



Distr.  
GENERAL

DP/PROJECTS/REC/2  
3 March 1982

ORIGINAL: ENGLISH

GOVERNING COUNCIL  
Special meeting  
24-28 May 1982, Geneva  
Agenda item 3(f)

COUNTRY AND INTERCOUNTRY PROGRAMMES AND PROJECTS

CONSIDERATION AND APPROVAL OF GLOBAL AND INTERREGIONAL PROGRAMMES AND PROJECTS

Project Recommendation of the Administrator

Assistance for a global project

Research on Tropical Wheat Improvement  
(GLO/81/001)

Estimated UNDP contribution:           \$US2,500,000  
Duration:                               Five years  
Executing Agency:                       UNDP

I.    Background

1.    The Centro Internacional de Mejoramiento de Maíz y Trigo (CIMMYT) grew out of a collaborative programme between the Mexican Government and the Rockefeller Foundation. The programme, established in 1943, expanded into an international institute in 1966. CIMMYT works with scientists and national programmes around the world on the improvement of maize, wheat, barley, and triticale (which is a man-made cross between wheat and rye and has considerable potential for high yields and superior nutritional quality).

2.    All told, cereals make up over half of the world's diet. Maize and wheat - plus barley, on which CIMMYT also works - account for 60 per cent of the global cereal harvest; they are grown on more than half the cultivated land in developing countries, where they are the major sources of carbohydrate and protein. Wheat is first among the world's food crops: the staff of life

throughout the Middle East, North Africa, and the Indian subcontinent; and a secondary staple and an important commercial crop in Latin America.

World-wide, some 440 million metric tons of wheat are harvested annually from 232 million hectares. Maize is a year-round or seasonal staple for at least 500 million people throughout Latin America and in parts of Asia and Africa, and increasingly important as a feed for cattle, swine and poultry.

3. In the early 1960s, before CIMMYT became an international institution, the centre's scientists and their Mexican colleagues won the world's admiration for the dramatic success of the first high-yielding dwarf wheats. Bred in Mexico, these broadly adapted varieties were transferred to spring wheat fields at varying latitudes and altitudes around the world, where they performed better than many local varieties under rain-fed conditions and spectacularly better under irrigation. By 1977, Mexican dwarf wheats from CIMMYT were planted on 30 million hectares - almost half the wheat land in the developing countries. Wheat production in India tripled from 1966 to 1979.

4. CIMMYT's parallel Wheat and Maize Programmes pursue the goal of increasing food production in the developing countries in similar ways. Genetic improvement of maize and wheat cultivars is fundamental. Plant breeders carry out continuous programmes to produce new genotypes with the potential to respond to improved farmer management under the conditions and constraints typical of the developing countries. At each stage of development, promising types are tested and selected on the basis of local adaptation by collaborating scientists in developing countries. The best performing of these lines are eventually named and released by national programmes for local farmers.

5. Along with improved cultivars, CIMMYT develops research procedures to orient crop production programmes. These procedures are designed to identify production constraints and to develop farmer recommendations to realize the yield potential of genetically improved plants under improved management. Like new seeds, improved farming methods are developed in close collaboration with developing country scientists and tested and adapted by national programmes.

6. Social scientists in CIMMYT's Economics Programme work closely with the biological scientists to develop research procedures to identify social, cultural and economic factors that condition farmers' acceptance of improved seeds and production practices.

7. CIMMYT strengthens national agricultural research and production programmes in developing countries in a number of significant ways. Collaboration with developing country scientists and Government programmes is an inherent and vital aspect of CIMMYT's regional programmes in wheat, maize, and economics. In addition, CIMMYT scientists and technicians work directly in many national programmes, through frequent visits or long-term assignments. In turn, young agricultural graduates, degree candidates, and visiting scientists from

developing countries come to Mexico for periods ranging from a few days to a year or more in order to improve their abilities to increase crop production.

8. Wheat provides more than one-quarter of the total world cereal grains and constitutes the main food in the diet of one-third of the world's population. Spring bread wheat is the major type of wheat grown in Mexico, India, Pakistan, Egypt, the Union of Soviet Socialist Republics, Canada and Australia. Large areas are also grown in China, the Middle East, North and East Africa, Brazil, Argentina, countries of the Andean region and the Northern United States of America. Winter wheat bread is the most important food crop in the highlands of Turkey, Iran and Afghanistan, and is widely grown in Chile and Argentina. Winter wheats also predominate in Europe, Japan, China, the Republic of Korea, the United States of America, and are very important in the Union of Soviet Socialist Republics. Durum wheat provides the world's macaroni, spaghetti, other pastas and such special preparations as couscous and semolina. This type of wheat is important in the Mediterranean Region and in Argentina, Chile, the United States of America, Canada, the Union of Soviet Socialist Republics and India.

