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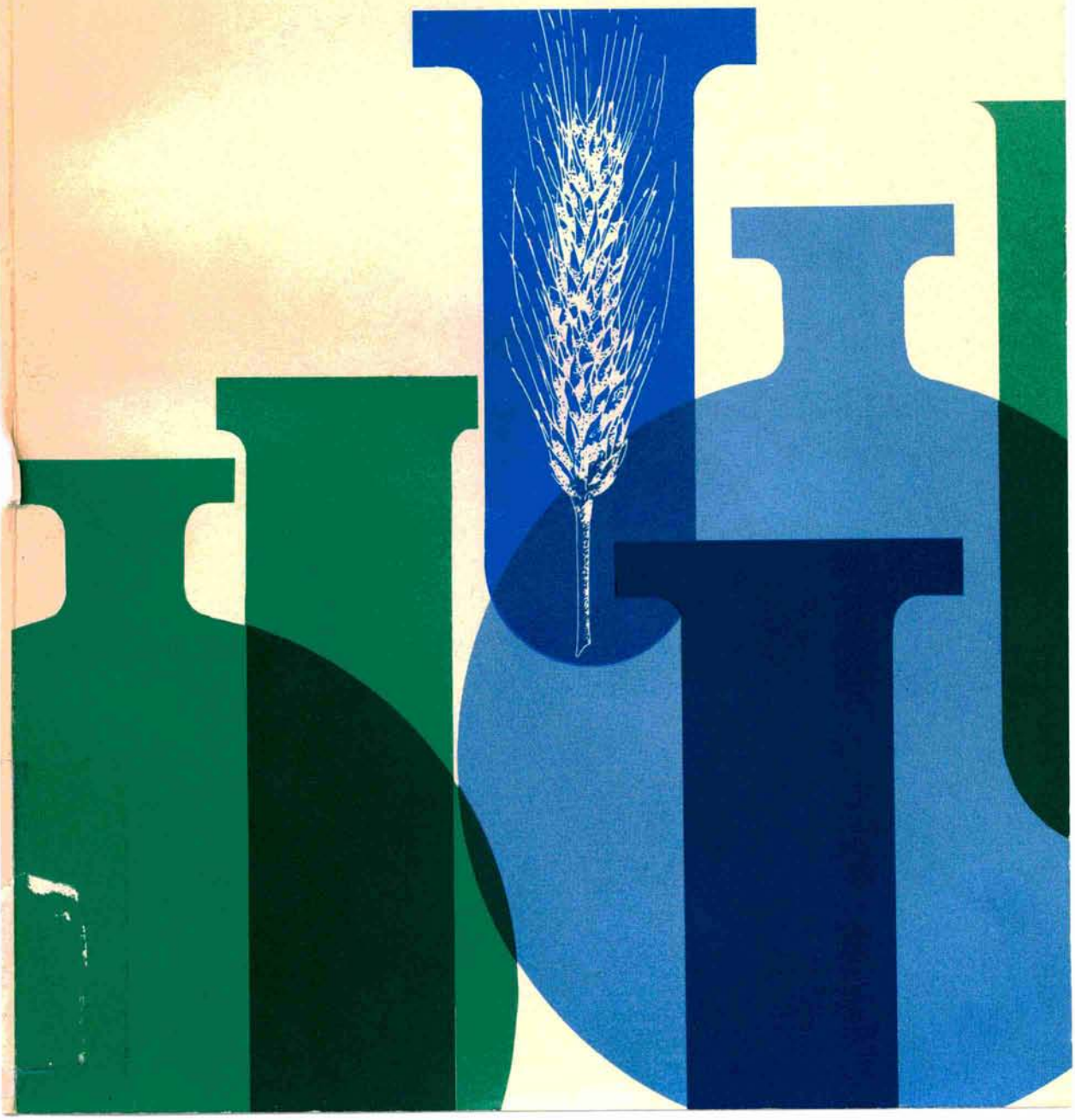
Editors: Reginald MacIntyre/Marilyn Campbell



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Editors: REGINALD MACINTYRE/MARILYN CAMPBELL

This symposium was co-sponsored by the Centro Internacional de Mejoramiento de Maiz y Trigo, the University of Manitoba, and the International Development Research Centre.

*The views expressed in this publication are those of the individual author(s) and do not necessarily represent the views of the International Development Research Centre.

