beyond general conversational English. They recommended that centers prepare teaching tapes for specialized professional English conversation in the main fields of interest of the centers. This would expand participants' ability to interact, especially with the senior English-speaking staff, and it would help center staff learn more about developing country conditions and problems. This

professional vocabulary might also encourage participants to be more active in networks that grow out of such contacts.

Point of View: Length and Content of Courses

Mild criticisms of length of courses -- both too short and too long -- were voiced by participants and national officials. Most concerned the courses of two weeks to under three months, which may lack the hands-on, field orientation common to the longer courses.

Long courses, more than 9 months and some degree-related training, can separate a participant from his or her country to the point that it is difficult to go back into the system.

Group may have wide range in qualifications

Some participants voiced concern about content of courses. Some thought content was affected when members of a training group came with a wide range of qualifications -- content selected that would not be too difficult for those with less than diploma work would likely not be rigorous enough for those with training up to doctorates.

More Topics Wanted

Concern was more often stated about topics not included than about content actually covered. One frequently mentioned was that some training on how to teach the topics would have been useful.

Training wanted on how to teach the topics

Topics which many thought needed more emphasis included: Socioeconomics for participants in natural-science-based subjects; technical, social, and economic aspects of past agricultural development; also agricultural change and adjustment in traditional rural societies.

Among technical topics mentioned: agricultural climatology, agroecological and land-use surveys, and remote sensing; statistical methods, management of research and research institutions -- including design of research on specific problems; seed industry production and management -- including standards, marketing, and relationships with plant breeders; plant and animal quarantine; communications and information storage; and documentation, report writing, and library organization.

Many of the topics appearing on the wanted list, as a matter of fact, were presently offered by one or another of the IARCs. Often the knowledge of courses available was not fully diffused among the institutions in developing countries.

Point of View: Towards a Consensus on Training in the CGIAR System

Observers contributing to this study saw evidence of the need for centers to articulate more clearly -- and perhaps to coordinate -- their training activities. Articulation was called for at two points: among the centers at the system level; and among centers active in a given country.

At System Level

At the system level, articulation was seen to be needed where the training programs of more than one center deal with the same topics, techniques, processes, or methods. Some of the examples include: farming systems; methods of survey and experimentation; design and analysis of experiments; methods of chemical and physical analysis; macroeconomic studies of countries and regions; and agroclimatology. When their participants work with these topics in programs of different centers, national leaders want consistency in the content of training.

The study team suggests that articulation can begin with scientists in the different fields; they must work out what needs to be done and how to do it. Training officers can then help achieve the goals.

Within One Country

Articulation may be more difficult within individual nations. Leadership must come from within the nation and, in the view of the study team, it will not be easy to determine how this is to be done. One goal will be a clearer identification and understanding of the relevant components of the nation's agricultural knowledge system.

Leadership must come from within the nation

Because of their activities within the country, the IARC representatives may often be among the few from outside who know the country situation well enough to help national leaders articulate the system. Once this articulation has been achieved, centers can fit their response more readily to the pattern desired by the national leaders, who have the responsibility to determine what the country needs.

5. A Look to the Future

In this study, TAC appraised IARC training from two viewpoints, that of the developing countries and that of the centers. In the same time frame as that of its study of training, TAC also devoted an intense effort towards recommending priorities for the CGIAR centers over the short and medium term.

Training was given a key role in that future. Four primary thrusts continue to be at the center of the CGIAR approach to helping meet world needs: enhancing sustainable agriculture production through resource management and conservation; increasing productivity of commodity production systems; improving the policy environment; and strengthening national research capabilities.

Comparative advantage will remain strongly anchored in research

The research programs of the centers themselves are expected to continue to evolve. The commodity centers' comparative advantage will remain strongly anchored in research -- in their ability to direct a critical mass of research resources into multidisciplinary and interdisciplinary attacks on problems within their mandates. Further decentralization will let the centers deal with needs over a broader range of environments.

As national research programs gain strength, the centers will expect to devote still more attention to "upstream" research matters. This means sharper focus on general problems that have widespread implications. That becomes possible as the increased capabilities nationally equip countries better to seek research solutions for their localized and specific situations.

The IARCs training advantage is based on research, and national scientists continue to be the primary clientele.

Resource-use forecasts project allocations to training in CGIAR centers at the level of the recent past, under 10 percent of center core funding. In its priorities for the coming years, TAC noted four areas of training and human resource development for the focus of attention:

* training national scientists
* training national research managers
* training of trainers and development of training materials
* assessment of training needs

The Changing Partnership

The center-nation relationship will tend to become more and more a partnership, with interaction involving training, information, and institution-building activities. The more sophisticated national research institutions -- in part due to effective training programs of the centers -- can apply their greater capability to matters that are of major concern in their own situations.

Shift more training responsibility to the nations

Many instances have been cited of partnerships for training that exist now between IARCs and national systems. They are likely to be the forerunners of the future. The centers have concentrated their training on research and how research can contribute to agricultural development. Different elements of national knowledge systems have been affected through training experiences of their staffs in universities, ministries, extension and development projects, and the private sector.

CIP Was Pattern-setter

CIP was the innovator for early and strong use of in-country training. While its headquarters facilities were under construction in 1972, CIP staged research-related potato production courses in cooperating countries. It has since developed various patterns of cooperation for in-country training.

CIP can provide most of the initiative for organizing and conducting a course in any country, much as if the participants were taken to the Lima headquarters. CIP can also take the planning initiative for a course, but involve the country in organizing planning, and some of the teaching. At another level of cooperation, the country takes the lead, with CIP in a supporting, complementing role to assist where needed and wanted by the country. In the next pattern of evolution, the country simply takes full responsibility for all aspects of training.

A review of in-country training experiences by CIP shows an overall trend toward greater involvement of the country in such programs, as shown in the graph.

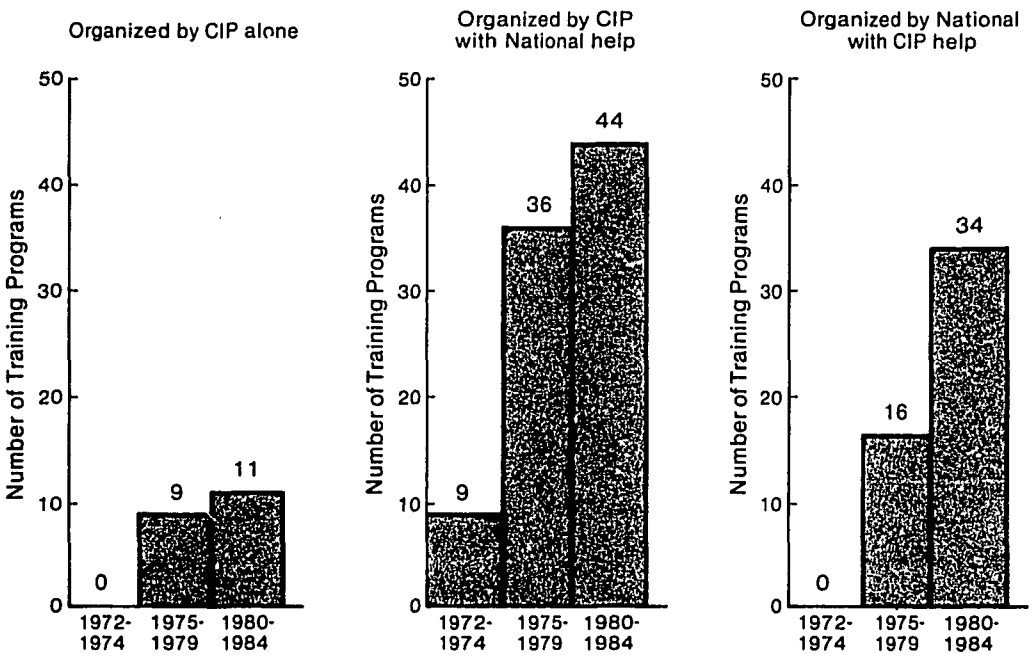
More In-country Training

Both national system leaders and those in IARCs favor the shift of much training responsibility to the nations. The shift has already begun, especially for production-related courses. It gives the nation a broader base on which to train to strengthen research capability. It can also increase opportunities for training commodity specialists in the country's extension and development programs, only a few of whom can be brought to IARCs to learn what research can do.

The pattern of evolution will probably follow recent experience, in which an IARC takes initiative with a given country to plan and carry out certain training courses in the country. Cooperation may be carried out through various in-country bodies -- agricultural department, in-service training unit, and agricultural universities or faculties. Frequently, external donor agencies also join in planning these courses.

The in-country cooperators strengthen their capabilities through working with a center's trainers, who already have experience with courses that produce effective results. As the national trainers gain experience and confidence, the training role of the IARC diminishes.

The graph of CIP work with cooperating countries shows the shift in responsibility between CIP and those countries for potato training courses over the last dozen years. It indicates that countries assumed increasing local initiative to organize and teach courses needed for their staffs and programs.



Some of the countries may develop to the point that they become trainers for neighboring countries that can't justify maintaining training capability in all fields of interest. The future may bring cases of developing countries that once sent many participants to IARC training courses later contributing as international trainers. For example, Brazil -- now a contributing donor in CGIAR -- might provide training in fields of its expertise to countries where Portuguese is a common language.

Funding In-country Courses

Funding will be an issue as courses shift to the countries. Centers now cover only fractions of training costs from their core resources; few will have means to underwrite courses given under national auspices -- though costs per participant should be lower.

Countries will typically need to find funds to provide such training. So donors may need to be drawn into the center-nation partnership to complement their role in supporting core budgets.

Producing Training Materials

In-country training will stimulate demands for effective training materials in all media from IARC programs. Most centers have established their own means to supply their own trainers; and in-country trainers will want and need similar support.

Autotutorial programs, audio-visuals, and printed materials all have their place in effective training. But they are costly to produce. Quantities of high-quality, effective materials may be well beyond limits of financial support available from training funds from either centers or national training projects. This area may call for greater attention from the donor community -- beyond those few now encouraging some centers with enabling grants.

Greater donor support for training needed

Focuses of Training

Some shifts are expected in the focus of IARC training in the future. As national systems strengthen their research capabilities, they may take over responsibility for most of the breeding and production-related investigations needed to fit center commodities to their environments. This will tend to free IARC resources for more attention to so-called upstream research concerns. Centers may be working more on complex basic matters with world-wide implications, such as virology, tissue culture propagation, quarantine procedures -- even some areas of biotechnology, and many other topics.

Centers likely to continue some production training courses

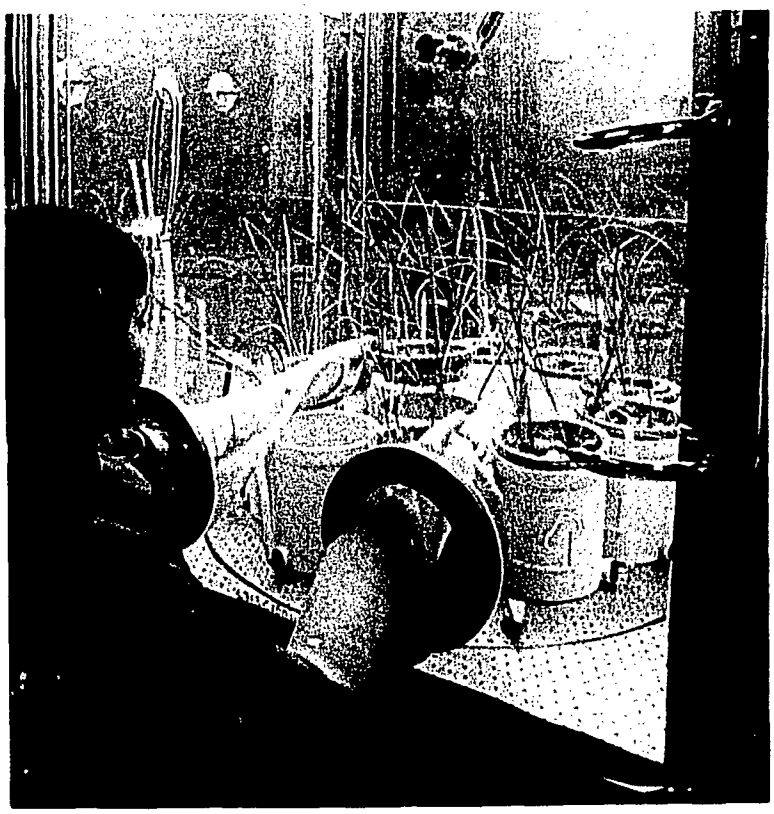
Findings from this research will need to be shared with all countries that can use them. Thus new training initiatives will be called for, continuing the emphasis on specialized courses that already occupy much center training activity.