9. The objectives of CIMMYT's wheat improvement programme are to:  
(a) assist in the development of national and regional programmes; (b) develop and exchange improved genetic materials with potential for higher yield, resistance to diseases and pests and improved nutritional quality; and  
(c) train scientists from national programmes. CIMMYT's wheat programme staff constitutes a cadre with unrivalled experience in the technology of wheat production on a world-wide basis. Therefore, they are able to perform an important role in promoting, in many developing countries, the production-oriented attitudes and approaches which characterize CIMMYT's programmes. Much of their strength in doing this arises because it is widely recognized that CIMMYT provides impartial advice with no political bias.

10. Developing countries throughout much of the tropics are becoming increasingly dependent upon wheat as a relatively low-cost source of calories for their urban poor and landless populations which earn their income solely through labour. In doing so, however, they have exposed a major poor segment of their population to the vagaries of the international marketplace for cereal supplies, have allowed themselves to be subjected to external political pressures and, in times of scarcity, must spend large amounts of scarce foreign exchange resources in order to fulfill this domestic food demand. Wheat originated in the subtropical and temperate climates of the Middle East. During the centuries of its domesticated evolution, wheat spread into the temperate northern climates where later cultivators and scientists greatly improved its yield potential, the breadth of its adaptation and its resistance to the pests and pathogens most devastating in these environments. In more recent years, it is increasingly being grown in the dryer, cooler seasons in the tropics and subtropics. Yields under these conditions are relatively low because of the generally short growing seasons. In addition, the crop is frequently subjected to insect and disease outbreaks for which little research work has been undertaken and resistance developed

in commercial varieties. In addition, many countries are now attempting to grow wheat in the humid tropics. They are doing so out of concern for the foreign exchange and political issues mentioned above.

11. If sufficient disease resistance to a variety of fungus diseases could be developed, wheat could play a much more important role in the cropping patterns of poor tropical countries. It has considerable drought tolerance, a serious problem in most of these situations. It is a high yielding, short duration crop that provides high quality food which peasant cultivators find it easy to incorporate into their traditional food preparation patterns.

12. Even though the wheat is not now well adapted to the tropics, recognizing this demand, CIMMYT has undertaken exploratory research to determine if it is feasible to try to broaden the range of adaptation of the wheat crop to include the more tropical environments. Although many problems have been encountered, it now appears that substantial progress could be made in this area. In addition to screening the world germ-plasm collection for tropical adaptation, CIMMYT is presently engaged in a modest programme of crossing wheat with related tropical grass species. The objective is to see if the superior insect and disease resistance found in these tropical grasses can be transferred to wheat. It is reasonable to assume that, when enough crosses have been made, some of these gene transfers can be accomplished. In addition, it is hoped that some of the tolerance to problem tropical soils found in native grasses can also be transferred to wheat.

13. Countries across the entire Central African sub-Saharan zone are attempting to develop wheat materials adapted to their production environments. Likewise, the South Asian belt of India, Bangladesh, Thailand, the Philippines and Indonesia, are increasingly interested in developing wheat as an important food source. The tropical belts of Ecuador, Brazil, Uruguay and Paraguay are also increasing their efforts in this area. While CIMMYT recognizes that it may not be possible to achieve substantial increase in yields of tropical wheat, in view of the fact that very limited resources are presently being allocated to exploratory efforts on tropical wheat, CIMMYT strongly believes that the research effort in this area should be expanded. The Technical Advisory Committee of the Consultative Group on International Agricultural Research (CGIAR), recognizing the increasing importation of wheat flour and consumption of bread in tropical countries of the developing world, has called for increased international research efforts on the adaptation of wheat to tropical areas, directed towards some basic research aspects of yield stability, plant physiology and resistance to pests and diseases.

