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COUNTRY AND INTERCOUNTRY PROGRAMMES AND PROJECTS

CONSIDERATION AND APPROVAL OF GLOBAL AND INTERREGIONAL PROGRAMMES AND PROJECTS

Project Recommendation of the Administrator

Supplementary assistance for a global project

International Rice Testing and Improvement Programme  
(GLO/79/003)

Estimated UNDP contribution: US\$600,000  
Duration: Two years  
Executing Agency: UNDP

I. Background

1. Since 1975, under the global agricultural research programme of UNDP, substantial financial assistance is being channelled to rice improvement research at the International Rice Research Institute (IRRI). During the period 1975-1979, a sum of nearly \$2 million was provided to launch an international rice testing programme (IRTP). The main objective of IRTP was to enable developing country rice scientists to participate in the systematic evaluation and development of the many diverse strains of rice adapted to different agro-ecological conditions, by means of an expanded international testing effort and by training in genetic evaluation and utilization. The project results to date are impressive. Several high performance varieties were identified in tests and trials in over 50 countries around the world, under widely varying conditions such as cold, drought, salinity, alkalinity, acidity, diseases and insect pests, etc. Training and scientific collaboration have developed rapidly. By 1981, over 250,000 seed

packets of more than 2,500 rice varieties were sent to over 50 countries for trials. Several promising rice varieties have been identified and yields of some of these entries are substantial at the farm level. Varieties adapted to limited rainfall and adverse soil conditions would be particularly beneficial to small farmers living in these regions. The project has developed a computer-based system for analysis of trial results and dissemination of information, and has strengthened collaboration among rice scientists from Asia, Africa, the Middle East and Latin America through numerous conferences, workshops, seminars, monitoring tours and training programmes. Through the above activities, IRTP has now become an indispensable and invaluable vehicle for technical co-operation among rice scientists of developing countries for the exchange of improved rice germ-plasm, knowledge and experiences in increasing rice production.

2. As a follow-up to the above project, the UNDP Governing Council approved, in January 1980 <sup>1/</sup>, further financial assistance over a five-year period amounting to nearly \$7.8 million. The new project, which has been operational for over a year, provides for a greatly expanded network of international rice nurseries, germ-plasm collection, co-operative research networks on innovative techniques for rice breeding and improvement and for an enlarged research programme on biological nitrogen fixation in rice paddy soils.

3. The yield potential of wetland rice under properly managed agronomic practices is conditioned by the agroclimatic environment. Under fully irrigated conditions, where water throughout the growing period of the rice crop is not a constraint and biological stresses are negligible, the yield potential is undoubtedly related to atmospheric parameters, such as air temperature and, in particular, solar radiation. Real-time weather observations at many experimental sites where yield trials are carried out lack information on incoming global radiation. The value of the yield trials of IRTP could be substantially increased if the interaction between the varieties (genotypes) and environment could be established, particularly so because this added information could become an operational tool for extrapolation of information on varietal behaviour to other similar environments. The results would also give rice breeders additional and more specific information on yield limitations imposed by local weather factors. Furthermore, agronomic practices such as fertilizer application rates could be designed to increase the yield potential of different varieties if interactions between genotypes and environmental factors are better established.

4. The irrigated yield nurseries of IRTP are presently grown in 52 countries. They offer a unique opportunity to obtain a better understanding of the response of rice varieties to climatic differences. Selection of varieties for specific agroclimatic environments should be greatly improved by the additional information.

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<sup>1/</sup> DP/PROJECTS/R.12/Add.2.

