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PROGRAMME PLANNING

COUNTRY AND INTERCOUNTRY PROGRAMMES AND PROJECTS

Assistance for a global project

International Crops Research Institute for the Semi-Arid Tropics Technology Transfer on Selected Food Crops for the Semi-Arid Tropics (GLO/87/002)

Recommendation of the Administrator

Estimated UNDP contribution	$4 900 000
Duration	Three years
Executing agency	UNDP

I. BACKGROUND

1. The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) was created by the Consultative Group on International Agricultural Research (CGIAR) in 1972 on the recommendation of its Technical Advisory Committee to conduct crop improvement and farming systems research in the semi-arid tropics in order to improve the nutrition and welfare of the rural poor dependent on rain-fed agriculture. The seasonally dry semi-arid tropical areas are spread over nearly 20 million square kilometres and cover all parts of 50 nations on five continents. They include much of South Asia, parts of South-East Asia, West Asia, Australia, two wide belts of Africa, areas of South America and Central America and much of Mexico.

2. The semi-arid tropics are a harsh region of limited, erratic rainfall and nutrient deficient soils. It is populated by more than 700 million people, most of whom live at subsistence levels and depend for their food on the limited production of small farms. The crops researched by ICRISAT are sorghum and millet, two of the major cereals in the semi-arid tropics and chickpea, pigeonpea and groundnut, the most important legumes of the region. Groundnut, rich in oil, is also an important cash crop for farmers in the semi-arid tropics. The four other crops are primarily subsistence food crops. Over half the total production of each, in some places nearly all of it, is consumed on the farms where it is grown.

3. ICRISAT headquarters are located near Hyderabad, India, but it also has scientific staff posted in nine countries of Africa, in Mexico, in Syria, and at six co-operative research stations of agricultural universities in India. Principal operations in Africa are in Burkina Faso, Kenya, Malawi, Mali, Niger, Nigeria, Senegal, Sudan and Zimbabwe. The main base of the future work of ICRISAT will be at the new Sahelian Centre near Niamey, Niger. Thirteen principal scientists located in different countries of the region are mounting an international effort to cope with the harsh environmental conditions of the Sahel. Several donors are assisting these programmes, including the construction of new offices and laboratories for the Sahelian Centre.

4. The main objectives of ICRISAT are:

(a) To serve as world centre for the improvement of grain yield and quality of sorghum, millet, chickpea, pigeonpea, and groundnut and to act as world repository for the genetic resources of these crops;

(b) To develop improved farming systems that will help to increase and stabilize agricultural production through more effective use of natural and human resources in the seasonally dry semi-arid tropics;

(c) To identify constraints to agricultural development in the semi-arid tropics and evaluate means of alleviating them through technological and institutional changes; and

(d) To assist in the development and transfer of technology to the farmer through co-operation with national and regional research programmes, and by sponsoring workshops and conferences, operating training programmes, and assisting extension activities.

5. Sorghum is a major source of food grain in the semi-arid tropics, which contain about 87 per cent of the world's acreage in sorghum, but accounts for 60 per cent of world production. In general, sorghum yields in the semi-arid tropics are very low - the average yield in India, a leading sorghum-producing country, is 750 kg/ha, whereas it is 3,500 kg/ha in the United States of America. Large increases in sorghum yields in the semi-arid tropics will require not only improved varieties and hybrids but also improved farming practices. Pearl millet, which is grown in environments of extreme drought, is the most important crop in the semi-arid tropics, providing food for some of the poorest countries and poorest people. Average yields are low, ranging from 420 kg/ha in India to 520 kg/ha in

Sahelian Africa. The control of diseases and pests and the development of early maturing varieties can significantly increase millet yields. Chickpea and pigeonpea are important pulse crops of dryland agriculture in Asia, Africa and Central and South America. Chickpea is grown in the Indian sub-continent, West Asia, the Mediterranean region, Ethiopia and Mexico. Pigeonpea is grown in the Indian sub-continent, Burma, Thailand, parts of Africa and Central America. These two crops constitute important dietary items as a source of protein in many semi-arid tropical countries, and are generally grown under erratic rain-fed conditions with little or no inputs. Yields are, therefore, generally low. Pests and diseases further depress yields. The control of pests and diseases of chickpea, pigeonpea and groundnut, another important legume, together with maximizing biological nitrogen fixation through these crops can enrich the soil, thus benefiting cereal crops which can be part of the intercropping or rotation system.

