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PROGRAMME PLANNING

COUNTRY AND INTERCOUNTRY PROGRAMMES AND PROJECTS

Assistance for a global project

Centro Internacional de Mejoramiento de Maíz y Trigo (CIMMYT)

Development of Wheat Varieties for Marginal Areas (GLO/87/003)

Recommendation of the Administrator

| | |
|-----------------------------|-------------|
| Estimated UNDP contribution | \$2 600 000 |
| Duration | Three 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). The first three crops provide the principal sources of calories and protein for approximately half of the world's population. They are the staple foods of some of the poorest people in many developing countries.

2. CIMMYT fulfils its mission in the following ways:

- (a) Conducting research in Mexico and elsewhere;
- (b) Distributing superior germplasm to national programmes for higher and more dependable yields and higher nutritional quality;
- (c) Developing procedures for crop improvement and crop management research;
- (d) Conducting applied training for scientists from developing countries;
- (e) Sponsoring technical seminars and publishing information on new technological components;
- (f) Consulting with developing countries on the organization of maize and wheat research programmes; and
- (g) Assigning specialists to work in regional and national programmes in Asia, Africa and Latin America. CIMMYT serves as the hub of collaborative research with maize and wheat scientists in more than 125 countries around the world.

3. The best-known contributions of CIMMYT are in wheat with over 35 million hectares in developing countries planted to hundreds of improved varieties emanating from germplasm distributed by the Centre. The investment made in the development of these varieties has resulted in an impressive return estimated at approximately \$3.0 billion per year. In addition to the contributions in germplasm development, CIMMYT has made significant contributions to training wheat researchers in national programmes in developing countries; over 2,000 scientists have been trained in various aspects of wheat improvement during the last 20 years.

4. Originating in the subtropical and temperate climates of the Middle East, wheat spread over the centuries into temperate northern climates. There, cultivators and scientists later improved its yield potential greatly, as well as the breadth of its adaptation and its resistance to the pests and diseases most devastating in these environments. Developing countries throughout much of the tropics are also becoming increasingly dependent upon wheat as a relatively low-cost source of food for their urban poor and their landless populations. Some wheat is home-grown in the tropics and subtropics during the drier, cooler seasons, but yields are relatively low because of the generally short growing seasons. The crop also suffers much damage from insects and diseases, since little research has been done to develop resistance to tropical pests in commercial varieties. Tropical countries must therefore import wheat to satisfy domestic demand, using up scarce foreign exchange.

5. Exploratory research conducted by CIMMYT led to the belief that wheat could play a much more important role in tropical countries if resistance to a variety of fungus diseases and insect pests could be overcome. Wheat has considerable tolerance to drought, is a high-yielding crop of short duration, and provides high quality food which is readily accepted. With UNDP assistance since July 1982,

CIMMYT has been carrying out the following activities covering the research programme to adapt wheat to warmer climates:

- (a) Crossing wheat with related tropical grass species to determine if their disease and insect resistance can be transferred;
- (b) Identifying and assembling available germplasm of wheat and related species possessing agronomic characteristics desirable for warmer, subtropical areas;
- (c) Screening of these materials intensively for desired traits;
- (d) Establishing special advanced generation nurseries to facilitate screening; and
- (e) Arranging multi-location testing for advanced materials.

6. In addition to the programme outlined above, the project is training selected developing country personnel in the development of new varieties, agronomic research and insect and disease methodologies. Regional workshops and conferences are being held to bring CIMMYT and developing country scientists together to discuss research progress and problems. The project has also provided modest basic equipment which is lacking in many countries. Good co-operation has been established with research programmes in Bangladesh, Thailand, Indonesia, Sri Lanka, China and Brazil. Since development of wheat varieties adapted to tropical climates through plant breeding takes a minimum of 10 years, further work is fully justified on the basis of the valuable groundwork already laid and the promising preliminary results. Furthermore, it is entirely possible that wheat could be adapted to withstand other environmental stresses such as acidity, alkalinity, salinity and aluminium toxicity which prevail in larger areas of the marginal lands of the world. While CIMMYT preliminary screening shows that certain strains of wheat can withstand these adverse conditions, an expanded research effort would be required to screen, test and adapt these strains to different agro-ecological conditions through a network of co-operators in selected developing countries. Success in any such effort could offer benefits to small farmers living in marginal areas with unfavourable conditions.