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Expanding the CIMMYT Outreach Programs

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Abstract The first outreach of CIMMYT's predecessor organization was accomplished through sending out genetic material developed within Mexico. A more formal relationship was entered into through the development of the Inter-American Yield Nursery, first distributed in 1959, which later developed into the International Spring Wheat Yield Nursery, first grown in 1964–65. As well, a training program was established at CIMMYT for scientists that operated from 1960 to 1973.

CIMMYT was officially formed in 1966 and since then new nurseries have developed and more trainees have studied at CIMMYT.

When a country indicates that food production is a priority item, CIMMYT at the government's request, can assist in securing funds from agencies to meet part of the financial burden. Once this is found, CIMMYT personnel may assist in the organization of the research base and the ensuing production programs. CIMMYT can provide training for young scientists and assist in furthering the education of those who should be further trained. CIMMYT personnel can provide advice and also genetic materials or facilitate exchange with scientists in other countries. Regional activities are eventually set up that better serve the region and also tie together the various national programs.

The triticale outreach program has grown from the distribution of 30 nurseries in 1969 to 208 nurseries in 1973. Triticale was readily accepted because the CIMMYT bread wheat program had already established connections with the countries receiving triticale. Three scientists were trained within the triticale program at the request of their government in 1973. It is suggested that each country that is interested in this crop should grow the nurseries, become familiar with the crop, stay abreast of the improvements being made, and at that point, when they are confident that this is a crop suitable for their production, give it full status as a new cereal crop.

Résumé La première réalisation importante de l'organisme ayant précédé le CIMMYT a été d'expédier à l'extérieur du matériel génétique mis au point au Mexique. La création de la pépinière de multiplication inter-américaine a permis à partir de 1959 l'établissement de relations plus officielles, cet organisme étant devenu la pépinière internationale de multiplication des blés de printemps à partir de 1964–65. En même temps, de 1960 à 1973, a eu lieu au CIMMYT un programme de formation de spécialistes.

La création officielle du CIMMYT date de 1966, qui a accueilli depuis lors davantage de stagiaires en même temps que l'on créait de nouvelles pépinières.

Lorsqu'un pays fait savoir que la production alimentaire constitue pour lui une

priorité, à la demande du gouvernement le CIMMYT peut lui apporter son aide sous forme de fonds provenant de différents organismes, prenant ainsi en charge une partie du fardeau financier. Le CIMMYT peut ensuite également intervenir en fournissant du personnel qui aidera à organiser la base de recherches et les programmes de production qui en découlent. Le CIMMYT peut fournir une formation aux jeunes chercheurs et apporter son aide au parachèvement des études de ceux qui en ont besoin. Le personnel du CIMMYT peut donner des conseils et fournir du matériel génétique, ou faciliter les échanges avec les spécialistes d'autres pays. Les activités régionales sont mises en place afin de mieux desservir toute une zone géographique et unir les différents programmes nationaux.

Le programme de diffusion du triticale a pris beaucoup d'expansion, passant de 30 pépinières en 1969 à 208 en 1973. Cette céréale a été rapidement acceptée du fait que le programme du CIMMYT d'utilisation du blé pour la panification avait déjà établi des liens avec les pays recevant du triticale. En 1973, à la demande de leurs gouvernements respectifs, le CIMMYT a formé trois spécialistes dans le cadre du programme triticale. On estime que chaque pays intéressé par cette culture devrait mettre en place des pépinières, se familiariser avec cette céréale, se tenir au courant des améliorations puis, une fois assuré que le tritricale est une culture qui convient à la production locale, lui donner officiellement le statut de nouvelle culture céréalière.

OUTREACH has become a very broad and complex subject. When CIMMYT first began its outreach programs, many of the problems were rather clear-cut and definable. The basic problem was: Country X produces too little food for its people. What is CIMMYT able to do to help fill this need? The first outreach of CIMMYT's predecessor organization was accomplished through sending out genetic materials developed within Mexico. These were first sent to Latin American countries. There was also a certain outreach through the appointment of scientists such as Dr J. Rupert to Chile. He had developed his experience in Mexico. A more formal relationship was entered into through the development of the Inter-American Yield Nursery, which was first distributed in 1959. About this time, Dr Borlaug was requested to accompany Drs Harrington and Vallega of FAO to assess the needs of many countries of the Near and Middle East.

As a result of the recommendations arising out of this survey, a training program was initiated in Mexico for young scientists of this region. Although some less formal training had been done in Latin America prior to that time, in this new arrangement, trainees were selected from the region by the FAO coordinator, funds in support of the program were supplied by the Rockefeller Foundation, and Dr Bolaug and his group at CIMMYT did the training. This program operated from 1960 to 1973 and many scientists received training under its provisions.