Centers appear likely to continue some production courses, in part to meet training needs of nations early in their development of research activity in the center's commodity. IARCs may also continue courses in order to train national trainers; they may also enlarge efforts to produce support materials for national users.

Relations with Universities

Against the backdrop of the literally hundreds of thousands of trained professionals needed for agricultural research and development in developing countries, the CGIAR system capacity of about 2,000 participants per year seems of minor significance. (Their impact has not been insignificant, however, as found in this study. It is mainly that centers'capacity is limited.) Universities seem a logical place to look to as trainers of many of the professionals needed; many universities in both developed and developing countries are involved already.

Numerous instances of productive IARC-university relationships in developing countries have been noted in this report. As both parties become more accustomed to



IRRI's well-developed relationships with many universities make its innovative work widely accessible -- use of a sophisticated growth chamber, the example shown here.

each other, mutually beneficial opportunities increase. Some university professors and center scientists work together on research on a given commodity; professors may spend sabbaticals as visiting scientists at centers; center scientists give lectures in university courses. Some university students do thesis research in a cooperative arrangement between their professors and center scientists.

Mutual interests of universities and centers may be expected to expand. There is ample room for more collaboration.

Mutual interests of universities and centers expected to expand

Many international donors are currently funding both centers and universities in the same countries -- sometimes with no collaboration between their projects. This appears to be an area ready for innovative program relations to strengthen research institutions and improve training. Donors may be in the ideal spot to encourage collaboration between these two key actors in programs of manpower development.

Enhancing Country-IARC Dialogue

Most developing countries today have abler and more knowledgeable research administrators and officers than was true when IARCs ventured into research training. Few of the systems are yet mature organizationally, but their evolution has improved the quality of dialogue between themselves and such cooperators as the IARCs -- an apparent benefit of IARC training, but not due to that alone.

Country leaders know the centers better, and they tend to bring more realistic requests to them. Less often do they ask for services, funds, and programs that fall far outside center options. Interviews with national leaders, however, showed many gaps remaining in leaders' knowledge of CGIAR centers. The system needs to expand its efforts to make itself and its programs known more widely among administrators and policy-makers in developing countries.

The quality of national leadership will continue to grow. With the authority of increased knowledge, the countries will articulate their needs and wants more clearly and precisely. Activities can then be worked out to meet the goals of both country and centers.

Centers will continue to respond to needs as felt and expressed by countries

Since the purposes of the CGIAR system are carried out in national programs, the centers will continue to respond to needs as they are felt and expressed within the countries. (The article, Special Interest in Africa, page 91, suggests the magnitude of training needs on one continent.)

A Growing Sense of System

CGIAR centers originated as separate and largely autonomous organizations. That mode has served well both the centers and their cooperating partners, developing countries and donors. Experience over time has brought a sense of common interest among the centers; the sense of community has become more pervasive.

Nations see benefits when centers coordinate in-country activities

Cooperating countries -- from their stance of working with several different centers, from 4 to 13 in the countries visited in this study -- see benefits to themselves when centers coordinate similar activities within the same country. The matter is not simple.

Centers differ in how they may best relate their mandate to the needs of a country. As independent units, each governed by an independent board and accustomed to a unique mode of operation, all can't be pressed into a common mold or expected to act in a common pattern. But steps are being taken as centers work together in a country or region.

In Peru, for example, work by CIAT, CIMMYT, and CIP is coordinated through another group with longstanding effort in the country -- North Carolina State University of U.S.A. Under the aegis of the Institute of Agricultural Research in Ethiopia, CIMMYT helps coordinate work in that country by itself, ILCA, ICRISAT, and ICARDA. With support by the United Nations Development Programme, ISNAR has undertaken a project that specifically seeks ways of helping IARCs integrate their activities in a group of countries in southern Africa.

Thus the centers are providing increasing evidence of collaboration. The future should bring more and more cases where one center, with the support of others, takes a convening role in a country so all may articulate their individual programs. From a broader base of knowing each other and the country better, all may gain.

A Global System

The centers of CGIAR, as has been noted often here, emerged as individual units. Yet through their own actions, and with guidance from CGIAR and TAC, they have become a global network with a growing strong sense that they form a common system. Among them, they devote attention to most of the crucial food commodities of the world (although in themselves, they have not contributed to the livestock sector with the thoroughness that they have to crops). Their dispersion around the world of the developing countries is also global.

In a larger sense, however, the centers of CGIAR are simply part of global systems. They are few among the

research institutions of the world which deal with agriculture. The reach of their training programs is global, but only fractional in terms of the population of all agricultural researchers in the developing countries.

Towards an Appropriate Agricultural Science

The two principals on the TAC study team came from long careers as scientists-educators in agriculture. At the end of the study, Professors Bunting and Araujo addressed themselves to some areas of need in aspects of training and education in international agriculture. And they saw potential roles and contributions for the CGIAR system, even beyond its well-regarded present activities.

To refine intellectual bases of training offered by centers

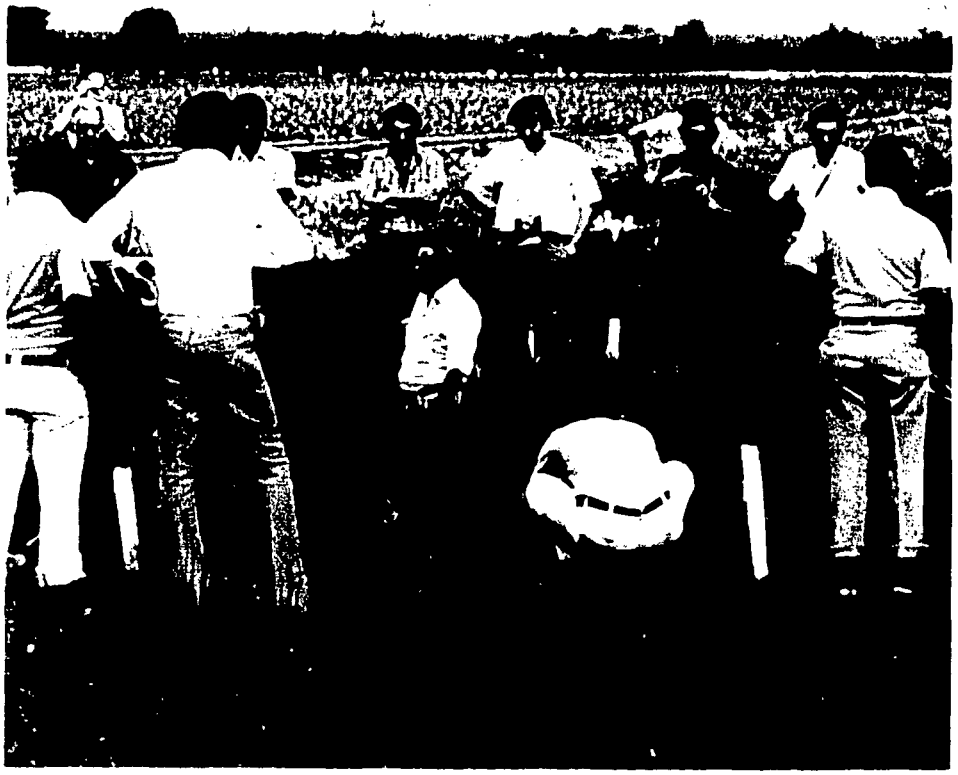
For one thing, the professors proposed that efforts be made to refine the intellectual bases of training such as offered by the centers. They suggested that CGIAR trainers have experiences that could provide wider benefits through collaboration with other agencies concerned with research-related training. Both men are products of agricultural science, which they describe as "largely a Western and Northern product, where the subject first emerged and where some unifying concepts were developed."

They go on to say, "These concepts are essentially derived from the environments and systems of regions of temperate climate. The curricula of agricultural faculties in all developing countries are largely derived from this source -- because in fact there is no other."

Many of the generalizations in agricultural science are universal, but much of the specific material is less than fully appropriate to all environments. Few developing countries are in temperate environments; more typical for them are regions of humid lowland tropics, tropical highlands, seasonally arid tropics, or seasonally arid winter-rainfall climate.

There are many differences between the temperate and tropical environments with respect to organisms involved, seasonal courses of water balance and nitrogen cycle, outbreaks of insects and other pests, social structure and customs, stage of development, and constraints on development.

Publications and training manuals from IARCs are already providing material related to such environments as these -- and they are in demand by researchers and educators in developing countries. The task, say the professors, is to generate a series of what they call "adapted variants of agricultural science" -- propositions that are appropriate to the environments of developing



Centers' research can help refine concepts in agricultural science for application to tropical environments.

countries. They believe these may be drawn from the research and training experiences of the centers, with participation and cooperation of universities and other research institutions in developing countries.

Towards a World Effort to Meet Training Needs

Significantly increased output of food and rural products will be needed in countries that occupy large areas, or have large populations, in tropical and subtropical environments. IARCs of the CGIAR system have earned a leading role in generating and disseminating new knowledge, skills, methods, and processes that support such increases, say Bunting and Araujo.

Training offered by IARCs has been found, in this study and in other instances, to provide an effective means of spreading research-based knowledge and systems to developing countries. The centers can assume only a small part of the training task that lies ahead, but they have a unique contribution to offer. How best to make that contribution deserves thinking by sponsors and donors who are likely to be involved in the large undertaking.

Such large training programs will require substantial funding, and Bunting and Araujo suggested that a change in funding approach could be helpful: Perhaps donors could establish core funding to IARCs earmarked for

training. The training program within a center could then be developed on its merits, not in competition for funds against research.

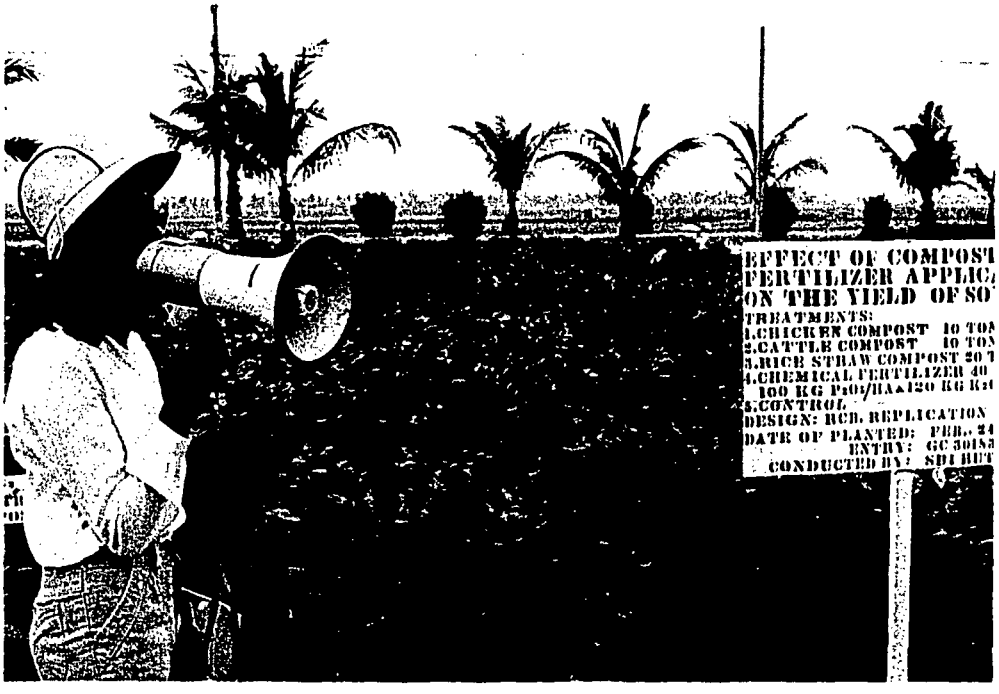
What is Needed to Make Training by IARCs More Effective and On Target in the Future?

First, targets have to be well defined. That is a task for the national systems, a task that will be facilitated if the country has fashioned an agricultural development and food policy, with strong participation of all the actors in the national agricultural knowledge system. Then it will be meaningful for the nation to draw up realistic plans for development of human resources, linking needs for expertise to -- for example -- specific food production needs.

The areas in which centers can respond with training have their limits. This report has shown what the centers can do in training and has emphasized that their strength comes from being based in the research that they do. To the present, that research has been centered on mandated food crops, livestock, and the production systems in which these commodities are produced. This focus, within flexible limits, defines the main areas for training by CGIAR centers.