6. Since its inception, ICRISAT has received substantial UNDP assistance for its sorghum and millet improvement programmes, both at ICRISAT headquarters in India and also in the Sahelian countries referred to above. Through sustained support from UNDP, which has now been supplemented by other donors, ICRISAT has made considerable headway in the development of several improved varieties of sorghum and millet. These varieties have been released in Burkina Faso, Burma, Ethiopia, Guatemala, Kenya, Malawi, Mexico and other countries. The development of a hybrid sorghum by ICRISAT in association with the national programme of Sudan is a spectacular achievement, since this variety produces three times the yield of the local variety.

7. More specifically, drawing on a world germ-plasm collection of over 19,000 and 12,000 strains of sorghum and millet respectively, significant achievements of genetic breeding and trials on these crops under different agro-ecological conditions have been made, as follows:

(a) Ten sorghum cultivars developed for distribution or final intensive evaluation in Ethiopia, Kenya and Venezuela;

(b) Nine sorghum hybrids provided for co-ordinated trials all over India, as well as some 150 new parents for further evaluation in hybrid combinations;

(c) Sorghum strain with resistance to grain mould developed and released for cultivation in China and African and Latin American countries;

(d) Techniques improved for evaluating food uses of sorghum;

(e) Return of 244 per cent on investments by farmers participating in trials on intercropping pigeonpeas with sorghum;

(f) Ways devised to evaluate seedling response to heat and moisture stresses for both crops;

(g) Pearl millet cultivar with promising resistance to downy mildew contributed for Indian national trials;

(h) Millet lines developed with promising resistance to ergot (a fungus disease); and

(i) Regional trials and exchange nurseries for millet initiated in many African countries.

8. Training in improved techniques of sorghum and millet production, which emphasizes African countries, has been given to over 450 specialists, including 200 scientists and technicians from 40 countries who trained for six to eight months in cereal improvement and production. Several M.Sc. and Ph.D. research students from different countries were trained. To enable sorghum and millet scientists from developing countries to exchange knowledge and experience, ICRISAT has hosted several workshops, conferences and symposia and produced over 100 articles and/or publications.

9. The research programmes of ICRISAT on chickpea, pigeonpea and groundnut, as well as farming systems, supported by several donors excluding UNDP, have made notable achievements. Several varieties of the three legumes possessing yield stability, resistance to pests and diseases and the ability to withstand the physical stresses of the semi-arid environment have been developed and released through various national programmes. Excellent international co-operation has been developed through multi-country testing trials, conferences and workshops. ICRISAT is also providing training to large numbers of developing country personnel in all aspects of the improvement of the three legumes and farming systems research. In regard to the latter, ICRISAT has developed strong disciplinary research on the optimum utilization of land, water and other farm resources in order to increase crop production in the resource-poor regions of the semi-arid tropics.

10. The overall progress and accomplishments of the ICRISAT programmes were evaluated at the end of 1984 by a panel of independent consultants appointed by the CGIAR Technical Advisory Committee. This panel strongly recommended the continuation of external assistance on a long-term basis to permit the expansion of the research and testing activities, together with the enlargement of an intensified training programme to benefit, in particular, those countries where agricultural research systems are still weak. The research and training programmes sponsored by UNDP form an essential and indispensable part of a larger effort of several bilateral and multilateral agencies which are providing substantial inputs of seeds, fertilizers, pesticides and agricultural implements, together with additional technical assistance, to help build up national capabilities in increasing food production in the concerned countries with special attention being given to African countries.

II. THE PROJECT

11. The main purpose of the project is to enable ICRISAT to impart training to national staff and to develop and transfer breeding material and technology relevant to semi-arid tropical food crops, which in turn will make food crop production more efficent in the agro-economic systems of the semi-arid tropics. To achieve these objectives, it is proposed to carry out the following activities:

(a) Develop improved varieties of pearl millet, sorghum, chickpea, pigeonpea and groundnut that are well adapted to the variable and unpredictable agricultural environment of the semi-arid tropics;

(b) Develop techniques that allow efficient screening of breeding lines for adaptation to major stress factors associated with agro-ecosystems in the semi-arid tropics;

(c) Transfer selected varieties and techniques developed at ICRISAT to national programmes for use in their crop improvement programmes; and

(d) Provide training, and technical and other support services to national programmes: (i) to make their research programme more efficient; (ii) to ensure that varieties and farming technology developed by national programmes, through assistance from ICRISAT, reach the farmers; and (iii) to ensure that stable high-level production is realized from year to year by providing technical advice on seed multiplication, pest surveillance and extension service.