With the advent of this first group of trainees and at their request, the Inter-American Yield Nursery was expanded and became the Near East-American Yield Nursery. Sets were increased and sent throughout the countries of the Middle East beginning in 1963. This, in turn, developed into the International Spring Wheat Yield Nursery, which was first grown in 1964–65.

Meanwhile, CIMMYT was formed officially in 1966, and since that time considerable growth has occurred. Within the wheat section, durum, triticale, and barley research were successively undertaken. New nurseries were developed, and these were duplicated in each crop. More and more trainees came. CIMMYT became directly involved in certain countries' programs with the appointment to them of CIMMYT's personnel. In all cases funding for these programs has been provided by one or another outside agency insofar as the wheat program is concerned.

The arrangements regarding personnel may take the form of a complete CIMMYT team, or a team that consists partly of CIMMYT personnel and partly of employees of other agencies.

There are now about 40 trainees per year, several visiting scientists for varying periods,

and visitors now numbering in the several thousands yearly. From the few nurseries circulated in 1960 there are now, in 1973, 1083. As late as 1971 there were 420. CIMMYT core staff have similarly increased their travel committments to different countries to advise and be advised on problems of those programs. Recently, CIMMYT has officially entered the field of regional activities through the appointment of Dr Gene Saari to the CIMMYT staff as regional pathologist, covering Asian and African national programs. At the same time, regional nurseries comprising varieties of the four crops have been instituted in both the eastern and western hemispheres to monitor disease and insect problems. Thus CIMMYT's outreach program has gradually increased in its complexity.

Regarding national programs, a start was normally made by using improved varieties and genetic materials, but this was only a start. The research organization had to be built or modified. Extension had to be joined to research. Production practices for higher yields demanded greater fertilizer supplies and governments had to react. Incentive prices were set and maintained to encourage production. The resulting increased yields strained traditional storage capacity to the breaking point. Transport was put under extreme pressure, marketing had to be developed, and second generation socio-economic problems arose.

Thus, a program that initially involved only the genetic improvement of material, rapidly developed into a very complex system of interrelated problems.

Philosophy of Outreach

I am not a believer in using the hard sell to persuade governments to accept CIMMYT services. If the government does not give high priority to agricultural research and production, it is unlikely to devote time, energy, or resources to assist its own program. There must be a desire for assistance before there can be mutual respect. Where this is lacking, any funding put into the program will pay little in the way of dividends. This will not result from any lack of interest on the part of scientists or even the administrators but because of a lack of knowledge at many levels of government of the potential benefits of research and resultant production to the country. In other words, there must be dedication to food production at all levels.

Assuming now that food production is a priority item, what can CIMMYT do to help? Firstly, at the government's request, it can try to assist in securing funds from funding agencies to meet part of the financial burden within the framework of the National Program. Usually this is that part of research costs that must be met by foreign exchange. Once this is found, it may seem desirable to appoint CIMMYT personnel to assist in the organization of the research base and the ensuing production programs. CIMMYT can provide a practical training base for young scientists, assist in identifying those who should be trained to a higher degree level, and help to find funding to support such educational programs. Its personnel from the base program can and do visit with the national programs to provide advice, based on their experience elsewhere, on problems that arise as the program develops. They can also provide genetic materials from the base program in Mexico or facilitate exchange with scientists in other countries.

We believe that all of our base scientists and those in outreach country programs should gain wide experience in the crop with which they are dealing as early as possible. As a result of this policy, all of our base scientists have travelled to the major countries involved with a particular crop with which these scientists are working directly. Without a thorough knowledge of the problems for which they are seeking a solution in support of country programs, their abilities to work toward such solutions are much impaired. All of our outreach scientists are encouraged to attend regional and base-held meetings. When a particular CIMMYT outreach scientist has special knowledge in a particular field, we will send him to another country as a special consultant. In other instances we will arrange to have outside

consultants brought in to help solve a specific problem or advise on approaches that should be taken.

Once a program is under way and is developing its own materials, the flow of germ plasm is a two-way street. In the country program, material sent from CIMMYT is reselected under the differing selection pressures of that country. Each of these selections will differ in many characters according to the intensity of selection to which they are subjected. These materials are then circulated back to the CIMMYT program and reincorporated by crossing into what Dr Borlaug calls the "genetic soup," which comprises the CIMMYT germ plasm pool. This again is sent back out to be reselected. Wider adaptation continues to develop when this process is continued either for disease resistance, weather, or other criteria.