The development of varieties suited to adverse environmental conditions would benefit many countries in Asia (e.g. India, Pakistan, Bangladesh, Thailand, China, Afghanistan, the Islamic Republic of Iran, etc.) and South America (e.g. Paraguay, Brazil and Bolivia). An advisory committee of experts which met in Thailand in January 1987 has strongly recommended further support to the research outlined above. An external panel of independent consultants commissioned by the Technical Advisory Committee of the Consultative Group on International Agricultural Research (CGIAR), which recently reviewed the work of CIMMYT, has also recommended that an increased research effort aimed at developing varieties with yield stability and resistance to pests and diseases be mounted to adapt wheat to regions with adverse environmental stress.

II. THE PROJECT

7. The overall objective of the project is to develop wheat varieties with stable yields and resistance to pests and diseases which will perform reasonably well under various environmental stresses prevailing in marginal areas of the tropics. More specifically, the research objectives will be:

(a) Improvement of germplasm with such desirable characteristics as heat tolerance, early maturity, tillering ability, acceptable processing and cooking qualities, resistance to bacterial and fungal diseases and tolerance to salinity, acidity, alkalinity and aluminium toxicity; and

(b) Development of improved agronomic practices, including soil and water management, use of green manures and rotations with leguminous crops to minimize application of chemical fertilizers and control of weeds, diseases and insects using integrated approaches designed to reduce use of toxic chemical pesticides.

8. To attain the above objectives expeditiously and to facilitate the distribution and adoption of suitable germplasm, the following activities, some of which are already in progress, will be expanded and intensified:

(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 resistance to various stresses and to achieve desired agronomic characteristics in the materials;

(b) International testing to facilitate selection of improved varieties through distribution of specialized nurseries to co-operating developing country scientists participating in 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 strengthen national programmes and to facilitate exchange of knowledge and experiences will consist of:

- (i) In-service training in Mexico for young scientists with much hands-on training in the fields of variety development, wheat production, and disease methodology (10 trainees each year);
- (ii) Support for visiting scientists (experienced researchers) who want to become more familiar with wheat research at CIMMYT or at other locations of importance (seven each year);
- (iii) Regional workshops which bring together people from different countries who are working with similar problems or for similar environments (two workshops per year); and

(iv) A conference that addresses global wheat problems and research progress (in the third year).

9. In addition to the training components, which will receive approximately 30 per cent of the UNDP contribution, the project will also provide to national programmes basic items of equipment for breeding and agronomic work.
10. UNDP funds will be used to finance the following specialists: one plant breeder at CIMMYT headquarters to function as project co-ordinator, two plant breeders, one to be located in South-East Asia and one in the Southern Cone of South America and one agronomist to be posted in the Southern Cone. Other specialists when needed will be provided from the CIMMYT core budget.
11. The research and training programmes described above - for which full descriptions, including the countries expected to participate, will be made available to UNDP upon project approval - will be implemented by CIMMYT in collaboration with national research institutions of developing countries. As indicated earlier, special conferences, seminars and workshops will be arranged as needs arise. Participants in those events, as well as training courses, will be carefully selected by CIMMYT, in consultation with appropriate national agencies.
12. In order to assess the impact of the project activities at the farm level and to measure the effectiveness of the various training programmes, UNDP will provide funds, under its own direct cost component, for the consultancies required in order to undertake an independent evaluation. It is anticipated that such an assessment will be made at two different periods: midway in the course of the project and at the end. Visits will be made to selected countries in order to provide adequate coverage of the countries involved so that the assessment will be meaningful. Special attention will be given in that evaluation to the outcome of the project with regard to strengthening national wheat improvement and extension programmes and the utilization of new technologies by farmers resulting in increased production.
13. 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 needed. As in the past, UNDP will follow closely all of the developments in this global project and, with FAO, will participate in the Project Advisory Committee which will be established. A concerted effort will be made to link the training and research activities with field work being undertaken at the country and intercountry levels. FAO assistance will be sought in implementing national trials and the introduction of new varieties and hybrids as they are developed. The Project Advisory Committee, which will include representatives of selected national agricultural research centres, will meet normally once a year, or at such times and places as deemed appropriate by CIMMYT. It will appraise the ongoing training and collaborative research programmes and advise on its future direction. Towards the end of the project, UNDP, in consultation with CIMMYT, will undertake a review of the accomplishments of the project to be carried out by a team of independent

consultants. This review will take place in conjunction with the assessment referred to in paragraph 11 above.

14. The proposed UNDP contribution is \$2,600,000, of which \$2,437,000 will be for sub-contracts, while direct costs will account for the remaining \$163,000. The expenditures under the project will be contained within the IPF available for global projects established by the Governing Council for the fourth cycle.

III. RECOMMENDATION BY THE ADMINISTRATOR

15. The Administrator recommends that the Governing Council approve this project.