12. ICRISAT will continue its ongoing activities: the development of breeding materials for use by national programmes, and strategic and adaptive research to make breeding programmes more effective. The major components of this project, however, are technology and the transfer of improved varieties of the five food crops to national programmes by collaborative research and networking among the national programmes and training of national scientists.

13. The specific objectives of strategic and adaptive research which ICRISAT proposes to carry out under this project, which will be an integral part of the core programmes of ICRISAT, will assist national programmes in:

(a) Adaptation of strains of the crops concerned in order to develop improved varieties with yield stability under different biotic and abiotic stresses. The biotic factors are resistance to pests and diseases, while abiotic stresses include tolerance to drought, nutrient deficiencies and high temperatures;

(b) The development of crops with high nutritional quality, acceptable taste, improved baking quality in sorghum and millet, desirable characteristics of sorghum for production of alcoholic beverages, and an acceptable yield of fodder quality of crops concerned, for use as livestock feed;

(c) The development and transfer of improved agronomic practices and farming system methodologies to achieve optimum crop yields; and

(d) The training of adequate numbers of developing country personnel in all aspects of the programmes.

14. UNDP funds will be provided to develop and transfer improved varieties of food crops and the technology relevant to these crops to national programmes. The project will also provide training and technical support to national programmes to make their research efforts more efficient and to ensure that the improved crop varieties will be made available to the farmers through the national extension

services. Strong co-operative links will be established with national scientists who will participate in ICRISAT multi-locational testing of crop varieties in order to screen them for adaptation to insect pests and diseases and other environmental stresses in the semi-arid tropics. ICRISAT headquarters in India, as well as the newly established Sahelian Centre in Niamey (Niger), will provide all necessary backstopping in the implementation of the research, training and development activities of the project.

15. With the increasing population of the semi-arid tropics, the food production gap is progressively widening. Many of the countries of the semi-arid tropics are presently importing substantial quantities of food from abroad. Based on the research results of ICRISAT in several countries of the semi-arid tropics, many of the crops investigated by ICRISAT have substantial yield potential. Improved and staple yields of these crops will provide adequate food, alleviate hunger, overcome malnutrition and generate cash incomes for the small farmers of the semi-arid tropics. UNDP inputs will serve as a catalyst to the core operations of ICRISAT, to which substantial financial assistance will be provided by the CGIAR donor group over the next several years. Since the proposed UNDP project will concentrate mostly on training and technology transfer, it will be crucial to the successful development of ICRISAT programmes to benefit the developing countries of the semi-arid tropics.

16. The research and training programmes described above, for which full descriptions including the countries expected to participate in them will be made available to UNDP on project approval, are to be implemented by ICRISAT in collaboration with national research institutions of developing countries. As already indicated, special conferences, seminars and workshops will be arranged as needs arise. Participants in those events as well as training courses for them will be carefully selected by ICRISAT, in consultation with appropriate national agencies.

17. 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, under its own direct costs component, funds for required consultancies 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 around the world 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 programmes on improvement of the concerned crops as well as extension programmes and the utilization of new technologies by farmers resulting in increased production. Provision will also be made to hold one or two workshops in agro-forestry, which involves intercropping of trees with food crops so as to prevent soil erosion and to sustain the food production systems.

18. The Administrator intends, through contractual arrangements between ICRISAT and UNDP, to entrust the implementation of this project to ICRISAT, with the clear understanding that the Director-General of ICRISAT 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 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. 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 normally meet once a year, or at such times and places as deemed appropriate by ICRISAT. 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 ICRISAT, 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 17 above.

19. The proposed UNDP contribution is $4,900,000 of which $4,500,000 will be for subcontracts, while direct costs will account for the remaining $400,000. The expenditures under the project will be contained within the indicative planning figure available for global projects established by the Governing Council for the fourth cycle.

III. RECOMMENDATION BY THE ADMINISTRATOR

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