It is natural that as numbers of country programs develop, some with direct CIMMYT personnel involvement and others with the assistance of other agencies, certain problems emerge that are common to all programs. One of the first of these is pathology, particularly that of the airborne pathogens. Another of regional nature is the coordination of distribution of materials within a region. Another might be entomological problems or agronomic problems of extensive application in a region. Still others may be training program activities within a region. At this point it is undoubtedly better to set up regional activities that will more closely and better service the region, than attempting to do this from some central point such as CIMMYT, but for coordination sake CIMMYT must have technical responsibility. These activities also serve to tie together the various national programs into a supra-national grouping. With their combined research strength, all of the countries in that group will benefit from each others active research.

Training

As outlined earlier, CIMMYT will provide a type of practical training that we hope will give young scientists a good appreciation of what is required to carry out a successful breeding program. Others will receive correspondingly greater involvement in pathology training. Still others will spend more time in quality determination in the laboratory or in other instances will learn how to conduct basic agronomic trials or production demonstrations in farmers' fields. These courses, where scientists work alongside our senior staff in the field, equip these young people to join as dynamic members of the research team in their home country.

CIMMYT also takes an active interest in arranging funding for outstanding young people whom they consider would be better equipped to help their national program with an advanced degree.

Once these young people are trained and absorbed back into national programs, we feel that governments should be sufficiently wise to place them in positions where their education will be best utilized. Further, they should receive salaries adequate to give them incentive and hold them in those positions. Unfortunately, this is seldom the case. We find scientists, sometimes with Ph.D. degrees, who are paid less than the average bellhop in a hotel in his own country. In my opinion, such a policy is short-sighted, and should raise distinct questions in the mind of CIMMYT or other institutions subsidizing such training or education, on the advisability of continuing to train people for that country.

Another area that thus far has received no attention is the training done at the undergraduate level in the national universities. Too often professors have been cut off from new ideas and new procedures. Their teaching is outdated, dry, irrelevant, and according to textbooks rather than common sense approaches. Would it not be useful to provide some funding for financing sabbatical years to send out some of the older and hence more powerful professors for refresher courses in their particular disciplines? Then we could expect to find bright young people with a well-trained background when we go in search of these for trainee positions. This is not an area in which CIMMYT is directly involved. Perhaps it is not CIMMYT's business, but it would certainly make our task easier in

imparting our type of training in support of the programs.

Within regions and at our base in Mexico, we have been involved in holding various seminars. We feel that these seminars and conferences are very valuable as long as they are focussed on specific problem areas and deal with them in depth. For example, at this present meeting, jointly sponsored by the University of Manitoba and CIMMYT, we hope that much of the present knowledge gained by the various triticale research programs can be brought together and pooled. More important in our view is that this knowledge will be transferred from one scientist to another so that each will be wiser. We also hope that the young scientists from different countries who hold responsible positions in their national programs will get to know one another, develop mutual respect, and forge those links of friendship that will assist in the exchange of ideas and materials. This latter benefit is probably more important than simply amassing the present knowledge.

Problems in the National Programs

These programs are beset by most of the stumbling blocks that can be placed in the way of progress. Sometimes funding is insufficient, salaries are generally low, or scientists are unable to communicate except through tortuous official channels with officials in their own ministry, planning commissions, or other offices. Foreign exchange is not provided for even the smallest needs that are not available in the country. If the scientist travels, his per diem is miniscule. It costs him so much money he stays at home. These and a thousand other frustrations stand in his way. Finally, if in spite of all of these, the program by some means is successful, someone is bound to say that the contribution of research is rather minor and he, the researcher, therefore, should not be recognized. Further, that since he was able to operate on nothing, it is obvious that he should continue to operate on nothing, so that available funds can be plowed into some other sink without bottom that has had a long history of failure and every expectancy of continuing in the same line. This may seem like a dismal picture, but it is part of the reality that I see on every side in my travels to the various countries, both developing and developed.

Based on this, as a background of experience, it has been my observation that when expatriate personnel are assigned within a country program, they can perform certain functions not open to the national scientist. Hopefully, they can assist as an experienced scientist in the development of the research programs. In many ways they perform an ever greater service in being the treasurer and source of a very small amount of accessible money that can be called upon for those items that spell either success or failure of the program. For example, a small item such as the filters for a Udey protein analyzer can only be purchased with foreign exchange. No foreign exchange is available. He buys the filters and the equipment continues to function. The list is virtually endless, but these are the things, minor as they may be, upon which the program succeeds or fails.