14. Under an agreement with UNDP for preparatory assistance in the amount of \$125,000, CIMMYT has, since July 1981, expanded its exploratory research on tropical wheat. Specifically, work has involved: (a) the continuation of the identification and assembling of the presently available germ-plasm of wheat and related species possessing agronomic characteristics desirable for warmer, subtropical areas; (b) intensive screening of these materials for

/...

the desired traits: (c) establishment of special advanced generation nurseries to facilitate the screening; and (d) identification and establishment of working relationships, where necessary, with locations for testing of advance materials. By June 1982, much of this preparatory work will have been completed. Based on the wheat materials identified for heat tolerance, earlier maturation, semi-dwarfism, disease resistance and good industrial characteristics, CIMMYT believes that a five-year project with UNDP assistance, beginning 1 July 1982, will enable CIMMYT to undertake expanded research effort on tropical wheat improvement which could yield significant results to assist tropical developing countries to meet some or all of their domestic wheat requirements.

## II. The project

15. The overall objective of the project is to develop high-yielding, disease resistant, semi-dwarf wheats that will perform well in the warmer subtropical areas of the world. More specifically, the research objectives are to develop wheat germ-plasm with the following characteristics: (a) wide adaptation and higher yield; (b) insensitivity to day length; (c) better heat tolerance; (d) higher tillering ability; (e) varying maturity to fit different environments; (f) semi-dwarf stature to withstand lodging; (g) acceptable milling and baking qualities; and (h) resistance to a wide range of fungi in different tropical environments.

16. To accomplish the above objectives in an expeditious manner and to facilitate the distribution and adoption of suitable germ-plasm, the following activities will be undertaken:

(a) Shuttle breeding involving the growing of alternate breeding cycles in diverse production environments. The seeds of superior selections will be shuttled back and forth between different research locations (e.g. Mexico and Argentina; China and Brazil; Mexico and Bangladesh; Mexico and Brazil, etc.) and used as crossing materials to pyramid disease resistance and to achieve desired agronomic characteristics in the materials;

(b) International testing to facilitate selection of improved varieties through distribution of three specialized nurseries to co-operating developing country scientists participating in the project. These nurseries will include a special subtropical screening nursery containing the most advanced lines developed through the project. The data generated will be used to evaluate the performance of project materials undergoing improvement under target country environmental conditions. The costs associated with the distribution and data analysis of these nurseries will be absorbed by CIMMYT and not charged directly to the UNDP project;

(c) Training and conferences to assist the exchange of information and experiences emanating from CIMMYT's activities under this project. Qualified developing country personnel will be trained in: (i) the development of new varieties; (ii) agronomic research (on-station and on-farm); and (iii) disease

/...

methodology. Regional workshops and conferences will be scheduled almost every year to bring CIMMYT and developing country scientists to focus on research progress and problems of the project. Approximately 30 per cent of project costs will be devoted to training and conferences. CIMMYT will also provide through this project basic items of research equipment which are lacking in many countries.

17. UNDP funds will be used by CIMMYT to provide: (a) one plant breeder to act as project co-ordinator to be based in Mexico; (b) two plant breeders, one located in Mexico and one outside Mexico to be supported by CIMMYT's plant pathology staff; and (c) funds for travel of project staff, fellowships, workshops and conferences, limited field and laboratory equipment, publications, vehicles and office expenses.

18. The Administrator intends, through contractual arrangements between CIMMYT and UNDP, to entrust the implementation of this project to CIMMYT with the clear understanding that the Director-General of CIMMYT will seek the advice of the Food and Agriculture Organization of the United Nations (FAO) as and when needed. As in the past, UNDP will follow closely all the developments in this global project and, together with FAO, will participate in the Project Advisory Committee which will be established for the project. A concerted effort will be made to link the training and research activities with field work being undertaken at the country and intercountry levels. Close collaboration will be maintained at all times with national agricultural research centres participating in the project. The Project Advisory Committee, which will include representatives of selected national co-operating centres, normally will meet once a year or at such times or places deemed appropriate. The Committee will appraise the ongoing training and collaborative research programmes and advise on its future direction. Towards the end of the project, UNDP will, in consultation with CIMMYT, undertake a review of the accomplishments of the project to be carried out by a team of independent consultants.

19. The expenditure components of the proposed UNDP assistance are:

	<u>US\$</u>
Subcontract	2 415 000
UNDP direct costs	<u>85 000</u>
Total	<u>2 500 000</u>

The proposed UNDP contribution will be contained within the Global IPF established by the Governing Council for the current cycle.