There are many points of overlap of the training needs of developing countries and the comparative training advantages of CGIAR centers. Such training, however, requires significant funding beyond the core budgets of the

Training on how to train others will take on increasing importance among IARC contributions.



centers. It will have to come from national budgets or be provided by donors. The national system is in the best position to approach donors concerning this need, together with the centers where this is useful

In its visits with officials of developing countries, the TAC study team was often asked about the functions of these IARCs. This indicates that purposes and limitations of the centers are less widely understood than would be desirable. With greater understanding and good will shown abundantly on all sides, well-targeted training efforts can be more effective. Both sides have to work to make them so.

Many conditions have to be met by the centers; they are being met fully or increasingly at all the centers. Content, duration, methods, and evaluation of training must be appropriate to the needs of participants. Preparation of participants prior to the training may go beyond language study to providing advance description of training and course literature. Some of the participants should be designated by their national institutions to receive intensive theoretical and practical instruction on how to train others -- and centers will have to provide it. To increase capacity for training, more staff of universities should have opportunity to spend time at a center. Center scientists in many cases can be helped to become good trainers also; they, as well as national trainers, need to be supported by uptodate training aids and materials. Other means of increasing effectiveness of training have been brought up elsewhere in this report.

Training is an institution building block

Training is an institution building block. Centers need national partners that can increasingly take on courses on crop production, plant breeding, and farming systems and practices in the environment from which greater food output must be secured. In-country training, too, should derive its strength from research. The nation can draw on all members of its agricultural knowledge system, especially its academic institutions, to derive that strength in areas of their expertise. Centers can and do help build viable research institutions and strengthen universities to undertake useful research and training.

Dr. Eduardo Casas Diaz, of Mexico's Postgraduate College at Chapingo, has written of what he regards as the necessity for unifying agricultural knowledge systems in Latin American countries in developing human resources for agricultural research in that region. He has pointed to a clear and definite CGIAR centers' role in that: "The Consultative Group on International Agricultural Research (CGIAR System) can make a significant contribution to

this task. . . in the long term, the CGIAR will be judged not by its contributions to the development of a particular crop, but by the number of agricultural knowledge systems that it will have helped to create." (His viewpoint seems applicable in other regions of the world.)

Effectiveness of training by these centers depends much on national efforts:

* in nominating good men and women for training;
* in recognizing the achievements by the participants of higher levels of competence and ability to carry responsibility;
* in providing the conditions in which the training can be applied;
* in creating and maintaining the means to promote an environment for research plus channels and incentives for delivery and adoption of useful research results;
* and, with regard to training, in creating and supporting training units within the structure of the national system.

These are but a few of the more important efforts being made in most countries that cooperate with CGIAR centers in training -- others have been described elsewhere in the report.

Training is learning from one another. That has been happening at these CGIAR centers. They and the national systems are learning by doing -- as partners in building human resources for improved food production to help developing nations help themselves.

Training in the CGIAR system will be adapted to meet the changing needs and to use the greater possibilities of the future.

Through their role as practical and field-based trainers, IARCs staffs have helped build human resources which, in turn, enable developing nations better to help themselves toward improved food production.

Special Interest in Africa

Much interest in the food situation in Africa has been shown the world over in the past several years. Below the Sahara Desert, poor weather and harvests, rapidly growing populations, and declining food output per capita have caused serious and expanding difficulties for several

At the root of these difficulties for some countries has been not enough capacity of the land and environment to support the nation's population, even at higher than customary levels of production techniques. In 1982, Niger, Rwanda, Ethiopia, and Kenya had already fallen behind. Others are expected to join them in the years ahead, Senegal and Nigeria among them. Larger imports, year after year, cannot be the answer for countries that do not have mineral wealth or oil reserves or other non-agricultural goods or services to foot the bill.

Twenty-two countries were appraised in this study of training. Among them, the eight African countries had lower rates of change from 1969-82 in both total food output and food per person, when compared with those statistics for the Latin American and Asian countries. Seven of the eight Subsaharan African countries actually lost ground on the measure of food output per capita (as the graphs portray).

FAO Statistics on Africa

FAO has made projections of the future situation in Subsaharan Africa. According to those statistics, food demand is expected to increase by 3.4 percent each year, but food output will rise at the lower rate of 2.6 percent. Based on those trends, FAO expects Africa's present rate of 83-percent self-sufficiency in food to drop to about 55 percent by the year 2000.

To find out what African countries could do themselves in the face of such prospects, in 1984 FAO surveyed the trained manpower situation of the continent, collecting data mainly through FAO representatives in the countries. The results show very uneven distribution of trained manpower in agriculture, both by country and by segment or activity in the agricultural sector. The data suggest in general that due to deficiencies in trained manpower, the French- and Portuguese-using nations will face grave difficulties in generating the needed increases in yield and output of agricultural products.

The situation appeared most dire in these non-anglophone countries, where total lack of professionally trained people was reported in some segments and activities: for example, no people trained to professional level were found in irrigation and water control for 6 of 8 countries; in mechanization in 15 of 17 countries; in agricultural research in 5 of 6 countries; and in training in 5 of 5. The situation was perhaps most severe in the livestock sector: zero trained staff was reported in livestock research in 17 countries -- 14 of that group use French or Portuguese as their language of international communication. Eight such countries were among the nine for which high numbers of livestock were reported per veterinarian.

This survey led FAO to conclude that at least nine French- and Portugese-using countries were likely to face major shortages of professional personnel in agriculture by the year 2000. In addition, Ethiopia, Malawi, and Uganda will probably have similar shortages. Great shortages were also foreseen among technical and support staff in 12 non-anglophone countries, plus Ethiopia, Kenya, Sudan, Tanzania, and Uganda. Lack of capacity for training at university and pre-university levels was considered a cause of these shortages, at least in such countries as Chad, Ethiopia, Madagascar, Niger, and Rwanda.

Even where numbers appeared adequate and where capacity for training seemed sufficient, the FAO survey raised questions about quality and appropriateness of past training and whether some institutions can meet needed standards. Many of the training institutions needed additional staff, especially with higher degree qualifications. In 1983, only 13 percent of some 9,000 instructors in national work forces had Ph.D. degrees; 27 percent had not gained the baccalaureate.

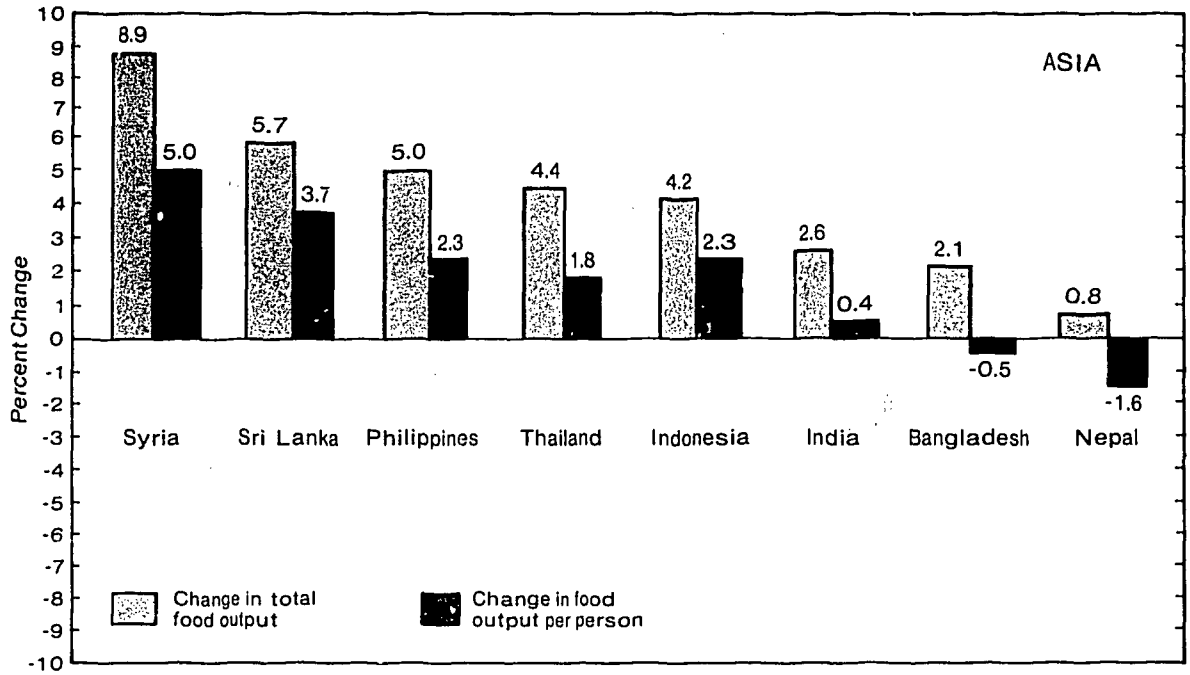
Similar Findings by TAC Study Team

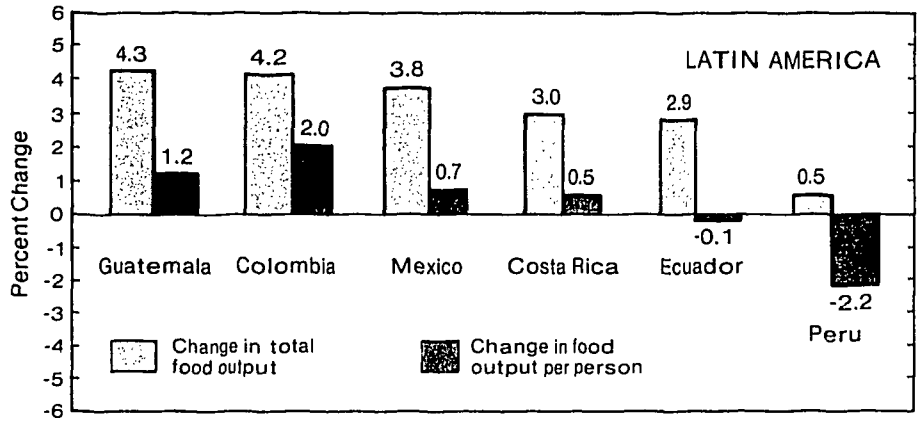
The TAC study team made similar findings in some of the countries it visited, notably Burkina Faso and Liberia; some others, such as Nigeria and Ethiopia, showed signs of some good training facilities and content -- these could be improved further, however.

Discussion with national officials, and interviews with IARC training participants, invariably brought out that trained personnel is not the only constraint on expansion of output. Often that was not considered the key constraint, even where the capacity of environmental resources to support the population would permit expansion; many of the other constraints were in the domain of national management and international relations -- which will not be considered further here.

In the larger countries visited by the study team, national agricultural research leaders were highly aware of these "other" constraints. Even when there were relatively large numbers of staff in post and where capacity for training in-country was -- or would likely become -- sufficient, these leaders earnestly desired that the centers do still more training. This was apparent also in reports of senior national officers who prepared case-studies -- especially those in Tunisia, Senegal, and Kenya. Yet none of these, nor of five other countries visited in Africa, had a nationally approved plan for development and employment of its human resources in agriculture.

This demand for additional training by CGIAR centers is probably well made and justified, as long as efforts continue to remove the "other" constraints. Officials expressed the hope that the centers could help, at least





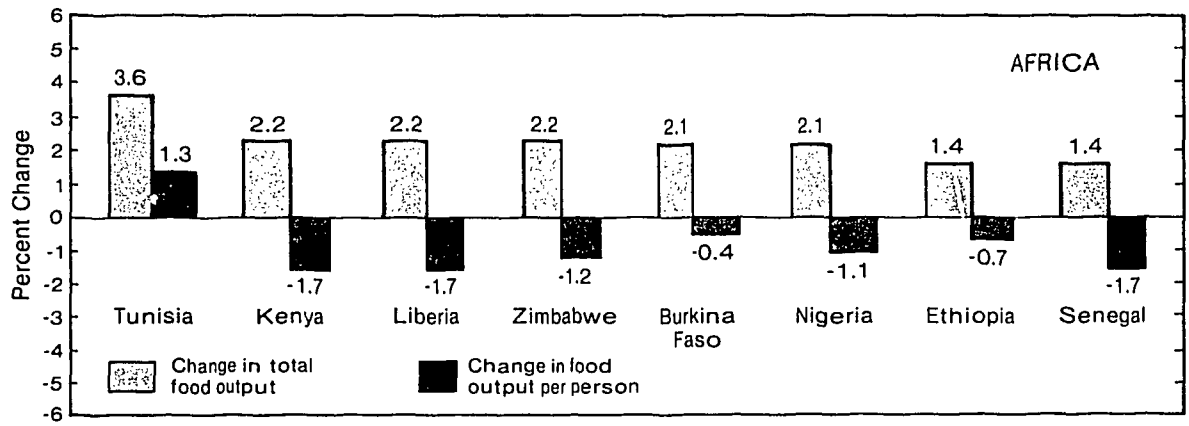


Fig. 7. Changes in food output between 1969 and 1984 in 22 countries visited in TAC study of training.

with advice on how to correct existing weaknesses in such areas as policy environment, organization and management of research, and in the content of professional education and training offered by national institutions. Improvements in these areas should mean that the best use could then be made of the limited training resources that the IARCs can offer.