Some funding agencies have traditionally considered that a program should function in virtually all respects on the local currency except for major items or payment of salaries of personnel appointed from without. Often large amounts of money are spent to support an expatriate scientist in the country program, but he is not provided with free funds to use in just such a situation as I have described above. I cannot stress too much the importance of this aspect. It cannot be covered by a grant made to most governments because once it has disappeared into the bureaucratic system, it cannot be retrieved without the same difficulties as are experienced in retrieving their own funds. Thus, some way must be found in each assistance grant to take care of this most important feature.

The Triticale Outreach Program

Turning specifically to triticale, I would like to give some indication of the growth of out-

reach that has occurred. In materials, about 30 nurseries were distributed in 1969, the year in which the first International Triticale Yield Nursery was sent out. (Smaller distributions of material had been made earlier on a nonorganized basis where specific requests were answered.) In 1970, 52 nurseries were circulated; in 1971, the total had risen to 82; in 1972 it was 133, and in 1973, 208 were distributed.

This increase in distribution has resulted from much increased interest because of the better types of triticale available (in height, fertility, seed type, and yield), a wider knowledge gained of its potential for nutrition, possible use on dry lands, and interest in the crop because it is new. During the same period, several countries have begun serious research. India now has several centres actively working with triticale. Pakistan has two centres; Algeria wants to mount a program as part of their cereal improvement; Kenya has one man appointed on triticale research; Ethiopia is seriously interested in using this crop commercially. Many others are at a point where they are awaiting further improvements before launching a full-scale program. This, I would say, is wise, since in most instances scientific manpower is very limited. In this connection I do not wish to ignore the well-advanced programs in such developed countries as Sweden, Spain, Hungary, the USSR, and the United States. The Canadian program, principally centred at the University of Manitoba, is considered jointly with that of CIMMYT. My remarks are confined to the programs in developing countries with which we are closely associated.

I feel that CIMMYT will not have to work at expanding the outreach of materials. The triticales have been distributed to many countries in all inhabited continents. The speed with which they were accepted is no doubt due to the fact that CIMMYT's bread wheat program had already established connections with those countries.

On the training front, three scientists have been specifically trained within the triticale program at the request of their governments in the past year. This, undoubtedly, will expand as it becomes more widely known that triticale training is available. As the country programs begin to proliferate, there will be need for financial assistance to some of those countries where it has proven to be successful. In the meantime, certain characteristics of triticales need to be improved and further research done to solve certain problems. As the triticales become more widely adapted and better characterized, I see them filling needs within each country on an equal footing with the other major cereals. I consider that farmer demonstrations should be conducted in countries such as India and Ethiopia where their value has already been shown at least for some ecological conditions.

In Lebanon, empirical observations indicate that triticales have greater resistance to moisture stress than spring bread or durum wheats; in Ethiopia, triticales give higher yields than bread wheats at many locations and in this case waterlogging of the soil is widespread; in India, yields are superior to those of wheat in mountainous tracts and this is thought to be due to better acceptance of low soil pH; in Brazil, triticales have been shown to have greater resistance to *Septoria* than the better wheats.

Other countries may not want to mount full-scale programs, but use their limited manpower on the proven cereals until triticales have been more fully developed. In the meantime, each country that is interested in this crop should grow the nurseries, become familiar with the crop, stay abreast of the improvements being made, and at that point when they are confident that this is a crop suitable for their production, give it full status as a new cereal crop.

It is my feeling that although there will be a wave of specialized products produced particularly in the developed countries, the main acceptance for triticale will come from its ability to yield as well as the other cereals. It will not be sold on its superior quality but on equal or greater returns. In the countries with which we deal, the uses are likely to parallel those of the other cereals. Aside from this, triticales may well perform in a superior way in certain ecological conditions. Should

it be able to spread into the dryer areas and give better results than wheat or barley, it would be accepted on this basis.

I am sure that triticale is now at the point of its coming of age. The major problems that prevented it from being immediately suitable to production seem to have been overcome. In reaching this position the germ plasm had to be narrowed. It is indeed surprising that the materials presently available are as widely adapted as they appear to be. Its basic germ plasm is now being rapidly expanded.

I would expect that within the next 3–5 years several additional varieties may find a place in commerce. As the germ plasm base is widened, wider adaptability will be incorporated and varieties then may grow successfully over much of the cereal acreage of the world.