5. About two-thirds of all rice farmers cultivate their crop under rainfed wetland conditions without fully controlled irrigation facilities. The yield potential under those conditions is limited by the water available to the crop during its growing period.
6. The effects of water stress on rice yield are as yet incompletely understood. Rice is more sensitive than most crops to water stress, and more information is needed before appropriate monitoring systems for wide use in rainfed rice yield nurseries can be recommended. Analysis of rice production potential under rainfed wetland conditions, therefore, will initially be determined at a few locations only, but with more detail recorded.
7. Under these conditions, the interaction between genotype and its environment is more complex, because there is also interaction between genotype and the soil factors and landscape position which strongly influence water availability to the crop. The combined interactions can be expressed as an accumulated water balance model. Such a model describes at any period in time the available amounts of water, taking into account water added from atmospheric sources (precipitation), from landscape sources (superficial as well as subsurface flow), and water held by the soil against gravity. The accumulated water balance also accounts for amounts of water taken away due to atmospheric forces (evaporation), due to landscape and soil factors (external runoff, internal percolation and seepage) and due to plant characteristics (absorption of water by the root system and transpiration of water through the leaf area of the crop canopy).
8. Not only are current weather observations called for, but, simultaneously, current soil and plant observations are required if the mechanisms of the accumulated water balance and the effects of water limitations on the growth and yield potential of the rice crop are to be determined. Interpretation of the real-time climate, soil and plant observations in relation to crop production will enable the suitability of drought resistance and submergence in tolerant varieties to be assessed in relation to their performance in different locations. This information will be valuable to plant breeders as well as agronomists and soil scientists in characterizing the soil potential in relation to rice production. The information will also be valuable to cropping systems scientists because it will give them a tool to characterize better the climatic environment in relation to the potential to introduce more intensive cropping systems.
9. Analysis of potential yield, and number of crops to be grown per year, under rainfed wetland conditions, under a variety of climate-soil combinations that are representative for the rainfed wetland rice growing environments, should ultimately be possible, using the information collected.
10. Preparatory assistance in the amount of \$125,000, approved by UNDP in November 1981, has enabled IRRI to prepare the necessary groundwork, including the development of a framework for conducting suitable investigations to supplement information on the behaviour of rice varieties in different climatic environments and varietal differences in stability of yield performance in diverse environments as currently obtained from the IRTIP nurseries.

Additionally, sites have been chosen for receiving agrometeorological equipment to record weather-related data. A project advisory committee consisting of country co-operating scientists has been set up. A programme to relate rice production to weather conditions has been initiated.

## II. The project

11. The main purpose of the supplementary assistance is to enable IRRI to undertake expanded research on rice/weather relationships over a two-year period. Specifically, the expanded effort will involve:

(a) Establishment of a network of agrometeorological stations at the locations of the experimental nurseries of the IRTP programme, including both irrigated and rainfed sites, in co-ordination with the national rice research organizations and the national meteorological services, with emphasis on global radiation measurements;

(b) Analysis of rice production in relation to radiation flux density and air temperature under fully water controlled conditions;

(c) Testing yield potential models with real-time weather data;

(d) Development of an accumulated water balance model in relation to rainfed-wetland rice-based cropping systems; and

(e) Analysis of rice production in relation to the accumulated water balance model under rainfed conditions.

12. The above activities will be under the supervision of a senior scientist who will also be directly involved in the development of the water balance models. The project will be implemented in close collaboration with the World Meteorological Organization (WMO). One WMO consultant will be primarily concerned with the instrumentation of the various sites, and the training of staff to use and maintain the meteorological equipment installed. Another (IRRI) will advise and assist in the processing and analysis of the collected data, particularly with respect to computer based analysis methods.

13. The immediate output of the project will be the additional information about the suitability for different locations of the rice varieties released by national programmes from the IRTP nurseries. This information will reduce substantially the number of further yield trials which must be conducted to determine the suitability of the varieties for specific localities. The information would also be of value to the rice breeders in many national programmes, enabling them to recognize those varieties which are adapted to specific climatic conditions, and utilizing them as parents to improve materials to be produced for those areas. It will also identify those varieties which are widely adapted for many environments. The characterization of the performance of rice varieties in rainfed environments will enable those varieties tolerant of different degrees of drought stress and

flooding, occurring at different stages of plant growth, to be more readily recognized, and hence the rate at which rice varieties can be selected for these non-irrigated environments will be increased.

14. The Project Advisory Committee will meet in 1983 and 1984 to discuss progress and advise on future programme. In 1983, the meetings will be held as part of a workshop, to which several plant breeders and other national programme scientists responsible for the conduct of the trials will be invited. This workshop will focus on the response of different rice varieties to weather variables, the selection of varieties for inclusion in future trials, and the choice of sites and weather variables for further examination. Papers presented at the workshop, and the conclusions of the workshop will be published, as well as the results and conclusions arising from the project.

15. Training activities will include instruction in the operation and maintenance of the weather stations, participation in the workshop, participation in monitoring tours conducted by IRTP and visits to sites included in the project.

16. The Administrator intends, through contractual arrangements between IRRI and UNDP, to entrust the implementation of this project to IRRI, with the clear understanding that the Director-General of IRRI will seek the advice of the Food and Agriculture Organization of the United Nations (FAO) and WMO as needed. As in the past, UNDP will follow closely all the developments in this global project and, together with FAO and WMO, will participate in the Project Advisory Committee. 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 research centres participating in the project. Towards the end of the project, UNDP will, in consultation with IRRI, undertake a review of the accomplishments of the project. The review will be carried out by a team of independent consultants.

17. The expenditure component of the proposed UNDP assistance is:

	<u>US\$</u>
Subcontract	550 000
UNDP Direct Costs	<u>50 000</u>
Total	<u>600 000</u>

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