Centers Are Aware of Special Needs

The directors of CGIAR centers are well aware of the need for special attention to provide training appropriate and useful to Africa. They are involved in discussions among themselves, with leaders of national programs and institutions, and with potential donors. Centers can, and do now, contribute to evolution in some countries of practical and output-oriented manpower development plans; also for groups of countries that may be too small and too poor in resources to establish separate research systems. And the search for advancement includes sources of training by others outside the centers or through centers' help in-country or in-region.

It is especially encouraging that all of the centers are coming together to work collectively in Africa. It is not just IITA, WARDA, ILRAD, and ILCA -- which are located there; nor is it just in regard to training. This augurs well for many countries becoming able to overcome constraints which are, indeed, linked to availability of suitably trained staff for agricultural growth, particularly through research.

A similar effort by the nations is now called for.

In their recommendations on training to the Technical Advisory Committee, Professors Bunting and Araujo said: "We felt the need to address a single and first suggestion in part to the developing countries which cooperate with the centers." And they added:

Nations should review their existing arrangements for articulating the components of their agricultural knowledge systems to ensure that they are as productive as possible for national development. Centers should be prepared to assist in this task if they are invited to do so.

The nations willing, the donors willing, and given the centers' special interest in an interactive partnership that will let research work for advances in food production, the relevant training and further training needs of the continent will be met.

Statistical Annex

Total participations in training and technical skill development activities of CGIAR centers through 1984. By Regions:

Subsaharan Africa
Latin America and Caribbean
Asia and Pacific
Near East and North Africa

Participations in training and technical skill development activities of individual CGIAR centers through 1984.

CIAT
CIMMYT
CIP
IBPGR
ICARDA
ICRISAT
IFPRI
IITA
ILRAD
ILCA
ISNAR
IRRI
WARDA

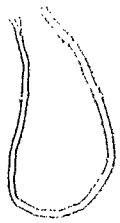


Table 1. Number of participations from countries of Latin America and Carribean in training and technical and skill development activities of IARCS through 1984. (In-country training not included.)

Center	Total	Post doctoral	Degree-related		Visiting scientist	Courses (Group training)
			M.Sc.	Ph.D.		
CIAT	2,396	17	76	21	1,155	1,127
CIMMYT	1,281	18	155	37	383	688
CIP	850	3	100	12	147	588
IBPGR	201	-	16	-	-	185
ICARDA	3	-	-	-	-	3
ICRISAT	52	-	2	2	13	35
IFPRI	6	-	-	-	6	-
IITA	55	1	1	1	6	46
ILCA	1	-	-	-	-	1
ILRAD	10	-	-	-	-	10
IRRI	67	4	19	4	2	38
Totals	4,922	43	369	77	1,712	2,721
ANTIGUA--3						
CIAT	1				1	
IITA	1					1
ARGENTIA--163						**Total: 163**
CIAT	40		2		14	24
CIMMYT	58	2	3		23	30
CIP	41			1	10	30
IBPGR	23		1			22
ILRAD	1					1
BAHAMAS--3						
CIAT	1					1
CIP	2				2	
BARBADOS--3						
CIMMYT	1	1				
IBPGR	1					1
ICRISAT	1					1
BELIZE--18						**Total: 18**
CIAT	11				6	5
CIMMYT	6				1	5
IITA	1				1	1
BOLIVIA--223						**Total: 223**
CIAT	108		1	1	37	69
CIMMYT	59		5		18	36
CIP	44		2		14	28
IBPGR	12		1			11
BRAZIL--647						**Total: 637**
CIAT	389	2	5	1	143	238
CIMMYT	97		3		68	26
CIP	89				16	73
IBPGR	21		3			18
ICRISAT	16		2	2	10	2
IFPRI	1				1	
IITA	18				3	15
IRAD	1					1
IRRI	5		2			13
CHILE-162						**Total: 162**
CIAT	44	2	1	1	20	20
CIMMYT	52	1	2	1	33	15
CIP	58	2		2	16	38
IBPGR	2					2
ICARDA	3					3
ICRISAT	2					2
IRRI	1		1			

COLUMBIA--769						**Total: 779**
CIAT	555	9	32	8	293	213
CIMMYT	77	2	18	2	7	48
CIP	90		4	4	9	73
IBPGR	26		2			24
ICRISAT	1					1
IFPRI	1				1	
IITA	3	1		1		1
ILRAD	1					1
IRRI	15	3	6			6
COSTA RICA						**Total:153**
CIAT	79		5		25	49
CIMMYT	32		2		9	21
CIP	31		2		5	24
IBPGR	8		1			7
IFPRI	2				2	
IITA	1					1
CUBA						**Total: 102**
CIAT	70		1	2	55	12
CIMMYT	8		2		3	3
CIP	5				3	2
IBPGR	1					1
IITA	1					1
ILRAD	1					1
IRRI	16					16
DOMINICA						**Total: 3**
CIMMYT	1					1
IITA	2		1			1
DOMINICAN REPUBLIC						**Total: 167**
CIAT	118		1	1	49	67
CIMMYT	25				3	22
CIP	15				2	13
IBPGR	3					3
ICRISAT	3				1	2
IITA	1				1	
IRRI	2			1		1
ECUADOR						**Total: 346**
CIAT	151		114		104	43
CIMMYT	94	1	9	2	29	55
CIP	87		2	1	11	73
IBPGR	11					11
IRRI	3		1		1	1
EL SALVADOR						**Total: 98**
CIAT	41		2	1	15	23
CIMMYT	49	2	3	1	12	31
CIP	2					2
IBPGR	1					1
ICRISAT	5					5
GRENADA						**Total: 3**
CIMMYT	3				2	1
GUATEMALA						**Total: 219**
CIAT	105	1	6	1	62	35
CIMMYT	88		16		27	45
CIP	17				2	15
IBPGR	7					7
ICRISAT	2					2
GUYANA						**Total: 20**
CIAT	9				4	5
CIMMYT	4	1				3
IITA	3					3
IRRI	4		2			2

HAITI						**Total: 40**
CIAT	17				4	13
CIMMYT	19				1	18
ICRISAT	2					2
IITA	2					2
HONDURAS						**Total: 153**
CIAT	81		4		33	44
CIMMYT	57		3	2	20	32
CIP	9					6
IBPGR	2					2
ICRISAT	4					4
JAMAICA						**Total: 16**
CIAT	7				3	4
CIMMYT	3				2	1
IITA	3				1	2
ILCA	1					1
IRRI	2					2
MEXICO						**Total: 509**
CIAT	139		1	1	55	82
CIMMYT	294	8	66	29	50	141
CIP	43		2	1	6	34
IBPGR	10		1			9
ICRISAT	10				1	9
IFPRI	2				2	
ILRAD	1					1
IRRI	10		4	1		5
NICARAGUA						**Total: 85**
CIAT	49		2	2	15	30
CIMMYT	27		1		1	25
CIP	2	1				1
IBPGR	2					2
ICRISAT	2					2
IITA	3					3
PANAMA						**Total: 137**
CIAT	78				49	29
CIMMYT	33		1		13	19
CIP	21				2	19
IBPGR	1					1
ICRISAT	2				1	1
IRRI	2			1		1
PARAGUAY						**Total: 68**
CIAT	46				33	15
CIMMYT	17				6	11
IBPGR	2					2
ILRAD	1					1
PERU						**Total: 619**
CIAT	169	2	7	1	96	63
CIMMYT	151		17		50	84
CIP	234		86	2	35	110
IBPGR	55		4			51
IITA	6				1	5
ILRAD	1					1
IRRI	3	1	1	1		
SURINAM						**Total: 2**
CIAT	1					1
IBPGR	1		1			
ST. LUCIA						**Total: 1**
IITA	1					1
ST. VINCENT						**Total: 1**
IITA	1					1

TRINIDAD AND TOBAGO						**Total: 13**
CIAT	6					6
IITA	6					6
IRRI	1					1
URGUAY						**Total: 31**
CIAT	5	1			1	3
CIMMYT	7		1		1	5
CIP	13		1		5	7
IBPGR	4		1			3
ICRISAT	1					1
ILRAD	1					1
VENEZUELA						**Total: 153**
CIAT	74		2	1	38	33
CIMMYT	17		3		4	10
CIP	47		1	1	5	40
IBPGR	8		1			7
ICRISAT	2					1
IITA	2					2
ILRAD	1					1
IRRI	3		2		1	

Table 2. Number of participations from countries of Subsaharan Africa in training andtechnical and skill development activities of IARCS through 1984. (In-country training not included.)

Center	Total	Post doctoral	Degree-related M.Sc.	Ph.D.	Visiting scientist	Courses (Group training)
CIAT	35	2	-	9	18	6
CIMMYT	478	6	19	3	136	314
CIP	477	2	1	-	24	450
IBPGR	147	-	34	-	-	113
ICADA	40	2	2	2	-	34
ICRISAT	453	2	30	5	12	404
IFPRI	10	-	-	-	10	-
IITA	2,606	35	124	80	263	2,104
ILCA	260	6	-	11	32	211
ILRAD	280	9	6	19	49	197
IRRI	128	5	15	3	1	104
ISNAR	147	-	-	-	-	147
WARDA	1,128	-	-	47	-	1,081
Totals	6,189	69	231	179	552	5,158
ANGOLA						**Total: 10**
IBPGR	1		1			
IITA	9				1	8
BENIN						**Total: 176**
CIMMYT	4		1		1	2
CIP	3					3
IBPGR	3					3
ICRISAT	7		1	1		5
IITA	86		36		6	44
ILCA	1					1
WARDA	72			3[a]		69
BOTSWANA						**Total: 36**
CIMMYT	4				2	2
ICRISAT	15				1	14
IITA	9					4
5						
ILCA	8				1	7

BURKINA FASO						**Total: 190**
CIMMYT	2				2	
CIP	2					2
IBPGR	5		1			4
ICRISAT	31	1	2		2	26
IFPRI	1				1	
IITA	67		1	1	5	60
ILCA	6					6
ILRAD	3					3
IRRI	2					2
WARDA	72			2[a]		70
BURUNDI						**Total: 68**
CIAT	1				1	
CIMMYT	2				1	1
CIP	46				2	44
IBPGR	2					2
ICRISAT	1					1
IITA	14		1			13
ILCA	1					1
ILRAD	1				1	
CAMEROON					**Total: 157**	
CIAT	3			3		
CIMMYT	14		1		4	9
CIP	7	1				6
IBPGR	1					1
ICRISAT	4					4
IITA	121	2	11	8	17	83
ILCA	5				1	4
ILRAD	1				1	
IRRI	1					1
CAPE VERDE						**Total: 5**
CIMMYT	1					1
CIP	3					3
ICRISAT	1					1
CENTRAL AFRICAN REPUBLIC						**Total: 22**
IITA	18				1	17
ILCA	4					4
CHAD						**Total: 33**
CIMMYt	1					1
ICRISAT	8					8
IITA	13		1		1	11
ILCA	8					8
WARDA	3					3
COMOROS						**Total: 1**
IITA	1					1
CONGO						**Total: 32**
CIMMYT	1					1
CIP	1					1
IBPGR	1					1
IITA	27				3	24
ILCA	2					2
DJIBOUTI						**Total: 3**
ICARDA	3					3
ETHIOPIA						**Total: 185**
CIMMYT	52	2	1	1	19	29
CIP	15	1			2	12
IBPGR	16		4			12
ICARDA	7					7
ICRISAT	27		2	1		24
IITA	32	2	1	1		28
ILCA	49			2	4	43
ILRAD	12				6	6
IRRI	2					2

GABON						**Total: 10**
CIP	2					2
IITA	8	1				7
GAMBIA						**Total: 106**
ICRISAT	12					12
IITA	20			1		19
ILCA	5					5
ILRAD	5				1	4
IRRI	1		1			
WARDA	73			1[a]		72
GHANA						**Total: 434**
CIAT	1			1		
CIMMYT	48		4		12	32
CIP	1					1
IBPGR	12		3			9
ICRISAT	16		3			13
IITA	136	4	12	8	21	91
ILCA	11	4			2	5
ILRAD	4					4
IRRI	13	2	2			9
WARDA	76			2[a]		74
GUINEA						**Total: 142**
CIMMYT	4	1				3
CIP	2					2
IBPGR	3					3
ICRISAT	4					4
IITA	50				4	46
ILCA	4					4
IRRI	1					1
WARDA	74			1[a]		73
GUINEA BISSAU						**Total: 73**
IITA	12					12
WARDA	61					61
IVORY COAST						**Total: 102**
CIMMYT	14			1	6	7
CIP	3					3
IBPGR	1					1
IFPRI	2				2	
IITA	34		3			31
ILCA	3					3
IRRI	1					1
WARDA	44			2[a]		42
KENYA						**Total: 405**
CIAT	7			1	5	1
CIMMYT	58	1			25	32
CIP	69		1		3	65
IBPGR	16		5			11
ICARDA	2					2
ICRISAT	41		5			36
IFPRI	2				2	
IITA	64	2	1	2	3	56
ILCA	22	1		2	3	16
ILRAD	115	5	5	13	21	71
IRRI	9		2			7
LESOTHO						**Total: 7**
CIMMYT	4				2	2
CIP	1					1
ICRISAT	2					2
LIBERIA						**Total: 170**
CIP	3					3
IBPGR	2					2
IITA	54			3	12	39
ILCA	3	1				2
ILRAD	3					3
IRRI	6					6
WARDA	99			1[a]		98

MADAGASCAR						**Total: 60**
CIMMYT	3					3
CIP	44					44
IBPGR	1					1
IITA	7					7
ILCA	2					2
IRRI	3					3
MALAWI						**Total: 138**
CIMMYT	8					8
CIP	71					71
IBPGR	1					1
ICRISAT	20					20
IITA	28		1		1	26
ILCA	6				1	5
ILRAD	4				1	3
MALI						**Total: 233**
CIMMYT	3				2	1
IBPGR	7		1			6
ICRISAT	43		4		1	38
IITA	59			1	11	47
ILCA	13				3	10
ILRAD	4				3	1
IRRI	9					9
WARDA	95			2[a]		93
MAURITANIA						**Total: 73**
CIP	2					2
ICRISAT	7					7
IITA	10				1	9
ILCA	1					1
WARDA	53					53
MAURITIUS						**Total: 9**
CIMMYT	1				1	
CIP	2					2
IITA	3			1		2
ILCA	3					3
MOZAMBIQUE						**Total: 18**
CIMMYT	8				4	4
IBPGR	1					1
ICRISAT	3					3
IITA	3				1	2
ILLCA	1					1
ILRAD	1					1
NIGER						**Total: 96**
IBPGR	1					1
ICRISAT	42		7	1		34
IITA	17				2	15
ILCA	2					2
WARDA	34			1[a]		33
NIGERIA						**Total: 1,306**
CIAT	4			3	1	
CIMMYT	43				11	32
CIP	7					7
IBPGR	19		5			14
ICRISAT	45			1	1	
IFPRI	1				1	
IITA	1,045	15	19	34	53	924
ILCA	26			2	6	18
ILRAD	13			1	2	10
IRRI	34	2	5	1	1	25
WARDA	69			3[a]		66

RWANDA						**Total: 124**
CIAT	2	1			1	
CIMMYT	6				1	5
CIP	88				12	76
IBPGR	1					1
ICARDA	1	1				
ICRISAT	1					1
IITA	17		1		2	14
ILCA	6					6
ILRAD	2			1	1	
SAO TOME AND PRINCIPE						**Total: 11**
IITA	10				5	5
ILCA	1					1
SENEGAL						**Total: 235**
CIMMYT	6				1	5
CIP	11					11
IBPGR	2					2
ICRISAT	33				3	30
IFPRI	1				1	
IITA	36				2	34
ILCA	17			2	6	9
ILRAD	3					3
IRRI	13		2			11
WARDA	103			1[a]		102
SEYCHELLES						**Total: 2**
CIAT	1					1
CIP	1					1
SIERRA LEONE						**Total: 229**
CIMMYT	12	1			11	
CIP	2					2
IBPGR	8		2			6
ICRISAT	1					1
IITA	98	3	3	3	24	65
ILCA	4				2	2
ILRAD	1					1
IRRI	11			1		10
WARDA	92			1[a]		91
SOMALIA						**Total: 50**
CIMMYT	7				3	4
IBPGR	5		2			3
ICARDA	4					4
ICRISAT	6		3			3
IITA	21				4	17
ILCA	1					1
ILRAD	4				1	3
IRRI	2					2
SUDAN						**Total: 145**
CIMMYT	10				7	3
CIP	7					7
IBPGR	7		1			6
ICARDA	22	1	2	2		17
ICRISAT	44		1	1	3	39
IITA	25				2	23
ILCA	11			1		10
ILRAD	11			2		9
IRRI	8	1		1		6
SWAZILAND						**Total: 9**
CIMMYT	1	1				
CIP	4					4
IITA	3				1	2
ILCA	1					1

TANZANIA						**Total: 267**
CIAT	10	1		1	8	
CIMMYT	69				1	68
CIP	8					8
IBPGR	2					2
ICARDA	1					1
ICRISAT	18					18
IITA	142		6	2	36	98
ILCA	9			1		8
ILRAD	7				1	6
IRRI	11		3			8
TOGO						**Total: 165**
CIMMYT	1				1	
CIP	6					6
IBPGR	4					4
ICRISAT	1					1
IITA	67	1	4	2	9	51
ILRAD	3				1	2
WARDA	83			2[a]		81
UGANDA						**Total: 125**
CIAT	4					4
CIMMYT	7	1			2	4
CIP	4					4
IBPGR	13		7			6
ICRISAT	15	1	2		1	11
IITA	60	2	4	1	8	45
ILCA	8			1	2	5
ILRAD	13	3	1	2	3	4
IRRI	1					1
ZAIRE						**Total: 255**
CIMMYT	48		11	1		36
CIP	52				5	47
IBPGR	8		1			7
IFPRI	1				1	
IITA	141	2	19	12	20	88
ILCA	4					4
ILRAD	4	1			1	2
ZAMBIA						**Total: 91**
CIAT	1				1	
CIMMYT	30				13	17
CIP	7					7
IBPGR	2					2
ICRISAT	2					2
IFPRI	2				2	
IITA	29				3	26
ILCA	6					6
ILRAD	12				3	9
ZIMBABWE						**Total: 35**
CIAT	1				1	
CIMMYT	6		1		3	2
CIP	3					3
IBPGR	2		1			1
ICRISAT	3					3
IITA	10	1				9
ILCA	6				1	5
ILRAD	4				2	2
OTHER						**Total: 222**
ILRAD[b]	50					50
ISNAR[c]	147					147
WARDA	25			25[a]		

[a]Includes all WARDA-sponsored degree candidates.
[b]Experimental statistics courses held for research scientists of Sub-Saharan Africa.
[c]Research management and related courses for research directors of Sub-Saharan AFrica, held respectively in Nigeria (66 participants), Tanzania (26), Swaziland (20) and Cameroon (35).

Table 3. Number of participations from countries of the Near East and North Africa in training and technical and skill development activities of IARCS through 1984. (In-country training not included.)

Center	Total	Post doctoral	Degree-related M.Sc.	Degree-related Ph.D.	Visiting scientist	Courses (Group training)
CIAT	6	-	-	-	4	2
CIMMYT	490	5	18	-	170	297
CIP	395	2	2	1	4	386
IBPGR	109	-	19	-	-	90
IACRDA	326	4	13	14	-	295
ICRISAT	12	-	-	-	3	9
IFPRI	4	-	-	-	4	-
IITA	7	1	-	-	2	4
ILCA	4	-	-	-	-	4
ILRAD	6	-	-	-	-	6
IRRI	32	-	1	2	-	29
Totals	1,391	12	53	17	187	1,122
ALGERIA						**Total: 171**
CIMMYT	93		14		24	55
CIP	55					55
IBPGR	7					7
ICARDA	16					16
BAHREIN						**Total: 1**
ICARDA	1					1
CYPRUS						**Total: 25**
CIMMYT	5				3	2
CIP	5					5
IBPGR	7		2			5
ICARDA	7					7
ILRAD	1					1
EGYPT						**Total: 211**
CIAT	3				1	2
CIMMYt	105	1	1		47	56
CIP	9				1	8
IBPGR	13		1			12
ICARDA	53	2		5		46
ICRISAT	2					2
IFPRI	4				4	
IITA	6	1			1	4
ILCA	1					1
ILRAD	1					1
IRRI	14			2		12
IRAN						**Total: 47**
CIMMYT	10					10
CIP	7	1				6
IBPGR	7		5			2
ICARDA	10					10
IRRI	13		1			12
IRAQ						**Total: 36**
CIMMYT	8				1	7
CIP	4					4
IBPGR	10		5			5
ICARDA	8		1	1		6
ICRISAT	2					2
ILRAD	1					1
IRRI	3					3
JORDAN						**Total: 82**
CIMMYT	13				6	7
CIP	53					53
IBPGR	2					2
ICARDA	11		2			9
ILCA	2					2
ILRAD	1					1

LEBANON						**Total: 153**
CIMMYT	12	1			6	5
CIP	128	1				127
IBPGR	2					2
ICARDA	11			3		8
LYBIA						**Total: 33**
CIMMYT	8				4	4
CIP	5				1	4
IBPGR	5					5
ICARDA	14					4
IITA	1				1	
MOROCCO						**Total: 81**
CIMMYT	32	1			9	22
CIP	23					23
IBPGR	3					3
ICARDA	23					23
OMAN						**Total: 2**
ICARDA	2					2
QATAR						**Total: 2**
IBPGR	1					1
ICARDA	1					1
SAUDI ARABIA						**Total: 6**
CIMMYT	2					2
IBPGR	1					1
ICARDA	3					3
SYRIA						**Total: 142**
CIMMYT	21	1			6	14
CIP	7					7
IBPGR	16		2			14
ICARDA	94	1	8	5		80
ICRISAT	2					2
ILCA	1					1
ILRAD	1					1
TUNISIA						**Total: 177**
CIMMYT	72		3		36	33
CIP	58			1	2	55
IBPGR	7					7
ICARDA	40	1				39
TURKEY						**Total: 204**
CIAT	3				3	
CIMMYT	99	1			26	72
CIP	41		2			39
IBPGR	24		4			20
ICARDA	11					11
ICRISAT	3				3	
ILRAD	1					1
IRRI	2					2
YEMEN, A.R.						**Total: 20**
CIMMYT	9				2	7
IBPGR	3					3
ICARDA	7					7
ICRISAT	1					1
YEMEN, P.D.R.						**Total: 18**
CIMMYT	1					1
IBPGR	1					1
ICARDA	14		2			12
ICRISAT	2					2

Table 4. Number of participations from countries of Asia and the Pacific in training and technical and skill development activities of IARCS through 1984. (In-country training not included.)

Center	Total	Post doctoral	Degree-related M.Sc.	Ph.D.	Visiting scientist	Courses (Group training)
CIAT	90	3	-	2	34	51
CIMMYT	792	13	11	6	318	444
CIP	746	1	12	6	47	680
IBPGR	363	-	60	-	-	303
ICARDA	64	1	1	-	-	62
ICRISAT	395	29	41	40	26	259
IFPRI	40	-	-	-	50	-
IITA	143	16	5	5	22	95
ILCA	1	-	-	-	-	1
ILRAD	19	1	-	-	6	12
IRRI	3,612	209	422	174	124	2,183
Totals	6,275	275	548	231	626	4,595
AFGHANISTAN						**Total: 67**
CIMMYT	44	1			22	21
CIP	3					3
IBPGR	5		3			2
ICARDA	12					12
ICRISAT	2				1	1
IRRI	1				1	1
BANGLADESH						**Total: 571**
CIMMYT	117		5	4	31	77
CIP	59		3	1	8	47
IBPGR	20					17
ICARDA	8					8
ICRISAT	11			2		9
IFPRI	3				3	
IITA	3			2	1	
IRRI	350	14	73	33		230
BHUTAN						**Total: 81**
CIP	24				2	22
IBPGR	3		1			2
IRRI	54					54
BURMA						**Total: 204**
CIMMYT	7				4	3
CIP	44					44
IBPGR	2					2
ICRISAT	3					3
IITA	3				1	2
IRRI	145	1	20			124
CHINA						**Total: 325**
CIAT	3				3	
CIMMYT	51	1			47	3
CIP	3			1	2	
IBPGR	3		1			2
ICARDA	4					4
ICRISAT	20				3	17
IRRI	241	25	55	4	2	154
COOK ISLANDS **Total: 1**						
IBPGR	1					1
FIJI						**Total: 18**
CIP	2					2
IBPGR	2					2
ICRISAT	4					4
IITA	2					2
IRRI	8					8

INDIA						**Total: 973**
CIAT	5					5
CIMMYT	103	7			59	37
CIP	96	1	3	1	2	89
IBPGR	49		6			43
ICARDA	6	1				5
ICRISAT	230	29	22	33	7	139
IFPRI	11				11	
IITA	31	10	2	2	2	15
ILCA	1					1
ILRAD	9	1			4	4
IRRI	432	103	9	27	4	289
INDONESIA						**Total: 666**
CIAT	13	1		1	1	10
CIMMYT	20				8	12
CIP	40				5	35
IBPGR	65		10			55
ICRISAT	11			2		9
IFPRI	20				20	
IITA	21		1	1	4	15
ILRAD	3					3
IRRI	473	2	28	20	1	422
KAMPUCHEA						**Total: 7**
CIP	1					1
IRRI	6					6
KIRIBATI						**Total: 6**
IBPGR	6					6
KOREA (Rep.)						**Total: 177**
CIMMYT	35				14	20
CIP	14				3	11
IBPGR	4					4
ICRISAT	4				2	2
IITA	1				1	
ILRAD	1				1	
IRRI	119	6	9	16	8	80
KOREA (D.P.R.)						**Total: 5**
CIMMYT	5				5	
LAOS						**Total: 27**
CIP	4					4
IRRI	23					23
MALAYSIA						**Total: 172**
CIAT	14				5	9
CIMMYT	5		1		1	3
CIP	7					7
IBPGR	34		9			25
ICRISAT	1					1
IITA	8	1				7
ILRAD	1					1
IRRI	102	3	2	2		95
NEPAL						**Total: 190**
CIAT	2				1	1
CIMMYT	82		3		27	52
CIP	11		1	1	1	8
IBPGR	17		4			13
ICRISAT	4		2	1		1
IFPRI	1				1	
ILRAD	1					1
IRRI	72	2	16	4		50
PAKISTAN						**Total: 487**
CIAT	1	1				
CIMMYT	154		2	2	39	111
CIP	128				1	127
IBPGR	13		8			5
ICARDA	34		1			33

ICRISAT	8					8
IITA	3				1	2
IRRI	146	8	14	9	1	114
PALAU						**Total: 1**
IBPGR	1					1
PAPUA-NEW GUINEA						**Total: 12**
CIMMYT	1					1
CIP	3				2	1
IBPGR	2					2
IITA	5				1	4
IRRI	1					1
PHILLIPPINES						**Total: 874**
CIAT	13				3	10
CIMMYT	64	1			22	41
CIP	123		3	1	13	106
IBPGR	62		8			54
ICRISAT	9				4	5
IFPRI	11				11	
IITA	13	1	2		1	9
IRRI	579	29	105	30	6	409
SAMOA						**Total: 4**
IBPGR	1					1
IITA	2					2
IRRI	1					1
SOLOMON ISLANDS						**Total: 7**
IBPGR	2					2
IITA	2					2
IRRI	3					3
SRI LANKA						**Total: 487**
CIAT	7	1		1		5
CIMMYT	3				1	2
CIP	89			1	5	83
IBPGR	14		5			9
ICRISAT	27		14		1	12
IFPRI	2				1	
IITA	39	2			9	28
ILRAD	3				1	2
IRRI	303	6	33	10		254
THAILAND						**Total: 647**
CIAT	32				21	11
CIMMYT	91	2			35	54
CIP	34				1	33
IBPGR	48		2			46
ICRISAT	61		3	2	8	48
IFPRI	2				2	
IITA	6	2			1	3
ILRAD	1					1
IRRI	406	6	53	15	1	331
TONGA					**Total: 4**	
CIP	1					1
IBPGR	2					2
IITA	1					1
TUVALU						**Total: 1**
IBPGR	1					1
VANATUA						**Total: 4**
CIP	2					2
IBPGR	2					2
VIETNAM						**Total: 161**
CIMMYT	11	1			3	7
CIP	58		2		2	54
IBPGR	1					1
IITA	2					2
IRRI	89	3	5	4		77
OTHER (MICRONESIA)						**Total: 104**
IBPGR	3					3
IRRI	101				101	

Table 5. Number of participations in CIAT training and technical and skill development activities through 1984 by types of activity and countries by regions. (In-country training not included.)

Country	Total	Post doctoral	Degree-related		Visiting scientist	Courses (Group training)
			M.Sc.	Ph.D.		
Worldwide total by regions						
Latin America	2,396	17	76	21	1,155	1,127
Subsaharan Africa	35	2		9	18	6
Near East North Africa	6				3	3
Asia and Pacific	90	3		2	34	51
Total	2,527	22	76	32	1,210	1,187
Developed countries	92	34	2	56		
TOTAL	2,619	56	78	88	1,210	1,187
THE LATIN AMERICAN AND CARIBBEAN REGION						
Antigua	1				1	
Argentina	40		2		14	24
Bahamas	1					1
Belize	11				6	5
Bolivia	108		1	1	37	69
Brazil	389	2	5	1	143	238
Chile	44	2	1	1	20	20
Columbia	555	9	32	8	293	213
Costa Rica	79		5		25	49
Cuba	70		1	2	55	12
Dominican Rep.	118		1	1	49	67
Ecuador	151		4		104	43
El Salvador	41		2	1	15	23
Guatemala	105	1	6	1	62	35
Guyana	9				4	5
Haiti	17				4	13
Honduras	81		4		33	44
Jamacia	7				3	4
Mexico	139		1	1	55	82
Micaragua	49		2	2	15	30
Panama	78				49	29
Paraguay	48				33	15
Peru	169	2	7	1	96	63
Surinam	1					1
Trinidad & Tobago	6					6
Uruguay	5	1			1	3
Venezuela	74		2	1	38	33
Total	2,396	17	76	21	1,155	1,127
THE SUBSAHARA AFRICA REGION						
Burundi	1				1	
Cameroon	3			3		
Ghana	1			1		
Kenya	7			1	5	1
Nigeria	4			3	1	
Rwanda	2	1			1	
Seychelles	1					1
Tanzania	10	1		1	8	
Uganda	4					4
Zambia	1				1	
Zimbabwe	1				1	
Total	35	2		9	18	6

			THE NEAR EAST AND NORTH AFRICA REGION			
Egypt	3				1	2
Turkey	3				3	
Total	6				4	2
			THE ASIA AND PACIFIC REGION			
China	3				3	
India	5					5
Indonesia	13	1		1	1	10
Malaysia	14				5	9
Nepal	2				1	1
Pakistan	1	1				
Philippines	13				3	10
Sri Lanka	7	1		1		5
Thailand	32				21	11
Total	90	3		2	34	51
			DEVELOPED COUNTRIES			
Australia	4	3		1		
Canada	3	1	1	1		
Germany (FR)	21	6		15		
Hungary	1	1				
Ireland	1			1		
Japan	2	2				
Netherlands	3	1		2		
UK	10	4		6		
USA	47	16	1	30		
Total	92	34	2	56		

Table 6. Number of participations in CIMMYT training and technical and skill develoment activities through 1984 by types of activity and countries by regions. (In-country training not included.)

Country	Total	Post doctoral	Degree-related		Visiting scientist	Courses (Group training)
			M.Sc.	Ph.D.		
			GLOBAL TOTALS			
Worldwide total by regions						
Latin America	1,281	18	155	37	383	688
Subsaharan Afrida	478	6	19	3	136	314
Near East, North Africa	490	5	18		170	297
Asia and Pacific	792	13	11	6	318	444
Total	3,041	42	203	46	1,007	1,743
Developed countries	69	49	17	3		
TOTAL	3,110	91	220	49	1,007	1,743
			THE LATIN AMERICA AND CARIBBEAN REGION			
Argentina	58	2	3		23	30
Barbados	1	1				
Belize	6				1	5
Bolivia	59		5		18	36
Brazil	97		3		68	26
Chile	52	1	2	1	33	15
Columbia	77	2	18	2	7	48
Costa Rica	32		2		9	21
Cuba	8		2		3	3
Dominica	1					1

Dominican Rep.	25				3	22
Ecuador	96	1	9	2	29	55
El Salvador	49	2	3	1	12	31
Grenada	3				2	1
Guatemala	88		16		27	45
Guyana	4	1				3
Haiti	19				1	18
Honduras	57		3	2	20	32
Jamaica	3				2	1
Mexico	294	8	66	29	50	141
Nicaragua	27		1		1	25
Panama	33		1		13	19
Paraguay	17				6	11
Peru	151		17		50	84
Uruguay	7		1		1	5
Venezuela	17		3		4	10
Total	1,281	18	155	37	383	688
			THE SUBSAHARA AFRICA REGION			
Benin	4		1		1	2
Botswana	4				2	2
Burkina Faso	2				2	
Burundi	2				1	1
Cameroon	14		1		4	9
Cape Verde	1					1
Chad	1					1
Congo	1					1
Ethiopia	52	2	1	1	19	29
Ghana	48		4		12	32
Guinea	4	1				3
Ivory Coast	14			1	6	7
Kenya	58	1			25	32
Lesotho	4				2	2
Madagascar	3					3
Malawi	8					8
Mali	3				2	1
Mauritius	1				1	
Mozambique	8				4	4
Nigeria	43				11	32
Rwanda	6				1	5
Senegal	6				1	5
Sierra Leone	12	1			11	
Somalia	7				3	4
Sudan	10				7	3
Swaziland	1				1	
Tanzania	69				1	68
Togo	1				1	
Uganda	7	1			2	4
Zaire	48		11	1		36
Zambia	30				13	17
Zimbabwe	6		1		3	2
Total	478	6	19	3	136	314
			THE NEAR EAST AND NORTH AFRICA REGION			
Algeria	93		14		24	55
Cyprus	5				3	2
Egypt	105	1	1		47	56
Iran	10					10
Iraq	8				1	7
Jordan	13				6	7
Lebanon	12	1			6	5
Libya	8				4	4
Morocco	32	1			9	22
Saudi Arabia	2					2
Syria	21	1			6	14
Tunisia	72		3		36	33
Turkey	99	1			26	72

Yemen A.R.	9				2	7
Yemen P.D.R.	1					1
Total	490	5	18		170	297
			THE ASIA AND PACIFIC REGION			
Afghanistan	44	1			22	21
Bangladesh	117		5	4	31	77
Burma	7				4	3
China	51	1			47	3
India	103	7			59	37
Indonesia	20				8	12
Korea Rep.	34				14	20
Korea D.P.R.	5				5	
Malaysia	5		1		1	3
Nepal	82		3		27	52
Pakistan	154		2	2	39	111
Papua N. Guinea	1					1
Philippines	64	1			22	41
Sri Lanka	3				1	2
Thailand	91	2			35	54
Vietnam	11	1			3	7
Total	792	13	11	6	318	44
			DEVELOPED COUNTRIES			
Australia	4	4				
Canada	2	1	1			
Denmark	2	1		1		
Germany (FR)	7	7				
France	2	2				
Iceland	1	1				
Ireland	2	1	1			
Japan	2	1	1			
Poland	1	1				
Netherlands	4	4				
New Zealand	1	1				
Sweden	1	1				
Switzerland	1	1				
UK	7	5	2			
USA	313	17	12	2		
Yugoslavia	1	1				
Total	69	49	17	3		

Table 7. Number of participations in CIP training and technical and skill development activities through 1984 by types of activity and countries by regions. (In-country trianing not included.)

Country	Total	Post doctoral	Degree-related		Visiting scientist	Courses (Group training)
			M.Sc.	Ph.D.		
Worldwide total by regions						
Latin America	850	3	100	12	147	588
Subsaharan Africa	477	2	1		24	450
Near East North Africa	395	2	2	1	4	386
Asia and Pacific	746	1	12	6	47	680
Total Developed countries	2,468	8	115	19	222	2,104
	32	21	3	8		
TOTAL	2,500	29	118	27	222	2,103

THE LATIN AMERICA AND CARIBBEAN REGION						
Argentina	41			1	10	30
Bahamas	2				2	
Bolivia	44		2		14	28
Brazil	89				16	73
Chile	58	2		2	16	38
Columbia	90		4	4	9	23
Costa Rica	31		2		5	24
Cuba	5				3	2
Dom. Rep.	15				2	13
Ecuador	87		2	1	11	73
El Salvador	2					2
Guatemala	17				2	15
Honduras	9				3	6
Mexico	43		2	1	6	34
Nicaragua	4	1			2	1
Panama	19					19
Peru	234		86	2	36	100
Urguay	13		1		5	7
Venezuela	47		1	1	5	40
Total	850	3	100	12	147	588
THE SUBSAHARA AFRICA REGION						
Benin	3					3
Burkina Faso	2					2
Burundi	46				2	44
Cameroon	7	1				6
Cape Verde	3					3
Congo	1					1
Ethiopia	15	1			2	12
Gabon	2					2
Ghana	1					1
Guinea	2					2
Ivory Coast	3					3
Kenya	69		1		3	65
Lesotho	1					1
Liberia	3					3
Madagascar	44					44
Malawi	71					71
Mauritania	2					2
Mauritius	2					2
Nigeria	7					7
Rwanda	88				12	76
Senegal	11					11
Seychelles	1					1
Sierra Leone	2					2
Sudan	7					7
Swaziland	4					4
Tanzania	8					8
Togo	6					6
Uganda	4					4
Zaire	52				5	47
Zambia	7					7
Zimbabwe	3					3
Total	477	2	1		24	450
THE NEAR EAST AND NORTH AFRICA REGION						
Algeria	55					55
Cyprus	5					5
Egypt	9				1	8
Iran	7	1				6
Iraq	4					4
Jordan	53					53
Lebanon	128	1				127
Libya	5				1	4
Morocco	23					23

Syria	7					7
Tunisia	58			1	2	55
Turkey	41		2			39
Total	395	2	2	1	4	386
			THE ASIA AND PACIFIC REGION			
Afghanistan	3					3
Bangladesh	59		3	1	8	47
Bhutan	24				2	22
Burma	44					44
China	3			1	2	
Fiji	2					2
India	96	1	3	1	2	89
Indonesia	40				5	35
Kampuchea	1					1
Korea (Rep.)	14					11
Laos	4					4
Malaysia	7					7
Nepal	11		1	1	1	8
Papua-N. Guinea	3				2	1
Pakistan	128				1	127
Philippines	123		3	1	13	106
Sri Lanka	89			1	5	83
Thailand	34				1	33
Tonga	1					1
Vanatua	2					2
Vietnam	58		2		2	54
Total	746	1	12	6	47	680
			DEVELOPED COUNTRIES			
Belgium	4	3	1		N/A	N/A
France	1			1		
Germany (FR)	5	3		2		
Japan	1	1				
Netherlands	1			1		
UK	6	4	1	1		
USA	16	12	1	3		
Total	32	21	3	8		

Table 8. Number of participations in IBPGR training and technical and skill develoment activites through 1984 by types of activity and countries by regions. (In-country training not included.)

Country	Total	Post doctoral	Degree-related		Visiting scientist	Courses (Group training)
			M.Sc.	Ph.D.		
			GLOBAL TOTALS			
Latin America	201		16			185
Subsahara Africa	147		34			113
Near East/ N. Africa	109		19			90
Asia	363		60			303
Total	820		129			691
Developed countries	59		59			
TOTAL	879		188			691
			THE LATIN AMERICA AND CARIBBEAN REGION			
Argentina	23		1			22
Barbados	1					1

Bolivia	12	1	11
Brazil	21	3	18
Chile	2		2
Columbia	26	2	24
Costa Rica	8	1	7
Cuba	1		1
Dominican Rep.	3		3
Ecuador	11		11
El Salvador	1		1
Guatemala	7		7
Honduras	2		2
Mexico	10	1	9
Nicaragua	2		2
Panama	1		1
Paraguay	2		2
Peru	55	4	51
Surinam	1	1	
Uruguay	4	1	3
Venezuela	8	1	7
Total	201	16	185

THE SUBSAHARAN AFRICA REGION

Angola	1	1	
Benin	3		3
Burkina Faso	5	1	4
Burundi	2		2
Cameroon	1		1
Congo	1		1
Ethiopia	16	4	12
Ghana	12	3	9
Guinea	3		3
Ivory Coast	1		1
Kenya	16	5	11
Liberia	2		2
Madagascar	1		1
Malawi	1		1
Mali	7	1	6
Mozambique	1		1
Niger	1		1
Nigeria	19	5	14
Rwanda	1		1
Senegal	2		2
Sierra Leone	8	2	6
Somalia	5	2	3
Sudan	7	1	6
Tanzania	2		2
Togo	4		4
Uganda	13	7	6
Zaire	8	1	7
Zambia	2		2
Zimbabwe	2	1	1
Total	147	34	113

THE NEAR EAST AND NORTH AFRICA REGION

Algeria	7		7
Cyprus	7	2	5
Egypt	13	1	12
Iran	7	5	2
Iraq	10	5	5
Jordan	2		2
Lebanon	2		2
Lybia	5		5
Morocco	3		3
Qatar	1		1
Saudi Arabia	1		1
Syria	16	2	14
Tunisia	7		7

Turkey	24	4	20
Yemen A.R.	3		3
Yemen P.D.R.	1		1
Total	109	19	90
		THE ASIA AND PACIFIC REGION	
Afghanistan	5	3	2
Bangladesh	20	3	17
Bhutan	3	1	2
Burma	2		2
China	3	1	2
Cook Islands	1		1
Fiji	2		2
India	49	6	43
Indonesia	65	10	55
Kiribati	6		6
Korea (Rep.)	4		4
Malaysia	34	9	25
Nepal	17	4	13
Pakistan	13	8	5
Palau	1		1
Papua-N. Guinea	2		2
Philippines	62	8	54
Solomon Islands	2		2
Samoa	1		1
Sri Lanka	14	5	9
Thailand	48	2	46
Tongo	2		1
Tuvalu	1		1
Vanatau	2		2
Vietnam	1		1
Other (Micronesia)	3		3
Total	363	60	303
		DEVELOPED COUNTRIES	
Australia	1	1	
France	1	1	
Germany (FR)	3	3	
Hungary	1	1	
Japan	1	1	
Italy	1	1	
Poland	1	1	
Portugal	1	1	
UK	47	47	
USA	1	1	
Yugoslavia	1	1	
Total	59	59	

Table 9. Number of parcipations in ICARDA training and technical and skill development activities through 1984 by types of activity and countries by regions. (In-country training not included.)

Country	Total	Post doctoral	Degree-related		Visiting scientist	Courses* (Group training)
			M.Sc.	Ph.D.		
		GLOBAL TOTALS				
Latin America	3					3
Subsahara Africa	40	2	2	2		34
Near East/ N. Africa	326	4	13	14		295

Asia	64	1	1			62
Total	433	7	16	16		394
Developed countries	11	3		8		
TOTAL	444	10	16	24		394
THE LATIN AMERICA AND CARIBBEAN REGION						
Chile	3					3
Total	3					3
THE SUBSAHARA AFRICA REGION						
Djibouti	3					3
Ethiopia	7					7
Kenya	2					2
Rwanda	1	1				1
Somalia	4					4
Sudan	22	1	2	2		17
Tanzania	1					1
THE NEAR EAST AND NORTH AFRICA REGION						
Algeria	16					16
Bahrain	1					1
Cyprus	7					7
Egypt	53	2		5		46
Iran	10					10
Iraq	8		1	1		6
Jordan	11		2			9
Lebanon	11			3		8
Libya	14					14
Morocco	23					23
Oman	2					2
Qatar	1					1
Saudi Arabia	3					3
Syria	94	1	8	5		80
Tunisia	40	1				39
Turkey					11	
Yemen A.R.	7					7
Yemen P.D.R.	14		2			12
Total	326	4	13	14		295
THE ASIA AND PACIFIC REGION						
Afghanistan	12					12
Bangladesh	8					8
China	4					4
India	6	1				5
Pakistan	34		1			33
Total	64	1	1			62
France	1	1				
Germany (FR)	7	1		6		
Netherlands	1			1		
UK	1			1		
USA	1	1				
Total	11	3		8		

(*) Visiting Scientists are included among "Courses".

Table 10. Number of participations in ICRISAT training and technical and skill development activities through 1984 by types of activity and countries by regions. (In-country training not included.)

Country	Total	Post doctoral	Degree-related		Visiting scientist*	Courses (Group training)
			M.Sc.	Ph.D.		
GLOBAL TOTALS						
Latin America	52		2	2	13	35
SubSahara Africa	453	2	30	5	12	404
Near East/ N. Africa	12				3	9
Asia	395	29	41	40	26	259
Total	911	31	73	47	54	707
Developed countries	45	23	2	20		
TOTAL	957	54	75	67	54	707
THE LATIN AMERICA AND CARIBBEAN REGION						
Barbados	1					1
Brazil	16		2	2	10	2
Chile	2					2
Columbia	1					1
Dominican Rep.	3				1	2
El Salvador	5					5
Guatemala	2					2
Haiti	2					2
Honduras	4					4
Mexico	10				1	9
Nicaragua	2					2
Panama	2				1	1
Uruguay	1					1
Venezuela	1					1
Total	52		2	2	13	35
THE SUBSAHARA AFRICA REGION						
Benin	7		1	1		5
Botswana	15				1	14
Burkina Faso	31	1	2		2	26
Burundi	1					1
Cameroon	4					4
Cape Verde	1					1
Chad	8					8
Ethiopia	27		2	1		24
Gambia	12					12
Ghana	16		3			13
Guinea	4					4
Kenya	41		5			36
Lesotho	2					2
Malawai	20					20
Mali	43		4		1	38
Ma[illegible]	7					7
[illegible]	3					3
Ni[illegible]	42		7	1		34
[illegible]	45			1	1	43
[illegible]	1					1
[illegible]	33				3	30
Sierra Leone	1					1
Somalia	6		3			3
Sudan	44		1	1	3	39
Tanzania	18					18
Togo	1					1

[a]"In-service fellows." "Visiting Scientists" are supported by research programs and data were not available.

Uganda	15	1	2		1	11
Zambia	2					2
Zimbabwe	3					3
Total	453	2	30	5	12	404
THE NEAR EAST AND NORTH AFRICA REGION						
Egypt	2					2
Iraq	2					2
Syria	2					2
Turkey	3				3	
Yemen A.R.	1					2
Yemen P.D.R.	2					2
Total	12				3	9
THE ASIA AND PACIFIC REGION						
Afghanistan	2				1	1
Bangladesh	11			2		9
Burma	3					3
China	20				3	17
Fiji	4					4
India	230	29	22	33	7	139
Indonesia	11			2		9
Korea (Rep.)	4				2	2
Malaysia	1					1
Nepal	4		2	1		1
Pakistan	8					8
Philippines	9				4	5
Sri Lanka	27		14		1	12
Thailand	61		3	2	8	48
Total	395	29	41	40	26	259
DEVELOPED COUNTRIES						
Australia	5	4		1		
Canada	1			1		
Germany (FR)	9			9		
Japan	2	2				
UK	8	6	1	1		
USA	20	11	1	8		
Total	45	23	2	20		

Table 11. Number of participations in IFPRI training and technical and skil development activities through 1984 by types of activity and countries by regions. (In-country training not included.)

Country	Total	Post doctoral	Degree-related		Visiting scientist	Courses (Group training)
			M.Sc.	Ph.D.		
Worldwide total by regions						
GLOBAL TOTALS						
Latin America	6				6	
SubSahara Africa	10				10	
Near East/ N. AFrica	4				4	
Asia	50				50	
TOTAL	70				70	

	THE LATIN AMERICA AND CARIBBEAN REGION		
Brazil	1		1
Columbia	1		1
Costa Rica	2		2
Mexico	2		2
Total	6		6
	THE SUBSAHARA AFRICA REGION		
Burkina Faso	1		1
Ivory Coast	2		2
Kenya	2		2
Nigeria	1		1
Senegal	1		1
Zaire	1		1
Zambia	2		2
Total	10		10
	THE NEAR EAST AND NORTH AFRICA REGION		
Egypt	4		4
Total	4		4
	THE ASIA AND PACIFIC REGION		
Bangladesh	3		3
India	11		11
Indonesia	20		20
Nepal	1		1
Philippines	11		11
Sri Lanka	2		2
Thailand	2		2
Total	50		50

Table 12. Number of participants in IITA training and technical and skill development activities through 1984 by types of activity and countries by regions. (In-country training not included.)

Country	Total	Post doctoral	Degree-related M.Sc.	Degree-related Ph.D.	Visiting scientist	Courses (Group training)
Worldwide total by regions			GLOBAL TOTALS			
Latin America	55	1	1	1	6	46
SubSahara Africa	2,606	35	124	80	263	2,104
Near East/ N. Africa	7	1			2	4
Asia	143	16	5	5	22	95
Total Developed countires	2,811	53	130	86	297	2,245
TOTAL	2,938	90	199	107	297	2,245
			THE LATIN AMERICA AND CARIBBEAN REGION			
Antigua	1					1
Belize	1					1
Brazil	18				3	15
Columbia	3	1		1		1
Costa Rica	1					1
Cuba	1					1
Dominica	2		1			1

Dominican Rep.	1				1	
Guyana	3					3
Haiti	2					2
Jamaica	3				1	2
Nicaragua	3					3
Peru	6				1	5
St. Lucia	1					1
St. Vincent	1					1
Trinidad & Tobago	6					6
Venezuela	2					2
Total	55	1	1	1	6	46
			THE SUBSAHARA AFRICA REGION			
Angola	9				1	8
Benin	86		36		6	44
Botswana	9				4	5
Burkina Faso	67		1	1	5	60
Burundi	14		1			13
Caermoon	121	2	11	8	17	83
Central African R.	18				1	17
Chad	13		1		1	11
Camoros Is.	1					1
Congo	27				3	24
Ethiopia	32	2	1	1		28
Gabon	8	1				7
Gambia	20			1		19
Ghana	136	4	12	8	21	91
Guinea	50				4	46
Guinea Bissau	12					12
Ivory Coast	34		3			31
Kenya	64	2	1	2	3	56
Liberia	54			3	12	39
Madagascar	7					7
Malawi	28		1		1	26
Mali	59			1	11	47
Mauritania	10				1	9
Mauritius	3			1		2
Mozambique	3				1	2
Niger	17				2	15
Nigeria	1,045	15	19	34	53	924
Rwanda	17		1		2	14
Sao Tome	10				5	5
Senegal	36				2	34
Sierra Leone	98	3	3	3	24	65
Somalia	21				4	17
Sudan	25				2	23
Swaziland	3				1	2
Tanzania	142		6	2	36	98
Togo	67	1	4	2	9	51
Uganda	60	2	4	1	8	45
Zaire	141	2	19	12	20	88
Zambia	29				3	26
Zimbabwe	10	1				9
Total	2,606	35	124	80	263	2,104
			THE NEAR EAST AND NORTH AFRICA REGION			
Egypt	6	1			1	4
Libya	1				1	
Total	7	1			2	4

THE ASIA AND PACIFIC REGION						
Bangladesh	3			2	1	
Burma	3				1	2
Fiji	2					2
India	31	10	2	2	2	15
Indonesia	21		1	1	4	15
Kiribati	1					1
Korea (Rep.)	1				1	
Malaysia	8	1				7
Papau N. Guinea	5				1	4
Pakistan	3				1	2
Philippines	13	1	2		1	9
Samoa	2					2
Solomon Is.	2					2
Sri Lanka	39	2			9	28
Thailand	6	2			1	3
Tonga	1					1
Vietnam	2					2
Total	143	16	5	5	22	95
DEVELOPED COUNTRIES						
Australia	3		1	2		
Belgium	46	5	39	2		
Canada	7	2	3	2		
Germany (FR)	18	3	6	9		
Japan	3	3				
Netherlands	11	3	7	1		
Switzerland	1		1			
UK	13	4	8	1		
USA	24	17	4	4		
Total	127	37	69	21		

TAble 13. Number of participations in ILCA training and technical and skill develoment activities through 1984 by types of activity and countries byb regions. (In-country training not included.)

Country	Total	post doctoral	Degree-related M.Sc.	Degree-related Ph.D.	Visiting scientist	Courses (Group training)
Worldwide total by regions						
GLOBAL TOTALS						
Latin America	1					1
SubSahara Africa	260	6		11	32	211
Near East/ N. Africa	4					4
Asia	1					1
Total	266	6		11	32	217
Developed countries	12	5		7		
TOTAL	278	11		18	32	217
THE LATIN AMERICA AND CARIBBEAN REGION						
Jamaica	1					1
Total	1					1

THE SUBSAHARA AFRICA REGION					
Benin	1				1
Botswana	8			1	7
Burkina Faso	6				6
Burundi	1				1
Cameroon	5			1	4
Central African Rep.	4				4
Chad	8				8
Congo	2				2
Ethiopia	49		2	4	43
Gambia	5				5
Ghana	11	4		2	5
Guinea	4				4
Ivory Coast	3				3
Kenya	22	1	2	3	16
Liberia	3	1			2
Madagascar	2				2
Malawi	6			1	5
Mali	13			3	10
Mauritania	1				1
Mauritius	3				3
Mozambique	1				1
Niger	2				2
Nigeria	26		2	6	18
Rwanda	6				6
Sao Tome & Principe	1				1
Senegal	17		2	6	9
Sierra Leone	4			2	2
Somalia	1				1
Sudan	11		1		10
Swaziland	1				1
Tanzania	9		1		8
Uganda	8		1	2	5
Zaire	4				4
Zambia	6				6
Zimbabwe	6			1	5
Total	260	6	11	32	211
THE NEAR EAST AND NORTH AFRICA REGION					
Egypt	1				1
Jordan	2				2
Syria	1				1
Total	4				4
THE ASIA AND PACIFIC REGION					
India	1				1
Total	1				1
DEVELOPED COUNTRIES					
Belgium	1		1		
Canada	1	1			
Germany (FR)	4	3	1		
Netherlands	1		1		
UK	2		2		
USA	2		2		
Total	12	5	7		

(*) M.Sc. and Ph.D. Candidates no listed separately.

Table 14. Number of participations in ILRAD training and technical and skill development activities through 1984 by types of activity and countries by regions. (In-country training not included.)

Country	Total	post doctoral	Degree-related M.Sc.	Degree-related Ph.D.	Visiting scientist	Courses (Group training)
			GLOBAL TOTALS			
Latin America	10					10
SubSahara Africa	280	9	6	19	49	197
Near East/ N. Africa	6					6
Asia	19	1			5	13
Total	315	10	6	19	54	226
Developed countries	36	22		14		
TOTAL	351	32	6	33	54	226
			THE LATIN AMERICA AND CARIBBEAN REGION			
Argentina	1					1
Brazil	1					1
Chili	1					1
Columbia	1					1
Cuba	1					1
Mexico	1					1
Paraguay	1					1
Peru	1					1
Urguay	1					1
Venezuela	1					1
Total	10					10
			THE SUBSAHARA AFRICA REGION			
Burkina Faso	3					3
Burundi	1				1	
Cameroon	1				1	
Ethiopia	12				6	6
Gambia	5				1	4
Ghana	4					4
Kenya	115	5	5	13	21	71
Liberia	3					3
Malawi	4				1	3
Mali	4				3	1
Mozambique	1					1
Nigeria	13			1	2	10
Rwanda	2			1	1	
Senegal	3					3
Sierra Leone	1					1
Somalia	4				1	3
Sudan	11			2		9
Tanzania	7				1	6
Togo	3				1	2
Uganda	13	3	1	2	3	4
Zaire	4	1			1	2
Zambia	12				3	9
Zimbabwe	4				2	2
Regional	50					50
Total	280	9	6	19	49	197
			THE NEAR EAST AND NORTH AFRICA REGION			
Cyrus	1					1
Egypt	1					1
Iraq	1					1

Jordan	1				1
Syria	1				1
Turkey	1				1
Total	6				6
		THE ASIA AND PACIFIC REGION			
India	9	1		4	4
Indonesia	3				3
Korea	1			1	
Malyasia	1				1
Nepal	1				1
Sri Lanka	3			1	2
Thailand	1				1
Total	19	1		6	12
		DEVELOPED COUNTRIES			
Australia	2	1	1	N/A	N/A
Belgium	7	4	3	N/A	N/A
Denmark	2	2		N/A	N/A
Germany (FR)	6	2	4	N/A	N/A
Italy	2		2	N/A	N/A
Japan	1	1		N/A	N/A
Netherlands	3	1	2	N/A	N/A
UK	5	4	1	N/A	N/A
USA	8	7	1	N/A	N/A
Total	36	22	14	N/A	N/A

Table 15. Number of participations in IRRI training and technical and skill development activities through 1984 by types of activity and countries by regions. (In-country training not included.)

Country	Total	Post doctoral	Degree-related M.Sc.	Degree-related Ph.D.	Visiting scientist	Courses (Group training)
			GLOBAL TOTALS			
Latin America	67	4	19	4	2	38
SubSahara Africa	128	5	16	2	1	104
Near East/ N. Africa	32		1	2		29
Asia	3,612	209	422	174	124	2,683
Total	3,839	218	458	182	127	2,854
Developed countries	104	47	15	42		
TOTAL	3,943	265	473	224	127	2,854
			THE LATIN AMERICA AND CARIBBEAN REGION			
Brazil	5		2			3
Chile	1		1			
Columbia	15	3	6			6
Cuba	16					16
Dominican Rep.	2			1		1
Ecudaor	3		1		1	1
Guyana	4		2			2
Jamaica	2					2
Mexico	10		4	1		5
Panama	2			1		1
Peru	3	1	1	1		
Trinidad & Tobago	1					1
Venezuela	3		2		1	
Total	67	4	19	4	2	38

THE SUBSAHARA AFRICA REGION						
Burkina Faso	2					2
Cameroon	1					1
Ethiopia	2					2
Gambia	1		1			
Ghana	13	2	2			9
Guinea	1					1
Ivory Coast	1					1
Kenya	9		2			7
Liberia	6					6
Madagascar	3					3
Mali	9					9
Nigeria	34	2	5	1	1	25
Senegal	13		2			11
Sierra Leone	11			1		10
Somalia	2					2
Sudan	8	1		1		6
Tanazania	11		3			8
Uganda	1					1
Total	128	5	15	3	1	104
THE NEAR EAST AND NORTH AFRICA REGION						
Egypt	14			2		12
Iran	13		1			12
Iraq	3					3
Turkey	2					2
Total	32		1	1		29
THE ASIA AND PACIFIC REGION						
Afghanistan	1					1
Bangladesh	350	14	73	33		230
Bhutan	11					11
Burma	145	1	20			124
China	241	26	55	4	2	154
Fiji	8					8
India	432	103	9	27	4	289
Indonesia	473	2	28	20	1	422
Kampuchea	6					6
Korea (Rep.)	119	6	9	16	8	80
Laos	23					23
Malaysia	102	3	2	2		95
Nepal	72	2	16	4		50
Pakistan	146	8	14	9	1	114
Papua N. Guinea	1					1
Philippines	579	29	105	30	6	409
Samoa	1					1
Solomon Is.	3					3
Sri Lanka	303	6	33	10		254
Thailand	406	6	53	15	1	331
Vietnam	89	3	5	4	77	
Other, n.o.c.	101				101	
Total	3,612	209	422	174	124	2,683
DEVELOPED COUNTRIES						
Australia	2		2			
Belgium	2	1		1		
Canada	2			2		
France	2	1	1			
Germany (FR)	18	6	1	11		
Italy	2	2				
Japan	31	25	1	5		
Netherlands	7	2	3	2		

Switzerland	1	1		
UK	8	4	1	3
USA	29	5	6	18
Total	104	47	15	42

Table 16. Number of participations in ISNAR training and technical and skill development activities through 1984 by types of activity and countries by regions. (In-country training not included.)

Country	Total	Post doctoral	Degree-related		Visiting scientist	Courses (Group training)
			M.Sc.	Ph.D.		
Subsahara Africa	147					147

Note: ISNAR had conducted group training for four groups in Subsaharan Africa, with a total of 147 participations. Country-by-country listings were not available.

Table 17. Number of participations in WARDA training and technical and skill development activities through 1984 by types of activity and countries by regions (In-country training not included.)

Country	Total	Post doctoral	Degree-related*		Visiting scientist No.	Couses** (Group training) No.
			M.Sc.	Ph.D.		
THE SUBSAHARA AFRICA REGION						
Benin	72			3		69
Burkina Faso	72			2		70
Chad	3					3
Gambia	73			1		72
Ghana	76			2		74
Guinea	74			1		73
Guinea Bissau	61					61
Ivory Coast	44			2		42
Liberia	99			1		98
Mali	95			2		93
Mauritania	53					53
Niger	34			1		33
Nigeria	69			3		66
Senegal	103			1		102
Sierra Leone	92			1		91
Togo	83			2		81
West Africa Reg. n.o.c.	25			25		
TOTAL	1,128			47		1,081

* Degree candidates for M.Sc. and Ph.D. or equivalent in French system.
** Total includes 211 participations in training courses run by WARDA in countries of the West Africa Region.